# Rosemount™ 8800D Series Vortex Flowmeter



**HART**
COMMUNICATION PROTOCOL

**EMERSON**™
**Process Management**

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# Rosemount™ 8800D Series Vortex Flowmeter

⚠ **CAUTION**

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.

⚠ **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.

⚠ **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.

# Section 1 Introduction

## 1.1 How to use this manual

This manual provides installation, configuration, operation, troubleshooting, and other procedures for the use of the Rosemount™ 8800D Vortex Flowmeter. For model code ordering information, see the Rosemount 8800D Series Vortex Flowmeter Product Data Sheet.

Section 2: Configuration contains information on entering and verifying basic configuration parameters.

Section 3: Installation contains mechanical and electrical installation instructions.

Section 4: Operation contains information on advanced configuration parameters and functions that can aid in maintaining the 8800D.

Section 5: Troubleshooting provides troubleshooting techniques, diagnostic information, and transmitter verification procedures.

Appendix A: Specifications and Reference Data provides reference and specification data.

Appendix B: Product Certifications provides specific information for approval codes.

Appendix C: Electronics Verification provides a short procedure for verification of electronic output to assist in meeting the quality standards for ISO 9001 certified manufacturing processes.

Appendix D: HART® Fast Keys provides command tree, and Fast Key Sequence tables for the Field Communicator when used in conjunction with the Rosemount 8800D.

## 1.2 Safety messages

Procedures and instructions in this manual may require special precautions to ensure the safety of the personnel performing the operations. Refer to the safety messages, listed at the beginning of each section, before performing any operations.

## 1.3 System description

The Rosemount 8800D Vortex Flowmeter consists of a meter body and transmitter, and 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 which creates a sine wave signal due to the passing vortices. The transmitter measures the frequency of the sine wave and converts it into a flowrate.

# Section 2          Configuration

## 2.1          Process variables

| FastKeys | 3, 2, 1 |
|---|---|

Process Variables for the Rosemount™ 8800D provides the flowmeter output. When commissioning a flowmeter, review each process variable, its function and output, and take corrective action if necessary before using the flowmeter in a process application.

### 2.1.1          Primary Variable (PV)

| FastKeys | 2, 2, 2, 1 |
|---|---|

The measured value of the variable mapped to the primary variable. This can be either Process Temperature (MTA option only) or Flow. Flow variables are available as mass, volume, corrected volume, or velocity. When bench commissioning, the flow values for each variable should be zero and the temperature value should be the ambient temperature.

If the units for the flow or temperature variables are not correct, refer to "Process Variable Units" on page 4. Use the Process Variable Units function to select the units for your application.

### 2.1.2          Percent of Range

| FastKeys | 3, 4, 3, 2 |
|---|---|

The primary variable as a percentage of range provides a gauge as to where the measured flow rate of the meter is within the configured range of the meter. For example, the range may be defined as 0 gal/min to 20 gal/min. If the measured flow rate is 10 gal/min, the percent of range is 50 percent.

### 2.1.3          Analog Output

| FastKeys | 3, 4, 3, 1 |
|---|---|

The analog output variable provides the analog value for the primary variable. The analog output refers to the industry standard output in the 4–20 mA range. Check the analog output value against the actual loop reading given by a multi-meter. If it does not match, a 4–20 mA trim is required. See "Analog Trim" on page 51.

## 2.1.4 Process Variable Units

| **FastKeys** | 2, 2, 2, 6 |
|---|---|

Allows for the viewing and configuration of Process Variable Units such as Volume, Velocity, Mass Flow, Electronics Temperature, Process Density, and Corrected Volume units, including corrected volume Special Units configuration.

### Volume Flow

| **FastKeys** | 3, 2, 1 |
|---|---|

Allows the user to view the volumetric flow rate value.

### Volume Flow Units

| **FastKeys** | 2, 2, 2, 6, 1 |
|---|---|

Allows the user to select the volumetric flow units from the available list.

| | |
|---|---|
| gallons per second | imperial gallons per minute |
| gallons per minute | imperial gallons per hour |
| gallons per hour | imperial gallons per day |
| gallons per day | liters per second |
| cubic feet per second | liters per minute |
| cubic feet per minute | liters per hour |
| cubic feet per hour | liters per day |
| cubic feet per day | cubic meters per second |
| barrels per second | cubic meters per minute |
| barrels per minute | cubic meters per hour |
| barrels per hour | cubic meters per day |
| barrels per day | mega cubic meters per day |
| imperial gallons per second | special units |

## Corrected Volumetric Flow Units

| FastKeys | 2,2,2,6,2 |
|---|---|

Allows the user to select the corrected volumetric flow units from the available list.

| | |
|---|---|
| gallons per second | imperial gallons per hour |
| gallons per minute | imperial gallons per day |
| gallons per hour | liters per second |
| gallons per day | liters per minute |
| cubic feet per second | liters per hour |
| standard cubic feet per minute | liters per day |
| standard cubic feet per hour | normal cubic meters per minute |
| cubic feet per day | normal cubic meters per hour |
| barrels per second | normal cubic meters per day |
| barrels per minute | cubic meters per second |
| barrels per hour | cubic meters per minute |
| barrels per day | cubic meters per hour |
| imperial gallons per second | cubic meters per day |
| imperial gallons per minute | special units |

**Note**

When measuring corrected volumetric flow, a base density and process density must be provided.

## Mass Flow

| FastKeys | 3, 2, 1 |
|---|---|

Allows the user to view the mass flow rate value and units.

## Mass Flow Units

| **FastKeys** | 2, 2, 2, 6, 5 |
|---|---|

Allows the user to select the mass flow units from the available list. (1 STon = 2000 lb; 1 MetTon = 1000 kg)

| | |
|---|---|
| grams per hour | pounds per day |
| grams per minute | special units |
| grams per second | short tons per day |
| kilograms per day | short tons per hour |
| kilograms per hour | short tons per minute |
| kilograms per minute | pounds per second |
| kilograms per second | tons (metric) per day |
| pounds per minute | tons (metric) per hour |
| pounds per hour | tons (metric) per minute |

**Note**
If you select a *Mass Flow Units* option, you must enter process density in your configuration.

## Velocity Flow

| **FastKeys** | 3, 2, 1 |
|---|---|

Allows the user to view the velocity flow rate value and units.

## Velocity Flow Units

| **FastKeys** | 2, 2, 2, 6, 3 |
|---|---|

Allows the user to select the Velocity Flow Units from the available list.

feet per second

meters per second

## Velocity Measurement Base

| **FastKeys** | 2, 2, 2, 6, 4 |
|---|---|

Determines if the velocity measurement is based on the mating pipe ID or the meter body ID. This is important for Reducer™ Vortex Applications.

### Special Units

| | |
|---|---|
| **FastKeys** | 2,2,2,7 (Volume)<br>2,2,2,8 (Mass)<br>2,2,2,9 (Corrected Volume) |

*A*llows the user to create flow rate units that are not among the standard options. Configuration of a special unit involves entry of these values: base flow unit, base time unit, user defined unit and conversion number. Suppose the user wants the Rosemount 8800D to display flow in beer barrels per minute instead of gallons per minute, and one beer barrel is equal to 31 gallons.

■    Base volume unit: gal

■    Base time unit: min

■    User defined unit: br

■    Conversion number: $1/31.0$

See the specific variables listed below for more information on setting special units.

## Base Flow Unit

| | |
|---|---|
| **FastKeys** | 2,2,2,7,1 (Volume)<br>2,2,2,8,1 (Mass)<br>2,2,2,9,1 (Corrected Volume) |

The unit from which the conversion is made. Select one of the Field Communicator defined unit options:

| Volumetric flow | Mass flow | Corrected volume flow |
|---|---|---|
| U.S. gallon | gram | U.S. gallon |
| liter | kilogram | liter |
| imperial gallon | metric ton | imperial gallon |
| cubic meter | pound | barrel |
| barrel | short ton | standard cubic foot |
| cubic foot | | normal cubic foot |

## Base Time Unit

| | |
|---|---|
| **FastKeys** | 2,2,2,7,4 (Volume)<br>2,2,2,8,4 (Mass)<br>2,2,2,9,4 (Corrected Volume) |

Provides the time unit from which to calculate the special units. For example, if the special unit is a volume per minute, select minutes. Choose from the following units:

■    Seconds (s)

■    Minutes (min)

■    Hours (h)

■    Days (d)

## Special Flow Unit

| **FastKeys** | 2,2,2,7,5 (Volume)<br>2,2,2,8,5 (Mass)<br>2,2,2,9,5 (Corrected Volume) |
|---|---|

A user created custom flow unit. The special unit is limited to four characters. The Field Communicator indicates the special unit with SPCL. The LCD display will display the actual four character user defined special unit.

## Conversion Number

| **FastKeys** | 2,2,2,7,2 (Volume)<br>2,2,2,8,2 (Mass)<br>2,2,2,9,2 (Corrected Volume) |
|---|---|

Used to relate base units to special units. For a straight conversion of volume units from one to another, the conversion number is the number of base units in the new unit.

For example, if it is desired to convert from gallons to beer barrels there are 31 gallons in a beer barrel. The conversion equation is as follows (where beer barrels is the new volume unit):

1 gallon = 0.032258 bbl.

## Total

| **FastKeys** | 2, 2, 4, 3, 1 |
|---|---|

Provides the output reading of the totalizer. Its value is the amount of liquid or gas that has passed through the flowmeter since the totalizer was last reset.

## Totalizer Control

| **FastKeys** | 2, 2, 4, 3, 2 |
|---|---|

Allows the totalizer to be started, stopped, or reset.

Start—Starts the totalizer counting from its current value.

Stop—Interrupts the totalizer count until it is restarted again. This feature is often used during pipe cleaning or other maintenance operations.

Reset—Returns the totalizer value to zero. If the totalizer was running, it will continue to run starting at zero.

## Totalizer Config

| FastKeys | 2, 2, 4, 3, 3 |
|---|---|

Used to configure the flow parameter (volume, mass, velocity, or corrected volume flow) that will be totaled.

**Note**
The totalizer value is saved in the non-volatile memory of the electronics every three seconds. Should power to the transmitter be interrupted, the totalizer value will start at the last saved value when the power is re-applied.

**Note**
Changes that affect the density, density ratio, or compensated K-Factor will affect the totalizer value being calculated. These changes will not cause the existing totalizer value to be recalculated.

**Note**
In order to totalize in compensated mass flow or compensated corrected volume flow, for units with the MTA option only, set pulse output to match the totalizer configuration even if the pulse output was not ordered.

## Pulse Frequency

| FastKeys | 3, 2, 5, 3 |
|---|---|

Allows the user to view the pulse output frequency value. To configure the pulse output, refer to the section on pulse output found on page 54.

## Shedding Frequency

| FastKeys | 3, 2, 5, 1 |
|---|---|

Allows the user to view the shedding frequency directly off of the sensor.

## Electronics Temperature

| FastKeys | 3, 2, 6, 2 |
|---|---|

Allows the user to view the Electronics Temperature value and units.

## Electronics Temperature Units

| FastKeys | 2, 2, 2, 6, 6 (without MTA)<br>2, 2, 2, 6, 7 (with MTA) |
|---|---|

Allows the user to select the Electronics Temperature Units from the available list.

- deg C
- deg F

### Calculated Process Density

| FastKeys | 3, 2, 1 |
|---|---|

Allows the user to view the calculated process density value when the transmitter is configured for temperature compensated steam or temperature compensated liquid applications.

### Process Density Units

| FastKeys | 2, 2, 2, 6, 7 (without MTA) |
|---|---|
| | 2, 2, 2, 6, 8 (with MTA) |

Allows the user to configure the Process Density Units from the available list.

- g/Cucm (cm$^3$)
- g/L
- kg/Cum (m$^3$)
- lb/Cuft (ft$^3$)
- lb/Cuin (in$^3$)

### Process Temperature

| FastKeys | 3, 2, 1 |
|---|---|

Allows the user to view the Process Temperature value when the transmitter has the temperature sensor option, MTA.

### Process Temperature Units

| FastKeys | 2, 2, 2, 6, 6 (only with MTA) |
|---|---|

Allows the user to configure the units for the process temperature from the available list.

- deg C
- deg F
- deg R
- Kelvin

### Temperature Sensor Failure Mode

| FastKeys | 2, 2, 1, 3, 1 |
|---|---|

Allows the user to configure the temperature sensor failure mode. In the event that the temperature sensor fails, the vortex can go either into an alarm output mode, or continue to operate normally using the Fixed Process Temperature value. See Fixed Process Temperature on . This mode is only relevant with the MTA option.

**Note**
If the Primary Variable is set to Process Temperature and there is an error, the output will always go to alarm and this setting will be ignored.

## 2.2        Basic setup

| **FastKeys** | 2, 1, 1, 1 |
|---|---|

The Rosemount 8800D must be configured for certain basic variables in order to be operational. In most cases, all of these variables are pre-configured at the factory. Configuration may be required if your Rosemount 8800D is not configured or if the configuration variables need revision. The basic setup wizard will take you through all the steps required to set up the Rosemount Vortex meter for basic operation.

The remainder of this section contains details about how to enter basic configuration parameters in order to manually configure the Rosemount 8800D.

### 2.2.1      Tag

| **FastKeys** | 2, 2, Device Information, 1, 1 |
|---|---|

The quickest way to identify and distinguish between flowmeters. Flowmeters can be tagged according to the requirements of your application. The tag may be up to eight characters long. Long Tag is available for HART® 7 and allows for up to 32 characters.

### 2.2.2      Long Tag

| **FastKeys** | 2,2,Device Information,1,2 |
|---|---|

Available for HART 7 and allows for up to 32 characters.

### 2.2.3      Process configuration

The flowmeter can be used for liquid or gas/steam applications, but it must be configured specifically for the application. If the flowmeter is not configured for the proper process, readings will be inaccurate. Select the appropriate process configuration parameters for your application:

#### Transmitter Mode

| **FastKeys** | 2, 2, 1, 1, 1 |
|---|---|

For units with an integral temperature sensor, the temperature sensor can be activated here.

Without Temperature Sensor

With Temperature Sensor

#### Set Process Fluid

| **FastKeys** | 2, 2, 1, 1, 3 |
|---|---|

Select the fluid type—either Liquid, Gas/Steam, Tcomp Sat Steam, or Tcomp Liquids. Tcomp Sat Steam and Tcomp Liquids require the MTA Option and provide dynamic density compensation based on the process temperature reading.

### Fixed Process Temperature

| **FastKeys** | 2, 2, 1, 1, 4 |
|---|---|

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 in the line during flowmeter operation.

May also be used as a back-up temperature value in the event of a temperature sensor failure if the MTA option is installed.

### Fixed Process Density

| **FastKeys** | 2, 2, 3, 1 |
|---|---|

A Fixed Process Density must be accurately configured if mass flow or corrected volume flow measurements are used. In mass flow it is used to convert volume flow to mass flow. In corrected volume flow it is used with the base process density to derive a density ratio which in turn is used to convert volume flow to corrected volume flow. In temperature compensated fluids the fixed process density is still required as it is used to convert volume flow sensor limits to sensor limits for temperature compensated fluids.

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**Note**
If mass or corrected volume units are chosen, you must enter the density of your process fluid into the software. Be careful to enter the correct density. The mass flow rate and density ratio are calculated using this user-entered density, and unless the transmitter is in TComp Sat Steam or TComp Liquids mode where changes in density are automatically being compensated for, any error in this number will cause error in the measurement.

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### Base Process Density

| **FastKeys** | 2, 2, 3, 2, 1 |
|---|---|

The density of the fluid at base conditions. This density is used in corrected volume flow measurement. It is not required for volume flow, mass flow, or velocity flow. The Base Process Density is used with the Process Density to calculate the Density Ratio. In temperature compensated fluids, the Process Density is calculated by the transmitter. In non-temperature compensated fluids the Fixed Process Density is used to calculate a fixed Density Ratio. Density Ratio is used to convert actual volumetric flow to standard volumetric flow rates based on the following equation:

$$DensityRatio = \frac{density\ at\ actual\ (flowing)\ conditions}{density\ at\ standard\ (base)\ conditions}$$

## 2.2.4    Reference K-factor

| **FastKeys** | 2, 2, 1, 2, 1 |
|---|---|

A factory calibration number relating the flow through the meter to the shedding frequency measured by the electronics. Every 8800 meter manufactured by Emerson is run through a water calibration to determine this value.

## 2.2.5 Flange Type

| **FastKeys** | 2, 2, 1, 4, 2 |
|---|---|

Enables the user 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
- JIS 10K
- JIS 10K Reducer
- JIS 16K/20K
- JIS 16K/20K Reducer
- JIS 40K
- JIS 40K Reducer
- Spcl

## 2.2.6 Pipe ID

| **FastKeys** | 2, 2, 1, 1, 6 |
|---|---|

The pipe ID (inside diameter) of the pipe adjacent to the flowmeter can cause entrance effects that may alter flowmeter readings. Configuring the actual mating pipe inside diameter will correct for theses effects. Enter the appropriate value for this variable.

Pipe ID values for schedule 10, 40, and 80 piping are given in Table 2-1. If the mating pipe ID is not listed in the table, confirm pipe ID with manufacturer or measure the pipe ID.

**Table 2-1. Pipe IDs for Schedule 10, 40, and 80 Piping**

| Pipe size inches (mm) | Schedule 10 inches (mm) | Schedule 40 inches (mm) | Schedule 80 inches (mm) |
|---|---|---|---|
| ½ (15) | 0.674 (17.12) | 0.622 (15.80) | 0.546 (13.87) |
| 1 (25) | 1.097 (27.86) | 1.049 (26.64) | 0.957 (24.31) |
| 1½ (40) | 1.682 (42.72) | 1.610 (40.89) | 1.500 (38.10) |
| 2 (50) | 2.157 (54.79) | 2.067 (52.50) | 1.939 (49.25) |
| 3 (80) | 3.260 (82.80) | 3.068 (77.93) | 2.900 (73.66) |
| 4 (100) | 4.260 (108.2) | 4.026 (102.3) | 3.826 (97.18) |

| Pipe size inches (mm) | Schedule 10 inches (mm) | Schedule 40 inches (mm) | Schedule 80 inches (mm) |
|---|---|---|---|
| 6 (150) | 6.357 (161.5) | 6.065 (154.1) | 5.761 (146.3) |
| 8 (200) | 8.329 (211.6) | 7.981 (202.7) | 7.625 (193.7) |
| 10 (250) | 10.420 (264.67) | 10.020 (254.51) | 9.562 (242.87) |
| 12 (300) | 12.390 (314.71) | 12.000 (304.80) | 11.374 (288.90) |

## 2.2.7    Variable mapping

| **FastKeys** | 2, 2, 2, 5 |
|---|---|

Allows the user to select which variables the 8800D will output.

### Primary Variable

| **FastKeys** | 2, 2, 2, 1 |
|---|---|

The variable mapped to the analog output. Selections for the primary variable are Mass Flow, Volumetric Flow, Corrected Volume Flow, Velocity Flow, and Process Temperature.

### Secondary Variable

| **FastKeys** | 2, 2, 2, 2 |
|---|---|

Selections for the secondary variable include all variables that can be mapped to the Primary Variable, and also Shedding Frequency, Pulse Frequency, Calculated Process Density, and Electronics Temperature. The full list is given below:

- Mass Flow
- Volumetric Flow
- Corrected Volumetric Flow
- Direct Shedding Frequency
- Pulse Output Frequency
- Totalizer
- Velocity
- Process Temperature (MTA only)
- Calculated Process Density (MTA only)
- Thermocouple Cold Junction Temperature (MTA only)
- Electronics Temperature
- Signal Strength

### Third Variable

| **FastKeys** | 2, 2, 2, 3 |
|---|---|

Selections for the Third Variable are identical to those of the Secondary Variable.

### Fourth Variable

| FastKeys | 2, 2, 2, 4 |
|---|---|

Selections for the Fourth Variable are identical to those of the Secondary Variable.

## 2.2.8    Process Variable Units

| FastKeys | 2, 2, 2, 6 |
|---|---|

This selection allows the user to set the units of measure for all available process variables.

## 2.2.9    Analog Output

| FastKeys | 3, 4, 3, 1 |
|---|---|

Enables you to set the upper and lower range values in order to maximize the resolution of the analog output. The meter is most accurate when operated within the expected flow ranges for your application. Setting the range to the limits of expected readings will maximize flowmeter performance.

The range of expected readings is defined by the Lower Range Value (LRV) and Upper Range Value (URV). Set the LRV and URV within the limits of flowmeter operation as defined by the line size and process material for your application. Values set outside that range will not be accepted.

### Primary Variable Upper Range Value (PV URV)

| FastKeys | 2, 2, 4, 1, 3 |
|---|---|

This is the 20 mA set point for the meter.

### Primary Variable Lower Range Value (PV LRV)

| FastKeys | 2, 2, 4, 1, 4 |
|---|---|

This is the 4 mA set point for the meter, and is typically set to 0 when the primary variable is a flow variable.

## 2.2.10    Damping

| **FastKeys** | 2, 1, 4, 1 |
|---|---|

Damping changes the response time of the flowmeter to smooth variations in output readings caused by rapid changes in input. Damping is applied to the *Analog Output*, *Primary Variable*, *Percent of Range*, and Vortex Frequency.

The default damping value is 2.0 seconds. This can be configured to any value between 0.2 to 255 seconds when PV is a flow variable or 0.4 to 32 seconds when PV is Process Temperature. Determine the appropriate damping setting based on the necessary response time, signal stability, and other requirements of the loop dynamics in your system.

**Note**
If the vortex shedding frequency is slower than the damping value selected, no damping is applied. Process Temperature damping can be modified when PV is set to Process Temperature.

## 2.2.11    Optimize DSP (Digital Signal Processing)

| **FastKeys** | 2, 1, 1, 3 |
|---|---|

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 4:1 signal to the trigger level ratio. This function will also reset all of the filters to optimize the flowmeter performance over the new range. If the configuration of the device has changed, this method should be executed to ensure the signal processing parameters are set to their optimum settings. For dynamic process densities, select a density value that is lower than the lowest expected flowing density.

**Table 2-2. Fast Keys for Rosemount 8800D HART 7 Device Revision 2 (DD Revision 1)/ HART 5 Device Revision 3 (DD Revision 1)**

| Function | Fast Key | Function | Fast Key |
|---|---|---|---|
| Analog Output | 3, 4, 3, 1 | Polling Address | 2, 2, –[1], 2, 1 |
| Analog Trim | 3, 4, 3, 7 | Primary Variable | 2, 2, 2, 1 |
| Base Mass Unit (MF) | 2, 2, 2, 8, 1 | Process Fluid Type | 2, 2, 1, 1, 3 |
| Base Process Density | 2, 2, 3, 2, 1 | Process Variables | 3, 2, 3 |
| Base Time Unit (CVF) | 2, 2, 2, 9, 4 | Pulse Output | 3, 2, 5, 3 |
| Base Time Unit (MF) | 2, 2, 2, 8, 4 | Pulse Output Test | 3, 5, 3, 4 |
| Base Time Unit (VF) | 2, 2, 2, 7, 4 | Reference K-Factor | 2, 2, 1, 2, 1 |
| Base Volume Unit (CVF) | 2, 2, 2, 9, 1 | Reset Transmitter | 3, 4, 4, 1, 2 |
| Base Volume Unit (VF) | 2, 2, 2, 7, 1 | Restore Default Filters | 2, 1, 4, 6 |
| Compensated K-Factor | 2, 2, 1, 2, 2 | Restore Factory Calibration | 3, 4, 3, 9 |
| Conversion Factor (CVF) | 2, 2, 2, 9, 2 | Revision Numbers | 2, 2, –[1], 2 |
| Conversion Factor (MF) | 2, 2, 2, 8, 2 | Scaled Analog Trim | 3, 4, 3, 8 |
| Conversion Factor (VF) | 2, 2, 2, 7, 2 | Second Variable | 2, 2, 2, 2 |
| Date | 2, 2, –[1], 1, 5 | Self Test | 3, 4, 4, 1, 1 |
| Corrected Volumetric Flow | 3,2,1 | Set Damping | 2, 1, 4, 1 |
| Corrected Volumetric Flow Units | 2,2,2,6,2 | Set Low Flow Cutoff | 2, 1, 4, 3 |
| Density Ratio | 2, 2, 3, 4 | Set Low-pass Corner Frequency | 2, 1, 4, 4 |
| Descriptor | 2, 2, –[1], 1, 6 | Set Trigger Level | 2, 1, 4, 5 |
| Device ID | 2, 2, –[1], 1 | Shedding Frequency | 3, 2, 5, 1 |
| Device Status | 1, 1 | Signal Strength | 3, 4, 2, 1, 4 |
| Display | 2, 1, 1, 2 | Special Flow Unit (CVF) | 2, 2, 2, 9, 5 |
| Electronics Temp | 3, 2, 6 | Special Flow Unit (MF) | 2, 2, 2, 8, 5 |
| Electronics Temp Units | 2, 2, 2, 6, 7 | Special Flow Unit (VF) | 2, 2, 2, 7, 5 |
| Final Assembly Number | 2, 2, 1, 4, 3 | Special Volume Unit | 2, 2, 2, 7, 3 |
| Fixed Process Density | 2, 2, 1, 1, 5 | Tag | 2, 2, –[1], 1, 1 |
| Fixed Process Temperature | 2, 2, 1, 1, 4 | Third Variable | 2, 2, 2, 3 |
| Flange Type | 2, 2, 1, 4, 2 | Total | 2, 2, 4, 3, 1 |
| Flow Simulation | 3, 5, 1, 2, 1 | Totalizer Configuration | 2, 2, 4, 3, 3 |
| Fourth Variable | 2, 2, 2, 4 | Totalizer Control | 2, 2, 4, 3, 2 |
| Loop Test | 3, 5, 2, 7 | Transmitter Mode | 2, 2, 1, 1, 1 |
| Lower Range Value | 2, 2, 4, 1, 4 | Upper Range Value | 2, 2, 4, 1, 3 |
| Lower Sensor Limit | 2, 2, 4, 1, 6 | Upper Sensor Limit | 2, 2, 4, 1, 5 |
| Mass Flow | 3, 2, 1 | Variable Mapping | 2, 2, 2, 5 |
| Mass Flow Units | 2, 2, 2, 6, 5 | Velocity Flow | 3, 2, 1 |
| Message | 2, 2, –[1], 1, 7 | Velocity Flow Units | 2, 2, 2, 6, 3 |
| Meter Factor | 2, 2, 1, 1, 7 | Velocity Measurement Base | 2, 2, 2, 6, 4 |
| Minimum Span | 2, 2, 4, 1, 7 | Volume Flow | 3, 2, 1 |
| Optimize DSP | 2, 1, 1, 3 | Volume Flow Units | 2, 2, 2, 6, 1 |
| Percent of Range | 3, 4, 3, 2 | Wetted Material | 2, 2, 1, 4, 1 |
| Pipe Inside Diameter | 2, 2, 1, 1, 6 | Write Protect | 2, 2, –[1], 4, 1 |

1. These items are in a list format without numeric labels. To access these features, you must scroll to this option in the HART Communicator.

## Figure 2-1. Overview Menu Map



**Overview**

Device Status
Comm Status[1]
Primary Variable
Primary Variable Value
Status[1]
Volume Flow
Status[1]
Process Temp
Status[1]
Analog Output
Device Information

Refresh Alerts
Clear Config Changed Flag
Active Alerts

Identification
Revision Numbers
Sensor
Alarm Type and Security

Tag
Long Tag[1]
Model
Serial Number
Date
Description
Message

Universal
Field Device
Software
Hardware
DD Revision

**Configure**

Process
Flow Sensor
Temperature Sensor
Meter Body

Transmitter Mode
Process Fluid
Fixed Proc Temp
Fixed Proc Density
Pipe Inside Diameter
Meter Factor

Reference K-factor
Compensated K-factor
Upper Sensor Limit
Lower Sensor Limit

T/C Failure Mode

Wetted Material
Flange Type
Meter Body Num
Body Num Suffix

**Service Tools**

Alarm Configuration
Security
Refresh

Alarm Direction
Alarm Level
High Alarm
High Saturation
Low Alarm
Low Saturation

Write Protect
Device is Locked[1]

**NOTES:**

[1]HART 7 only

Availability of options depends on configuration, such as using temperature compensation
(MTA option). The order in which parameters display may vary.
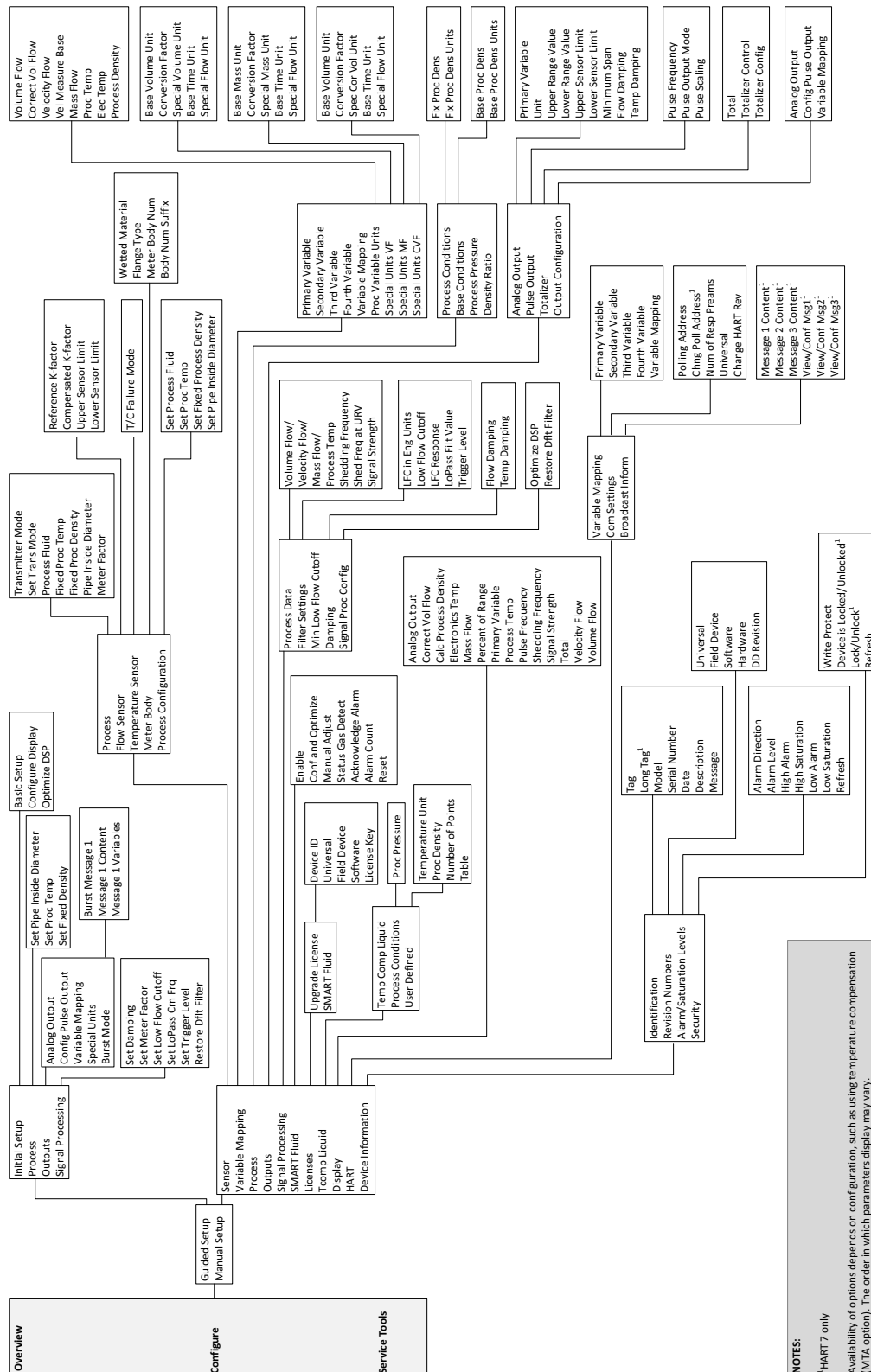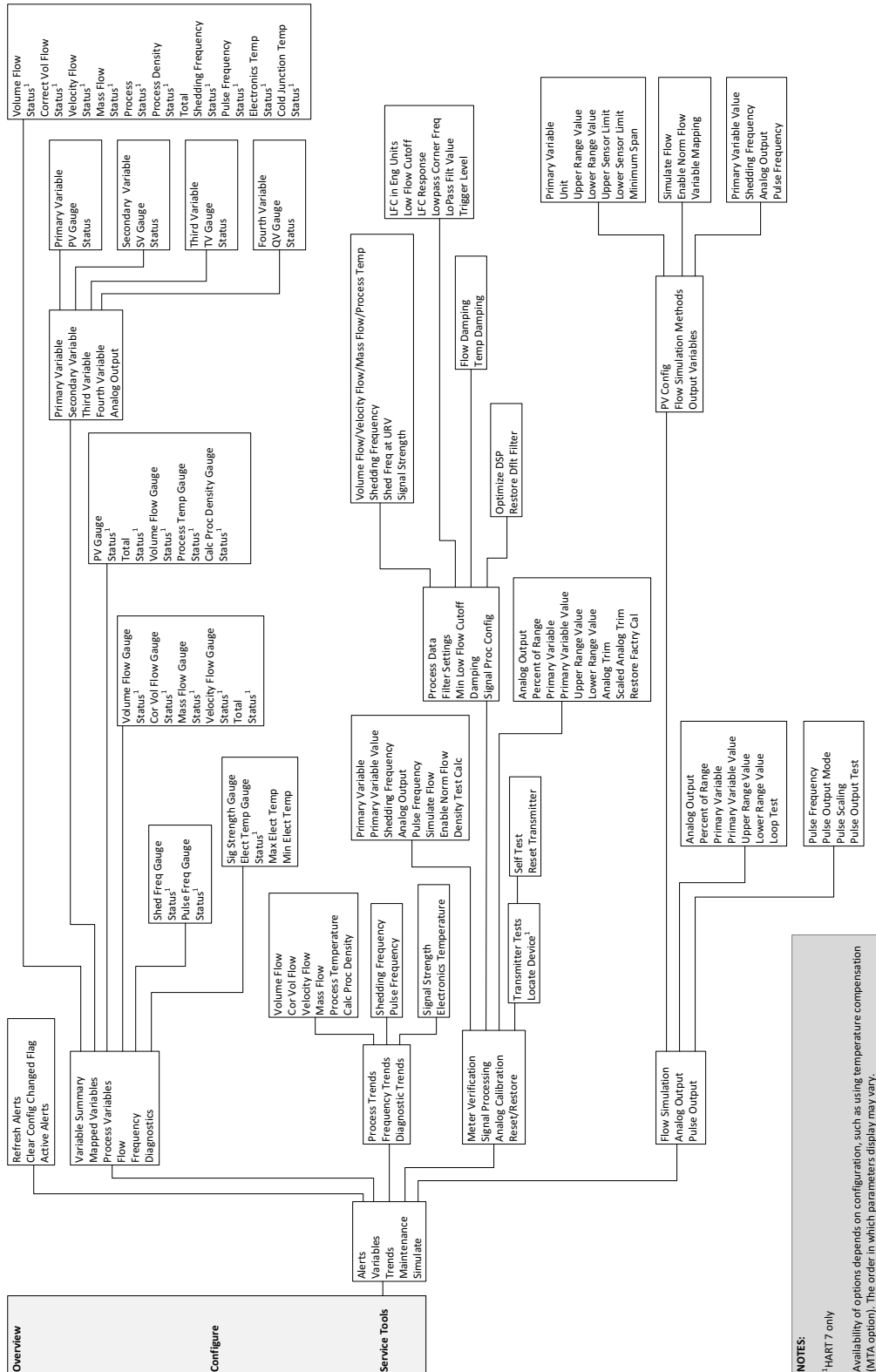
**Figure 2-2. Configure Menu Map**

**Overview**

- Initial Setup
- Process
- Outputs
- Signal Processing

**Configure**

- Guided Setup
- Manual Setup

**Service Tools**

- Sensor
- Variable Mapping
- Process
- Outputs
- Signal Processing
- SMART Fluid
- Licenses
- Tcomp Liquid
- Display
- HART
- Device Information

---

- Set Pipe Inside Diameter
- Set Proc Temp
- Set Fixed Density

- Analog Output
- Config Pulse Output
- Variable Mapping
- Special Units
- Burst Mode

- Set Damping
- Set Meter Factor
- Set Low Flow Cutoff
- Set LoPass Crn Frq
- Set Trigger Level
- Restore Dflt Filter

- Upgrade License
- SMART Fluid

- Temp Comp Liquid
- Process Conditions
- User Defined

- Identification
- Revision Numbers
- Alarm/Saturation Levels
- Security

---

- Basic Setup
- Configure Display
- Optimize DSP

- Process
- Flow Sensor
- Temperature Sensor
- Meter Body
- Process Configuration

- Burst Message 1
- Message 1 Content
- Message 1 Variables

- Device ID
- Universal
- Field Device
- Software
- License Key

- Proc Pressure

- Temperature Unit
- Proc Density
- Number of Points
- Table

- Enable
- Conf and Optimize
- Manual Adjust
- Status Gas Detect
- Acknowledge Alarm
- Alarm Count
- Reset

- Process Data
- Filter Settings
- Min Low Flow Cutoff
- Damping
- Signal Proc Config

- Analog Output
- Correct Vol Flow
- Calc Process Density
- Electronics Temp
- Mass Flow
- Percent of Range
- Primary Variable
- Process Temp
- Pulse Frequency
- Shedding Frequency
- Signal Strength
- Total
- Velocity Flow
- Volume Flow

- Tag
- Long Tag[1]
- Model
- Serial Number
- Date
- Description
- Message

- Alarm Direction
- Alarm Level
- High Alarm
- High Saturation
- Low Alarm
- Low Saturation
- Refresh

- Universal
- Field Device
- Software
- Hardware
- DD Revision

- Write Protect
- Device is Locked/Unlocked[1]
- Lock/Unlock[1]
- Refresh

---

- Transmitter Mode
- Set Trans Mode
- Process Fluid
- Fixed Proc Temp
- Fixed Proc Density
- Pipe Inside Diameter
- Meter Factor

- Reference K-factor
- Compensated K-factor
- Upper Sensor Limit
- Lower Sensor Limit

- T/C Failure Mode

- Set Process Fluid
- Set Proc Temp
- Set Fixed Process Density
- Set Pipe Inside Diameter

- Volume Flow/
- Velocity Flow/
- Mass Flow/
- Process Temp
- Shedding Frequency
- Shed Freq at URV
- Signal Strength

- LFC in Eng Units
- Low Flow Cutoff
- LFC Response
- LoPass Filt Value
- Trigger Level

- Flow Damping
- Temp Damping

- Optimize DSP
- Restore Dflt Filter

- Variable Mapping
- Com Settings
- Broadcast Inform

---

- Wetted Material
- Flange Type
- Meter Body Num
- Body Num Suffix

- Primary Variable
- Secondary Variable
- Third Variable
- Fourth Variable
- Variable Mapping
- Proc Variable Units
- Special Units VF
- Special Units MF
- Special Units CVF

- Process Conditions
- Base Conditions
- Process Pressure
- Density Ratio

- Analog Output
- Pulse Output
- Totalizer
- Output Configuration

- Primary Variable
- Secondary Variable
- Third Variable
- Fourth Variable
- Variable Mapping

- Polling Address
- Chng Poll Address[1]
- Num of Resp Preams
- Universal
- Change HART Rev

- Message 1 Content[1]
- Message 2 Content[1]
- Message 3 Content[1]
- View/Conf Msg1[1]
- View/Conf Msg2[1]
- View/Conf Msg3[1]

---

- Volume Flow
- Correct Vol Flow
- Velocity Flow
- Vel Measure Base
- Mass Flow
- Proc Temp
- Elec Temp
- Process Density

- Base Volume Unit
- Conversion Factor
- Special Volume Unit
- Base Time Unit
- Special Flow Unit

- Base Mass Unit
- Conversion Factor
- Special Mass Unit
- Base Time Unit
- Special Flow Unit

- Base Volume Unit
- Conversion Factor
- Spec Cor Vol Unit
- Base Time Unit
- Special Flow Unit

- Fix Proc Dens
- Fix Proc Dens Units

- Base Proc Dens
- Base Proc Dens Units

- Primary Variable
- Unit
- Upper Range Value
- Lower Range Value
- Upper Sensor Limit
- Lower Sensor Limit
- Minimum Span
- Flow Damping
- Temp Damping

- Pulse Frequency
- Pulse Output Mode
- Pulse Scaling

- Total
- Totalizer Control
- Totalizer Config

- Analog Output
- Config Pulse Output
- Variable Mapping

---

**NOTES:**

[1] HART 7 only

Availability of options depends on configuration, such as using temperature compensation (MTA option). The order in which parameters display may vary.

**Figure 2-3. Service Tools Menu Map**

Overview

Configure

Service Tools
- Alerts
- Variables
- Trends
- Maintenance
- Simulate

Alerts
- Refresh Alerts
- Clear Config Changed Flag
- Active Alerts

Variables
- Variable Summary
- Mapped Variables
- Process Variables
- Flow
- Frequency
- Diagnostics

Trends
- Process Trends
- Frequency Trends
- Diagnostic Trends

Maintenance
- Meter Verification
- Signal Processing
- Analog Calibration
- Reset/Restore

Simulate
- Flow Simulation
- Analog Output
- Pulse Output

Variable Summary
- Primary Variable
- Secondary Variable
- Third Variable
- Fourth Variable
- Analog Output

Primary Variable
- PV Gauge
- Status

Secondary Variable
- SV Gauge
- Status

Third Variable
- TV Gauge
- Status

Fourth Variable
- QV Gauge
- Status

PV Gauge
- Status[1]
- Total
- Status[1]
- Volume Flow Gauge Status[1]
- Process Temp Gauge Status[1]
- Calc Proc Density Gauge Status[1]

Mapped Variables
- Volume Flow Status[1]
- Correct Vol Flow Status[1]
- Velocity Flow Status[1]
- Mass Flow Status[1]
- Process Status[1]
- Process Density Status[1]
- Total
- Shedding Frequency Status[1]
- Pulse Frequency Status[1]
- Electronics Temp Status[1]
- Cold Junction Temp Status[1]

Flow
- Volume Flow Gauge Status[1]
- Cor Vol Flow Gauge Status[1]
- Mass Flow Gauge Status[1]
- Velocity Flow Gauge Status[1]
- Total
- Status[1]

Frequency
- Shed Freq Gauge Status[1]
- Pulse Freq Gauge Status[1]

Diagnostics
- Sig Strength Gauge
- Elect Temp Gauge Status[1]
- Max Elect Temp
- Min Elect Temp

Process Variables
- Volume Flow
- Cor Vol Flow
- Velocity Flow
- Mass Flow
- Process Temperature
- Calc Proc Density

Frequency
- Shedding Frequency
- Pulse Frequency

Diagnostics
- Signal Strength
- Electronics Temperature

Variable Mapping
- Primary Variable
- Primary Variable Value
- Shedding Frequency
- Analog Output
- Pulse Frequency
- Simulate Flow
- Enable Norm Flow
- Density Test Calc

Transmitter Tests
- Self Test
- Reset Transmitter

Locate Device[1]

Signal Proc Config
- Volume Flow/Velocity Flow/Mass Flow/Process Temp
- Shedding Frequency
- Shed Freq at URV
- Signal Strength

LFC Response
- LFC in Eng Units
- Low Flow Cutoff
- LFC Response
- Lowpass Corner Freq
- LoPass Filt Value
- Trigger Level

Flow Damping
- Temp Damping

- Optimize DSP
- Restore Dflt Filter

Process Data
- Filter Settings
- Min Low Flow Cutoff
- Damping
- Signal Proc Config

Analog Output
- Percent of Range
- Primary Variable
- Primary Variable Value
- Upper Range Value
- Lower Range Value
- Analog Trim
- Scaled Analog Trim
- Restore Factry Cal

PV Config
- Flow Simulation Methods
- Output Variables

- Primary Variable
- Unit
- Upper Range Value
- Lower Range Value
- Upper Sensor Limit
- Lower Sensor Limit
- Minimum Span

- Simulate Flow
- Enable Norm Flow
- Variable Mapping

- Primary Variable Value
- Shedding Frequency
- Analog Output
- Pulse Frequency

Analog Output
- Percent of Range
- Primary Variable
- Primary Variable Value
- Upper Range Value
- Lower Range Value
- Loop Test

Pulse Output
- Pulse Frequency
- Pulse Output Mode
- Pulse Scaling
- Pulse Output Test

**NOTES:**

[1]HART 7 only

Availability of options depends on configuration, such as using temperature compensation (MTA option). The order in which parameters display may vary.

# Section 3 Installation

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

The options available for the Rosemount 8800D Flowmeter are also described in this section. The numbers in parentheses refer to the codes used to order each option.

## 3.1 Safety messages

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Please 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 HART®-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
> - 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.

> **⚠ WARNING**
>
> **Failure to follow these installation guidelines could result in death or serious injury.**
> - Make sure only qualified personnel perform the installation.

**Figure 3-1. Installation Flowchart**
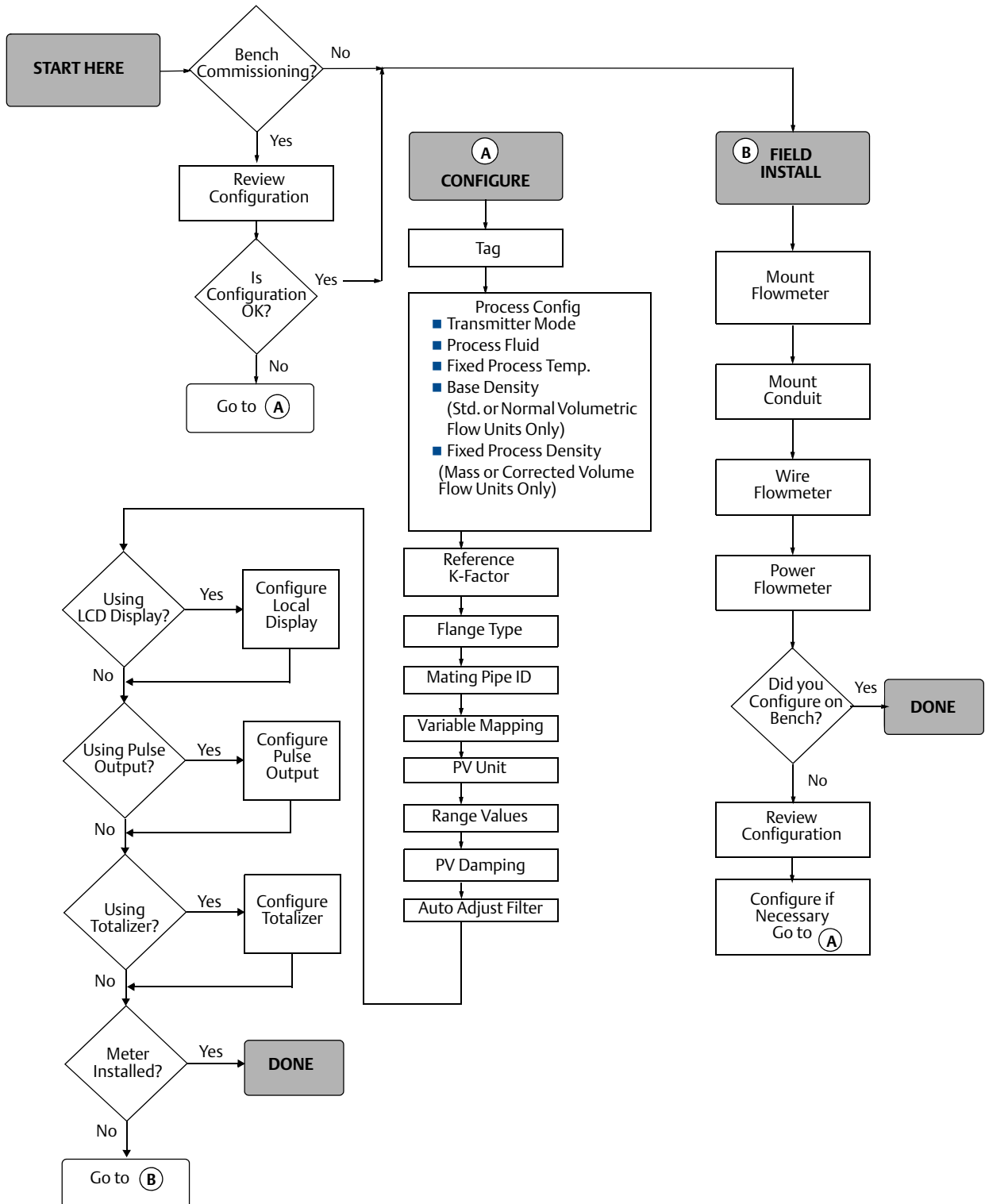
## 3.2 Commissioning

Commission the Rosemount 8800D before putting it into operation. This ensures proper configuration and operation of the meter. It also enables you to check hardware settings, test the flowmeter electronics, verify flowmeter configuration data, and check output variables. Any problems can be corrected – or configuration settings changed – before going out into the installation environment. To commission on the bench, connect the Field Communicator or AMS™ Device Manager (or other communications device) to the signal loop in accordance with the specifications for your device.

Before you install a flowmeter in any application, you must consider flowmeter sizing (the line size) and location. Choose the correct flowmeter size for an application to increase rangeability and minimize pressure drop and cavitation. Proper location of the flowmeter can ensure a clean and accurate signal. Follow the installation instructions carefully to reduce start-up delays, ensure ease of maintenance, and ensure optimum performance.

### 3.2.1 Flowmeter sizing

Correct meter sizing is important for flowmeter performance. The Rosemount 8800D is capable of measuring flow within the limitations described in Appendix A: Specifications and Reference Data.

To determine the correct flowmeter size for an application, process conditions must be within the stated requirements for Reynolds number and velocity. See Appendix A: Specifications and Reference Data for sizing data.

Contact your local Rosemount Inc. sales representative to obtain a copy of Instrument Toolkit™ which contains a sizing module for the Rosemount 8800D Vortex Flowmeter. The vortex sizing module will calculate valid flowmeter sizes based on user-supplied application information.

### 3.2.2 Flowmeter orientation

Design process piping so the meter body will remain full, with no entrapped air. Allow enough straight pipe both upstream and downstream of the meter body to ensure a nonskewed, symmetrical flow profile. Install valves downstream of the meter when possible.

#### Vertical installation

Vertical, upward, installation allows upward process liquid flow and is generally preferred. Upward flow ensures that 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. This type of application should be strongly discouraged for liquid flows, although it can be done with proper piping design.

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

## Horizontal installation

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

## 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 3-2. Insulation may be required around the pipe to maintain an electronics temperature below 185 °F (85 °C). See Figure 3-10 on page 34 for special insulation considerations.

**Figure 3-2. Examples of High-Temperature Installations**



A                                              B
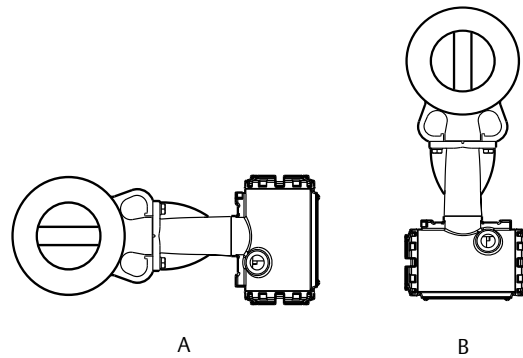
A. Preferred installation—The meter body installed with the electronics to the side of the pipe.
B. Acceptable installation—The meter body installed with the electronics below the pipe.

## Steam installations

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

**Figure 3-3. Avoid this Type of Installation for Steam Applications**
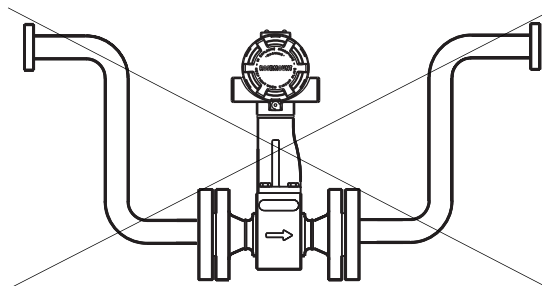
## Upstream/downstream piping

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.

To achieve reference accuracy, straight pipe lengths of 35D upstream and 5D downstream are required. The value of the K-factor may shift up to 0.5% when the upstream straight pipe length is between 10D and 35D. Please see Technical Data Sheet (00816-0100-3250) on Installation Effects for optional K-factor corrections. This effect can be corrected for using the "Meter Factor" on page 53.

## Pressure and temperature transmitter location

When using pressure and temperature transmitters in conjunction with the Rosemount 8800D for compensated mass flows, install the transmitter(s) downstream of the Vortex Flowmeter. See Figure 3-4.

**Figure 3-4. Pressure and Temperature Transmitter Location**
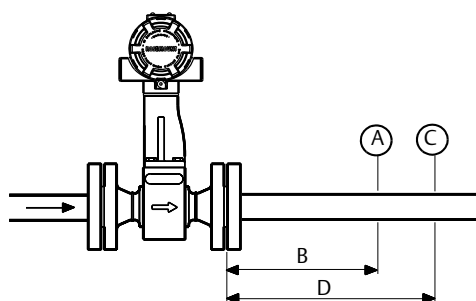


A. Pressure transmitter
B. Four straight pipe diameters downstream
C. Temperature transmitter
D. Six straight pipe diameters downstream

**Note**
The MTA option can be purchased for an integral temperature measurement and mass flow temperature compensation for saturated steam and liquids.

## 3.2.3    Wetted material selection

Ensure that the process fluid is compatible with the meter body wetted materials when specifying the Rosemount 8800D. Corrosion will shorten the life of the meter body. Consult recognized sources of corrosion data or contact your Emerson Flow Sales Representative for more information.

**Note**
If Positive Material Identification (PMI) is required, perform test on a machined surface.

## 3.2.4 Environmental considerations

Avoid excessive heat and vibration to ensure maximum flowmeter life. Typical problem areas include high-vibration lines with integrally mounted electronics, warm-climate installations in direct sunlight, and outdoor installations in cold climates.

Although the signal conditioning functions reduce susceptibility to extraneous noise, some environments are more suitable than others. Avoid placing the flowmeter or its wiring close to devices that produce high intensity electromagnetic and electrostatic fields. Such devices include electric welding equipment, large electric motors and transformers, and communication transmitters.

# 3.3 Hazardous locations

The Rosemount 8800D 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. See Appendix B: Product Certifications for specific approval categories.

# 3.4 Hardware configuration

The hardware jumpers on the Rosemount 8800D enable you to set the alarm and security. (See Figure 3-5.) To access the jumpers, remove the electronics housing cover from the electronics end (opposite of the terminal blocks) of the Rosemount 8800D. If your Rosemount 8800D includes an LCD option, the alarm and security jumpers are found on the face of the LCD indicator. (See Figure 3-6 on page 28.)

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

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

**Figure 3-5. Alarm and Security Jumpers**
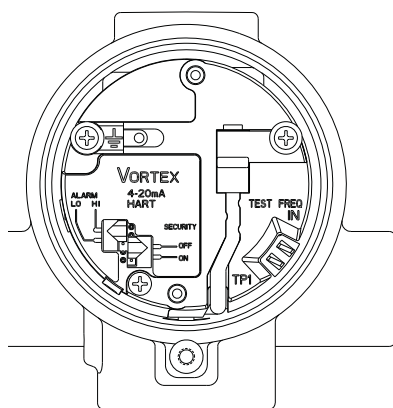


## Alarm

As part of normal operations, the Rosemount 8800D continuously runs a self-diagnostic routine. If the routine detects an internal failure in the electronics, flowmeter output is driven to a low or high alarm level, depending on the position of the failure mode jumper.

The failure mode jumper is labeled ALARM and is set at the factory per the CDS (Configuration Data Sheet); the default setting is HI.

## Security

You can protect the configuration data with the security lockout jumper. With the security lockout jumper ON, any configuration changes attempted on the electronics are disallowed. You can still access and review any of the operating parameters and scroll through the available parameters, but no actual changes will be permitted. The security lockout jumper is labeled SECURITY and is set at the factory per the CDS; the default setting is OFF.

## 3.4.1 Failure mode vs. saturation output values

The failure mode alarm output levels differ from the output values that occur when the operating flow is outside the range points. When the operating flow is outside the range points, the analog output continues to track the operating flow until reaching the saturation value listed below; the output does not exceed the listed saturation value regardless of the operating flow. For example, with standard alarm and saturation levels and flows outside the 4—20 mA range points, the output saturates at 3.9 mA or 20.8 mA. When the transmitter diagnostics detect a failure, the analog output is set to a specific alarm value that differs from the saturation value to allow for proper troubleshooting. The saturation and alarm levels are software selectable between Rosemount Standard and NAMUR levels.

**Table 3-1. Analog Output: Standard alarm values vs. Saturation Values**

| Level | 4—20 mA saturation value | 4—20 mA alarm value |
|-------|--------------------------|---------------------|
| Low | 3.9 mA | $\leq 3.75$ mA |
| High | 20.8 mA | $\geq 21.75$ mA |

**Table 3-2. Analog Output: NAMUR-Compliant Alarm Values vs. Saturation Values**

| Level | 4—20 mA saturation value | 4—20 mA alarm value |
|-------|--------------------------|---------------------|
| Low | 3.8 mA | $\leq 3.6$ mA |
| High | 20.5 mA | $\geq 22.6$ mA |

## 3.4.2 LCD indicator option

If your electronics are equipped with the LCD indicator (Option M5), the ALARM and SECURITY jumpers are located on the face of the indicator as shown in Figure 3-6.

**Figure 3-6. LCD Indicator Alarm and Security Jumpers**
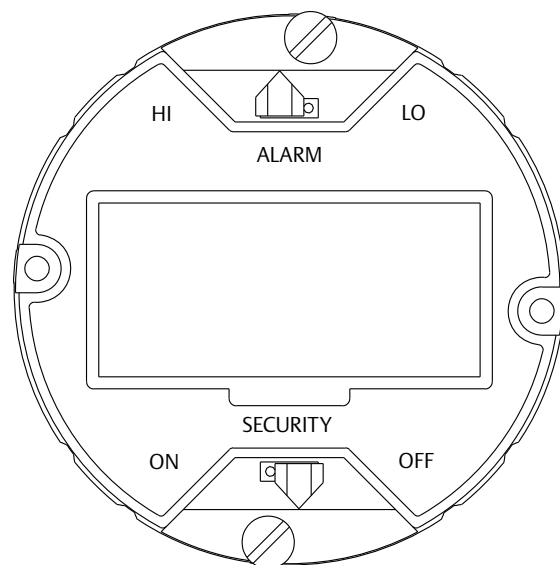


# 3.5 Meter body installation tasks

The installation tasks include detailed mechanical and electrical installation procedures.

## 3.5.1 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 3-7.

**Figure 3-7. Lifting Supports**



## 3.5.2    Flow direction

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

## 3.5.3    Gaskets

The Rosemount 8800D 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.

## 3.5.4    Flange bolts

Install the Rosemount 8800D Flowmeter between two conventional pipe flanges, as shown in Figure 3-8 on page 32 and Figure 3-9 on page 32. Table 3-3, 3-4, and 3-5 list the recommended minimum stud bolt lengths for wafer-style meter body size and different flange ratings.

**Table 3-3. 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 3-4. 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 63 | 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 3-5. 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. This will ensure the flowmeter achieves its specified accuracy.

Alignment rings are provided with each wafer-style meter body for centering purposes. Follow these steps to align the meter body for installation. Refer to Figure 3-8 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, see Spacers and Table 3-6 below.

**Note**
Be sure to 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 3-11 on page 35.

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 Rosemount 8800D to maintain the Rosemount 8800A 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 3-6. Spacer Dimensions for 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 3-8. Wafer-Style Flowmeter Installation with Alignment Rings**
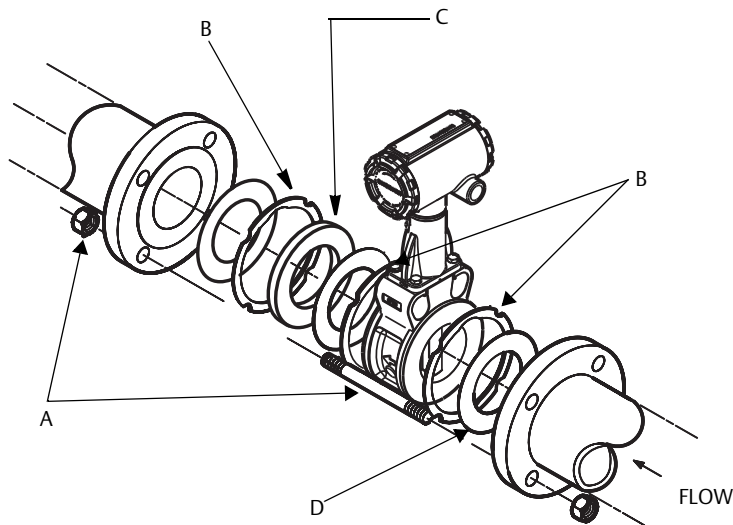


A. Installation studs and nuts (supplied by customer)
B. Alignment rings
C. Spacer (for Rosemount 8800D to maintain Rosemount 8800A dimensions)
D. Gaskets (supplied by customer)

**Figure 3-9. Flanged-Style Flowmeter Installation**
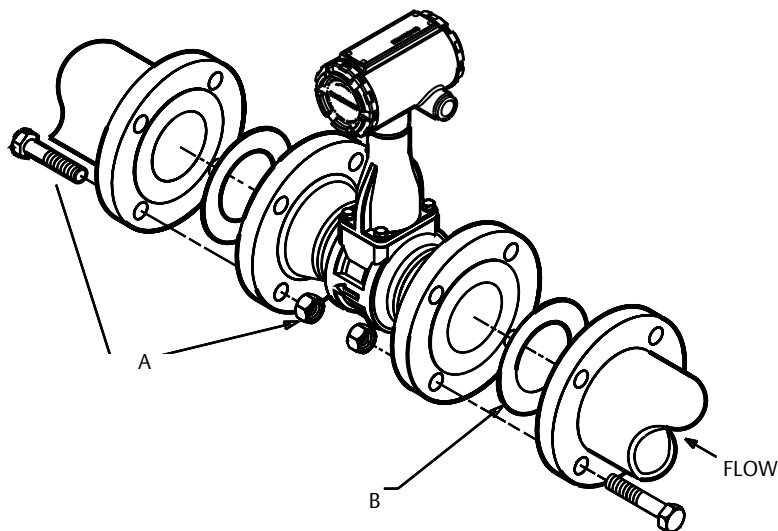


A. Installation bolts and nuts (supplied by customer)
B. Gaskets (supplied by customer)

## 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 3-11.

**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. Insert temperature sensor into the hole in the bottom of meter body until it reaches the bottom of the hole. Hold it in place and tighten bolt with $1/2$ inch open end wrench until it reaches $3/4$ turns past finger tight.

The 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. See Figure 3-10.

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

**Figure 3-10. RED Area for Both Integral and Remote Electronics Connection Types**
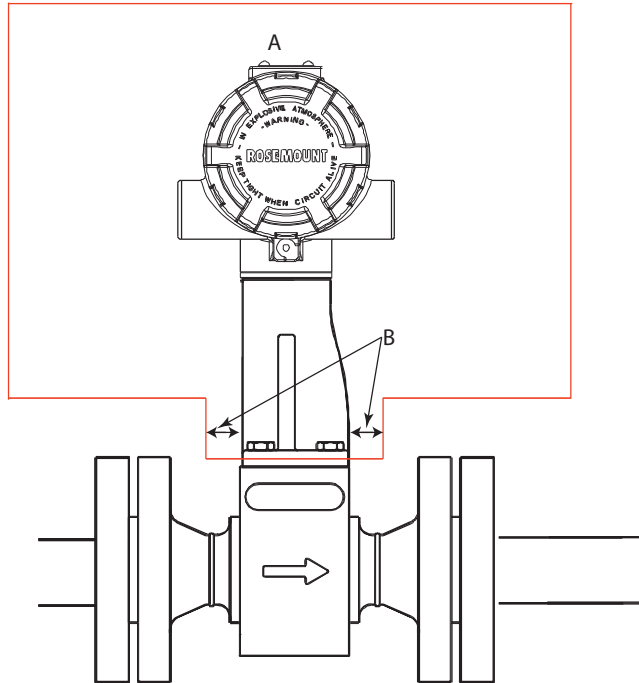


A. Do not insulate within the RED area for both integral and remote electronics connection types.
B. 1 in. (25 mm) minimum

**Figure 3-11. Flange Bolt Torquing Sequence**
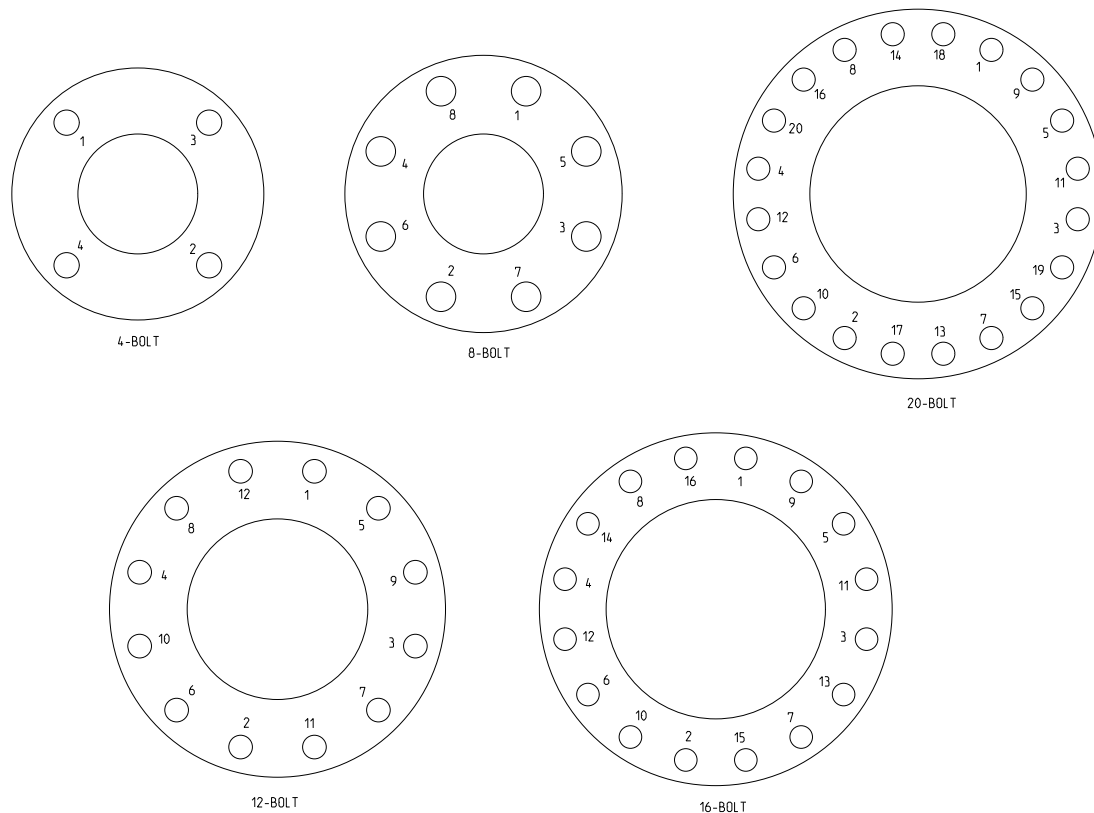


3.5.7  Flowmeter grounding

Grounding is not required in typical vortex applications; however, a proper ground will eliminate possible noise pickup by the electronics. Grounding straps may be used to ensure that the meter is grounded to the process piping. If you are using the transient protection option (T1), grounding straps are required to provide a proper low impedance ground.

**Note**
Properly ground flow meter body and transmitter per the local code.

To use grounding straps, secure one end of the grounding strap to the bolt extending from the side of the meter body and attach the other end of each grounding strap to a suitable ground.

# 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 Appendix A: Specifications and Reference Data for dimensional information.

## 3.6.1 High-temperature installations

Install the meter body so the electronics are positioned to the side of or below the pipe as shown in Figure 3-2 on page 24. Insulation may be required around the pipe to maintain an ambient transmitter temperature below 185 °F (85 °C) or the more restrictive temperature ratings marked on hazardous locations tags.

## 3.6.2 Conduit connections

The electronics housing has two ports for $1/2$–14 NPT or M20$\times$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. Conduit plugs should not be removed when circuit is live or in explosive atmosphere.

## 3.6.3 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 3-12. Proper Conduit Installation with Rosemount 8800D**
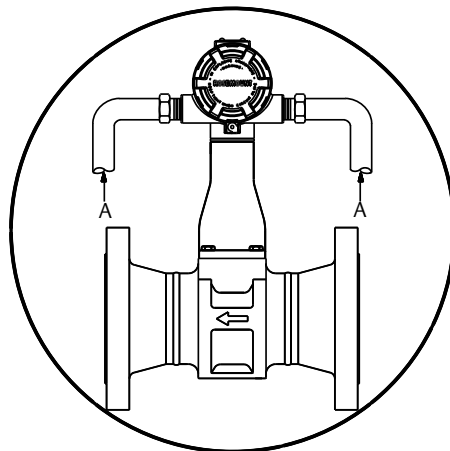


A. Conduit line

### 3.6.4 Cable gland

If you are using cable glands 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.

### 3.6.5 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. This screw is identified by a ground symbol (⏚), and is standard on all Rosemount 8800D transmitters.

- **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). The External Ground Assembly can also be ordered with the transmitter (Option Code V5) and is automatically included with certain hazardous area approvals.

**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 46 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.

### 3.6.6 Wiring procedure

The signal terminals are located in a compartment of the electronics housing separate from the flowmeter electronics. Connections for a HART-based communicator and an electric current test connection are above the signal terminals. Figure 3-13 on page 38 illustrates the power supply load limitations for the flowmeter.

**Note**
A power disconnect is required to remove power from the transmitter for maintenance, removal, and replacement.

#### Power supply

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

**Note**

A minimum loop resistance of 250 ohms is required to exchange information with a HART-based communicator. With 250 ohms of loop resistance, the flowmeter will require a minimum power supply voltage ($V_{ps}$) of 16.8 volts to output 24 mA.

**Note**

If a Smart Wireless THUM™ Adapter is being used with the Rosemount 8800D flowmeter to exchange information via IEC 62591 (*Wireless*HART® Protocol) technology, a minimum loop resistance of 250 ohms is required. In addition, a minimum power supply voltage ($V_{ps}$) of 19.3 volts will be required to output 24 mA.

**Note**

If a single power supply is used to power more than one Rosemount 8800D Flowmeter, the power supply used and circuitry common to the flowmeters should not have more than 20 ohms of impedance at 1200 Hz. See Figure 3-13 and Table 3-7.

**Figure 3-13. Power Supply Load Limitations**
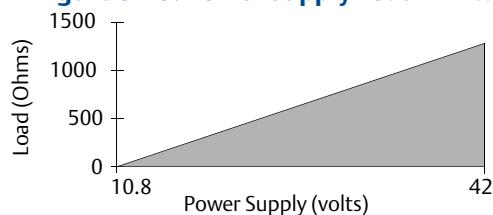


$R_{max}$ = 41.7($V_{ps}$ – 10.8)
$V_{ps}$ = power supply voltage (volts)
$R_{max}$ = maximum loop resistance (ohms)

**Table 3-7.  Resistance Based on Wire Gauge**

| Gauge number A.W.G. | Ohms per 1,000 ft (305 m) at 68°F (20°C) equivalent |
|---|---|
| 14 | 2.5 |
| 16 | 4.0 |
| 18 | 6.4 |
| 20 | 10 |
| 22 | 16 |
| 24 | 26 |

## Analog output

The flowmeter provides a 4–20 mA dc isolated electric current output, linear with the flow rate.

To make connections, remove the FIELD TERMINALS side cover of the electronics housing. All power to the electronics is supplied over the 4–20 mA signal wiring. Connect the wires as shown in Figure 3-16 on page 41.

**Note**
Twisted pairs are required to minimize noise pickup in the 4–20 mA signal and digital communication signal. For high EMI/RFI environments, shielded signal wire is required and recommended in all other installations. To ensure communication, wiring should be 24 AWG or larger and not exceed 5,000 ft (1500 m).

## Pulse output

**Note**
Remember when using the pulse output, all power to the electronics is still supplied over the 4–20 mA signal wiring.

The flowmeter provides an isolated transistor switch-closure frequency output signal proportional to flow, as shown in Figure 3-14 on page 39. The frequency limits are as follows:

- Maximum Frequency = 10000 Hz
- Minimum Frequency = 0.0000035 Hz (1 pulse/79 hours)
- Duty Cycle = 50%
- External Supply Voltage ($V_s$): 5 to 30 V dc
- Load Resistance ($R_L$): 100 $\Omega$ to 100 k$\Omega$
- Max Switching Current = 75 mA >= $V_S/R_L$
- Switch Closure: Transistor, open collector
  Open contact < 50 $\mu$A leakage
  Close contact < 20 $\Omega$

The output may drive an externally powered electromechanical or electronic totalizer, or may serve as a direct input to a control element.

To connect the wires, remove the FIELD TERMINALS side cover of the electronics housing. Connect the wires as shown in Figure 3-17 on page 41.

**Figure 3-14. Example: The Pulse Output will Maintain a 50 Percent Duty Cycle for all Frequencies**



50% Duty Cycle
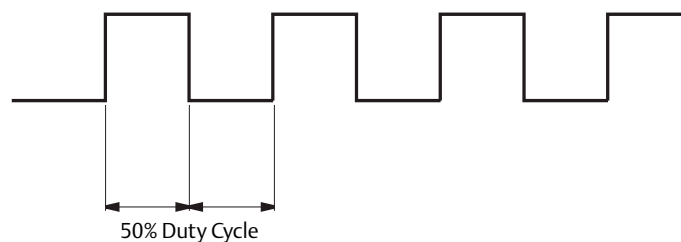
**Note**
When using pulse output, be sure to follow these precautions:

■ Shielded twisted pair is required when the pulse output and 4–20 mA output are run in the same conduit or cable trays. Shielded wire will also reduce false triggering caused by noise pickup. Wiring should be 24 AWG or larger and not exceed 5,000 ft. (1500 m).

■ Do not connect the powered signal wiring to the test terminals. Power could damage the test diode in the test connection.

■ Do not run signal wiring in conduit or open trays with power wiring, or near heavy electrical equipment. If needed, ground signal wiring at any one point on the signal loop, such as the negative terminal of the power supply. The electronics housing is grounded to the meter body.

■ If the flowmeter is protected by the optional transient protector, you must provide a high-current ground connection from the electronics housing to earth ground. Also, tighten the housing ground screw in the bottom of the terminal block to provide a good ground connection.

**Figure 3-15. Transient Terminal Block**
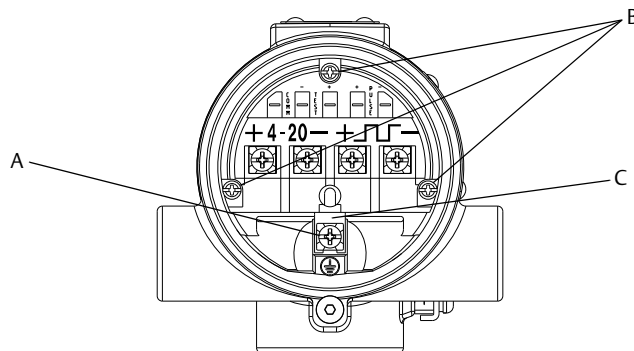


A. Housing ground screw
B. Captive screws
C. Transient terminal block ground tab

■ Plug and seal all unused conduit connections on the electronics housing to avoid moisture accumulation in the terminal side of the housing.

■ If the connections are not sealed, mount the flowmeter with the conduit entry positioned downward for drainage. Install wiring with a drip loop, making sure the bottom of the drip loop is lower than the conduit connections or the electronics housing.

**Figure 3-16. 4-20 mA Wiring**
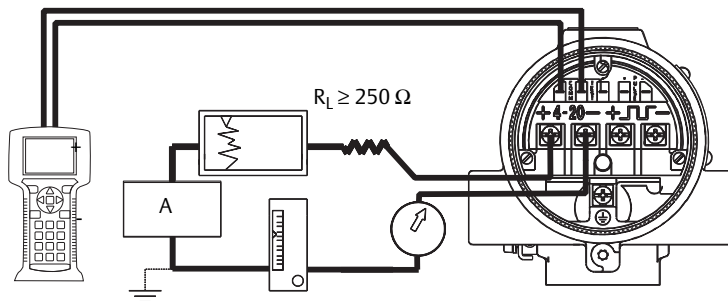


A. Power supply

**Figure 3-17. 4–20 mA and Pulse Wiring with Electronic Totalizer/Counter**
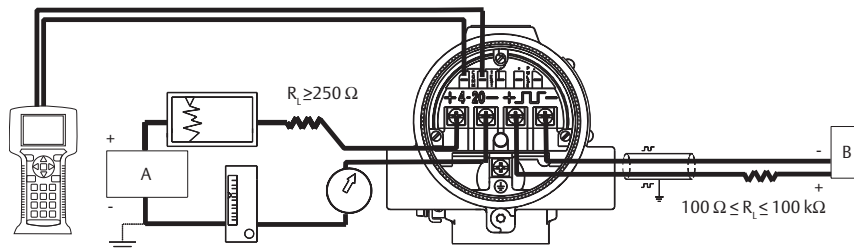


A. Power supply
B. Power supply with counter

## 3.6.7    Remote electronics

If you order one of the remote electronics options (options R10, R20, R30, R33, R50, 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. 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 Figure 3-18 and the following instructions to connect the loose end of the coaxial cable to the electronics housing. (See "Remote electronics procedure" on page 88 if connecting/disconnecting the meter adapter to the meter body.)

**Figure 3-18. Remote Electronics Installation**
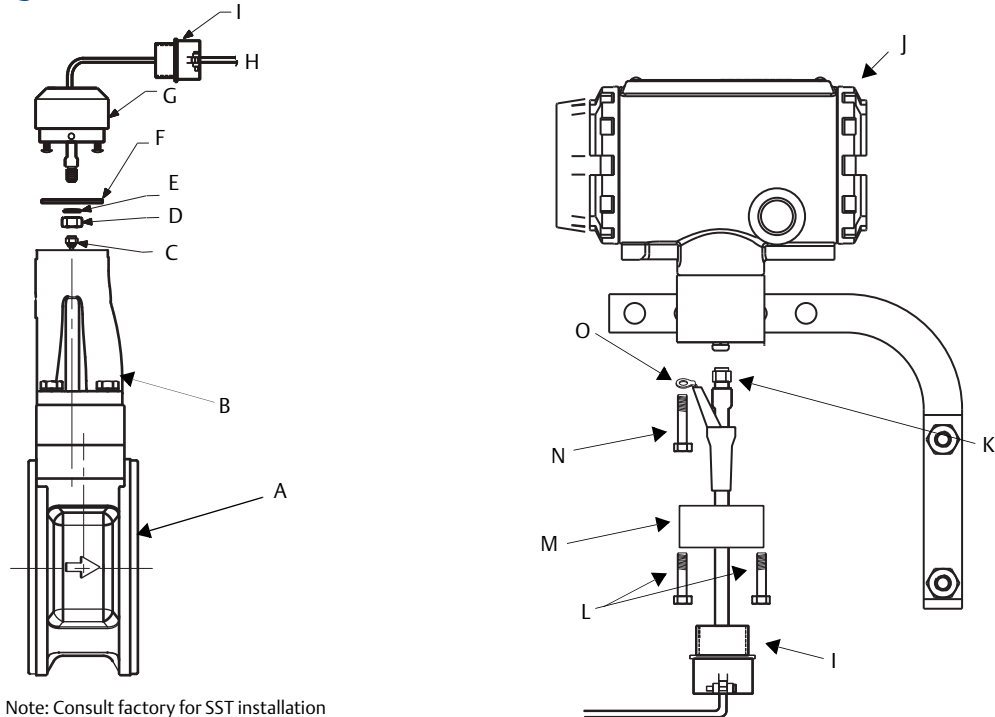


Note: Consult factory for SST installation

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

I. ½ 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

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.

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 the coaxial cable ground wire to the housing via the housing base ground screw.

9.      Attach and securely tighten the coaxial cable nut to the connection on the electronics housing.

10.     Align the housing adapter with the housing and attach with two 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 or use sealed cable glands at both ends of the cable.

In remote mount configurations when ordered with a hazardous area option code, the remote sensor cable and the interconnecting thermocouple cable (MTA option) are protected by separate intrinsic safety circuits, and must be segregated from each other, other intrinsically safe circuits, and non-intrinsically safe circuits per local and national wiring code.

# 3.6.8      Calibration

Rosemount 8800D Flowmeters are wet-calibrated at the factory and need no further calibration during installation. The calibration factor (K-factor) is indicated on each meter body and is entered into the electronics. Verification can be accomplished with a Field Communicator or AMS Device Manager.

# 3.7      Software configuration

To complete the installation of the Rosemount 8800D Vortex 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.

## LCD display

The LCD display (option M5) provides local indication of the output and abbreviated diagnostic messages governing operation of the flowmeter. The display is located on the electronics side of the flowmeter electronics. An extended cover is required to accommodate the display. Figure 3-19 on page 44 shows the flowmeter fitted with the LCD display and extended cover.

**Figure 3-19. Rosemount 8800D with Optional Indicator**
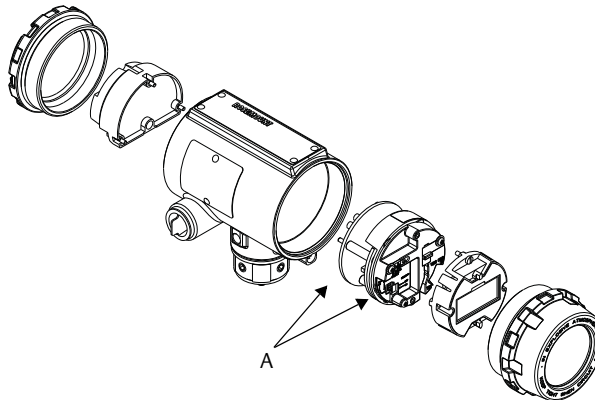


A. Electronics board

The indicator features an eight-character (and five alphanumeric) liquid crystal display that gives a direct reading of the digital signal from the microprocessor. During normal operation, the display can be configured to alternate between the following readings:

- Primary variable in engineering units
- Percent of range
- Totalized flow
- 4–20 mA electrical current output
- Shedding Frequency
- Electronics Temperature
- Pulse Output Frequency
- Process Temperature
  (MTA Option Only)
- Mass Flow
- Volume Flow
- Velocity Flow
- Calculated Process Density
  (MTA Option Only)
- Signal Strength
- Corrected Volume Flow

shows the indicator display with all segments lit.

**Figure 3-20. Optional Liquid Crystal Display**
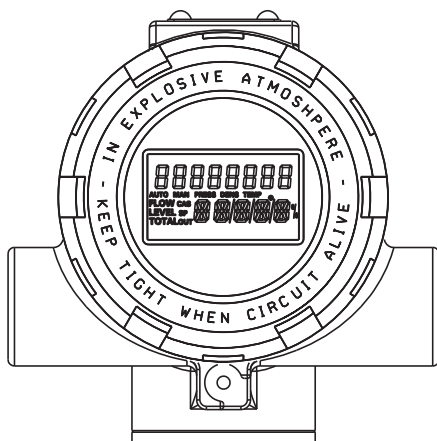


A HART-based communicator can be used to change the engineering units of the parameters displayed on the indicator. (See Section 4: Operation for more information).

## 3.7.1    Installing the indicator

For flowmeters ordered with the LCD indicator, the indicator is shipped installed. When purchased separately from the Rosemount 8800D, you must install the indicator using a small instrument screwdriver and the indicator kit. The indicator kit includes:

- One LCD indicator assembly
- One extended cover with o-ring installed
- One connector
- Two mounting screws
- Two jumpers

Referring to Figure 3-19 on page 44, use the following steps to install the LCD indicator:

1.    If the flowmeter is installed in a loop, secure the loop and disconnect the power.

2.    Remove the flowmeter cover on the electronics side.

**Note**
The circuit board is electrostatically sensitive. Be sure to observe handling precautions for static-sensitive components.

3.      Insert the mounting screws into the LCD indicator.

4.      Remove the two jumpers on the circuit board that coincide with the Alarm and the Security settings.

5.      Insert the connector into the Alarm/Security junction.

6.      Gently slide the LCD indicator onto the connector and tighten the screws into place.

7.      Insert jumpers into ALARM and SECURITY positions on the face of the LCD indicator.

8.      Attach the extended cover and tighten at least one-third turn past O-ring contact.

**Note**
The indicator may be installed in 90-degree increments for easy viewing. Mounting screws may need to be installed in the alternative holes based on LCD display orientation. One of the four connectors on the back of the indicator assembly must be positioned to fit into the 10-pin connector on the electronic board stack.

Note the following LCD display temperature limits:

| | | |
|---|---|---|
| Operating: | −4 to 185°F | (−20 to 85°C) |
| Storage: | −50 to 185°F | (−46 to 85°C) |

# 3.8      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 was verified using test waveforms specified in the following standard:

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

**Note**
The ground screw inside the terminal housing must be tightened for the proper operation of the transient protection. Also, a high-current ground connection to earth is required.

## 3.8.1    Installing the transient protector

For flowmeters ordered with the transient protector option (T1), the protector is shipped installed. When purchased separately from the Rosemount 8800D, you must install the protector on a Rosemount 8800D Flowmeter using a small instrument screwdriver, a pliers, and the transient protection kit.

The transient protection kit includes the following:

- One transient protection terminal block assembly
- Three captive screws

Use the following steps to install the transient protector:

1.    If the flowmeter is installed in a loop, secure the loop and disconnect power.

2.    Remove the field terminal side flowmeter cover.

3.    Remove the captive screws. Refer to Figure 3-21.

4.    Remove the housing ground screw.

5.    Use pliers to pull the terminal block out of the housing.

6.    Inspect the connector pins for straightness.

7.    Place the new terminal block in position and carefully press it into place. The terminal block may have to be moved back and forth to get the connector pins started into the sockets.

8.    Tighten the captive screws.

9.    Install and tighten the ground screw.

10.    Replace the cover.

**Figure 3-21. Transient Terminal Block**
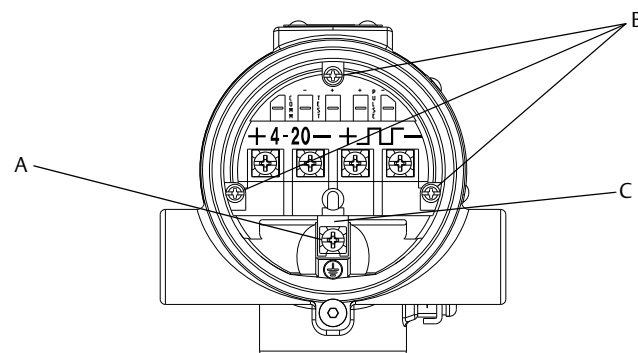


A. Housing ground screw
B. Captive screws
C. Transient terminal block ground tab

# Section 4 Operation

This section contains information for advanced configuration parameters and diagnostics.

The software configuration settings for the Rosemount™ 8800D can be accessed through a HART®-based communicator or through a control system. The software functions for the Field Communicator are described in detail in this section of the manual. It provides an overview and summary of communicator functions. For more complete instructions, see the communicator manual.

Before operating the Rosemount 8800D in an actual installation, you should review all of the factory set configuration data to ensure they reflect the current application.

## 4.1 Diagnostics/service

Use the following functions to verify the flowmeter is functioning properly, or when you suspect component failure or a problem with loop performance, or when instructed to do so as part of a troubleshooting procedure. Initiate each test with the Field Communicator or other HART-based communications device.

### 4.1.1 Device Alerts

| FastKeys | 3, 1 |
|---|---|

Shows any active device alerts and allows the user to reset alert status to verify that corrected alerts have been cleared.

### Density Test Calculation

| FastKeys | 3, 4, 1, 7 |
|---|---|

Allows for the density test calculation for temperature compensated density. The vortex meter will calculate the associated density at a user entered temperature value. Process Fluid must be set to Tcomp Sat Steam or Tcomp Liquid in order to run this test.

### Minimum Electronics Temperature

| FastKeys | 3, 2, 6, 5 |
|---|---|

Displays the lowest temperature that the electronics has been exposed to.

### Maximum Electronics Temperature

| FastKeys | 3, 2, 6, 4 |
|---|---|

Displays the highest temperature that the electronics has been exposed to.

### Self Test

| **FastKeys** | 3, 4, 4, 1, 1 |
|---|---|

Although the Rosemount 8800D performs continuous self-diagnostics, you can initiate an immediate diagnostic to check for possible electronics failure.

Self test checks proper communications with the transmitter and provides diagnostic capabilities for transmitter problems. Follow on-screen instructions if problems are detected, or check the appropriate appendix for error messages relating to your transmitter. Initiating a Self Test will suspend flow measurement for up to five seconds.

### Reset Transmitter

| **FastKeys** | 3, 4, 4, 1, 2 |
|---|---|

Restarts the transmitter (same as cycling power). This function does not change or reset the configuration parameters.

## 4.1.2    Loop Test

| **FastKeys** | 3, 5, 2, 7 |
|---|---|

Verifies the analog output of the flowmeter, the integrity of the loop, and the operation of any recorders or similar devices. Conduct the loop test after the flowmeter is installed in the field.

If the meter is located in a loop with a control system, the loop will have to be set to manual control before the loop test is performed.

Loop test allows the device to be set to any output between the 4 mA and 20 mA.

## 4.1.3    Flow Simulation

| **FastKeys** | 3, 5, 1 |
|---|---|

Enables the operator to verify electronics functionality. The transmitter supports internal and external flow simulation. The PV must be configured to Volume Flow, *Velocity Flow*, Mass Flow, or *Corrected Volume Flow* before *Flow Simulation* can be enabled.

### Primary Variable (PV)

| **FastKeys** | 3, 5, 1, 3, 1 |
|---|---|

Shows the primary variable value in engineering units for the flow simulation.

### Shedding Frequency

| **FastKeys** | 3, 5, 1, 3, 2 |
|---|---|

Shows the shedding frequency for the flow simulation.

### Simulate Flow

| FastKeys | 3, 5, 1, 2, 1 |
|----------|---------------|

Allows flow simulation using either an internal or external sensor input signal.

### Internal Flow Simulation

| FastKeys | 3, 5, 1, 2, 1, 2 |
|----------|------------------|

Disconnects the sensor signal from the electronics, and allows for configuration of the internal flow simulation for fixed or ramped flow.

### Fixed Flow

| FastKeys | 3, 5, 1, 2, 1, 2, 1 |
|----------|---------------------|

The fixed flow simulation signal can be entered as either a percent of range or flow rate in engineering units. This simulation locks the input signal at the configured fixed flow rate.

### Ramped Flow

| FastKeys | 3, 5, 1, 2, 1, 2, 2 |
|----------|---------------------|

The minimum and maximum flowrate can be entered as either percent of range or as a flow rate in engineering units. The ramp time can be entered in seconds from a minimum of 0.6 seconds to a maximum of 34951 seconds. This simulation causes the output of the meter to continuously ramp from the minimum entered rate to the maximum entered rate and back over the ramp time.

### External Flow Simulation (sensor offline)

| FastKeys | 3, 5, 1, 2, 1, 3 |
|----------|------------------|

With external flow simulation, the sensor connection must be removed from the electronics such that an external frequency source can be used to test and verify the electronics.

### Enable Normal Flow

| FastKeys | 3, 5, 1, 2, 1, 1 |
|----------|------------------|

Exits the flow simulation mode (internal or external) and return to normal operation mode. Enable Normal Flow must be activated after any simulation is run. Failure to enable normal flow will leave the vortex in simulation mode.

## 4.1.4    Analog Trim

| FastKeys | 3, 4, 3, 7 |
|----------|------------|

Trims and verifies the analog output in a single function. If the analog output is trimmed, it will be scaled proportionally through the range of the output.

To trim the digital-to-analog output, initiate the Analog Trim function and connect an ammeter to the loop to measure the actual analog output of the meter. Follow the on-screen functions to complete the task.

## 4.1.5    Scaled Analog Trim

| **FastKeys** | 3, 4, 3, 8 |
|---|---|

Calibrates the flowmeter analog output using a different scale than the standard 4-20 mA output scale. Non-scaled Analog Trim (described above), is typically performed using an ammeter where calibration values are entered in units of milliamperes. Both non-scaled Analog Trim and Scaled Analog Trim allow you to trim the 4-20 mA output to approximately ±5% of the nominal 4 mA end point and ±3% of the nominal 20 mA end point. Scaled Analog Trim allows you to trim the flowmeter using a scale that may be more convenient based upon your method of measurement.

For example, it may be more convenient for you to make electrical current measurements by direct voltage readings across the loop resistor. If your loop resistor is 500 Ohms, and you want to calibrate the meter using voltage measurements made across this resistor, you could rescale (select CHANGE on the Field Communicator) your trim points from 4-20 mA to 4-20 mA x 500 ohm or 2-10 VDC. Once your scaled trim points have been entered as 2 and 10, you can now calibrate your flowmeter by entering voltage measurements directly from the voltmeter.

## 4.1.6    Shedding Frequency at URV

| **FastKeys** | 3, 4, 2, 1, 3 |
|---|---|

Gives the shedding frequency corresponding to the URV (Upper Range Value). If the Primary Variable (PV) is Process Temperature, the Shedding Frequency at URV represents the shedding frequency of the Volumetric Flow URV. This can be set by assigning Volumetric Flow to PV and setting range values.

# 4.2    Advanced functionality

The Rosemount 8800D enables the configuration of the flowmeter for a wider range of applications and special situations. Advanced configuration items not detailed in Section 2: Configuration are shown here.

## Flow Sensor

| **FastKeys** | 2, 2, 1, 2 |
|---|---|

Provides information on Reference and Compensated K-factor and displays values for the Upper and Lower Sensor Limit.

Upper Sensor Limit—30 ft/s for liquids, 300 ft/s for gases, 800 °F for process temp.

Lower Sensor Limit—0 ft/s (liquid or gas), -58 °F for process temp.

The reference K-factor is factory set according to the actual K-factor for your application. It should only be changed if you replace parts of the flowmeter. Contact your Rosemount representative for details.

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

## Meter Body

| FastKeys | 2, 2, 1, 4 |
|---|---|

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

Flange Type is a factory set configuration value that reflects the flange type and rating.

Meter Body Serial Number is a factory set configuration value that identifies the meter body number.

Body Number Suffix 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 character. The number designates the body number. The alpha character designates the meter body type. There are three options for the alpha character:

- None—Indicates welded meter construction
- A—Indicates welded meter construction
- B—Indicates cast construction

## Meter Factor

| FastKeys | 2, 2, 1, 1, 7 |
|---|---|

Compensates the flowmeter for installation effects caused by less than ideal straight run piping. See reference graphs located in the Rosemount 8800 Vortex Installation Effects Technical Data Sheet for the percent of K-factor shift based on entrance effects of upstream disturbances. This value is entered as a flow multiplication factor of the range of 0.8 to 1.2.

## Alarm/Saturation Levels

| FastKeys | 2, 2, Device Information, 3 |
|---|---|

Displays the analog output settings for high and low saturation. You can also view the alarm direction to determine if the alarm jumper on the device electronics is set to high or low.

The Alarm/Saturation Levels can also be set to either Rosemount Standard or NAMUR.

### Restore Factory Calibration

| FastKeys | 3, 4, 3, 9 |
|---|---|

Restores factory analog trim settings.

## 4.2.1 Pulse Output

| FastKeys | 2, 2, 4, 4, 2 |
|---|---|

Can be configured using the configuration tool guided setups.

**Note**
Configuration of the pulse features is allowed even if the pulse option (Option P) was not ordered.

The Rosemount 8800D comes with an optional pulse output option (P). This enables the flowmeter to output the pulse rate to an external control system, totalizer, or other device. If the flowmeter was ordered with the pulse mode option, it may be configured for either pulse scaling (based on rate or unit) or shedding frequency output.

There are several methods for configuring the pulse output:

- Off
- Direct (Shedding Frequency)
- Scaled Volume
- Scaled Velocity
- Scaled Mass
- Scaled Corrected Volumetric

**Note**
In order to totalize in compensated mass flow, for units with the MTA option only, set pulse output to Scaled Mass even if the pulse output was not ordered or will not be used.

### Direct (shedding)

This mode provides the vortex shedding frequency as output. In this mode, the software does not compensate the K-factor for effects such as thermal expansion or differing mating pipe inside diameters. Scaled pulse mode must be used to compensate the K-factor for thermal expansion and mating pipe effects.

### Scaled volumetric

This mode allows for configuration of the pulse output based on a volumetric flow rate. For example, set 100 gallons per minute = 10,000 Hz. (The user enterable parameters are flow rate and frequency.)

### Scaled corrected volumetric

This mode allows for configuration of the pulse output based on a corrected volumetric flow rate.

### Scaled velocity

This mode allows for configuration of the pulse output based on a velocity flow rate.

### Scaled mass

This mode allows for configuration of the pulse output based on based on a mass flow rate. If Process Fluid = Tcomp Sat Steam or Tcomp Liquid, this is a temperature compensated mass flow.

### Pulse scaling based on flow rate

Allows the user to set a certain flow rate to a desired frequency.

For example:

1000 lbs/hr = 1000HZ

1.    Enter a flow rate of 1000 lbs/hr.

2.    Enter a frequency of 1000Hz.

### Pulse scaling based on flow unit

Allows the user to set one pulse equal to a desired mass, volume or distance.

For example:

1 pulse = 1000lbs.

Enter 1000 for the mass.

### Pulse Loop Test

| **FastKeys** | 3, 5, 3, 4 |
| --- | --- |

Fixed frequency mode test that checks the integrity of the pulse loop. It tests that all connections are good and that pulse output is running on the loop.

**Note**
The Pulse Loop Test will not check for valid pulse scaling configuration. It will set a frequency without consideration of the pulse scaling configuration.

## 4.2.2    Temperature Compensation

When the vortex meter is ordered with the MTA option, the transmitter is capable of dynamically compensating for changes in fluid density to provide accurate mass and corrected volumetric flow measurement. Temperature Compensation is for use with the Temperature Compensated Steam (TComp Sat Steam) or Temperature Compensated Liquids (TComp Liquid) fluid types.

## Temperature Compensated Steam

| **FastKeys** | 2, 2, 1, 1, 3 |
|---|---|

To compensate for changes in saturated steam, select the Temperature Compensated Steam (TComp Sat Steam) fluid type. Choosing this fluid type automatically enables dynamic density compensation while measuring mass flow or corrected volumetric flow by using the built-in steam tables.

## Temperature Compensated Liquids

| **FastKeys** | 2, 2, 1, 1, 3 (set Process Fluid Type) |
|---|---|

Setting the Process Fluid Type to Temperature Compensated Liquids (Tcomp Liquid) directs the transmitter to dynamically compensate for changes in process density using either the built-in water density calculations per IAPWS-IF97 or the user defined temperature and density points.

### Water

| **FastKeys** | 2, 2, 8, 1 (set Temp Comp Liquid to Water)<br>2, 2, 8, 2 (set Process Pressure) |
|---|---|

To compensate for density changes in water, first set the Temperature Compensated Liquid (Temp Comp Liquid) fluid type to water. Then set the approximate process pressure. This will enable dynamic density compensation while measuring mass flow or corrected volumetric flow by using the built-in water density calculations.

### User Defined

| **FastKeys** | 2,2,8,1 (set Temp Comp Liquid to User Defined)<br>2,2,8,2 (set Temperature/Density Points) |
|---|---|

To compensate for density changes in a liquid type other than water, navigate to the Temp Comp Liquid screen using a Field Communicator and select User Defined. Next, configure the appropriate temperature and density points. Enter between 2 and 5 temperature and density points in order of ascending temperature. The transmitter will use these entered values to interpolate between and calculate the process density. This enables dynamic density compensation while measuring mass flow or corrected volumetric flow for a user defined liquid.

## 4.2.3    SMART Fluid Diagnostic

| FastKeys | 2, 2, 6 |
|----------|---------|

> ⚠ **CAUTION**
>
> Due to unpredictable flow conditions and multiple potential failure modes in a process piping system, the SMART Fluid Diagnostic should not be used as a fail-safe alert when the transition from liquid to gas represents a safety hazard.

Alerts users when the fluid flow changes from liquid flow to gas flow. This is useful in oil and gas separator applications where stuck dump valves may allow gas to pass through the water leg and eventually into storage tanks. The diagnostic will alert users when gas begins flowing through the water leg. Additionally, the diagnostic can be used in blow down cycles where air, nitrogen, or steam are used to clear pipes. Once the liquid has been cleared, the meter will detect gas flow and the user can use that alert to properly time blow down cycles.

The SMART Fluid Diagnostic uses several application specific parameters to allow users to fine-tune functionality to their installation. Additionally, the diagnostic is available as a trial for 30 days on all equipped transmitters.

### Control

| FastKeys | 2, 2, 6, 2, 1 |
|----------|---------------|

Enables user to turn the SMART Fluid Diagnostic Functionality ON or OFF. Default is OFF unless configured for SMART Fluid Diagnostic from the factory.

### Alarm Type

| FastKeys | 2, 2, 6, 2, 2 |
|----------|---------------|

Enables user to select the alarm type. The alarm types are Analog, Pulse, Analog and Pulse, and Neither Analog or Pulse. This is the output that the transmitter will use to send the alarm when the meter detects a change from liquid to gas flow. In order to use the pulse output alarm, the transmitter must be equipped with the pulse output option. The default setting is Neither Analog or Pulse.

### Analog Alarm

| FastKeys | 2, 2, 6, 2, 3 |
|----------|---------------|

If the output type selected includes Analog, then the output level chosen here will be used for the alarm. The valid range is 3.5–22.65 mA. Default is 21.75 mA.

### Pulse Alarm

| FastKeys | 2, 2, 6, 2, 4 |
|----------|---------------|

If the output type selected includes pulse, then the output frequency you choose here will be used for the alarm. The valid range is 1–10,000 Hz. Default is 1 Hz.

## Alarm Latch

| FastKeys | 2, 2, 6, 2, 5 |
|---|---|

Dictates the behavior of the alarm once gas flow is detected. If Alarm Latch is Enabled, the alarm will continue until the user resets the alarm manually (using a HART communication device such as AMS Device Manager, or handheld communicator). When Disabled, the alarm will stop once liquid flow is detected by the transmitter, at which time the meter will continue normal operation. The default is Disabled.

## Optimize Gas Detection Filters

| FastKeys | 2, 2, 6, 2, Next |
|---|---|

Once the gas density has been determined, optimize the gas detection filters. This consists of two parts. The first is setting the gas density and second is setting the gas detection window.

The gas density value must be selected from a list of densities. This will be used to set the detection filters for the gas flow. Choose the value from the drop down that is the closest to the process gas density without exceeding it. Default value is 0.15 lb/cu ft. After filter optimization, it is best practice to verify that your gas detection low flow cutoff is above your highest expected liquid flow rate frequency.

The Gas Detection Window specifies how long the meter will look for a gas flow event after the meter stops detecting liquid flow. Under typical conditions, the transition takes place quickly; however, if the transition is slow, then a longer window may be required. The acceptable range of values is 1 to 9 seconds and the default value is 1 second.

## SMART Fluid Diagnostic Trial

| FastKeys | 2, 2, 7, 1 |
|---|---|

The SMART Fluid Diagnostic can be used on a trial basis for 30 days following activation of the trial. The trial period can be activated by entering "8800" in the license field. To permanently activate the diagnostic following the trial, contact Customer Support to obtain an activation code.

### Licensing

| FastKeys | 2, 2, 7, 1, 5 |
|---|---|

Enter the license key to enable SMART Fluid Diagnostics if it was not ordered from the factory.

## 4.2.4    Communications

| **FastKeys** | 2, 2, HART |
|---|---|

Multidrop configuration refers to the connection of several flowmeters to a single communications transmission line. Communication occurs digitally between a HART-based communicator or control system and the flowmeters. Multidrop mode automatically deactivates the analog output of the flowmeters. Using the HART communications protocol, up to 15 transmitters can be connected on a single twisted pair of wires or over leased phone lines.

The use of a multidrop installation requires consideration of the update rate necessary from each transmitter, the combination of transmitter models, and the length of the transmission line. Multidrop installations are not recommended where intrinsic safety is a requirement. Communication with the transmitters can be accomplished with commercially available Bell 202 modems and a host implementing the HART protocol. Each transmitter is identified by a unique address (1-15) and responds to the commands defined in the HART protocol.

Figure 4-1 on page 59 shows a typical multidrop network. This figure is not intended as an installation diagram. Contact Rosemount product support with specific requirements for multidrop applications.

**Figure 4-1. Typical Multi-drop Network**



RS-232-C
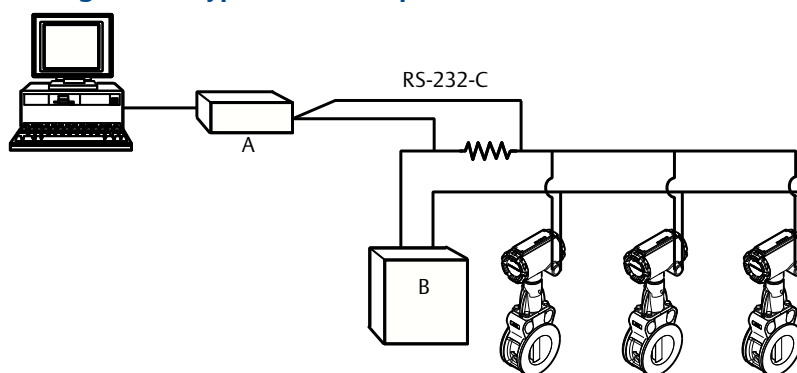
A. Bell 202 Modem
B. Power Supply

**Note**
The Rosemount 8800D is set to poll address zero at the factory, allowing it to operate in the standard point-to-point manner with a 4–20 mA output signal. To activate multidrop communication, the transmitter poll address must be changed to a number between 1 and 15. This change deactivates the 4–20 mA analog output, setting it to 4 mA, and disables the failure mode alert signal.

### Poll address

| FastKeys | 2, 2, HART, 2, 1 |
|---|---|

Enables configuration of the poll address for a multi-dropped meter. The poll address is used to identify each meter on the multi-drop line. Follow the on-screen instructions to set the address at a number from 1 to 15. HART 7 allows an address range of 0 to 63. To set or change the flowmeter address, establish communication with the selected Rosemount 8800D in the loop.

### Auto poll

| FastKeys | OFF LINE FCN |
|---|---|

When a HART-based communicator is powered up and auto polling is on, the communicator automatically polls the flowmeter addresses to which it is connected. If the address is 0, the HART-based communicator enters its normal Online mode. If it detects an address other than 0, the communicator finds each device in the loop and lists them by poll address and tag. Scroll through the list and select the meter with which you need to communicate.

If *Auto Poll* is off, the flowmeter must have the poll address set to 0 or the flowmeter will not be found. Additionally, if a single connected device has an address other than zero and auto polling is off, the device will not be found.

## 4.2.5    Burst Mode

| FastKeys | 2, 2, HART, 3 |
|---|---|

### Burst Mode configuration

The Rosemount 8800D includes a burst mode function that broadcasts the primary variable or all dynamic variables approximately three to four times a second. The *Burst Mode* is a specialized function used in very specific applications. The burst mode function enables you to select the variables to broadcast while in the burst mode and to select the burst mode option. HART 7 devices offer enhanced burst mode capabilities including the ability to broadcast variable status, the ability to broadcast up to 8 variables, and the ability to trigger messages based on variable events or at defined values.

The Burst Mode variable enables you to set the burst mode to the needs of your application. Options for the burst mode setting include:

Off—Turns off the burst mode so that no data are broadcast on the loop.

On—Turns burst mode on so that the data selected under *Burst Option* are broadcast over the loop.

Additional command options may appear that are reserved and do not apply to the Rosemount 8800D.

### Burst Option

Enables you to select the variables to broadcast over the loop:

PV—Selects the primary variable for broadcast over the loop.

Percent Range/Current—Selects the primary variable as percent of range and analog output current for broadcast over the loop.

Process vars/crnt—Selects the primary variables and analog outuput current for broadcast over the loop.

Dynamic Vars—Burst all dynamic variables in the transmitter.

Xmtr Vars—Allows the user to define custom burst variables.

## 4.2.6    Local Display

| **FastKeys** | 2, 2, 9 |
|---|---|

Allows user to select which variables are shown on the optional (M5) local display:

- Primary Variable
- Percent of Range
- Loop Current
- Total
- Shedding Frequency
- Process Temperature (MTA Option Only)
- Signal Strength

- Mass Flow
- Velocity Flow
- Volume Flow
- Pulse Frequency
- Electronics Temperature
- Calculated Process Density (MTA Option Only)
- Corrected Volume Flow

## 4.2.7    Signal Processing

| **FastKeys** | 2, 2, 5 |
|---|---|

The Rosemount 8800D and its HART-based communications feature enables the ability to filter out noise and other frequencies from the vortex signal. The four user-alterable parameters associated with the digital signal processing on the Rosemount 8800D include low-pass filter corner frequency, low-flow cutoff, trigger level, and damping. These four signal conditioning functions are configured at the factory for optimum filtering over the range of flow for a given line size, service type (liquid or gas), and process density. For most applications, leave these parameters at the factory settings. Some applications may require adjustment of the signal processing parameters.

Use signal processing only when recommended in the troubleshooting section of this manual. Some of the problems that may require signal processing include:

- High output (output saturation)
- Erratic output with or without flow present
- Incorrect output (with known flow rate)
- No output or low output with flow present
- Low total (missing pulses)
- High total (extra pulses)

If one or more of these conditions exist, and you have checked other potential sources (K-factor, service type, lower and upper range values, 4–20 mA trim, pulse scaling factor, process temperature, pipe ID), refer to Section 5: Troubleshooting. If problems persist after signal processing adjustments, consult the factory.

## Optimize DSP (Digital Signal Processing

| **FastKeys** | 2, 2, 5, 5, 1 |
|---|---|

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 4:1 signal to the trigger level ratio. This function will also reset all of the filters to optimize the flowmeter performance over the new range. For a stronger signal, select a density value that is lower than the actual flowing density. For dynamic process densities, select a density value that is lower than the lowest expected flowing density.

## Signal Strength

| **FastKeys** | 3, 4, 2,1, 4 |
|---|---|

Variable that indicates the flow signal strength to trigger level ratio. This ratio indicates if there is enough flow signal strength for the meter to work properly. For accurate flow measurement, the value should be greater than 4. Values greater than 4 will allow increased filtering for noisy applications. For values greater than 4, with sufficient density, the Optimize DSP function can be utilized to optimize the measurable range of the flowmeter.

Values less than 4 may indicate applications with very low densities and/or applications with excessive filtering.

## Manual Filter Adjust

| **FastKeys** | 2, 2, 5, 2 |
|---|---|

Allows for manual adjustment of the following settings: Low Flow Cutoff, Low Flow Cutoff Response, Low Pass Corner Frequency, and Trigger Level, while monitoring flow and or signal strength.

## Low Flow Cutoff

| FastKeys | 2, 2, 5, 2, 2 |
|----------|---------------|

Enables the 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.

Low Flow Cutoff offers two modes for adjustment:

- Decrease Low Flow Cutoff
- Increase Low Flow Cutoff

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. The dead band extends to approximately 20 percent above the low flow cutoff value. The dead band prevents the output from bouncing between 4 mA and normal flow range if the flow rate is near the low flow cutoff value.

## LFC Response

| FastKeys | 2, 2, 5, 2, 3 |
|----------|---------------|

Defines how the output of the Vortex meter will behave entering into and coming out of the Low Flow Cutoff. Options are stepped or damped. (See Technical Note 00840-0200-4004 for more information regarding Low Flow Measurement).

## Low Pass Corner Frequency

| FastKeys | 2, 2, 5, 2, 4 |
|----------|---------------|

Sets the low-pass filter 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 you are experiencing problems. See Section 5: Troubleshooting.

The Low Pass Filter corner frequency variable offers two modes for adjustment:

- Decrease Low Pass Corner Frequency
- Increase Low Pass Corner Frequency

## Trigger Level

| FastKeys | 2, 2, 5, 2, 5 |
|----------|---------------|

Configured to reject noise within the flow range while allowing normal amplitude variation of the vortex signal. Signals of amplitude lower than the Trigger Level setting are filtered out. The factory setting optimizes noise rejection in most applications. Trigger Level offers two modes for adjustment:

- Increase Trigger Level
- Decrease Trigger Level

**Note**
Do not adjust this parameter unless directed to do so by a Rosemount Technical Support Representative.

### Restore Default Filter

| FastKeys | 2, 2, 5, 5, 2 |
|----------|---------------|

Restores all of the signal conditioning variables to default values. Default values for signal conditioning variables will be set automatically depending on fluid type using the *Optimize DSP* function with a density setting of 40 lb/ft$^3$ for liquid or 0.15 lb/ft$^3$ for gas.

### Flow Damping

| FastKeys | 2, 2, 5, 4 |
|----------|------------|

The default damping value is 2.0 seconds. *Flow Damping* can be reset to any value between 0.2 and 255 seconds.

### Temperature Damping

| FastKeys | 2, 2, 5, 4 (MTA Option Only) |
|----------|------------------------------|

The default damping value is 2.0 seconds. *Temperature Damping* can be reset to any value between 0.4 and 32 seconds. Temperature Damping can only be configured if Temperature is assigned to be PV.

## 4.2.8 Device Information

| FastKeys | 2, 2, Device Information |
|----------|-------------------------|

Used for identification of flowmeters in the field and to store information that may be useful in service situations. Information variables have no effect on flowmeter output or process variables.

### Tag

| FastKeys | 2, 2, Device Information, 1, 1 |
|----------|--------------------------------|

The quickest variable to identify and distinguish between flowmeters. Flowmeters can be tagged according to the requirements of your application. The tag may be up to eight characters long. HART 7 supports Long Tag, which allows up to 32 characters.

### Long Tag

| FastKeys | 2, 2, Device Information, 1, 2 |
|----------|--------------------------------|

Available for HART® 7 and allows for up to 32 characters

## Descriptor

| FastKeys | 2, 2, Device Information, 1, 6 |
|---|---|

Longer user-defined variable to assist with more specific identification of the particular flowmeter. It is usually used in multi-flowmeter environments and provides 16 characters.

## Message

| FastKeys | 2, 2, Device Information, 1, 7 |
|---|---|

Provides an even longer user-defined variable for identification and other purposes. It provides 32 characters of information and is stored with the other configuration data.

## Date

| FastKeys | 2, 2, Device Information, 1, 5 |
|---|---|

User-defined variable that provides a place to save a date, typically used to store the last date that the transmitter configuration was changed.

## Write Protect

| FastKeys | 2, 2, Device Information, 4, 1 |
|---|---|

Read-only informational variable that reflects the setting of the hardware security switch. If Write Protect is ON, configuration data are protected and cannot be changed from a HART-based communicator or control system. If Write Protect is OFF, configuration data may be changed using the communicator or control system. For HART 7 devices, a software lock is also available.

## Revision Numbers

| FastKeys | 2, 2, Device Information, 2 |
|---|---|

Fixed informational variables that provide the revision number for different elements of your Field Communicator and Rosemount 8800D. These revision numbers may be required when calling the factory for support. Revision numbers can only be changed at the factory and are provided for the following elements:

### Universal Revision

| FastKeys | 2, 2, Device Information, 2, 1 |
|---|---|

Designates the HART Universal Command specification to which the transmitter is designed to conform.

### Transmitter Revision

| FastKeys | 2, 2, Device Information, 2, 2 |
|---|---|

Designates the revision for Rosemount 8800D specific command identification for HART compatibility.

### Software Revision

| FastKeys | 2, 2, Device Information, 2, 3 |
|---|---|

Designates the internal software revision level for the Rosemount 8800D.

### Hardware Revision

| FastKeys | 2, 2, Device Information, 2, 4 |
|---|---|

Designates the revision level for the Rosemount 8800D hardware.

### DD Revision

| FastKeys | 2, 2, Device Information, 2, 5 |
|---|---|

Factory-defined unique identifier for device descriptor revision identification in the software.

## 4.2.9 Change HART Revisions

| FastKeys | 2, 2, HART, 2, Change HART Rev |
|---|---|

On enabled devices, change between HART revision 5 and 7. Configuration will be saved while switching between revisions.

## 4.2.10 Locate Device

| FastKeys | 3, 4, 4, 2 |
|---|---|

For HART 7 devices with LCD displays, enabling Locate Device displays the characters "0-0-0-0" on the LCD display. This allows for easy field identification of the device during commissioning or service.

# Section 5 Troubleshooting

provides summarized troubleshooting suggestions for the most common problems that occur during operation. The symptoms of metering problems include:

■ Communications problems with a HART®-based communicator

■ Incorrect 4–20 mA output

■ Incorrect pulse output

■ Error messages on HART-based communicator

■ Flow in pipe but no transmitter output

■ Flow in pipe with incorrect transmitter output

■ Output with no actual flow

**Note**
The Rosemount™ 8800D Sensor is extremely reliable and should not have to be replaced. Please consult the factory before removing the sensor.

# 5.1 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 in this section.

**⚠ WARNING**

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

- Do not remove the transmitter cover or thermocouple (MTA option only) from the electronics housing in explosive atmospheres when the circuit is alive.

- Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

- 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**

The sensor cavity could contain line pressure if an abnormal failure has occurred inside the meter body. De-pressurize flow line before removing sensor nut.

# 5.2 Troubleshooting tables

The most common problems experienced by users of the Rosemount 8800D are listed in Table 5-1 along with potential causes of the problem and suggested corrective actions. If the problem you are experiencing is not listed here, see the Advanced Troubleshooting section.

**Table 5-1. Troubleshooting Table**

| Symptom | Corrective action | |
|---|---|---|
| Communication problems with HART-based Communicator | • Check for a minimum of 10.8 Vdc at transmitter terminals.<br>• Check communications loop with HART-based communicator.<br>• Check for loop resistor (250 to 1000 ohms).<br>• Measure loop resistor value ($R_{loop}$) and source power supply voltage ($V_{ps}$). Check that $[V_{ps} - (R_{loop} \times 0.024)] > 10.8$ Vdc. | • Check for transmitter in multidrop mode.<br>• Check for transmitter in burst mode.<br>• Remove pulse connection if you have a three wire pulse installation.<br>• Replace electronics. |

| Symptom | Corrective action | |
|---|---|---|
| Incorrect 4–20 mA Output | • Check for minimum 10.8 Vdc at transmitter terminals.<br>• Check URV, LRV, Density, Special Units, LFC– compare these inputs with the sizing program results. Correct configuration.<br>• Perform 4–20 mA loop test. | • Check for corrosion on terminal block.<br>• Replace electronics if necessary.<br>• Refer to Advanced troubleshooting .<br>• See Appendix C: Electronics Verification for electronics verification procedure. |
| Incorrect Pulse Output | • Check that 4–20 mA output is correct.<br>• Check pulse counter specifications.<br>• Check pulse mode and scaling factor. (Make sure scaling factor is not inverted). | • Perform pulse test.<br>• Select pulse scaling so that pulse output is less than 10,000Hz at URV. |
| Error Messages on HART-based Communicator | • See alphabetical listing in the Error Messages Table for the communicator starting at Diagnostic messages . | |

| Flow in Pipe, No Output | **Basics**<br>• Check to make sure the meter is installed with the arrow in the direction of process flow.<br>• Perform basic checks for Incorrect 4–20 mA Output Problem (see Incorrect 4–20 mA Output).<br>• Check and correct configuration parameters in this order:<br>  Process Config - transmitter mode, process fluid, fixed process temperature, density, reference K-factor, flange type, mating pipe ID, variable mapping, PV unit, range values - (URV, LRV), PV damping, auto filter adjust, pulse mode and scaling (if used).<br>• Check sizing. Make sure flow is within measurable flow limits. Use Instrument Toolkit for best sizing results.<br>• Refer to Advanced troubleshooting .<br>• See Appendix C: Electronics Verification for electronics verification procedure.<br>**Electronics**<br>• Run a self test with a HART-based interface tool.<br>• Using sensor simulator, apply test signal.<br>• Check configuration, LFC, trigger level, STD vs. actual flow units.<br>• Replace electronics. | **Application Problems**<br>• Calculate expected frequency (see Appendix C: Electronics Verification). If actual frequency is the same, check configuration.<br>• Check that application meets viscosity and specific gravity requirements for the line size.<br>• Recalculate back pressure requirement. If necessary and possible, increase back pressure, flow rate, or operating pressure.<br><br>**Sensor**<br>• Inspect coaxial sensor cable for cracks. Replace if necessary.<br>• Check that sensor impedance at process temperature is > 1 Mega-Ohm (will function down to 0.5 Mega-Ohms). Replace sensor if necessary (Replacing the sensor ).<br>• Measure sensor capacitance at SMA connector (115-700pF).<br>• Check torque on sensor nut (32 ft-lb). For 1-8 inch meter body with ANSI 1500 flanges torque on sensor nut should be 50 ft-lbs. |

# 5.3 Advanced troubleshooting

The Rosemount 8800D electronics provides several advanced troubleshooting features. These features enhance your ability to look inside the electronics and can be helpful for troubleshooting inaccurate readings. As shown in Figure 5-1, there are several test points located on the electronics.

## 5.3.1 Diagnostic messages

The Field Communicator diagnostic messages and their corresponding descriptions are shown in Table 5-2.

**Table 5-2. Field Communicator Diagnostic Messages**

| Message | Description |
|---|---|
| ROM CHECKSUM ERROR | The EPROM memory checksum test has failed. The transmitter will remain in ALARM until the ROM checksum test passes. |
| NV MEM CHECKSUM ERROR | The User Configuration area in Nonvolatile EEPROM memory has failed the checksum test. It is possible to repair this checksum by verifying and reconfiguring ALL transmitter parameters. The transmitter will remain in ALARM until the EEPROM checksum test passes. |
| RAM TEST ERROR | Transmitter RAM memory test has detected a failed RAM location. The transmitter will remain in ALARM until the RAM test passes. |
| DIGITAL FILTER ERROR | The digital filter in the transmitter electronics is not reporting. The transmitter will remain in ALARM until the digital signal processor resumes reporting flow data. |
| COPROCESSOR ERROR | If this occurs at power-up, the RAM/ROM test in the coprocessor has failed. If this occurs during normal operations, the coprocessor has reported either a math error or a negative flow. This is a FATAL error and the transmitter will remain in ALARM until reset. |
| SOFTWARE DETECTED ERROR | The software has detected corrupted memory. One or more of the software tasks has corrupted memory. This is a FATAL error and the transmitter will remain in ALARM until reset. |
| ELECTRONICS FAILURE | This is a summary error indication. This error will be reported if any of the following error conditions are present:<br>1. ROM Checksum Error<br>2. NV Memory Checksum Error<br>3. RAM Test Error<br>4. ASIC Interrupt Error<br>5. Digital Filter Error<br>6. Coprocessor Error<br>7. Software Detected Error |
| TRIGGER LEVEL OVERRANGE | The trigger level in the transmitter digital signal processing has been set beyond its limit. Use manual filter adjustment to "Increase Filtering" or "Increase Sensitivity" to bring the trigger level back within range. |
| LOW PASS FILT OVERRANGE | The low pass filter in the transmitter digital signal processing has been set beyond its limit. Use manual filter adjustment to "Increase Filtering" or "Increase Sensitivity" to bring the low pass filter adjustment back within range. |
| ELECTRONICS TEMP OUT OF LIMITS | The electronics temperature sensor within the transmitter is reporting a value out of range. |
| INVALID CONFIGURATION | Certain configuration parameters are out of range. Either they have not been properly configured, or they have been forced out of range as a result of a change to a related parameter. For example: When using mass flow units, changing the process density to a value too low could push the configured Upper Range Value beyond the sensor limit. In this case, the Upper Range Value would need to be reconfigured. |
| FACTORY EEPROM CONFIG ERROR | The factory configured values in non-volatile EEPROM memory have become corrupted. This is a FATAL error. The transmitter will remain in ALARM until reset. |
| LOW FLOW CUTOFF OVERRANGE | On start-up, the configured setting for the VDSP Low Flow Cutoff setting was found to be too high or too low. The increase range or decrease no flow noise command of the VDSP Low Flow Cutoff setting has not yet brought the setting into a valid range. Continue adjusting the Low Flow Cutoff to a valid value or use the Filter Restore Option. |
| T/C A/D ERROR | The ASIC responsible for the analog to digital conversion of the process temperature thermocouple and cold junction RTD has failed. If the problem persists, replace the transmitter electronics. |
| THERMOCOUPLE OPEN | The thermocouple that is used to measure the process temperature has failed. Check the connections to the transmitter electronics. If the problem persists, replace the thermocouple. |
| CJ RTD FAILURE | The RTD temperature sensing device for sensing the cold junction temperature has failed. If the problem persists, replace the transmitter electronics. |

| Message | Description |
|---------|-------------|
| FLOW SIMULATION | The transmitter flow signal is being simulated by a signal generator internal to the transmitter. The actual flow through the meter body is NOT being measured. |
| SENSOR SIGNAL IGNORED | The transmitter flow signal is being simulated by a signal generator external to the transmitter. The actual flow through the meter body is NOT being measured. |
| LOW LOOP VOLTAGE | The voltage at the transmitter terminals has dropped to a level that is causing the internal voltage supplies to drop, reducing the capability of the transmitter to accurately measure a flow signal. Check the terminal voltage and either increase the power supply voltage or reduce loop resistance. |
| INTERNAL COMM FAULT | After several attempts, the microprocessor failed in communication with the Sigma-Delta ASIC. A power cycle may resolve the problem. Also, check the inter-board connector. If the problem persists, replace the transmitter electronics. |
| INTERNAL SIGNAL FAULT | The flow data encoded on a pulse signal from the Sigma-Delta ASIC to VDSP has been lost. A power cycle may resolve the problem. Also check the inter-board connector. If the problem persists, replace the transmitter electronics. |
| FACTORY NV MEM CONFIG ERROR | A segment of nonvolatile memory that is written only at the factory has failed a checksum verification. This fault *cannot* be fixed by reconfiguring the transmitter parameters. Replace the transmitter electronics. |
| TEMPERATURE ELECTRONICS FAILURE | The electronics circuitry that supports the measurement of the Process Temperature has failed. The transmitter can still be used in a non-Process Temperature mode. |
| PROCESS TEMP OUT OF RANGE | The Process Temperature is beyond the defined sensor limits of -50 °C to 427 °C. |
| PROCESS TEMP ABOVE DENSITY CALCULATION LIMITS | The calculation of temperature compensated process density is no longer accurate. Reduce the process temperature or verify device configuration. |
| PROCESS TEMP BELOW DENSITY CALCULATION LIMITS | The calculation of temperature compensated process density is no longer accurate. Increase the process temperature or verify device configuration. |
| FIXED PROCESS TEMPERATURE IS ACTIVE | Due to a problem detected with the thermocouple, a configured fixed Process Temperature is being substituted for the measured Process Temperature. This fixed Process Temperature is also being used in saturated steam density calculations. |
| INVALID MATH COEFF | The area of nonvolatile memory used to store the curve fit coefficients for the coprocessor calculations does not contain valid data. This data can only be loaded at the factory. Replace the transmitter electronics. |
| CJ TEMP ABOVE SENSOR LIMITS | The temperature reported from the Cold Junction temperature sensor is above CJ sensor limits. |
| CJ TEMP BELOW SENSOR LIMITS | The temperature reported from the Cold Junction temperature sensor is below CJ sensor limits. |

## 5.3.2 Electronics test points

As shown in Figure 5-1, there are several test points located on the electronics.

**Figure 5-1. Electronics Test Points**
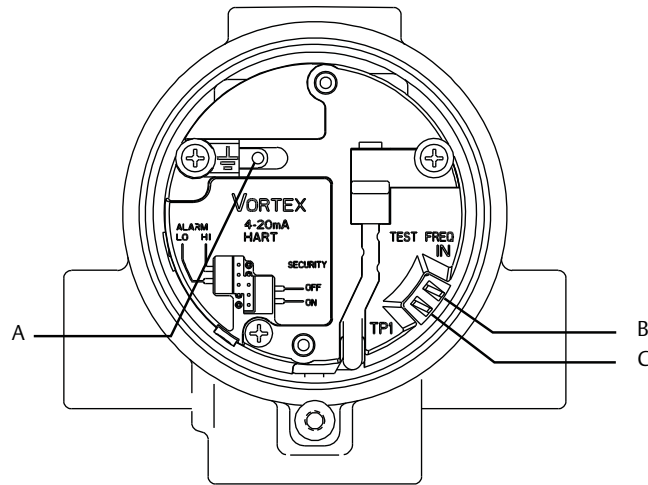


A. Ground
B. Test Frequency IN
C. TP1

The electronics is capable of internally generating a flow signal that may be used to simulate a sensor signal to perform electronics verification with a handheld communicator or AMS™ Device Manager interface. The simulated signal amplitude is based on the transmitter required minimum process density. The signal being simulated can be one of several profiles – a simulated signal of constant frequency or a simulated signal representative of a ramping flow rate. The electronics verification procedure is described in detail in Appendix C: Electronics Verification. To verify the electronics, you can input a frequency on the "TEST FREQ IN" and "GROUND" pins to simulate flow via an external signal source such as a frequency generator. To analyze and/or troubleshoot the electronics, an oscilloscope (set for AC coupling) and a handheld communicator or AMS Device Manager interface are required. Figure 5-2 is a block diagram of the signal as it flows from the sensor to the microprocessor in the electronics.

**Figure 5-2. Signal Flow**
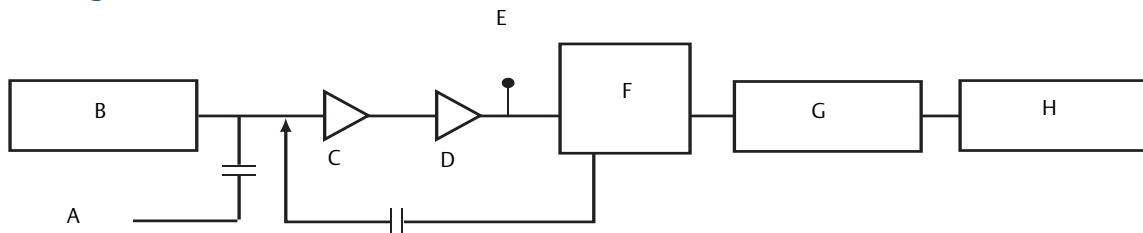


A. External Test Frequency Input
B. Sensor
C. Charge Amplifier
D. Amplifier/Low Pass Filter
E. TP1
F. A-to-D Converter/Internal Frequency Generator
G. Digital Filter
H. Microprocessor

### 5.3.3 TP1—Test point 1

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.

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

**Figure 5-3. Clean Signals**
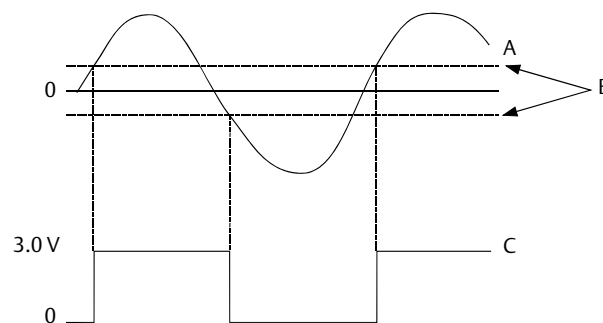


A. Vortex signal (TP1)
B. Trigger level
C. Shedding frequency output

**Figure 5-4. Noisy Signals**
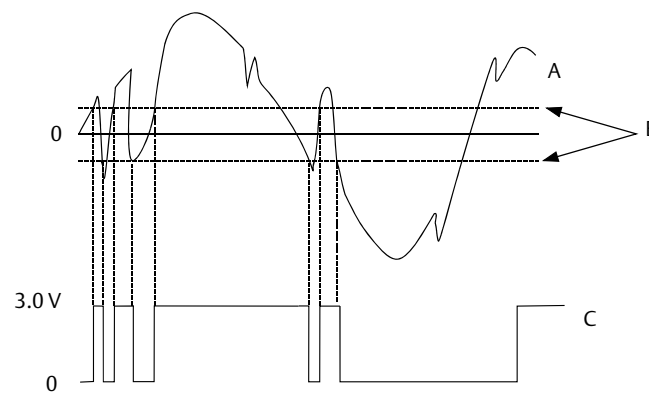


A. Vortex signal (TP1)
B. Trigger level
C. Shedding frequency output

**Figure 5-5. Improper Sizing/Filtering**
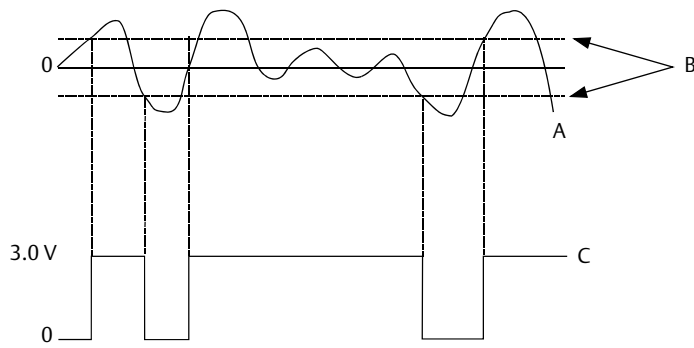


A. Vortex signal (TP1)
B. Trigger level
C. Shedding frequency output

## 5.4    Diagnostic messages on LCD display

In addition to the output, the LCD display displays diagnostic messages for troubleshooting the flowmeter. These messages are as follows:

### SELFTEST

The flowmeter is in the process of performing an electronics self test.

### FAULT_ROM

The flowmeter electronics has undergone a EPROM checksum fault. Contact your Field Service Center.

### FAULT_EEROM

The flowmeter electronics has undergone a EEPROM checksum fault. Contact your Field Service Center.

### FAULT_RAM

The flowmeter electronics has undergone a RAM test fault. Contact your Field Service Center.

### FAULT_ASIC

The flowmeter electronics has undergone a digital signal processing ASIC update fault. Contact your Field Service Center.

### FAULT_CONFG

The flowmeter electronics has lost critical configuration parameters. This message will be followed by information detailing the missing configuration parameters. Contact your Field Service Center.

### FAULT_COPRO

The flowmeter electronics has detected a fault in the math coprocessor. Contact your Field Service Center.

### FAULT_SFTWR

The flowmeter electronics has detected a non-recoverable fault in the software operation. Contact your Field Service Center.

### FAULT_BDREV

The flowmeter electronics has detected incompatible electronics hardware. Contact your Field Service Center.

### FAULT_SDCOM

The flowmeter electronics has detected an unexpected sigma-delta ASIC communications fault. Contact your Field Service Center.

### FAULT_SDPLS

The flowmeter electronics has detected a loss of flow data from the sigma-delta ASIC. Contact your Field Service Center.

### FAULT_TASK(#)

The flowmeter electronics has detected a fatal error. Record (#) and contact your Field Service Center.

### FAULT_COEFF

The area of NV memory used to store the curve fit coefficients for the coprocessor calculation does not contain valid data. This data can only be loaded at the factory. Contact your Field Service Center.

### FAULT_TACO (MTA option only)

The ASIC responsible for the analog to digital conversion of the process temperature has failed. Contact your Field Service Center.

### FAULT_TC (MTA option only)

The temperature sensor that is used to measure the process temperature has failed. Contact your Field Service Center.

### FAULT_RTD (MTA option only)

The RTD for cold junction compensation has failed. Contact your Field Service Center.

### SIGNAL_SIMUL

The transmitter flow signal is being simulated by a signal generator internal to the transmitter. The actual flow through the meter body is NOT being measured.

### SENSOR_OFFLINE

The transmitter flow signal is being simulated by a signal generator external to the transmitter. The actual flow through the meter body is NOT being measured.

### FAULT_LOOPV

The voltage at the transmitter terminals has dropped to a level that is causing the internal voltage supplies to drop, reducing the capability of the transmitter to accurately measure a flow signal. Check the terminal voltage and either increase the power supply voltage or reduce loop resistance.

## 5.5  Testing procedures

Use the test functions to verify that the flowmeter is functioning properly, or when you suspect component failure or a problem with loop performance, or when instructed to do so as part of a troubleshooting procedure. Initiate each test with a HART-based communications device. See "Diagnostics/service" on page 49 for details.

## 5.6 Hardware replacement

The following procedures will help you disassemble and assemble the Rosemount 8800D hardware if you have followed the troubleshooting guide earlier in this section of the manual and determined that hardware components need to be replaced.

**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.

**Note**
Process should be vented before the meter body is removed from service for disassembly. Flowmeters should not be left in service once they have been determined to be inoperable.

## 5.6.1 Replacing the terminal block in the housing

To replace the 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 Rosemount 8800D.
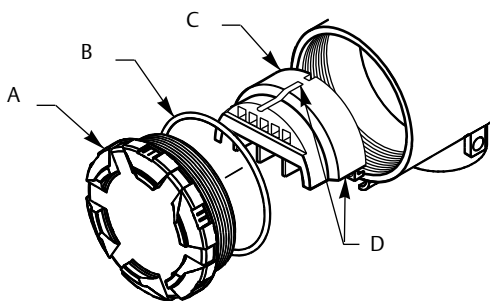
**Note**
Remove power before removing the electronics cover.

### Remove the terminal block

1. Turn off the power to the Rosemount 8800D.

2. Unscrew the cover. Refer to Figure 5-6.

See "Safety messages" on page 68 for complete warning information.

**Figure 5-6. Terminal Block Assembly**



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

3. Disconnect the wires from the field terminals. Be sure to secure them out of the way.

4. Remove the ground screw if transient protection (Option T1) is installed.

5. Loosen the three captive screws.

6. Pull outward on the terminal block to remove it from the housing.

### Install the terminal block

1. Align the socketed holes on the back side of the terminal block over the pins protruding from the bottom of the housing cavity 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 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. Reinstall and tighten the transient ground screw if you have the transient option (Option T1).

6. Screw on and tighten the cover.

## 5.6.2    Replacing the electronics boards

The Rosemount 8800D 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 Rosemount 8800D. You will need a small Phillips head screwdriver and pliers.

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

**Note**
Remove power before removing the electronics cover.

## Remove the electronics boards

1. Turn off the power to the Rosemount 8800D.

2. Unscrew and remove the electronics board compartment cover. (Unscrew and remove the LCD display cover if you have the LCD display option).

**Figure 5-7. Electronics Boards Assembly**
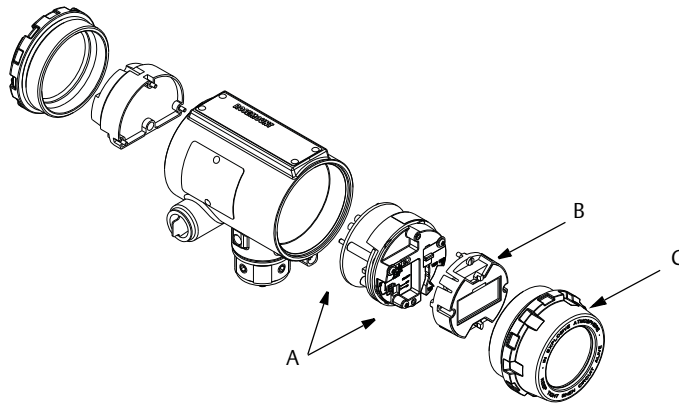


A. Electronics boards
B. LCD display
C. LCD display cover

3. If the meter has the LCD display option, loosen the two screws. Remove the LCD display and the connector from the electronics board.

4. Loosen the three captive screws that anchor the electronics.

5. Use pliers or a flathead screwdriver to carefully remove the sensor cable clip from the electronics.

6. Remove thermocouple if MTA option installed.

7. Use the handle molded into the black plastic cover to slowly pull the electronics boards out of the housing.

**Install the electronics boards**

1.  Verify that power to the Rosemount 8800D 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.  Carefully insert sensor cable clip into 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 the alarm and security jumpers into the correct location.

8.  If the meter has LCD display option, insert the connector header 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.

## 5.6.3    Replacing the electronics housing

The Rosemount 8800D electronics housing can be replaced easily when necessary. Use the following procedure:

### Tools needed

■   $^5/_{32}$-in. (4 mm) hex wrench

■   $^5/_{16}$-in. (8 mm) open end wrench

■   Screwdriver to disconnect wires

■   Tools to disconnect conduit

⚠ **Note**
Remove power before removing the electronics housing.

## Remove the electronics housing

1.      Turn off the power to the Rosemount 8800D.

2.      Remove the terminal block side cover.

3.      Disconnect the wires and conduit from the housing.

4.      Use a $5/32$-in. (4 mm) hex wrench to loosen the housing rotation screws (at the base of the electronics housing) by turning screws clockwise (inward) until they clear the bracket.

5.      Slowly pull the electronics housing no more than 1.5-in. (40 mm) from the top of the support tube.

6.      Loosen the sensor cable nut from the housing with a $5/16$-in. (8 mm) open end wrench.

**Note**
Lift the electronics housing until the sensor cable nut is exposed. Do not pull the housing more than 1.5-in. (40 mm) from the top of the support tube. Damage to the sensor may occur if this sensor cable is stressed.

## Install the electronics housing

1.      Verify that power to the Rosemount 8800D is off.

2.      Screw the sensor cable nut onto the base of the housing.

3.      Tighten the sensor cable nut with a $5/16$-in. (8 mm) open end wrench.

4.      Place the electronics housing into the top of the support tube.

5.      Use a hex wrench to turn the three hex socket screws counterclockwise (outward) to engage support tube.

6.      Place the access cover on the support tube (if applicable).

7.      Tighten the screw on the access cover.

8.      Connect conduit and wires.

9.      Replace the terminal block cover.

10.     Apply power.

## 5.6.4 Replacing the sensor

The sensor for the Rosemount 8800D 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. 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

- $^5/_{32}$-in. (4 mm) hex wrench
- $^5/_{16}$-in. (8 mm) open end wrench
- $^7/_{16}$-in. (11 mm) open end wrench
- $^3/_4$-in. (19 mm) open end wrench (for 3- and 4-in. [80 and 100 mm] SST wafers)
- $1^1/_8$-in. (28 mm) 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

## 5.6.5 Replacing the sensor: removable support tube

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 68 for complete warning information.

1. If the meter body 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 $^3/_{16}$" OD with a 0.035" wall thickness.

4.      Using a $^7/_{16}$-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 meter body may need to be replaced.

6.      De-pressurize the flow line.

7.      Remove the electronics housing (see "Replacing the electronics housing" on page 80).

## Removable support tube

8.      Loosen the four support tube anchor bolts with a $^7/_{16}$-in. open end wrench. See Figure 5-8.

**Figure 5-8. Removable Support Tube Assembly**
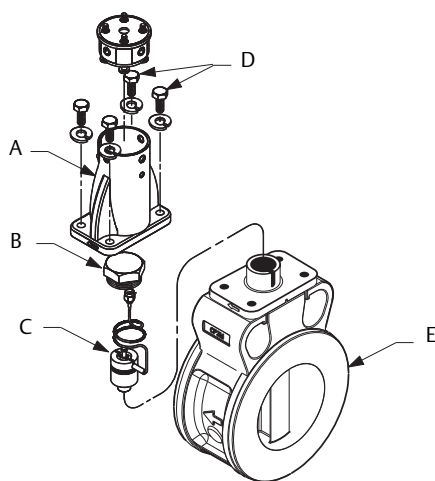


A.Removable support tube
B. Sensor nut
C. Sensor
D. Anchor bolts
E. Meter body

9.       Remove the support tube.

10.     Loosen and remove the sensor nut from the sensor cavity with a $1^1/_8$-in. (28-mm) open end wrench. (Use a $^3/_4$-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 Critical Process (CPA option) is present, tighten the valve to insure 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 render the flowmeter dangerous.

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

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. See Figure 5-9.

**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 5-9. O-Ring Sealing Surface in Sensor Cavity**
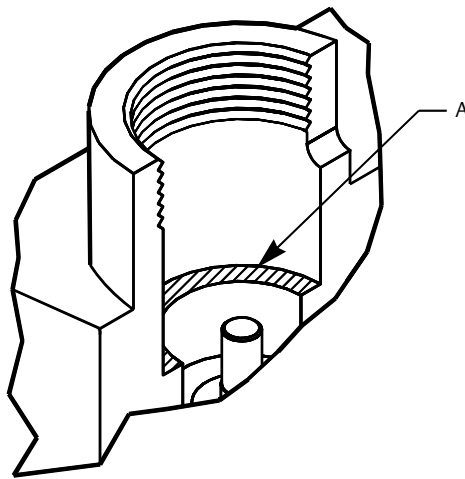


A. Sealing surface

## Sensor installation

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

2.      Ensure that the sensor is centered on the post. See Figure 5-10 for an example of improper installation and Figure 5-11 for an example of proper installation.

**Note**
If the sensor is installed in a high temperature application place the sensor in the sensor cavity and wait for it to come up to temperature before seating the sensor on the post.

**Figure 5-10. Sensor Installation – Improper Alignment**
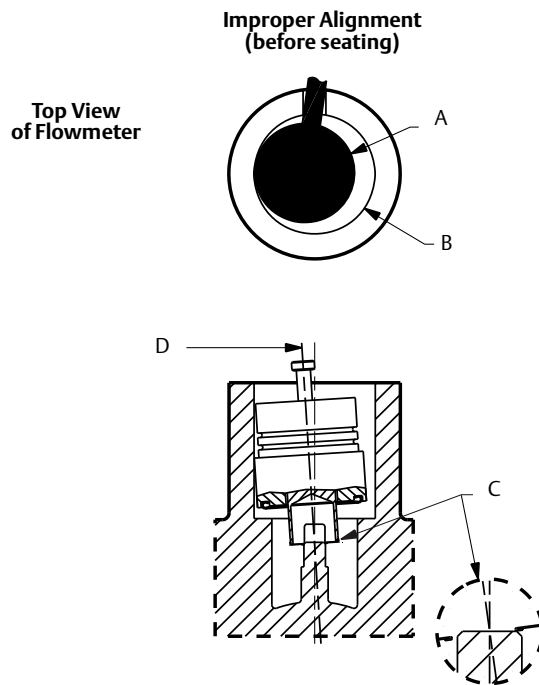


A. Sensor
B. Sensor cavity in flowmeter
C. Sensor not properly aligned
D. Sensor centerline is not aligned with flowmeter centerline. Damage to sensor will occur.

**Figure 5-11. Sensor Installation – Proper Alignment**

**Proper Alignment**
**(before seating)**

**Top View**
**of Flowmeter**

A

B

C
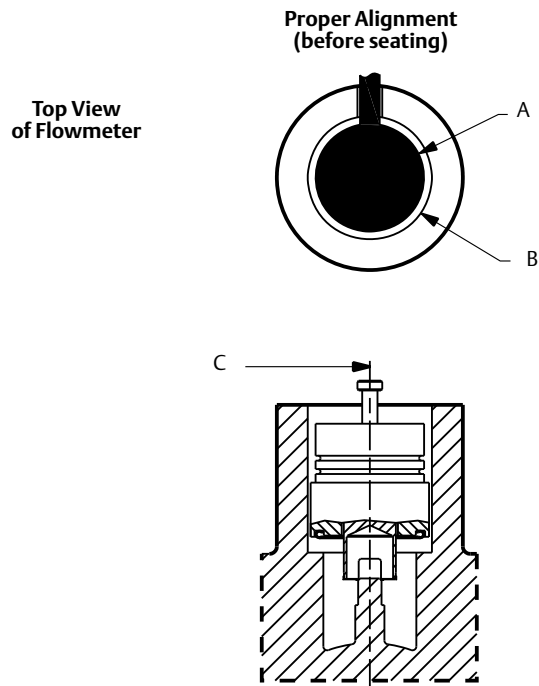
A. Sensor
B. Sensor cavity in flowmeter
C. Sensor centerline must be aligned with flowmeter centerline.

3.      Sensor should remain as close to vertical as possible when applying force to seat.
        See Figure 5-12.

**Figure 5-12. Sensor Installation – Applying Force**
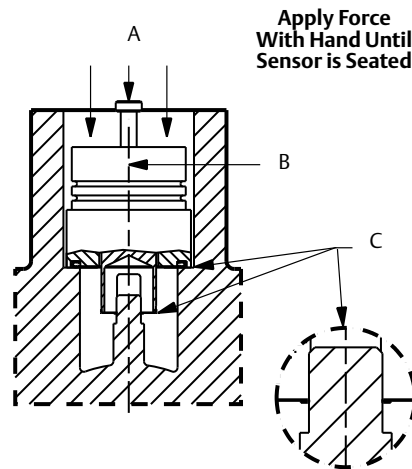


A. Pressure
B. Sensor centerline must be aligned with flowmeter centerline.
C. Sensor properly seated

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 $1^1/_8$-in. (28 mm) open end torque wrench to 32 ft-lbs (43.4 N-m) (50 ft-lbs (67.8 N-m) for ANSI 1500 meter body). (Use a $3/_4$-in. (19 mm) open end wrench for 3- and 4-in. [80 and 100 mm] SST wafers). Do not over-tighten the sensor nut.

6.    Replace the support tube.

7.    Tighten the four bolts that anchor the support tube in place with a $7/_{16}$-in. (11 mm) open end wrench.

8.    Install the flowmeter electronics housing. See"Replacing the electronics housing" on page 80.

## 5.6.6    Remote electronics procedure

If the Rosemount 8800D 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 Terminal Block in the Housing (see page 77).

■    Replacing the Electronics Boards (see page 78).

■    Replacing the Sensor (see page 82).

To disconnect the coaxial cable from the meter body and electronics housing, follow the instructions below.

## Disconnect the coaxial cable at the meter

1.      Remove the access cover on the meter body support tube if present.

2.      Loosen the three housing rotation screws at the base of the meter adapter with a $^5/_{32}$-in. hex wrench by turning the screws clockwise (inward) until they clear the bracket.

3.      Slowly pull the meter adapter no more than 1.5-in. (40 mm) from the top of the support tube.

4.      Loosen and disconnect the sensor cable nut from the union using a $^5/_{16}$-in. open end wrench.

**Note**
Do not pull the adapter more than 1.5-in. (40 mm) from the top of the support tube. Damage to the sensor may occur if the sensor cable is stressed.

**Figure 5-13. Coaxial Cable Connections**
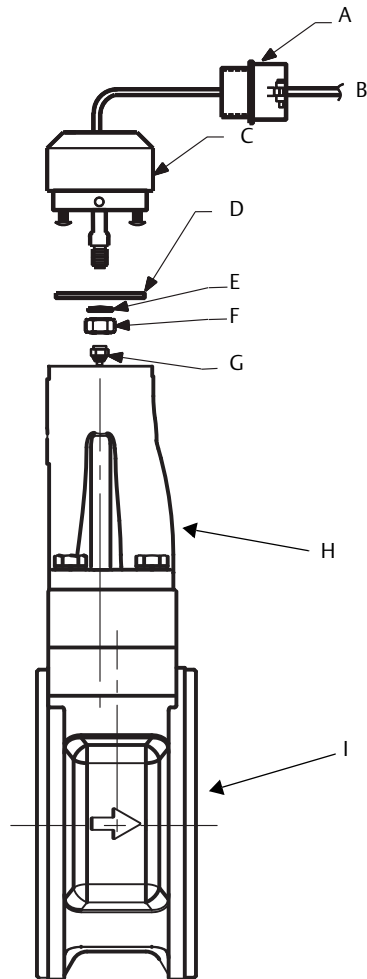


A. ½ NPT conduit adapter or cable gland (supplied by customer)
B. Coaxial cable
C. Meter adapter
D. Union
E. Washer
F. Nut
G. Sensor cable nut
H. Support tube
I. Meter body

## Detach 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.

## Attach 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 $^5/_{16}$-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.

## Connect 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-in. (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.      Replace the access cover on the support tube (6-8-in. wafer style only).

5.      Tighten the conduit adapter or cable gland into the meter adapter.

## 5.6.7    Coaxial cable at the electronics housing

### Remove 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.

**Figure 5-14. Remote Electronics Exploded View**
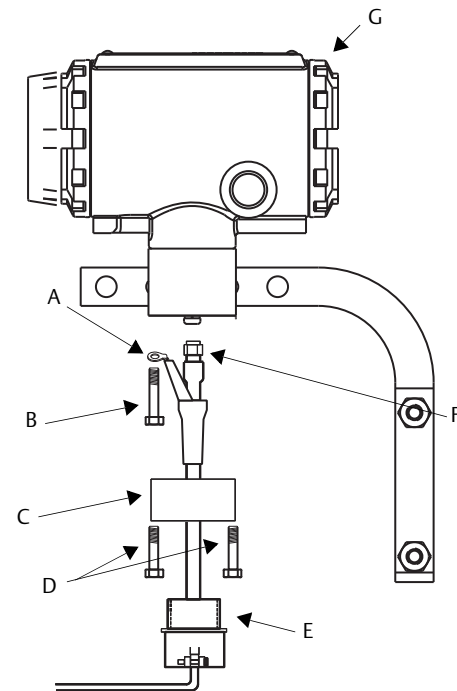


A. Ground connection
B. Housing base screw
C. Housing adapter
D. Housing adapter screws
E. Conduit adapter (optional—supplied by customer)
F. Coaxial cable nut
G. Electronics housing

### Attach 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.

## 5.6.8 Changing the housing orientation

The entire electronics housing may be rotated in 90 degree increments for better wiring access or improved viewing of the display:

1. Loosen the screw on the access cover on the support tube (if present) and remove the cover.

2. Loosen the three housing rotation set screws at the base of the electronics housing with a $5/32$-in. hex wrench by turning the screws clockwise (inward) until they clear the support tube.

3. Slowly pull the electronics housing out of the support tube.

4. Unscrew the sensor cable from the housing with a $5/16$-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.

5. Rotate the housing to the desired orientation.

6. 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. This will stress the cable and may damage the sensor.

7.      Place the electronics housing into the top of the support tube.

8.      Use a hex wrench to turn the three housing rotation screws counterclockwise to engage the support tube.

9.      Replace the access cover on the support tube (if present).

10.     Tighten the screw on the access cover (if present).

## 5.6.9      Temperature sensor replacement (MTA option only)

Replacement of the temperature sensor should only be necessary in the event of a failure. Use the following procedure for replacement.

**Note**
Disconnect power before replacing temperature sensor.

1.      Turn off power to Rosemount 8800D.

2.      Remove temperature sensor from meter body by using a $^1/_2$-in. open end wrench.

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

3.      Remove temperature sensor from electronics by using a 2.5 mm hex wrench to remove hex socket screw from electronics.

4.      Gently pull temperature sensor from electronics.

**Note**
This will expose the electronics to the atmosphere.

5.      Insert new temperature sensor into electronics housing using care to align pin and cap head screw to align connector pins.

6.      Tightening cap head screw with 2.5 mm hex wrench.

7.      Slide bolt and ferrule assembly onto temperature sensor and hold into place.

8.      Insert temperature sensor into hole in bottom of meter body until it reaches the bottom of the hole. Hold it in place and tighten bolt with $^1/_2$-in. open end wrench until $^3/_4$ turns past finger tight to seat ferrule.

9.      Reapply power to Rosemount 8800D.

# 5.7    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.

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

## A.1    Specifications

The following specifications are for the Rosemount™ 8800D, Rosemount 8800DR, Rosemount 8800DD, and Rosemount 8800DW, 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.

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**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.

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## 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**
Consult your local sales representative to obtain a computer sizing program that describes in greater detail how to specify the correct flowmeter size for an application.

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

**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[1]**

| | Feet per second | Meters per second |
|---|---|---|
| Liquids[2] | $\sqrt{36/\rho}$ | $\sqrt{54/\rho}$ |
| Gases | $\sqrt{36/\rho}$ | $\sqrt{54/\rho}$ |
| The $\rho$ is the process fluid density at flowing conditions in lb/ft$^3$ for ft/s and kg/m$^3$ 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[1] (Use smaller of two values)**

| | Feet per second | Meters per second |
|---|---|---|
| Liquids | $\sqrt{90,000/\rho}$ or 30 | $\sqrt{134,000/\rho}$ or 9.1 |
| Gases[2] | $\sqrt{90,000/\rho}$ or 300 | $\sqrt{134,000/\rho}$ or 91.2 |
| The $\rho$ is the process fluid density at flowing conditions in lb/ft$^3$ for ft/s and kg/m$^3$ 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 (–40 to 427 °C)

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

## Output signals

### 4–20 mA digital HART® signal

Superimposed on 4–20 mA signal

### Optional scalable pulse output

0 to 10000 Hz; transistor switch closure with adjustable scaling via HART communications; capable of switching up to 30 Vdc, 120 mA maximum.

## Analog output adjustment

Engineering units and lower and upper range values are user-selected. Output is automatically scaled to provide 4 mA at the selected lower range value, 20 mA at the selected upper range value. No frequency input is required to adjust the range values.

## Scalable frequency adjustment

The scalable pulse output can be set to a specific velocity, volume, or mass (i.e. 1 pulse = 1 lb). The scalable pulse output can also be scaled to a specific rate of volume, mass, or velocity (i.e. 100 Hz = 500 lb/hr).

## 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, 900, and 1500, 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

### HART analog

External power supply required. Flowmeter operates on 10.8 to 42 Vdc terminal voltage (with 250Ω minimum load required for HART communications, 16.8 Vdc power supply is required)

## Power consumption

One watt maximum

## Load limitations (HART analog)

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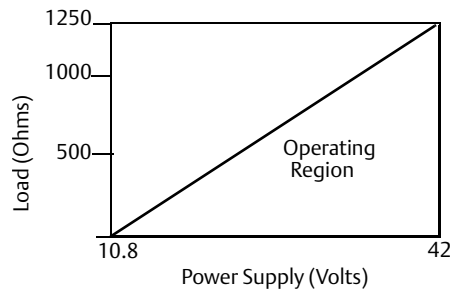


$$R_{max} = \quad 41.7(V_{ps} - 10.8)$$
$$V_{ps} = \quad \text{Power Supply Voltage (Volts)}$$
$$R_{max} = \quad \text{Maximum Loop Resistance (Ohms)}$$

**Note**
HART Communication requires a minimum loop resistance of 250 ohms.

## Optional LCD display

The optional LCD display is capable of displaying:

- Analog Output
- Calculated Process Density (MTA only)
- Corrected Volumetric Flow
- Electronics Temperature
- Mass Flow
- Percent of Range
- Primary Variable
- Process Temperature (MTA only)
- Pulse Output Frequency
- Shedding Frequency
- Signal Strength
- Totalizer
- Velocity Flow
- Volumetric Flow

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

## Enclosure rating

FM Type 4X; CSA Type 4X; IP66

## Permanent pressure loss

The approximate permanent pressure loss (PPL) from the Rosemount 8800D 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:

$\rho_f$ = Density at operating conditions (lb/ft$^3$ or kg/m$^3$)

Q = Actual volumetric flow rate (Gas = ft$^3$/min or m$^3$/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 following table:

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

| Meter style | English units | | SI units | |
|---|---|---|---|---|
| | A$_{Liquid}$ | A$_{Gas}$ | A$_{Liquid}$ | A$_{Gas}$ |
| 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[1] | $6.12 \times 10^{-5}$ | $3.42 \times 10^{-3}$ | 0.765 | 212 |

1. For all 6-in. thru 12-in. line sizes, A is the same for 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 = $2.9 * \Delta P + 1.3 * p_v$ or P = $2.9 * \Delta P + p_v + 0.5$ 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)

## Failure mode alarm

### HART analog

If self-diagnostics detect a gross flowmeter failure, the analog signal will be driven to the values below:

| Low | 3.75 mA |
|-----|---------|
| High | 21.75 mA |
| NAMUR Low | 3.60 mA |
| NAMUR High | 22.6 mA |

High or low alarm signal is user-selectable through the fail mode alarm jumper on the electronics. NAMUR-compliant alarm limits are available through the C4 or CN Option. Alarm type is field configurable also.

## Saturation output values

When the operating flow is outside the range points, the analog output continues to track the operating flow until reaching the saturation value listed below; the output does not exceed the listed saturation value regardless of the operating flow. The NAMUR-Compliant Saturation Values are available through the C4 or CN option. Saturation type is field configurable.

| Low | 3.9 mA |
|-----|---------|
| High | 20.8 mA |
| NAMUR Low | 3.8 mA |
| NAMUR High | 20.5 mA |

## 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

### HART analog

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.

## Output testing

### Current source

Flowmeter may be commanded to set the electrical current to a specified value between 4 and 20 mA.

### Frequency source

Flowmeter may be commanded to set the frequency to a specified value between 0 and 10000 Hz.

## Low flow cutoff

Adjustable over entire flow range. Below selected value, output is driven to 4 mA and zero pulse output frequency.

## Humidity limits

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

## Over-range capability

### HART analog

Analog signal output continues to 105 percent of span, then remains constant with increasing flow. The digital and pulse outputs will continue to indicate flow up to the upper sensor limit of the flowmeter and a maximum pulse output frequency of 10400 Hz.

## 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.

**Table A-5. Typical Pipe Velocity Ranges for 8800D and 8800DR[1]**

| Process line size | | Liquid velocity ranges | | Gas velocity ranges | |
|---|---|---|---|---|---|
| (Inches/ DN) | Vortex meter [2] | (ft/s) | (m/s) | (ft/s) | (m/s) |
| 0.5/ 15 | 8800DF005 | 0.70 to 25.0 | 0.21 to 7.6 | 6.50 to 250.0 | 1.98 to 76.2 |
| 1/ 25 | 8800DF010 | 0.70 to 25.0 | 0.21 to 7.6 | 6.50 to 250.0 | 1.98 to 76.2 |
| | 8800DR010 | 0.25 to 8.8 | 0.08 to 2.7 | 2.29 to 87.9 | 0.70 to 26.8 |
| 1.5/ 40 | 8800DF015 | 0.70 to 25.0 | 0.21 to 7.6 | 6.50 to 250.0 | 1.98 to 76.2 |
| | 8800DR015 | 0.30 to 10.6 | 0.09 to 3.2 | 2.76 to 106.1 | 0.84 to 32.3 |
| 2/ 50 | 8800DF020 | 0.70 to 25.0 | 0.21 to 7.6 | 6.50 to 250.0 | 1.98 to 76.2 |
| | 8800DR020 | 0.42 to 15.2 | 0.13 to 4.6 | 3.94 to 151.7 | 1.20 to 46.2 |
| 3/ 80 | 8800DF030 | 0.70 to 25.0 | 0.21 to 7.6 | 6.50 to 250.0 | 1.98 to 76.2 |
| | 8800DR030 | 0.32 to 11.3 | 0.10 to 3.5 | 2.95 to 113.5 | 0.90 to 34.6 |
| 4/ 100 | 8800DF040 | 0.70 to 25.0 | 0.21 to 7.6 | 6.50 to 250.0 | 1.98 to 76.2 |
| | 8800DR040 | 0.41 to 14.5 | 0.12 to 4.4 | 3.77 to 145.2 | 1.15 to 44.3 |
| 6/ 150 | 8800DF060 | 0.70 to 25.0 | 0.21 to 7.6 | 6.50 to 250.0 | 1.98 to 76.2 |
| | 8800DR060 | 0.31 to 11.0 | 0.09 to 3.4 | 2.86 to 110.2 | 0.87 to 33.6 |
| 8/ 200 | 8800DF080 | 0.70 to 25.0 | 0.21 to 7.6 | 6.50 to 250.0 | 1.98 to 76.2 |
| | 8800DR080 | 0.40 to 14.4 | 0.12 to 4.4 | 3.75 to 144.4 | 1.14 to 44.0 |
| 10/ 250 | 8800DF100 | 0.90 to 25.0 | 0.27 to 7.6 | 6.50 to 250.0 | 1.98 to 76.2 |
| | 8800DR100 | 0.44 to 15.9 | 0.13 to 4.8 | 4.12 to 158.6 | 1.26 to 48.3 |
| 12/ 300 | 8800DF120 | 1.10 to 25.0 | 0.34 to 7.6 | 6.50 to 250.0 | 1.98 to 76.2 |
| | 8800DR120 | 0.63 to 17.6 | 0.19 to 5.4 | 4.58 to 176.1 | 1.40 to 53.7 |

1. Table A-5 is a reference of pipe velocities that can be measured for the standard Rosemount 8800D and the reducer Rosemount 8800DR Vortex Meters. It does not consider density limitations, as described in Table A-2 and Table A-3. Velocities are referenced in schedule 40 pipe.

2. Velocity range of the Rosemount 8800DW is the same as Rosemount 8800DF.

### Table A-6. Water Flow Rate Limits for the Rosemount 8800D and 8800DR[1]

| Process line size | Vortex meter [2] | Minimum and maximum measurable water flow rates[3] | |
|---|---|---|---|
| (Inches/ DN) | | Gallons/minute | Cubic meters/hour |
| 0.5/ 15 | 8800DF005 | 1.76 to 23.7 | 0.40 to 5.4 |
| 1/ 25 | 8800DF010 | 2.96 to 67.3 | 0.67 to 15.3 |
| | 8800DR010 | 1.76 to 23.7 | 0.40 to 5.4 |
| 1.5/ 40 | 8800DF015 | 4.83 to 158 | 1.10 to 35.9 |
| | 8800DR015 | 2.96 to 67.3 | 0.67 to 15.3 |
| 2/ 50 | 8800DF020 | 7.96 to 261 | 1.81 to 59.4 |
| | 8800DR020 | 4.83 to 158.0 | 1.10 to 35.9 |
| 3/ 80 | 8800DF030 | 17.5 to 576 | 4.00 to 130 |
| | 8800DR030 | 7.96 to 261.0 | 1.81 to 59.3 |
| 4/ 100 | 8800DF040 | 30.2 to 992 | 6.86 to 225 |
| | 8800DR040 | 17.5 to 576 | 4.00 to 130 |
| 6/ 150 | 8800DF060 | 68.5 to 2251 | 15.6 to 511 |
| | 8800DR060 | 30.2 to 992 | 6.86 to 225 |
| 8/ 200 | 8800DF080 | 119 to 3898 | 27.0 to 885 |
| | 8800DR080 | 68.5 to 2251 | 15.6 to 511 |
| 10/ 250 | 8800DF100 | 231 to 6144 | 52.2 to 1395 |
| | 8800DR100 | 119 to 3898 | 27.0 to 885 |
| 12/ 300 | 8800DF120 | 391 to 8813 | 88.8 to 2002 |
| | 8800DR120 | 231 to 6144 | 52.2 to 1395 |

1. Table A-6 is a reference of flow rates that can be measured for the standard Rosemount 8800D and the reducer 8800DR Vortex Meters. It does not consider density limitations, as described in Table A-2 and Table A-3.

2. Velocity range of the 8800DW is the same as 8800DF.

3. Conditions: 77 °F (25 °C) and 14.7 psia (1.01 bar absolute)

**Table A-7.  Air Flow Rate Limits at 59 °F (15 °C)**

| Process pressure[1] | Flow rate limits | Minimum and maximum air flow rates for line sizes ¹/₂ inch/DN 15 through 1 inch/DN 25 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | ¹/₂ Inch/DN 15 | | | | 1 Inch/DN 25 | | | |
| | | Rosemount 8800D | | Rosemount 8800DR | | Rosemount 8800D | | Rosemount 8800DR | |
| | | ACFM | ACMH | ACFM | ACMH | ACFM | ACMH | ACFM | ACMH |
| 0 psig (0 bar G) | max min | 27.9 4.62 | 47.3 7.84 | N/A | N/A | 79.2 9.71 | 134 16.5 | 27.9 4.62 | 47.3 7.84 |
| 50 psig (3,45 bar G) | max min | 27.9 1.31 | 47.3 2.22 | N/A | N/A | 79.2 3.72 | 134 6.32 | 27.9 1.31 | 47.3 2.22 |
| 100 psig (6,89 bar G) | max min | 27.9 0.98 | 47.3 1.66 | N/A | N/A | 79.2 2.80 | 134 4.75 | 27.9 0.98 | 47.3 1.66 |
| 150 psig (10,3 bar G) | max min | 27.9 0.82 | 47.3 1.41 | N/A | N/A | 79.2 2.34 | 134 3.98 | 27.9 0.82 | 47.3 1.41 |
| 200 psig (13,8 bar G) | max min | 27.9 0.82 | 47.3 1.41 | N/A | N/A | 79.2 2.34 | 134 3.98 | 27.9 0.82 | 47.3 1.41 |
| 300 psig (20,7 bar G) | max min | 27.9 0.82 | 47.3 1.41 | N/A | N/A | 79.2 2.34 | 134 3.98 | 27.9 0.82 | 47.3 1.41 |
| 400 psig (27,6 bar G) | max min | 25.7 0.82 | 43.9 1.41 | N/A | N/A | 73.0 2.34 | 124 3.98 | 25.7 0.82 | 43.9 1.41 |
| 500 psig (34,5 bar G) | max min | 23.0 0.82 | 39.4 1.41 | N/A | N/A | 66.0 2.34 | 112 3.98 | 23.0 0.82 | 39.4 1.41 |

1.    Barometric pressure of 14.7 psia (1.01 bar-a).

**Table A-8. Air Flow Rate Limits at 59 °F (15 °C)**

| Process pressure[1] | Flow rate limits | Minimum and maximum air flow rates for line sizes 1¹/₂ inch/DN 40 through 2 inch/DN 50 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1½ Inch/DN 40 | | | | 2 Inch/DN 50 | | | |
| | | Rosemount 8800D | | Rosemount 8800DR | | Rosemount 8800D | | Rosemount 8800DR | |
| | | ACFM | ACMH | ACFM | ACMH | ACFM | ACMH | ACFM | ACMH |
| 0 psig (0 bar G) | max | 212 | 360 | 79.2 | 134 | 349 | 593 | 212 | 360 |
| | min | 18.4 | 31.2 | 9.71 | 16.5 | 30.3 | 51.5 | 18.4 | 31.2 |
| 50 psig (3,45 bar G) | max | 212 | 360 | 79.2 | 134 | 349 | 593 | 212 | 360 |
| | min | 8.76 | 14.9 | 3.72 | 6.32 | 14.5 | 24.6 | 8.76 | 14.9 |
| 100 psig (6,89 bar G) | max | 212 | 360 | 79.2 | 134 | 349 | 593 | 212 | 360 |
| | min | 6.58 | 11.2 | 2.80 | 4.75 | 10.8 | 18.3 | 6.58 | 11.2 |
| 150 psig (10,3 bar G) | max | 212 | 360 | 79.2 | 134 | 349 | 593 | 212 | 360 |
| | min | 5.51 | 9.36 | 2.34 | 3.98 | 9.09 | 15.4 | 5.51 | 9.36 |
| 200 psig (13,8 bar G) | max | 212 | 360 | 79.2 | 134 | 349 | 593 | 212 | 360 |
| | min | 5.51 | 9.36 | 2.34 | 3.98 | 9.09 | 15.4 | 5.51 | 9.36 |
| 300 psig (20,7 bar G) | max | 198 | 337 | 79.2 | 134 | 326 | 554 | 198 | 337 |
| | min | 5.51 | 9.36 | 2.34 | 3.98 | 9.09 | 15.4 | 5.51 | 9.36 |
| 400 psig (27,6 bar G) | max | 172 | 293 | 73.0 | 124 | 284 | 483 | 172 | 293 |
| | min | 5.51 | 9.36 | 2.34 | 3.98 | 9.09 | 15.4 | 5.51 | 9.36 |
| 500 psig (34,5 bar G) | max | 154 | 262 | 66.0 | 112 | 254 | 432 | 154 | 262 |
| | min | 5.51 | 9.36 | 2.34 | 3.98 | 9.09 | 15.4 | 5.51 | 9.36 |

1. Barometric pressure of 14.7 psia (1.01 bar-a).

**Table A-9. Air Flow Rate Limits at 59 °F (15 °C), 14.7 psia (1.01 bar-a)**

| Process pressure[1] | Flow rate limits | Minimum and maximum air flow rates for line sizes 3 inch/DN 80 through 4 inch/DN 100 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 3 Inch/DN 80 | | | | 4 Inch/DN 100 | | | |
| | | Rosemount 8800D | | Rosemount 8800DR | | Rosemount 8800D | | Rosemount 8800DR | |
| | | ACFM | ACMH | ACFM | ACMH | ACFM | ACMH | ACFM | ACMH |
| 0 psig (0 bar G) | max | 770 | 1308 | 349 | 593 | 1326 | 2253 | 770 | 1308 |
| | min | 66.8 | 114 | 30.3 | 51.5 | 115 | 195 | 66.8 | 114 |
| 50 psig (3,45 bar G) | max | 770 | 1308 | 349 | 593 | 1326 | 2253 | 770 | 1308 |
| | min | 31.8 | 54.1 | 14.5 | 24.6 | 54.8 | 93.2 | 31.8 | 54.1 |
| 100 psig (6,89 bar G) | max | 770 | 1308 | 349 | 593 | 1326 | 2253 | 770 | 1308 |
| | min | 23.9 | 40.6 | 10.8 | 18.3 | 41.1 | 69.8 | 23.9 | 40.6 |
| 150 psig (10,3 bar G) | max | 770 | 1308 | 349 | 593 | 1326 | 2253 | 770 | 1308 |
| | min | 20.0 | 34.0 | 9.09 | 15.4 | 34.5 | 58.6 | 20.0 | 34.0 |
| 200 psig (13,8 bar G) | max | 770 | 1308 | 349 | 593 | 1326 | 2253 | 770 | 1308 |
| | min | 20.0 | 34.0 | 9.09 | 15.4 | 34.5 | 58.6 | 20.0 | 34.0 |
| 300 psig (20,7 bar G) | max | 718 | 1220 | 326 | 554 | 1237 | 2102 | 718 | 1220 |
| | min | 20.0 | 34.0 | 9.09 | 15.4 | 34.5 | 58.6 | 20.0 | 34.0 |
| 400 psig (27,6 bar G) | max | 625 | 1062 | 284 | 483 | 1076 | 1828 | 625 | 1062 |
| | min | 20.0 | 34.0 | 9.09 | 15.4 | 34.5 | 58.6 | 20.0 | 34.0 |
| 500 psig (34,5 bar G) | max | 560 | 951 | 254 | 432 | 964 | 1638 | 560 | 951 |
| | min | 20.0 | 34.0 | 9.09 | 15.4 | 34.5 | 58.6 | 20.0 | 34.0 |

1. Barometric pressure of 14.7 psia (1.01 bar-a).

**Table A-10.  Air Flow Rate Limits at 59 °F (15 °C), 14.7 psia (1.01 bar-a)**

| Process pressure[1] | Flow rate limits | Minimum and maximum air flow rates for line sizes 6 inch/DN 150 through 8 inch/DN 200 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 6 Inch/DN 150 | | | | 8 Inch/DN 200 | | | |
| | | Rosemount 8800D | | Rosemount 8800DR | | Rosemount 8800D | | Rosemount 8800DR | |
| | | ACFM | ACMH | ACFM | ACMH | ACFM | ACMH | ACFM | ACMH |
| 0 psig (0 bar G) | max | 3009 | 5112 | 1326 | 2253 | 5211 | 8853 | 3009 | 5112 |
| | min | 261 | 443 | 115 | 195 | 452 | 768 | 261 | 443 |
| 50 psig (3,45 bar G) | max | 3009 | 5112 | 1326 | 2253 | 5211 | 8853 | 3009 | 5112 |
| | min | 124 | 211 | 54.8 | 93.2 | 215 | 365 | 124 | 211 |
| 100 psig (6,89 bar G) | max | 3009 | 5112 | 1326 | 2253 | 5211 | 8853 | 3009 | 5112 |
| | min | 93.3 | 159 | 41.1 | 69.8 | 162 | 276 | 93.3 | 159 |
| 150 psig (10,3 bar G) | max | 3009 | 5112 | 1326 | 2253 | 5211 | 8853 | 3009 | 5112 |
| | min | 78.2 | 133 | 34.5 | 58.6 | 135 | 229 | 78.2 | 133 |
| 200 psig (13,8 bar G) | max | 3009 | 5112 | 1326 | 2253 | 5211 | 8853 | 3009 | 5112 |
| | min | 78.2 | 133 | 34.5 | 58.6 | 135 | 229 | 78.2 | 133 |
| 300 psig (20,7 bar G) | max | 2807 | 4769 | 1237 | 2102 | 4862 | 8260 | 2807 | 4769 |
| | min | 78.2 | 133 | 34.5 | 58.6 | 135 | 229 | 78.2 | 133 |
| 400 psig (27,6 bar G) | max | 2442 | 4149 | 1076 | 1828 | 4228 | 7183 | 2442 | 4149 |
| | min | 78.2 | 133 | 34.5 | 58.6 | 136 | 229 | 78.2 | 133 |
| 500 psig (34,5 bar G) | max | 2188 | 3717 | 964 | 1638 | 3789 | 6437 | 2188 | 3717 |
| | min | 78.2 | 133 | 34.5 | 58.6 | 136 | 229 | 78.2 | 133 |

1.    Barometric pressure of 14.7 psia (1.01 bar-a).

**Table A-11. Air Flow Rate Limits at 59 °F (15 °C), 14.7 psia (1.01 bar-a)**

| Process pressure[1] | Flow rate limits | Minimum and maximum air flow rates for line sizes 10 inch/DN 250 through 12 inch/DN 300 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 10 Inch/DN 250 | | | | 12 Inch/DN 300 | | | |
| | | Rosemount 8800D | | Rosemount 8800DR | | Rosemount 8800D | | Rosemount 8800DR | |
| | | ACFM | ACMH | ACFM | ACMH | ACFM | ACMH | ACFM | ACMH |
| 0 psig (0 bar G) | max | 8214 | 13956 | 5211 | 8853 | 11781 | 20016 | 8214 | 13956 |
| | min | 712.9 | 1211 | 452 | 768 | 1022 | 1736 | 712.9 | 1211 |
| 50 psig (3,45 bar G) | max | 8214 | 13956 | 5211 | 8853 | 11781 | 20016 | 8214 | 13956 |
| | min | 339.5 | 577 | 215 | 365 | 486.9 | 827 | 339.5 | 577 |
| 100 psig (6,89 bar G) | max | 8214 | 13956 | 5211 | 8853 | 11781 | 20016 | 8214 | 13956 |
| | min | 254.7 | 433 | 162 | 276 | 365.4 | 621 | 254.7 | 433 |
| 150 psig (10,3 bar G) | max | 8214 | 13956 | 5211 | 8853 | 11781 | 20016 | 8214 | 13956 |
| | min | 213.6 | 363 | 135 | 229 | 306.3 | 520 | 213.6 | 363 |
| 200 psig (13,8 bar G) | max | 8214 | 13956 | 5211 | 8853 | 11781 | 20016 | 8214 | 13956 |
| | min | 213.6 | 363 | 135 | 229 | 306.3 | 520 | 213.6 | 363 |
| 300 psig (20,7 bar G) | max | 7664 | 13021 | 4862 | 8260 | 10992 | 18675 | 7664 | 13021 |
| | min | 213.6 | 363 | 135 | 229 | 306.3 | 520 | 213.6 | 363 |
| 400 psig (27,6 bar G) | max | 6664 | 11322 | 4228 | 7183 | 9559 | 16241 | 6664 | 11322 |
| | min | 213.6 | 363 | 136 | 229 | 306.3 | 520 | 213.6 | 363 |
| 500 psig (34,5 bar G) | max | 5972 | 10146 | 3789 | 6437 | 8565 | 14552 | 5972 | 10146 |
| | min | 213.6 | 363 | 136 | 229 | 306.3 | 520 | 213.6 | 363 |

1. Barometric pressure of 14.7 psia (1.01 bar-a).

**Notes**

The Rosemount 8800D measures the volumetric flow under operating conditions (i.e. the actual volume at the operating pressure and temperature–acfm or acmh), as shown above. However, gas volumes are strongly dependent on pressure and temperature. Therefore, gas quantities are typically stated in standard or normal conditions (e.g. SCFM or NCMH). (Standard conditions are typically 59 °F and 14.7 psia. Normal conditions are typically 0 °C and 1.01 bar abs.)
The flow rate limits in standard conditions are found using the equations below:
*Standard Flow Rate* = Actual Flow Rate X Density Ratio
*Density Ratio* = Density at Actual (Operating) Conditions / Density at Standard Conditions

**Table A-12.  Saturated Steam Flow Rate Limits (Assumes Steam Quality is 100%)**

| Process pressure | Flow rate limits | Minimum and maximum saturated steam flow rates for line sizes ½ inch/DN 15 through 1 inch/DN 25 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | ½ Inch/DN 15 | | | | 1 Inch/DN 25 | | | |
| | | Rosemount 8800D | | Rosemount 8800DR | | Rosemount 8800D | | Rosemount 8800DR | |
| | | lb/hr | kg/hr | lb/hr | kg/hr | lb/hr | kg/hr | lb/hr | kg/hr |
| 15 psig (1,03 bar G) | max | 120 | 54.6 | N/A | N/A | 342 | 155 | 120 | 54.6 |
| | min | 12.8 | 5.81 | | | 34.8 | 15.8 | 12.8 | 5.81 |
| 25 psig (1,72 bar G) | max | 158 | 71.7 | N/A | N/A | 449 | 203 | 158 | 71.7 |
| | min | 14.0 | 6.35 | | | 39.9 | 18.1 | 14.0 | 6.35 |
| 50 psig (3,45 bar G) | max | 250 | 113 | N/A | N/A | 711 | 322 | 250 | 113 |
| | min | 17.6 | 8.00 | | | 50.1 | 22.7 | 17.6 | 8.00 |
| 100 psig (6,89 bar G) | max | 429 | 194 | N/A | N/A | 1221 | 554 | 429 | 194 |
| | min | 23.1 | 10.5 | | | 65.7 | 29.8 | 23.1 | 10.5 |
| 150 psig (10,3 bar G) | max | 606 | 275 | N/A | N/A | 1724 | 782 | 606 | 275 |
| | min | 27.4 | 12.5 | | | 78.1 | 35.4 | 27.4 | 12.5 |
| 200 psig (13,8 bar G) | max | 782 | 354 | N/A | N/A | 2225 | 1009 | 782 | 354 |
| | min | 31.2 | 14.1 | | | 88.7 | 40.2 | 31.2 | 14.1 |
| 300 psig (20,7 bar G) | max | 1135 | 515 | N/A | N/A | 3229 | 1464 | 1135 | 515 |
| | min | 37.6 | 17.0 | | | 107 | 48.5 | 37.6 | 17.0 |
| 400 psig (27,6 bar G) | max | 1492 | 676 | N/A | N/A | 4244 | 1925 | 1492 | 676 |
| | min | 44.1 | 20.0 | | | 125 | 56.7 | 44.1 | 20.0 |
| 500 psig (34,5 bar G) | max | 1855 | 841 | N/A | N/A | 5277 | 2393 | 1855 | 841 |
| | min | 54.8 | 24.9 | | | 156 | 70.7 | 54.8 | 24.9 |

**Table A-13. Saturated Steam Flow Rate Limits (Assumes Steam Quality is 100%)**

| Process pressure | Flow rate limits | Minimum and maximum saturated steam flow rates for line sizes 1¹/₂ inch/DN 40 through 2 inch/DN 50 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1½ Inch/DN 40 | | | | 2 Inch/DN 50 | | | |
| | | Rosemount 8800D | | Rosemount 8800DR | | Rosemount 8800D | | Rosemount 8800DR | |
| | | lb/hr | kg/hr | lb/hr | kg/hr | lb/hr | kg/hr | lb/hr | kg/hr |
| 15 psig (1,03 bar G) | max | 917 | 416 | 342 | 155 | 1511 | 685 | 917 | 416 |
| | min | 82.0 | 37.2 | 34.8 | 15.8 | 135 | 61.2 | 82.0 | 37.2 |
| 25 psig (1,72 bar G) | max | 1204 | 546 | 449 | 203 | 1983 | 899 | 1204 | 546 |
| | min | 93.9 | 42.6 | 39.9 | 18.1 | 155 | 70.2 | 93.9 | 42.6 |
| 50 psig (3,45 bar G) | max | 1904 | 864 | 711 | 322 | 3138 | 1423 | 1904 | 864 |
| | min | 118 | 53.4 | 50.1 | 22.7 | 195 | 88.3 | 118 | 53.4 |
| 100 psig (6,89 bar G) | max | 3270 | 1483 | 1221 | 554 | 5389 | 2444 | 3270 | 1483 |
| | min | 155 | 70.1 | 65.7 | 29.8 | 255 | 116 | 155 | 70.1 |
| 150 psig (10,3 bar G) | max | 4616 | 2094 | 1724 | 782 | 7609 | 3451 | 4616 | 2094 |
| | min | 184 | 83.2 | 78.1 | 35.4 | 303 | 137 | 184 | 83.2 |
| 200 psig (13,8 bar G) | max | 5956 | 2702 | 2225 | 1009 | 9818 | 4453 | 5956 | 2702 |
| | min | 209 | 94.5 | 88.7 | 40.2 | 344 | 156 | 209 | 94.5 |
| 300 psig (20,7 bar G) | max | 8644 | 3921 | 3229 | 1464 | 14248 | 6463 | 8644 | 3921 |
| | min | 252 | 114 | 107 | 48.5 | 415 | 189 | 252 | 114 |
| 400 psig (27,6 bar G) | max | 11362 | 5154 | 4244 | 1925 | 18727 | 8494 | 11362 | 5154 |
| | min | 295 | 134 | 125 | 56.7 | 487 | 221 | 295 | 134 |
| 500 psig (34,5 bar G) | max | 14126 | 6407 | 5277 | 2393 | 23284 | 10561 | 14126 | 6407 |
| | min | 367 | 167 | 156 | 70.7 | 605 | 274 | 367 | 167 |

**Table A-14. Saturated Steam Flow Rate Limits (Assumes Steam Quality is 100%)**

| Process pressure | Flow rate limits | Minimum and maximum saturated steam flow rates for line sizes 3 inch/DN 80 through 4 inch/DN 100 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 3 Inch/DN 80 | | | | 4 Inch/DN 100 | | | |
| | | Rosemount 8800D | | Rosemount 8800DR | | Rosemount 8800D | | Rosemount 8800DR | |
| | | lb/hr | kg/hr | lb/hr | kg/hr | lb/hr | kg/hr | lb/hr | kg/hr |
| 15 psig (1,03 bar G) | max | 3330 | 1510 | 1511 | 685 | 5734 | 2601 | 3330 | 1510 |
| | min | 298 | 135 | 135 | 61.2 | 513 | 233 | 298 | 135 |
| 25 psig (1,72 bar G) | max | 4370 | 1982 | 1983 | 899 | 7526 | 3414 | 4370 | 1982 |
| | min | 341 | 155 | 155 | 70.2 | 587 | 267 | 341 | 155 |
| 50 psig (3,45 bar G) | max | 6914 | 3136 | 3138 | 1423 | 11905 | 5400 | 6914 | 3136 |
| | min | 429 | 195 | 195 | 88.3 | 739 | 335 | 429 | 195 |
| 100 psig (6,89 bar G) | max | 11874 | 5386 | 5389 | 2444 | 20448 | 9275 | 11874 | 5386 |
| | min | 562 | 255 | 255 | 116 | 968 | 439 | 562 | 255 |
| 150 psig (10,3 bar G) | max | 16763 | 7603 | 7609 | 3451 | 28866 | 13093 | 16763 | 7603 |
| | min | 668 | 303 | 303 | 137 | 1150 | 522 | 668 | 303 |
| 200 psig (13,8 bar G) | max | 21630 | 9811 | 9818 | 4453 | 37247 | 16895 | 21630 | 9811 |
| | min | 759 | 344 | 344 | 156 | 1307 | 593 | 759 | 344 |
| 300 psig (20,7 bar G) | max | 31389 | 14237 | 14248 | 6463 | 54052 | 24517 | 31389 | 14237 |
| | min | 914 | 415 | 415 | 189 | 1574 | 714 | 914 | 415 |
| 400 psig (27,6 bar G) | max | 41258 | 18714 | 18727 | 8494 | 71047 | 32226 | 41258 | 18714 |
| | min | 1073 | 487 | 487 | 221 | 1847 | 838 | 1073 | 487 |
| 500 psig (34,5 bar G) | max | 51297 | 23267 | 23284 | 10561 | 88334 | 40068 | 51297 | 23267 |
| | min | 1334 | 605 | 605 | 274 | 2297 | 1042 | 1334 | 605 |

**Table A-15. Saturated Steam Flow Rate Limits (Assumes Steam Quality is 100%)**

| Process pressure | Flow rate limits | Minimum and maximum saturated steam flow rates for line sizes 6 inch/DN 150 through 8 inch/DN 200 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 6 Inch/DN 150 | | | | 8 Inch/DN 200 | | | |
| | | Rosemount 8800D | | Rosemount 8800DR | | Rosemount 8800D | | Rosemount 8800DR | |
| | | lb/hr | kg/hr | lb/hr | kg/hr | lb/hr | kg/hr | lb/hr | kg/hr |
| 15 psig (1,03 bar G) | max | 13013 | 5903 | 5734 | 2601 | 22534 | 10221 | 13013 | 5903 |
| | min | 1163 | 528 | 513 | 233 | 2015 | 914 | 1163 | 528 |
| 25 psig (1,72 bar G) | max | 17080 | 7747 | 7526 | 3414 | 29575 | 13415 | 17080 | 7747 |
| | min | 1333 | 605 | 587 | 267 | 2308 | 1047 | 1333 | 605 |
| 50 psig (3,45 bar G) | max | 27019 | 12255 | 11905 | 5400 | 46787 | 21222 | 27019 | 12255 |
| | min | 1676 | 760 | 739 | 335 | 2903 | 1317 | 1676 | 760 |
| 100 psig (6,89 bar G) | max | 46405 | 21049 | 20448 | 9275 | 80356 | 36449 | 46405 | 21049 |
| | min | 2197 | 996 | 968 | 439 | 3804 | 1725 | 2197 | 996 |
| 150 psig (10,3 bar G) | max | 65611 | 29761 | 28866 | 13093 | 113440 | 51455 | 65611 | 29761 |
| | min | 2610 | 1184 | 1150 | 522 | 4520 | 2050 | 2610 | 1184 |
| 200 psig (13,8 bar G) | max | 84530 | 38342 | 37247 | 16895 | 146375 | 66395 | 84530 | 38342 |
| | min | 2965 | 1345 | 1307 | 593 | 5134 | 2329 | 2965 | 1345 |
| 300 psig (20,7 bar G) | max | 122666 | 55640 | 54052 | 24517 | 212411 | 96348 | 122666 | 55640 |
| | min | 3572 | 1620 | 1574 | 714 | 6185 | 2805 | 3572 | 1620 |
| 400 psig (27,6 bar G) | max | 161236 | 73135 | 71047 | 32226 | 279200 | 126643 | 161236 | 73135 |
| | min | 4192 | 1901 | 1847 | 838 | 7259 | 3293 | 4192 | 1901 |
| 500 psig (34,5 bar G) | max | 200468 | 90931 | 88334 | 40068 | 347134 | 157457 | 200468 | 90931 |
| | min | 5212 | 2364 | 2297 | 1042 | 9025 | 4094 | 5212 | 2364 |

**Table A-16. Saturated Steam Flow Rate Limits (Assumes Steam Quality is 100%)**

| Process pressure | Flow rate limits | Minimum and maximum saturated steam flow rates for line sizes 10 inch/DN 250 through 12 inch/DN 300 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 10 Inch/DN 250 | | | | 12 Inch/DN 300 | | | |
| | | Rosemount 8800D | | Rosemount 8800DR | | Rosemount 8800D | | Rosemount 8800DR | |
| | | lb/hr | kg/hr | lb/hr | kg/hr | lb/hr | kg/hr | lb/hr | kg/hr |
| 15 psig (1,03 bar G) | max | 35519 | 16111 | 22534 | 10221 | 50994 | 23130 | 35519 | 16111 |
| | min | 3175 | 1440 | 2015 | 914 | 4554 | 2066 | 3175 | 1440 |
| 25 psig (1,72 bar G) | max | 46618 | 21146 | 29575 | 13415 | 66862 | 30328 | 46618 | 21146 |
| | min | 4570 | 2073 | 2308 | 1047 | 5218 | 2367 | 4570 | 2073 |
| 50 psig (3,45 bar G) | max | 73748 | 33452 | 46787 | 21222 | 105774 | 47978 | 73748 | 33452 |
| | min | 4575 | 2075 | 2903 | 1317 | 6562 | 2976 | 4575 | 2075 |
| 100 psig (6,89 bar G) | max | 126660 | 57452 | 80356 | 36449 | 181663 | 82401 | 126660 | 57452 |
| | min | 5996 | 2720 | 3804 | 1725 | 8600 | 3901 | 5996 | 2720 |
| 150 psig (10,3 bar G) | max | 178808 | 81106 | 113440 | 51455 | 256457 | 116327 | 178808 | 81106 |
| | min | 7125 | 3232 | 4520 | 2050 | 10218 | 4635 | 7125 | 3232 |
| 200 psig (13,8 bar G) | max | 230722 | 104654 | 146375 | 66395 | 330915 | 150101 | 230722 | 104654 |
| | min | 8092 | 3670 | 5134 | 2329 | 11607 | 5265 | 8092 | 3670 |
| 300 psig (20,7 bar G) | max | 334810 | 151867 | 212411 | 96348 | 480203 | 217816 | 334810 | 151867 |
| | min | 9749 | 4422 | 6185 | 2805 | 13983 | 6343 | 9749 | 4422 |
| 400 psig (27,6 bar G) | max | 440085 | 199619 | 279200 | 126643 | 631195 | 286305 | 440085 | 199619 |
| | min | 11442 | 5190 | 7259 | 3293 | 16411 | 7444 | 11442 | 5190 |
| 500 psig (34,5 bar G) | max | 547165 | 248190 | 347134 | 157457 | 784775 | 355968 | 547165 | 248190 |
| | min | 14226 | 6453 | 9025 | 4094 | 20404 | 9255 | 14226 | 6453 |

# A.3        Performance specifications

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

## Flow accuracy

Includes linearity, hysteresis, and repeatability.

## Liquids—for Reynolds Numbers over 20000

### Digital and Pulse Output

±0.65% of rate

**Note**
The accuracy for the 8800DR, line sizes 6 to 12 inch (150 to 300mm), is ±1.0% of rate.

### Analog output

Same as pulse output plus an additional 0.025% of span

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

### Digital and Pulse Output

±1.0% of rate

**Note**
The accuracy for the 8800DR, line sizes 6 to 12 inch (150 to 300mm), is ±1.35% of rate.

### Analog Output

Same as pulse output plus an additional 0.025% of span.

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 +/-2.0%. For Reynolds Numbers down to 5,000 the accuracy error band will increase linearly from +/-2.0% to +/-6.0%.

## Process temperature accuracy

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

**Note**
For remote mount installations, add ±0.018 °F/ft. (±0.03 °C/m) of uncertainty to the temperature measurement.

## Mass flow accuracy for temperature compensated steam mass flow

2.0% of rate (Typical)

### Repeatability

± 0.1% of actual flow rate

## Mass flow accuracy for temperature compensated liquid mass flow (water)

± .70% of rate (Typical) between 32 and 500°F (0 to 260 °C)

± .85% of rate (Typical) between 500 and 600°F (260 and 316 °C)

Pressure Range Limits : 10 psia to 6264 psia

### Repeatability

± 0.1% of actual flow rate

## Mass flow accuracy for temperature compensated liquid mass flow (user-defined)

Dependent on user inputs

### Repeatability

± 0.1% of actual flow rate

## Stability

±0.1% of rate over one year

## Process temperature effect

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

Table A-17 indicates the percent change in K-factor per 100 °F (55.6 °C) in process temperature from reference temperature of 77 °F (25 °C).

**Table A-17. Process Temperature Effect**

| Material | Percent change in K-factor per 100 °F (55.6 °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 and pulse outputs

No effect

### Analog output

±0.1% of span from –58 to 185 °F (–50 to 85 °C)

## 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.

## Vibration specifications

### Integral aluminum housings, remote aluminum housings, and remote SST housings

At or near the minimum liquid flow rate in a normal pipe mounted installation, the maximum vibration should be 0.087-in. (2,21 mm) double amplitude displacement or 1 g acceleration, whichever is smaller. At or near the minimum gas flow rate in a normal pipe mounted installation, the maximum vibration should be 0.043-in. (1,09 mm) double amplitude displacement or $1/2$ g acceleration, whichever is smaller.

### 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.

### HART analog

Output error less than ±0.025% of span with twisted pair from 80-1000 MHz for radiated field strength of 10 V/m; 1.4 - 2.0 GHz for radiated field strength of 3 V/m; 2.0 - 2.7 GHz for radiated field strength of 1 V/m. Tested per EN61326.

### HART digital

No affect on the values that are being given if using HART digital signal. Tested per EN61326.

## Magnetic-field interference

### HART analog

Output error less than ±0.025% of span at 30 A/m (rms). Tested per EN61326.

## Series mode noise rejection

### HART analog

Output error less than ±0.025% of span at 1 V rms, 60 Hz.

## Common mode noise rejection

### HART analog

Output error less than ±0.025% of span at 30 V rms, 60 Hz.

## Power supply effect

### HART analog

Less than 0.005% of span per volt

# A.4    Physical specifications

## NACE compliance

Materials of Construction meet NACE material recommendations per MR0175/ISO15156 for use in $H_2S$ 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.

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

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## Electrical connections

$^1/_2$ –14 NPT or M20 X 1.5 conduit threads; screw terminals provided for 4–20 mA and pulse output 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

### Meter body

CF-3M cast stainless, N06022 wrought Nickel Alloy and CW2M cast Nickel Alloy. Also available in WCB and LCC cast carbon steel and 6A duplex stainless steel.

### Flanges

316/316L stainless steel

Nickel Alloy N06022 Weld Neck

A105 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 µ inches
(1.6 to 3.1 µ meters) Ra roughness

## Process connections

Mounts between the following flange configurations:

ASME B16.5 (ANSI): Class 150, 300, 600, 900, 1500

EN 1092-1: PN 10, 16, 25, 40, 63, 100, 160

JIS: 10K, 20K, and 40K

Weld-end: Schedule 10, Schedule 40, Schedule 80, Schedule 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, 30, 33, and 50 ft (3.0, 6.1, 9.1, 10, and 15.2 m) lengths. Consult factory for non-standard lengths up to 75 ft (22,9 m). Remote mounting hardware includes a pipe mount bracket with one 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). Refer to Figure A-1.

**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**
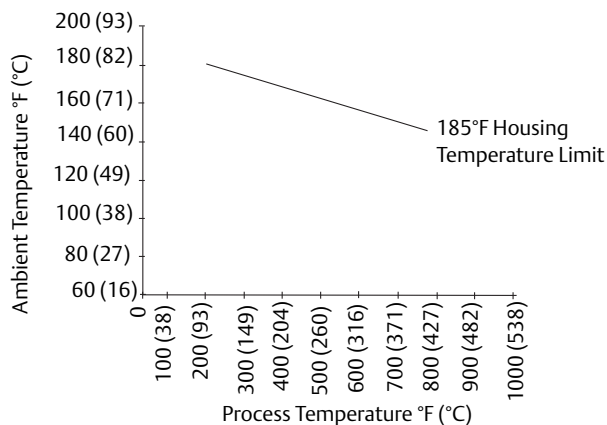


**Note**
The indicated limits are for horizontal pipe and vertical meter position, with meter and pipe insulated with three inches of ceramic fiber insulation.

## 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.

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 35D upstream and 5D downstream. The value of the K-factor may shift up to 0.5% when the upstream straight pipe length is between 10D and 35D. Please see Technical Data Sheet (00816-0100-3250) on Installation Effects for optional K-factor corrections. This effect can be corrected in the electronics.

## 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-in. (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.

## 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.

# A.5      Dimensional drawings

**Figure A-2. Flanged-Style Flowmeter—Line Sizes ¹/₂- through 12-in. (15 through 300 mm)**
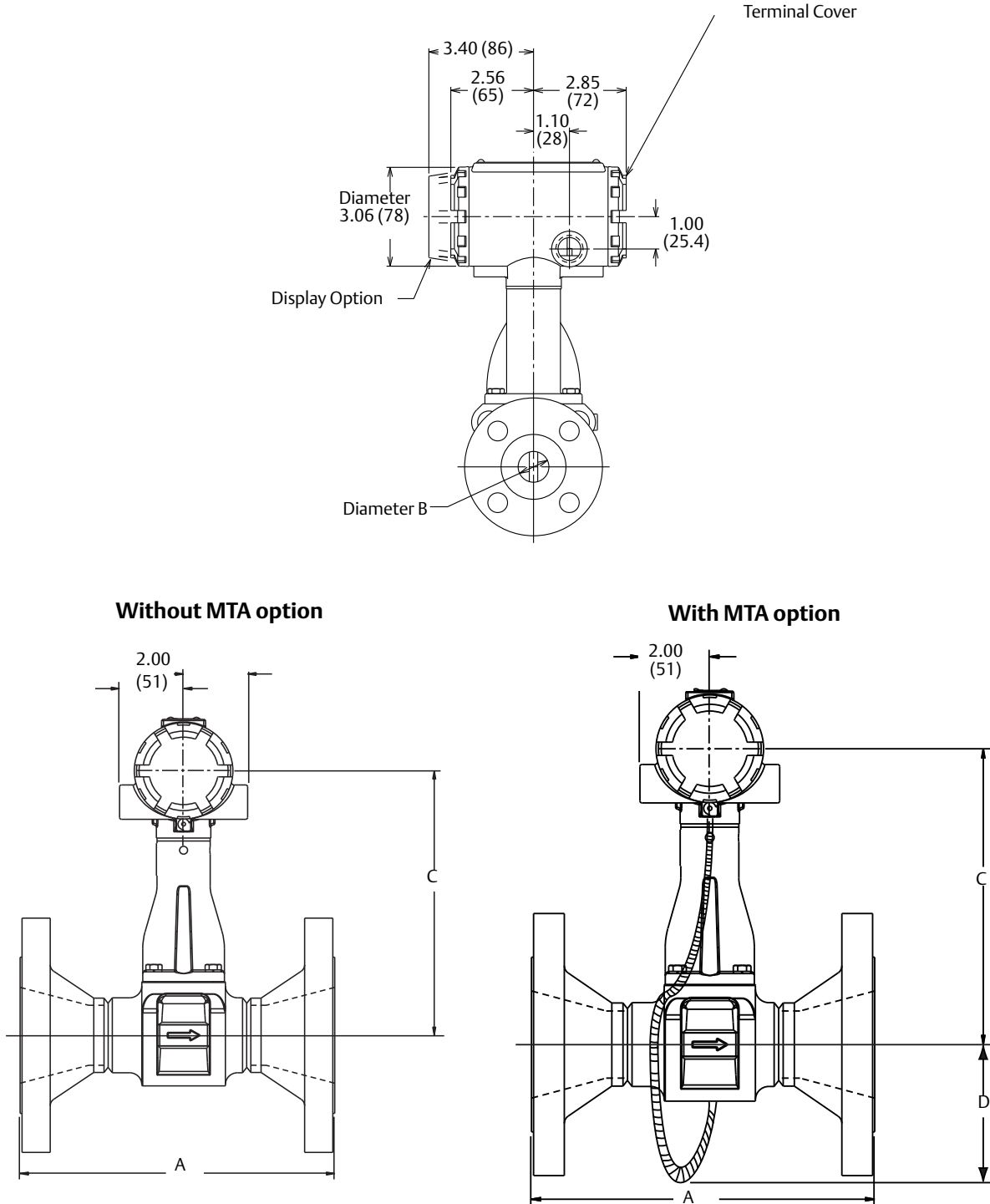


Dimensions are in inches (millimeters).

### Table A-18.  Flanged-Style Flowmeter—Line Sizes 1/2- through 2-in. (15 through 50 mm)

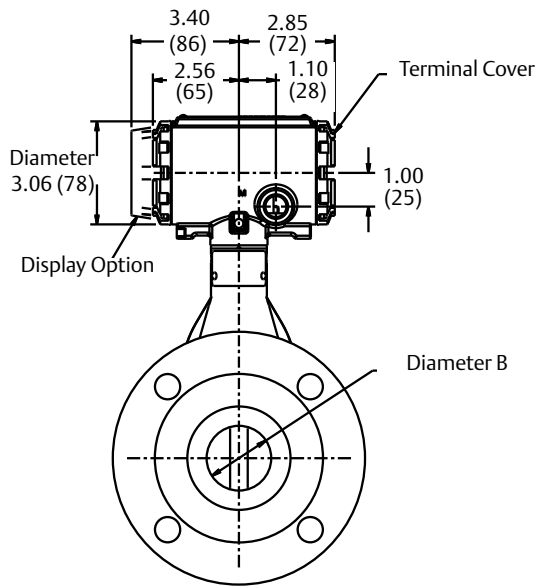| Nominal Size Inch (mm) | Flange Rating | Face-to-face A Inch (mm) | A-ANSI RTJ Inch (mm) | Diameter B Inch (mm) | C Inch (mm) | Weight lb (kg) |
|---|---|---|---|---|---|---|
| ½ (15) | Class 150 | 6.8 (173) | N/A | 0.54 (13,7) | 7.6 (193) | 9.1 (4,1) |
| | Class 300 | 7.2 (183) | 7.6 (193) | 0.54 (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) |
| | 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) |
| 1 (25) | 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) |
| | 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) |
| 1 ½ (40) | 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) |
| | 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) |
| 2 (50) | 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) |
| | 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) |
| | 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-19.  Flanged-Style Flowmeter—Line Sizes 3- through 6-in. (80 through 150mm) (refer to Figure A-2)**

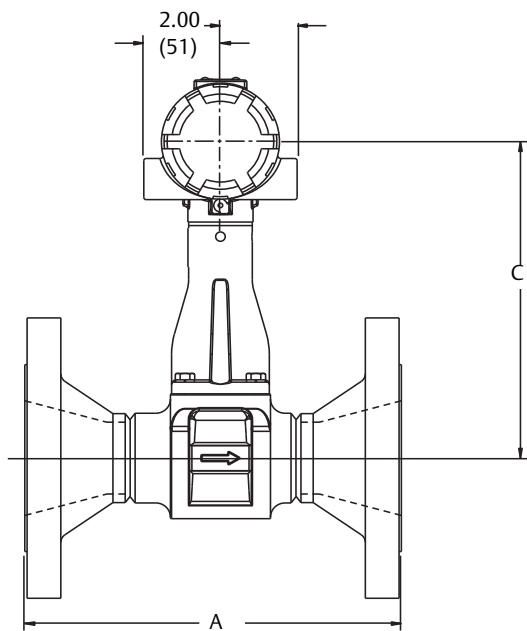| Nominal size inch (mm) | Flange rating | Face-to-face A inch (mm) | A ANSI RTJ inch (mm) | Diameter B inch (mm) | C inch (mm) | Weight lb (kg) |
|---|---|---|---|---|---|---|
| 3 (80) | Class 150 | 9.9 (251) | 10.4 (264) | 2.87 (72,9) | 9.1 (231) | 37.2 (16,9) |
|  | Class 300 | 10.6 (269) | 11.2 (284) | 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) | 51.3 (23,3) |
|  | 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-20. Flanged-Style Flowmeter—Line Sizes 8- through 12-in. (200 through 300mm) (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/AN/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—Line Sizes 1- through 12-in. (25 through 300 mm**



**Without MTA option**

**With MTA option**
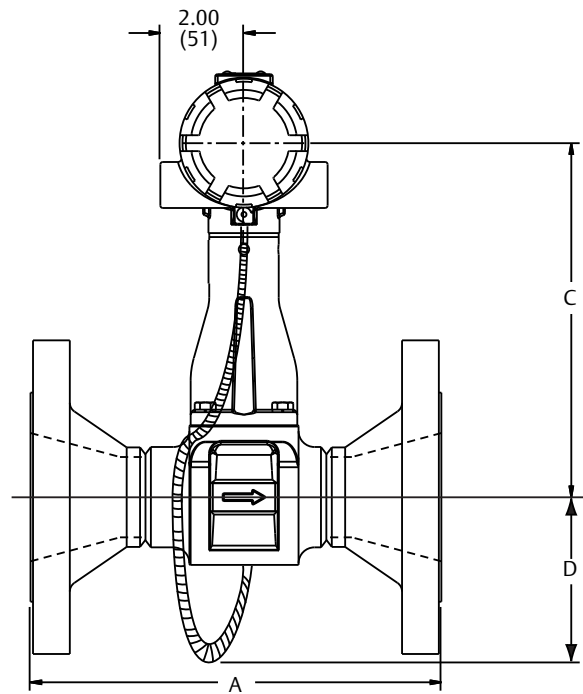
Dimensions are in inches (millimeters).

**Table A-21. Reducer Flowmeter—Line Sizes 1- through 3-in. (25 through 80 mm)**

| 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 ½ (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) |
| | PN 160 | 8.4 (213) | N/A | 0.95 (24,1) | 7.7 (196) | 27.67 (12,55) |
| 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) |
| | PN 100 | 9.6 (244) | N/A | 1.49 (37,8) | 8.1 (206) | 37.25 (16,90) |
| | PN 160 | 10.2 (259) | N/A | 1.49 (37,8) | 8.1 (206) | 39.64 (17,98) |
| 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) |
| | 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-22. Reducer Flowmeter—Line Sizes 4- through 12-in. (100 through 300mm) (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) |
| | 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—Line Sizes ¹/₂- through 8-in. (15 through 200 mm)**
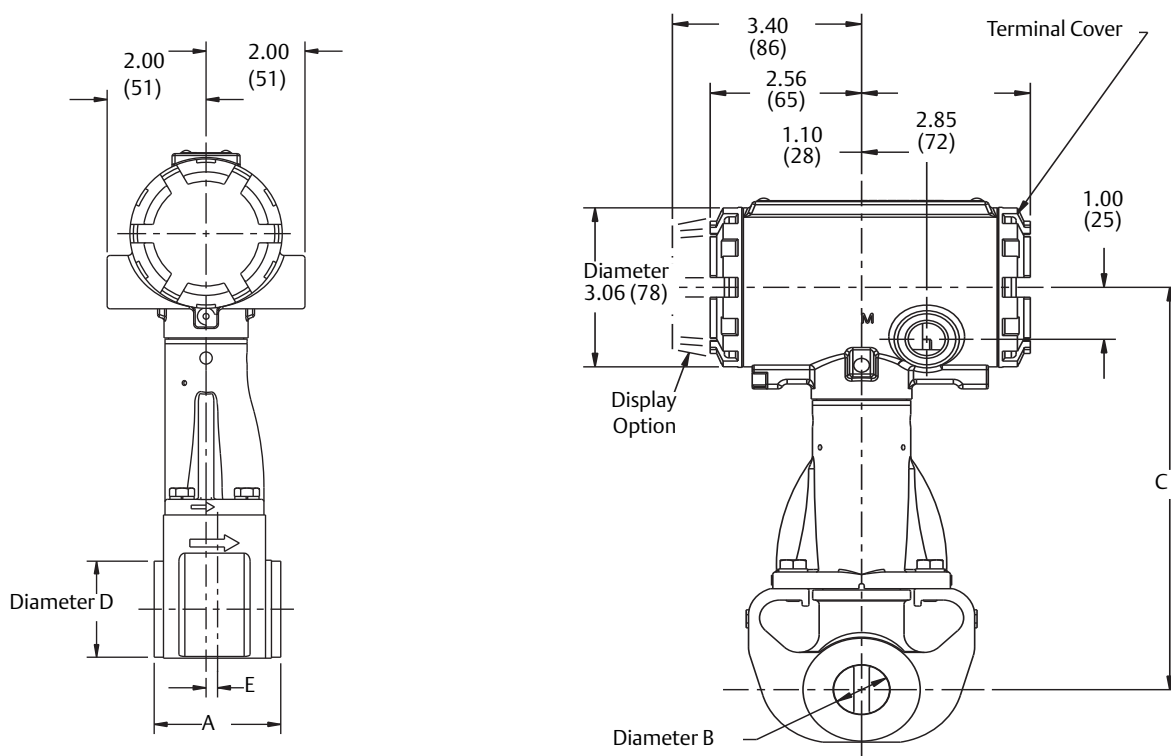


Dimensions are in inches (millimeters).
Electronics housing may be rotated in 90 degree increments.

**Table A-23.  Rosemount 8800D 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)[1] |
|---|---|---|---|---|---|
| ½ (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) |
| 1½ (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—Line Sizes ¹/₂- through 3-in. (15 through 80 mm)**
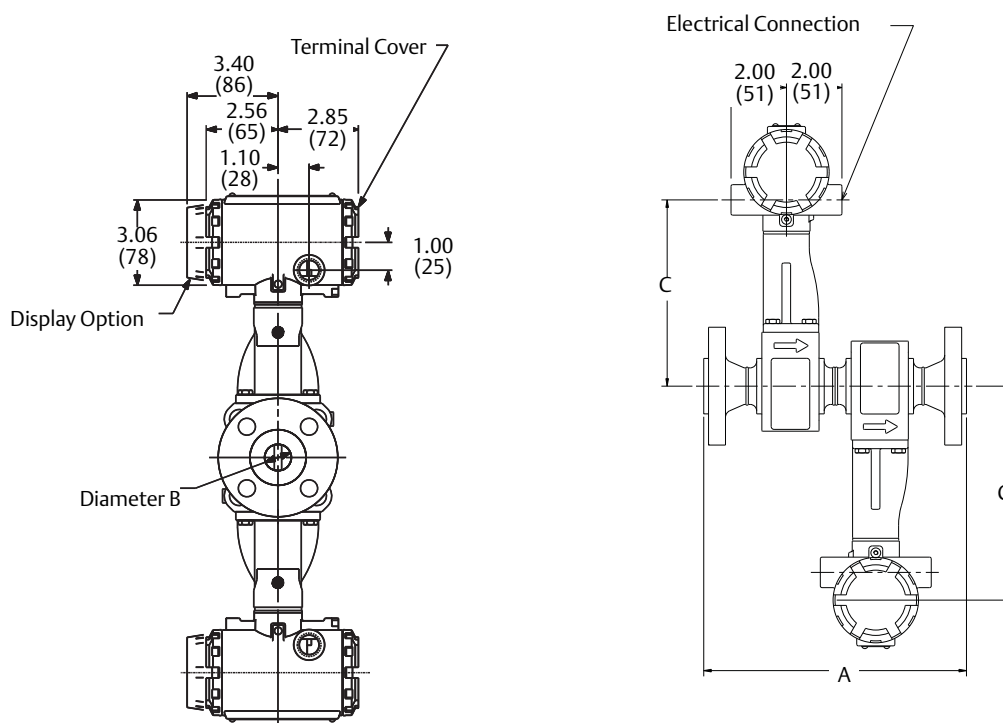

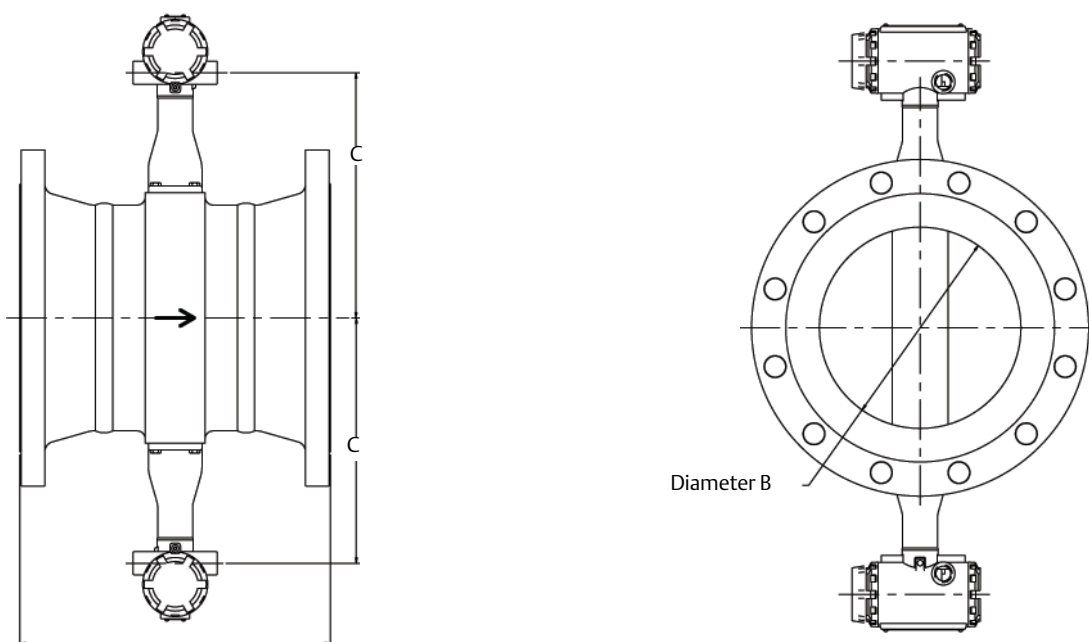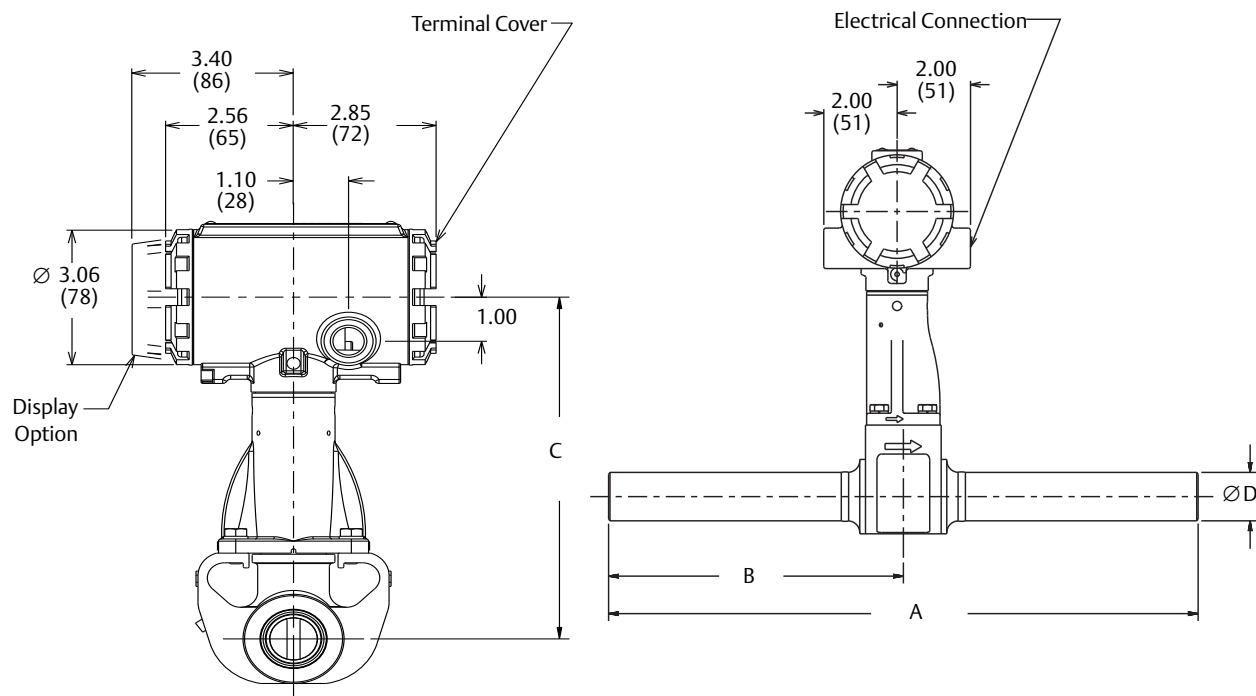
Dimensions are in inches (millimeters).

**Table A-24.  Vortex Dual-Sensor Style Flowmeter—Line Sizes ¹/₂- through 3-in. (15 through 80 mm)**

| 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) |
|---|---|---|---|---|---|---|
| ½ (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) |
| 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 | 14.0 (356) | N/A | 0.95 (24,1) | 7.7 (196) | 22.3 (10.1) |
| | JIS 40K | 15.4 (391 | N/A | 0.95 (24,1) | 7.7 (196) | 26.08 (11,8) |

**Table A-24. Vortex Dual-Sensor Style Flowmeter—Line Sizes ¹/₂- through 3-in. (15 through 80 mm)**

| 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 ½ (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 | 10.3 (262) | N/A | 1.49 (37,8) | 8.1 (206) | 27.9 (12,6) |
| | JIS 40K | 11.5 (292) | N/A | 1.49 (37,8) | 8.1 (206) | 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 | 11.5 (292) | N/A | 1.92 (48,8) | 8.5 (216) | 29.1 (13,2) |
| | JIS 20K | 12.0 (305) | N/A | 1.92 (48,8) | 8.5 (216) | 30.0 (13,6) |
| | JIS 40K | 13.6 (345) | N/A | 1.92 (48,8) | 8.5 (216) | 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 | 12.3 (312) | N/A | 2.87 (72,9) | 9.1 (231) | 41.4 (18,8) |
| | JIS 20K | 13.7 (348) | N/A | 2.87 (72,9) | 9.1 (231) | 48.8 (22,1) |
| | JIS 40K | 15.5 (394) | N/A | 2.87 (72,9) | 9.1 (231) | 63.7 (28,9) |

**Figure A-6. Vortex Dual-Sensor Style Flowmeter—Line Sizes 4- through 12-in. (100 through 300 mm)**



**Table A-25.  Vortex Dual-Sensor Style Flowmeter—Line Sizes 4- through 12-in. (100 through 300 mm)**

| 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) |
| 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-25. Vortex Dual-Sensor Style Flowmeter—Line Sizes 4- through 12-in. (100 through 300 mm)**

| 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) | 202 (91,6) |
| | 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—Line Sizes ¹/₂- through 4-in. (15 through 100 mm)**



Dimensions are in inches (millimeters).

**Table A-26. Vortex Weld-End Style Flowmeter—Line Sizes ¹/₂- through 4-in. (15 through 100 mm)**

| Nominal size in. (mm) | A in. (mm) | B in. (mm) | C ± 0.20 in. (5.1 mm) | Diameter D ± 0.031 in. (0.79 mm) |
|---|---|---|---|---|
| 0.5 | 16.0 (406) | 8.0 (203) | 7.63 (194) | .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**
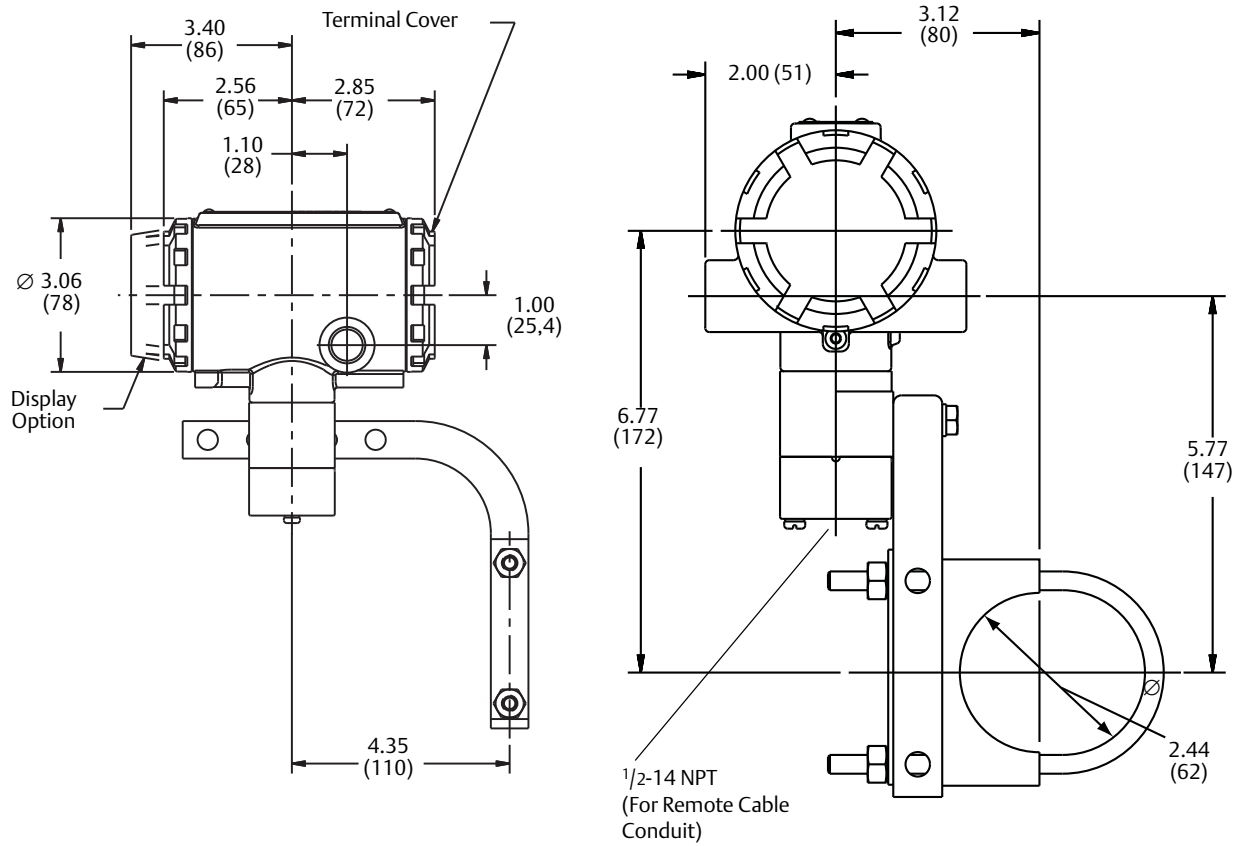


**Note**
Consult factory for SST installation. Dimensions are in inches (millimeters).

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

¹/₂-14 NPT (For Remote Cable Conduit)

E
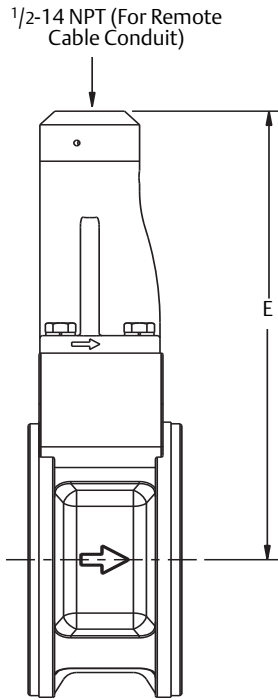
**Table A-27.  Rosemount 8800D Wafer-Style Meter**

| Nominal size inch (mm) | E Wafer style inch (mm) |
|---|---|
| ½ (15) | 6.3 (160) |
| 1 (25) | 6.5 (165) |
| 1½ (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—Line Sizes $1/2$- through 12-in. (15 through 300 mm)**



Flanged Flowmeter

Dual-Sensor Style Flowmeter
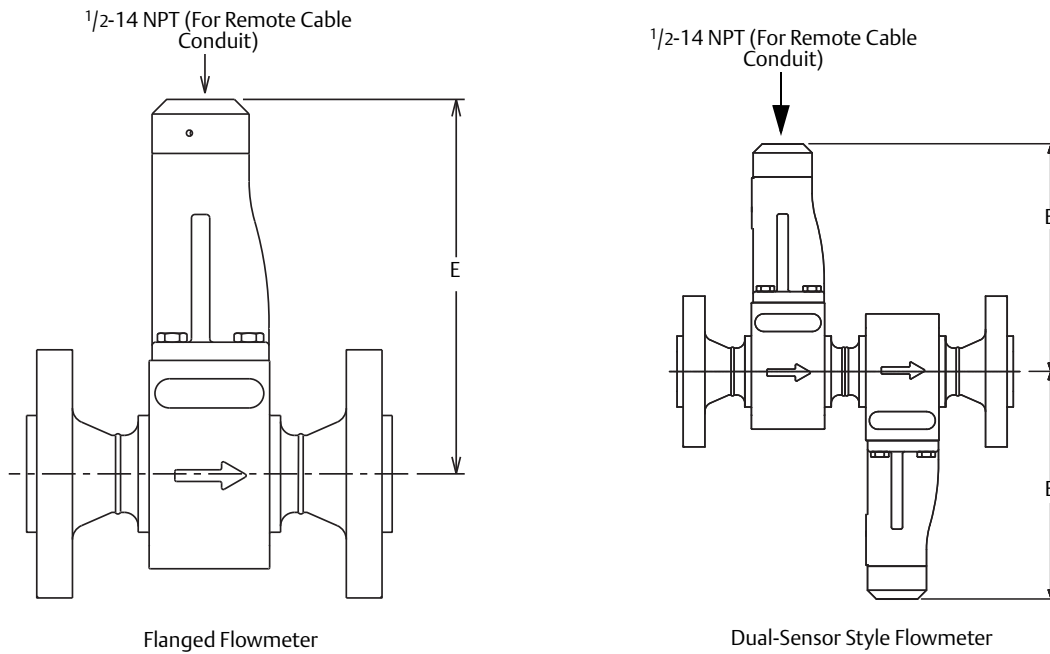
Dimensions are in inches (millimeters).

**Table A-28.  Remote Mount, Flanged-and Dual Sensor Flowmeter Dimensions**

| Nominal size inch (mm) | E Flange style inch (mm) |
|---|---|
| ½ (15) | 6.4 (162) |
| 1 (25) | 6.5 (165) |
| 1½ (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) |

# Appendix B  Product Certifications

## B.1 Overview

This appendix contains information on approved manufacturing locations, European directive information, Hazardous Locations Certifications, field circuit configuration drawings, and CSA Intrinsic Safety approval drawings.

## B.2 Product certifications

### B.2.1 Approved Manufacturing Locations

Emerson Process Management—Eden Prairie, Minnesota, USA

Emerson Process Management BV - Ede, The Netherlands

Emerson Process Management Flow Technologies Co., Ltd - Nanjing, Jiangsu Province, P.R. China

SC Emerson SRL - Cluj, Romania

### B.2.2 Flameproof enclosure Ex d protection type in accordance with IEC 60079-1, EN 60079-1

⚠ ■ Transmitters with Flameproof enclosure type protection shall only be opened when power is removed.

⚠ ■ Closing of entries in the device must be carried out using the appropriate Ex d cable gland or blanking plug. Unless otherwise marked on housing, the standard conduit entry thread forms are 1/2-14 NPT.

### B.2.3 Type n protection type in accordance with IEC 60079-15, EN60079-15

⚠ Closing of entries in the device must be carried out using the appropriate Ex e or Ex n cable gland and metal blanking plug or any appropriate ATEX or IECEx approved cable gland and blanking plug with IP66 rating certified by an EU approved certification body.

## B.3 European Directive Information

The CE Declaration of Conformity for all applicable European directives for this product can be found on our website at EmersonProcess.com/Rosemount. A hard copy may be obtained by contacting our local sales office.

## B.4 ATEX Directive

Emerson Process Management complies with the ATEX Directive.

## B.5 European Pressure Equipment Directive (PED)

**Rosemount 8800D Vortex Flowmeter Line Size 40 mm to 300 mm**

Certificate Number 4741-2014-CE-HOU-DNV

C€ 0575

Module H Conformity Assessment

Mandatory CE-marking for flowmeters in accordance with Article 15 of the PED can be found on the flowtube body.

Flowmeter categories I – III use module H for conformity assessment procedures.

**Rosemount 8800D Vortex Flowmeter Line Size 15 mm and 25 mm**

**Sound Engineering Practice (SEP)**

Flowmeters that are SEP are outside the scope of PED and cannot be marked for compliance with PED.

## B.6 Hazardous Location Certifications

### B.6.1 North American Certifications

#### Factory Mutual (FM)

**E5** Explosion proof-Intrinsically Safe for Class I, Division 1, Groups B, C, and D;
Dust-ignition proof for Class II/III, Division 1, Groups E, F, and G;
Temperature Code T6 (-50 °C ≤ Ta ≤ 70 °C)
Factory Sealed
Enclosure Type 4X, IP66

**I5** Intrinsically safe for use in Class I, II, III Division 1, Groups A, B, C, D, E, F, and G;
Non-incendive for Class I, Division 2, Groups A, B, C, and D
NIFW (Non-incendive Field Wiring) when installed per Rosemount Drawing 08800-0116
Temperature Code T4 (-50 °C ≤ Ta ≤ 70 °C) 4-20 mA HART®
Temperature Code T4 (-50 °C ≤ Ta ≤ 60 °C) Fieldbus
Enclosure Type 4X, IP66

**IE** FISCO for Class I, II, III, Division 1, Groups A, B, C, D, E, F and G;
FNICO for Class I Division 2, Groups A, B, C, and D when installed per Rosemount control drawing 08800-0116
Temperature Code T4 (-50 °C ≤ Ta ≤ 60 °C)
Enclosure Type 4X, IP66

#### Combined Factory Mutual (FM) Certifications

**K5** Combination of E5 and I5

#### *Special Conditions for Safe Use (X):*

1. When fitted with 90V transient suppressors (T1 Option), the equipment is not capable of passing the 500V insulation test. This must be taken into account upon installation.

2. The Model 8800D Vortex Flowmeter when ordered with aluminum electronics housing is considered to constitute a potential risk of ignition by impact or friction. Care should be taken into account during installation and use to prevent impact or friction.

#### Canadian Standards Association (CSA)

**E6** Explosion-Proof for Class I, Division 1, Groups B, C, and D;
Dust-ignition proof for Class II and Class III, Division 1, Groups E, F, and G
Class I, Zone 1, Ex d[ia] IIC
Temperature Code T6 (-50 °C ≤ Ta ≤ 70 °C)
Factory Sealed
Single Seal
Enclosure Type 4X

**I6** Intrinsically safe for use in Class I, II, III Division 1, Groups A, B, C, D, E, F, G;
Non-incendive for Class I, Division 2, Groups A, B, C and D
Temperature Code T4 (-50 °C ≤ Ta ≤ 70 °C) 4-20 mA HART
Temperature Code T4 (-50 °C ≤ Ta ≤ 60 °C) Fieldbus
Single Seal
Enclosure Type 4X

**IF** FISCO for Class I, Division 1, Groups A, B, C, and D
FNICO for Class I Division 2, Groups A, B, C, and D
Temperature Code T4 (-50 °C ≤ Ta ≤ 60 °C)
When installed per Rosemount drawing 08800-0112
Enclosure Type 4X

#### Combined Canadian Certifications (CSA)

**K6** Combination of E6 and I6

#### Combined North America Certifications (FM and CSA)

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

### B.6.2 European Certifications

#### ATEX Intrinsic Safety

EN 60079-0: 2012
EN 60079-11: 2012

**I1** Certification No. Baseefa05ATEX0084X
ATEX Marking
⟨Ex⟩ II 1 G Ex ia IIC T4 Ga (-60 °C ≤ Ta ≤ 70 °C) 4-20 mA HART
⟨Ex⟩ II 1 G Ex ia IIC T4 Ga (-60 °C ≤ Ta ≤ 60 °C) Fieldbus
CE 0575

| 4-20 mA HART entity parameters | Fieldbus entity parameters | FISCO input parameters |
|---|---|---|
| $U_i$ = 30 VDC | $U_i$ = 30 VDC | $U_i$ = 17.5 VDC |
| $I_i$[1] = 185 mA | $I_i$[1] = 300 mA | $I_i$[1] = 380 mA |
| $P_i$[1] = 1.0 W | $P_i$[1] = 1.3 W | $P_i$[1] = 5.32 W |
| $C_i$ = 0 µF | $C_i$ = 0 µF | $C_i$ = 0 µF |
| $L_i$ = 0.97mH | $L_i$ < 10 µH | $L_i$ < 10 µH |

1. Total for transmitter.

### ATEX FISCO

**IA**    Certification No. Baseefa05ATEX0084X
ATEX Marking
⟨Ex⟩ II 1 G Ex ia IIC T4 Ga (-60 °C ≤ Ta ≤ 60 °C)
CE 0575

*Special Conditions for Safe Use (X):*

1. When fitted with 90V transient suppressors (T1 option), the equipment is not capable of passing the 500V isolation test. This must be taken into account upon installation.

2. The enclosure may be made from aluminum alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion when located in Zone 0 environment. The polyurethane paint finish may constitute an electrostatic hazard and must only be cleaned with a damp cloth.

3. When the equipment is installed, particular precautions must be taken to ensure taking into account the effect of process fluid temperature, that the ambient temperature of the electrical housing of the equipment meets the marked protection type temperature range.

### ATEX Type n Certification

EN 60079-0: 2012
EN 60079-11: 2012
EN 60079-15: 2010

**N1**    Certification No. Baseefa05ATEX0085X
ATEX Marking
⟨Ex⟩ II 3 G Ex nA ic IIC T5 Gc (-50 °C ≤ Ta ≤ 70 °C) 4-20 mA HART
⟨Ex⟩ II 3 G Ex nA ic IIC T5 Gc (-50 °C ≤ Ta ≤ 60 °C) Fieldbus
Maximum Working Voltage = 42 VDC 4-20 mA HART
Maximum Working Voltage = 32 VDC Fieldbus

*Special Conditions for Safe Use (X):*

1. When fitted with 90V transient suppressors (T1 Option), the equipment is not capable of passing the 500V isolation test. This must be taken into account upon installation.

2. The enclosure may be made from aluminum alloy with a protective polyurethane paint finish. The polyurethane paint finish may constitute and electrostatic hazard and must only be cleaned with a damp cloth.

3. When the equipment is installed, particular precautions must be taken to ensure, taking into account the effect of process fluid temperature, that the ambient temperature of the electrical housing of the equipment meets the marked protection type temperature range.

### ATEX Flameproof Certification

EN 60079-0: 2009
EN 60079-1: 2007
EN 60079-11: 2012
EN 60079-26: 2007

**E1**    Certificate: KEMA99ATEX3852X
Integral Flowmeter marked:
⟨Ex⟩ II 1/2 G Ex d [ia] IIC T6 Ga/Gb (-50 °C ≤ Ta ≤ 70 °C)
Remote Transmitter marked:
⟨Ex⟩ II 2(1) G Ex d [ia Ga] IIC T6 Gb (-50 °C ≤ Ta ≤ 70 °C)
with meter body marked:
⟨Ex⟩ II 1 G Ex ia IIC T6 Ga (-50 °C ≤ Ta ≤ 70 °C)
42 VDC Max 4-20 mA HART
32 VDC Max Fieldbus
$U_m$ = 250V

### Installation instructions:

1. The cable and conduit entry devices shall be of a certified flameproof type Ex d, suitable for the conditions of use and correctly installed.

2. Unused apertures shall be closed with suitable blanking elements.

3. When the ambient temperature at the cable or conduit entries exceed 60 °C, cables suitable for at least 90 °C shall be used.

4. Remote mounted sensor; in type of protection EX ia IIC, only to be connected to the associated Model 8800D Vortex Flowmeter electronics. the maximum allowable length of the interconnecting cable is 152 m (500 ft).

*Special Conditions for Safe Use (X):*

1. For information regarding the dimensions of the flameproof joints, the manufacturer shall be contacted.

2. The Flowmeter shall be provided with special fasteners of property class A2-70 or A4-70.

3. Units marked with "Warning: Electrostatic Charging Hazard" may use non-conductive paint thicker that 0.2 mm. Precaution shall be taken to avoid ignition due to electrostatic charge on the enclosure.

### Combined ATEX Certifications

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

## B.6.3 International IECEx Certifications

### Intrinsic Safety

IEC 60079-0: 2011
IEC 60079-11: 2011

**I7** Certificate No. IECEx BAS05.0028X
Ex ia IIC T4 Ga (-60 °C ≤ $T_a$ ≤ 70 °C) 4-20 mA HART
Ex ia IIC T4 Ga (-60 °C ≤ $T_a$ ≤ 60 °C) Fieldbus

| 4-20 mA HART entity parameters | Fieldbus entity parameters | FISCO input parameters |
|---|---|---|
| $U_i$ = 30 VDC | $U_i$ = 30 VDC | $U_i$ = 17.5 VDC |
| $I_i^{(1)}$ = 185 mA | $I_i^{(1)}$ = 300 mA | $I_i^{(1)}$ = 380 mA |
| $P_i^{(1)}$ = 1.0 W | $P_i^{(1)}$ = 1.3 W | $P_i^{(1)}$ = 5.32 W |
| $C_i$ = 0 μF | $C_i$ = 0 μF | $C_i$ = 0 μF |
| $L_i$ = 0.97mH | $L_i$ < 10 μH | $L_i$ < 10 μH |

1. Total for transmitter.

### FISCO

**IG** Certificate: IECEx BAS 05.0028X
Ex ia IIC T4 Ga (-60 °C ≤ Ta ≤ 60 °C)

*Special Conditions for Safe Use (X):*

1. When fitted with 90V transient suppressors (T1 Option), the equipment is not capable of passing the 500V isolation test. This must be taken into account upon installation.

2. The enclosure may be made from aluminum alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion when located in Zone 0 environment. The polyurethane paint finish may constitute an electrostatic hazard and must only be cleaned with a damp cloth.

3. When the equipment is installed, particular precautions must be taken to ensure, taking into account the effect of process fluid temperature, that the ambient temperature of the electrical housing of the equipment meets the marked protection type temperature range.

### Type n Certification

IEC 60079-0: 2011
IEC 60079-11: 2011
IEC 60079-15: 2010

**N7** Certificate No. IECEx BAS05.0029X
Ex nA ic IIC T5 Gc (-50 °C ≤ Ta ≤ 70 °C) 4-20 mA HART
Ex nA ic IIC T5 Gc (-50 °C ≤ Ta ≤ 60 °C) Fieldbus
Maximum Working Voltage = 42 VDC 4-20 mA HART
Maximum Working Voltage = 32 VDC Fieldbus

*Special Conditions for Safe Use (X):*

1. When fitted with 90V transient suppressors (T1 Option), the equipment is not capable of passing the 500V isolation test. This must be taken into account upon installation.

2. The enclosure may be made from aluminum alloy with a protective polyurethane paint finish. The polyurethane paint finish may constitute an electrostatic hazard and must only be cleaned with a damp cloth.

3. When the equipment is installed, particular precautions must be taken to ensure, taking into account the effect of process fluid temperature, that the ambient temperature of the electrical housing of the equipment meets the marked protection type temperature range.

### Flameproof Certification

IEC 60079-0: 2007-10
IEC 60079-1: 2007-04
IEC 60079-11: 2011
IEC 60079-26: 2006

**E7** Certificate: IECEx KEM05.0017X
Integral Flowmeter marked:
Ex d [ia] IIC T6 Ga/Gb (-50 °C ≤ Ta ≤ 70 °C)
Remote Transmitter marked:
Ex d [ia Ga] IIC T6 Gb (-50 °C ≤ Ta ≤ 70 °C)
with meter body marked:
Ex ia IIC T6 Ga (-50 °C ≤ Ta ≤ 70 °C)

42 VDC Max 4-20 mA HART
32 VDC Max Fieldbus
$U_m$ = 250V

#### Installation instructions:

1. The cable and conduit entry devices shall be of a certified flameproof type Ex d, suitable for the conditions of use and correctly installed.

2. Unused apertures shall be closed with suitable blanking elements.

3. When the ambient temperature at the cable or conduit entries exceed 60 °C, cables suitable for at least 90 °C shall be used.

4. The remote mounted sensor may only be connected to the transmitter with the associated cable, supplied by the manufacturer.

*Special Conditions for Safe Use (X):*

1. For information regarding the dimensions of the flameproof joints, the manufacturer shall be contacted.

2. The Flowmeter shall be provided with special fasteners of property class A2-70 or A4-70.

3. Units marked with "Warning: Electrostatic Charging Hazard" may use non-conductive paint thicker that 0.2 mm. Precaution shall be taken to avoid ignition due to electrostatic charge on the enclosure.

### Combined IECEx Certifications

**K7** Combination of E7, I7, and N7

## B.6.4 Chinese Certifications (NEPSI)

### Flameproof Certification

GB3836.1 – 2010
GB3836.2 – 2010
GB3836.4 – 2010
GB3836.20 – 2010

**E3** Certification No. GYJ12.1493X
Ex ia / d IIC T6 Ga/Gb (Integral Transmitter)
Ex d [ia Ga] IIC T6 Gb (Remote Transmitter)
Ex ia IIC T6 Ga (Remote Sensor)
Ambient temperature range: -50 °C ≤ Ta ≤ +70 °C
Process temperature range: -202 °C to +427 °C
Power Supply: 42 Vdc Max 4-20 mA HART
Power Supply: 32 Vdc Max Fieldbus
$U_m$ = 250V

*Special Conditions for Safe Use (X):*

1. The maximum allowable length of the interconnecting cable between transmitter and sensor is 152 m. The cable shall also be provided by Rosemount Inc., or by Emerson Process Management Flow Technologies Co., Ltd.

2. Suitable heat-resisting cables rated at least +80 °C shall be used when the temperature around the cable entry exceeds +60 °C.

3. Dimensions of flameproof joints are other than the relevant minimum or maximum specified in Table 3 of GB3836.2-2010. Contact manufacturer for details.

4. The Flowmeter is provided with special fasteners of property class A2-70 or A4-70.

5. Any friction should be prevented in order to avoid the risk of electrostatic charge on the enclosure due to non-conductive paint.

6. The earthing terminal should be connected to the ground reliably at site.

7. Do not open when energized.

8. The cable entry holes have to be connected by means of suitable entry device or stopping plugs with type of protection of Ex d IIC Gb the cable entry device and stopping plugs are approved in accordance with GB3836.1-2010 and GB3836.2-2010, and which are covered by a separate examination certificate, any unused entry hole is to be fitted with type of protection of Ex d IIC Gb flameproof stopping plug.

9. Users are forbidden to change the configuration to ensure the explosion protection performance of the equipment. Any faults shall be settled with experts from the manufacturer.

10. Precautions shall be taken to ensure that the electronic parts are within permissible ambient temperature considering the effect of the allowed fluid temperature.

11. During installation, operation and maintenance, users shall comply with the relevant requirements of the product instruction manual, GB3836.13-1997 "Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres", GB3836.15-2000 "Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous areas (other than mines)", GB3836.16-2006 "Electrical apparatus for explosive gas atmospheres Part 16: Inspection and maintenance of electrical installation (other than mines)", and GB50257-1996 "Code for construction and acceptance of electrical device for explosion atmospheres and fire hazard electrical equipment installation engineering".

### I. S. Certification

GB3836.1 – 2010
GB3836.4 – 2010
GB3836.20 – 2010
GB12476.1 – 2000

**I3** Certification No. GYJ12.1106X
Ex ia IIC T4 Ga (-60 °C ≤ Ta ≤ + 70 °C) 4-20 mA HART
Ex ia IIC T4 Ga (-60 °C ≤ Ta ≤ + 60 °C) Fieldbus

| 4-20 mA HART entity parameters | Fieldbus entity parameters | FISCO input parameters |
|---|---|---|
| $U_i$ = 30 VDC | $U_i$ = 30 VDC | $U_i$ = 17.5 VDC |
| $I_i$[1] = 185 mA | $I_i$[1] = 300 mA | $I_i$[1] = 380 mA |
| $P_i$[1] = 1.0 W | $P_i$[1] = 1.3 W | $P_i$[1] = 5.32 W |
| $C_i$ = 0 µF | $C_i$ = 0 µF | $C_i$ = 0 µF |
| $L_i$ = 0.97mH | $L_i$ < 10 µH | $L_i$ < 10 µH |

1. Total for transmitter.

### FISCO

**IH** Certification No. GYJ12.1106X
Ex ia IIC T4 Ga (-60 °C ≤ Ta ≤ +60 °C)

*Special Conditions for Safe Use (X):*

1. The maximum allowable length of the interconnecting cable between transmitter and sensor is 152 m. The cable shall also be provided by manufacturer.

2.  When transient protection terminal block applied to this product, during installation, users shall comply with Clause 12.2.4 in GB3836.15-2000 "Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous areas (other than mines)."

3.  Suitable heat-resisting cables rated at least +80 °C shall be used when the temperature around the cable entry exceeds +60 °C.

4.  Only be connected to the certified associated apparatus, the Vortex Flowmeter could be used in the explosive atmosphere. The connection should be complied with the requirements of the manual of the associated apparatus and the Vortex Flowmeter.

5.  The enclosure should be taken to protect it from impact.

6.  Any friction should be prevented in order to avoid the risk of electrostatic charge on the enclosure due to non-conductive paint.

7.  The cable with shield is suitable for connection, and the shield should be connected to earth.

8.  The enclosure shall be kept from the dust, but the dust shall not be blown by compressed air.

9.  The cable entry holes have to be connected by means of suitable cable entry, the way of being installed shall be ensure that the equipment satisfies degree of protection IP66 according to GB4208-2008.

10. Users are forbidden to change the configuration to ensure the explosion protection performance of the equipment. Any faults shall be settled with experts from the manufacturer.

11. Precautions shall be taken to ensure that the electronic parts are within permissible ambient temperature considering the effect of the allowed fluid temperature.

12. During installation, operation and maintenance, users shall comply with the relevant requirements of the product instruction manual, GB3836.13- 1997 "Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres", GB3836.15-2000 "Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous areas (other than mines)", GB3836.16-2006 "Electrical apparatus for explosive gas atmospheres Part 16: Inspection and maintenance of electrical installation (other than mines)", and GB50257-1996 "Code for construction and acceptance of electrical device for explosion atmospheres and fire hazard electrical equipment installation engineering".

**Type n Certification**

GB3836.1 – 2010
GB3836.4 – 2010
GB3836.8 – 2003

**N3** Certification No. GYJ12.1107X
Ex nA ic IIC T5 Gc (- 50 °C ≤ $T_a$ ≤ +70 °C) 4-20 mA HART
Ex nA ic IIC T5 Gc (- 50 °C ≤ $T_a$ ≤ +60 °C) Fieldbus

*Special Conditions for Safe Use (X):*

1.  The maximum allowable length of the interconnecting cable between transmitter and sensor is 152 m. The cable shall also be provided by the manufacturer.

2.  Suitable heat-resisting cables rated at least +80 °C shall be used when the temperature around the cable entry exceeds +60 °C.

3.  When transient protection terminal block (The Other Option is T1) applied to this product, during installation, users shall comply with Clause 12.2.4 in GB3836.15-2000 "Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous areas (other than mines)."

4.  Any friction should be prevented in order to avoid the risk of electrostatic charge on the enclosure due to non-conductive paint.

5.  Do not open when energized.

6.  The cable entry holes have to be connected by means of suitable cable entry, the way of being installed shall be ensure that the equipment satisfies degree of protection IP54 according to GB4208-2008.

7.  Users are forbidden to change the configuration to ensure the explosion protection performance of the equipment. Any faults shall be settled with experts from the manufacturer.

8.  Precautions shall be taken to ensure that the electronic parts are within permissible ambient temperature considering the effect of the allowed fluid temperature.

9.  During installation, operation and maintenance, users shall comply with the relevant requirements of the product instruction manual, GB3836.13- 1997 "Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres", GB3836.15-2000 "Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous areas (other than mines)", GB3836.16-2006 "Electrical apparatus for explosive gas atmospheres Part 16: Inspection and maintenance of electrical installation (other than mines)", and GB50257-1996 "Code for construction and acceptance of electrical device for explosion atmospheres and fire hazard electrical equipment installation engineering".

**Combined Chinese Certifications (NEPSI)**

**K3** Combination of E3, I3, and N3

### B.6.5 Brazilian Certifications (INMETRO)

#### I. S. Certification

ABNT NBR IEC 60079-0: 2013
ABNT NBR IEC 60079-11: 2009
ABNT NBR IEC 60079-26: 2008 and 2009 correction
ABNT NBR IEC 60079-27: 2010

**I2**    Certification Number: NCC 11.0699 X
Ex ia IIC T4 Ga (-60 °C ≤ Ta ≤ + 70 °C) 4-20 mA HART
Ex ia IIC T4 Ga (-60 °C ≤ Ta ≤ + 60 °C) Fieldbus

**IB**    Certification Number: NCC 11.0699 X
Ex ia IIC T4 Ga (-60 °C ≤ Ta ≤ + 60 °C)

*Special Conditions for Safe Use (X):*

1.  When fitted with 90V transient suppressors, the equipment is not capable of passing the 500V insulation test. This must be taken into account upon installation.

2.  The enclosure may be made from aluminum alloy with a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion when located in Zone 0. The polyurethane paint finish may constitute an electrostatic hazard and must only be cleaned with a damp cloth.

3.  When the equipment is installed, particular precautions must be taken to ensure, taking into account the effect of process fluid temperature, that the ambient temperature of the electrical housing of the equipment meets the marked protection type temperature range.

#### Flameproof Certification

ABNT NBR IEC 60079-0: 2013
ABNT NBR IEC 60079-1: 2009 and 2011 correction
ABNT NBR IEC 60079-11: 2009
ABNT NBR IEC 60079-26: 2008 and 2009 correction

**E2**    Certification Number: NCC 11.0622 X
Ex d [ia] IIC T6 Ga/Gb (Integral Transmitter)
Ex d [ia Ga] IIC T6 Gb (Remote Transmitter)
Ex ia IIC T6 Ga (Remote Sensor)
Ambient temperature range: -50 °C ≤ Ta ≤ +70 °C
Process temperature range: -202 °C to +427 °C
Power Supply: 42 Vdc Max 4-20 mA HART
Power Supply: 32 Vdc Max Fieldbus
Transmitter Um = 250 V

#### Remote mounted sensor

In type of protection Ex ia IIC, only to be connected to the associated Model 8800D Vortex Flowmeter electronics. The maximum length of the interconnecting cable is 152 m (500 ft).

*Special Conditions for Safe Use (X):*

1.  For information regarding the dimensions of the flameproof joints, the manufacturer shall be contacted.

2.  The Flowmeter is provided with special fasteners of property class A2-70 of A4-70.

3.  Units marked with "Warning: Electrostatic Charging Hazard" may use non-conductive paint thicker than 0.2 mm. Precautions shall be taken to avoid ignition due to electrostatic charge of the enclosure.

#### Combined Brazilian Certifications (INMETRO)

**K2**    Combination of E2 and I2

### B.6.6 EurAsian Conformity (EAC)

This section addresses compliance with the requirements of technical regulations of the Customs Union.

- TR CU 020/2011—Electromagnetic compatibility of technical means

- TR CU 032/2013—On the safety of equipment operating under excessive pressure

- TR CU 012/2011—About the safety of equipment for use in potentially explosive atmospheres

GOST R IEC 60079-0-2011, GOST R IEC 60079-1-2011, GOST R IEC 60079-11-2010, GOST R IEC 60079-15-2010, GOST 31610.26-2002/IEC 60079-26:2006

**E8**    Type of protection flameproof enclosure «d» with intrinsically safe flow sensor

Ex marking of the integral installation:

Ga/Gb Ex d [ia] IIC T6 X (-50°C ≤ Ta ≤ 70°C)

Ex marking of the remote installation:

electronics module:

1Ex d [ia Ga] IIC T6 Gb X (-50°C ≤ Ta ≤ 70°C)

flow sensor:

0Ex ia IIC T6 Ga X (-50°C ≤ Ta ≤ 70°C)

Electrical parameters:

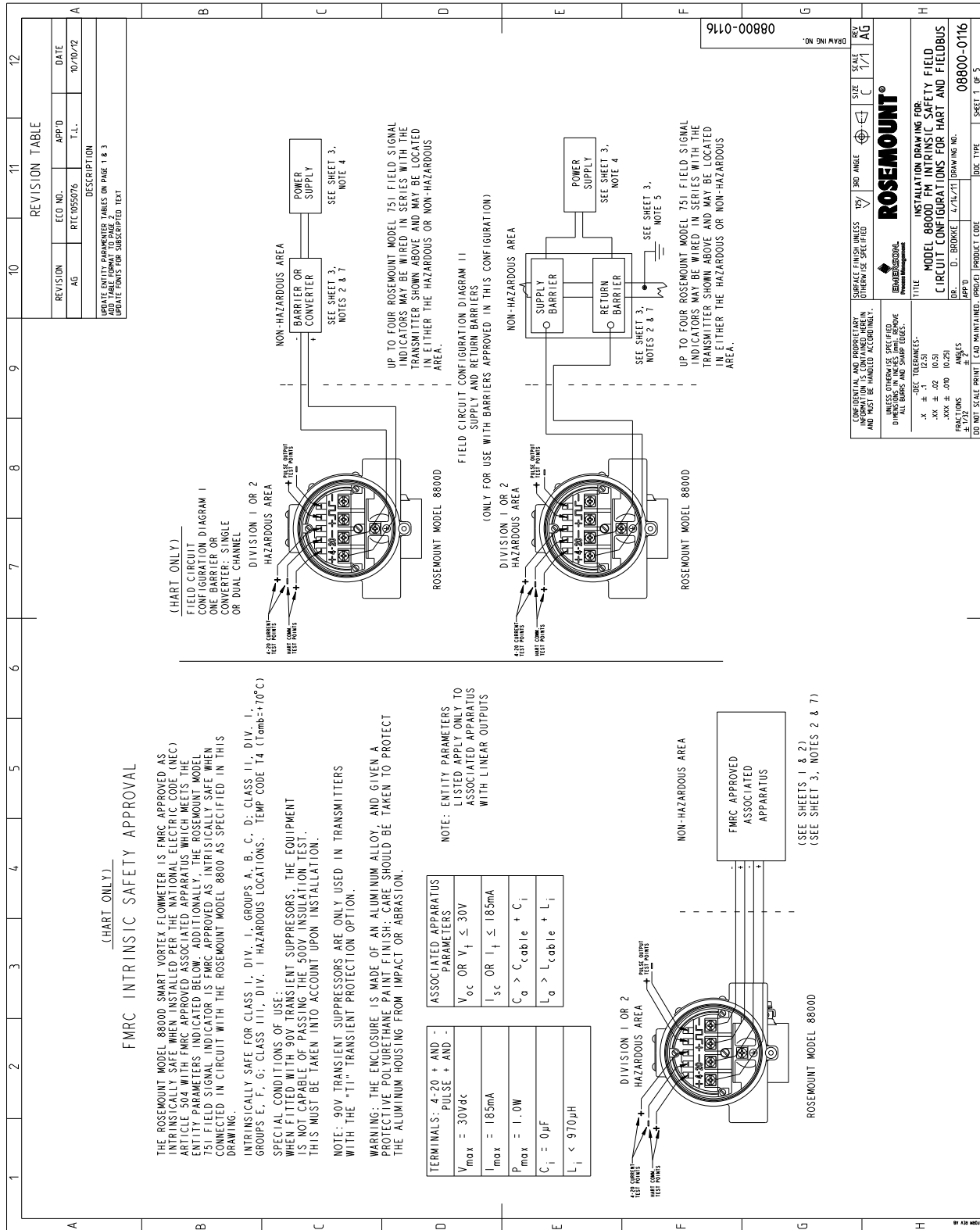Maximum DC supply voltage (with output signal 4-20 mA HART/pulse) 42 V;

Maximum DC supply voltage (with output signal Foundation Fieldbus and FISCO) 32 V

*Special conditions for safe use (X):*

- For flowmeters with Ex marking 0Ex ia IIC T6 Ga X, Ga / Gb Ex d [ia] IIC T6 X and transmitter with Ex marking 1Ex d [ia Ga] IIC T6 Gb X cabling in explosive area must be conducted according to requirements of IEC 60079-14-2011. Sheath cables must be designed for a maximum ambient temperature;

- Remote installation should be made only with special coaxial cable provided by the manufacturer of flowmeters;

- When the equipment is installed, particular precautions must be taken to ensure, taking into account the effect of process fluid temperature, that the ambient temperature of the electrical housing of the equipment meets the marked protection type temperature range;

- Precautions shall be taken to avoid ignition due to electrostatic charge on the enclosure

**I8, G8**   Type of protection "intrinsically safe circuit" level «ia»

Ex marking:

0Ex ia IIC T4 Ga X

Ambient temperature range:

(I8) Flowmeters with pulse output signals, 4-20 mA /HART (-60°C ≤ Ta ≤ 70°C)

Flowmeters with output Fieldbus (I8) and FISCO (G8) (-60°C ≤ Ta ≤ 60°C)

### Input intrinsically safe parameters:

| Intrinsically safe parameters | Output signal | | |
|---|---|---|---|
| | 4-20mA/HART Pulse | Foundation Fieldbus | FISCO |
| Ui,[1] V | 30 | 30 | 17.5 |
| Ii,[1] mA | 185 | 300 | 380 |
| Pi,[1] W | 1 | 1.3 | 5.32 |
| Li, uH | 970 | 20 | 10 |
| Ci, nF | 0 | 0 | 0 |

1. Applicable values Ui, Ii are limited by the maximum input power Pi. It is not allowed to apply max values of Ui, Ii at the same time.

*Special conditions for safe use (X):*

- Power supply of flowmeters with Ex marking 0Ex ia IIC T4 Ga X must be implemented through intrinsically safe barriers having certificate of conformity for appropriate subgroups of electrical equipment;

- Inductance and capacitance of intrinsically safe circuits of flowmeters with Ex marking 0Ex ia IIC T4 Ga X, with given parameters connecting cables must not exceed maximum values shown on the intrinsically safe barrier from the side of explosive zone;

- When the equipment is installed, particular precautions must be taken to ensure, taking into account the effect of process fluid temperature, that the ambient temperature of the electrical housing of the equipment meets the marked protection type temperature range;

- When fitted with the 90V transient suppressors, the equipment is not capable of passing the 500V insulation test. This must be taken into account upon installation;

- The enclosure may be made from aluminium alloy with a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion when located in Zone 0;

**N8**   Type of protection «n» and "intrinsically safe" level «ic»

Ex marking:

2Ex nA ic IIC T5 Gc X (-50°C ≤ Ta ≤ 70°C)

Electrical parameters:

The maximum DC voltage (with output 4-20 mA HART/pulse) 42V;

Maximum supply DC voltage (with output signal Foundation Fieldbus and FISCO) 32V

*Special conditions for safe use (X):*

- When the equipment is installed, particular precautions must be taken to ensure, taking into account the effect of process fluid temperature, that the ambient temperature of the electrical housing of the equipment meets the marked protection type temperature range;

- When fitted with the 90V transient suppressors, the equipment is not capable of passing the 500V insulation test. This must be taken into account upon installation;

- Precautions shall be taken to avoid ignition due to electrostatic charge on the enclosure.

**K8**   Combination of E8, I8, N8

**Figure B-1. FM Intrinsic Safety Field Circuit Configurations for HART and Fieldbus (Sheet 1 of 5)**

**Figure B-2. FM Intrinsic Safety Field Circuit Configurations for HART and Fieldbus (Sheet 2 of 5)**
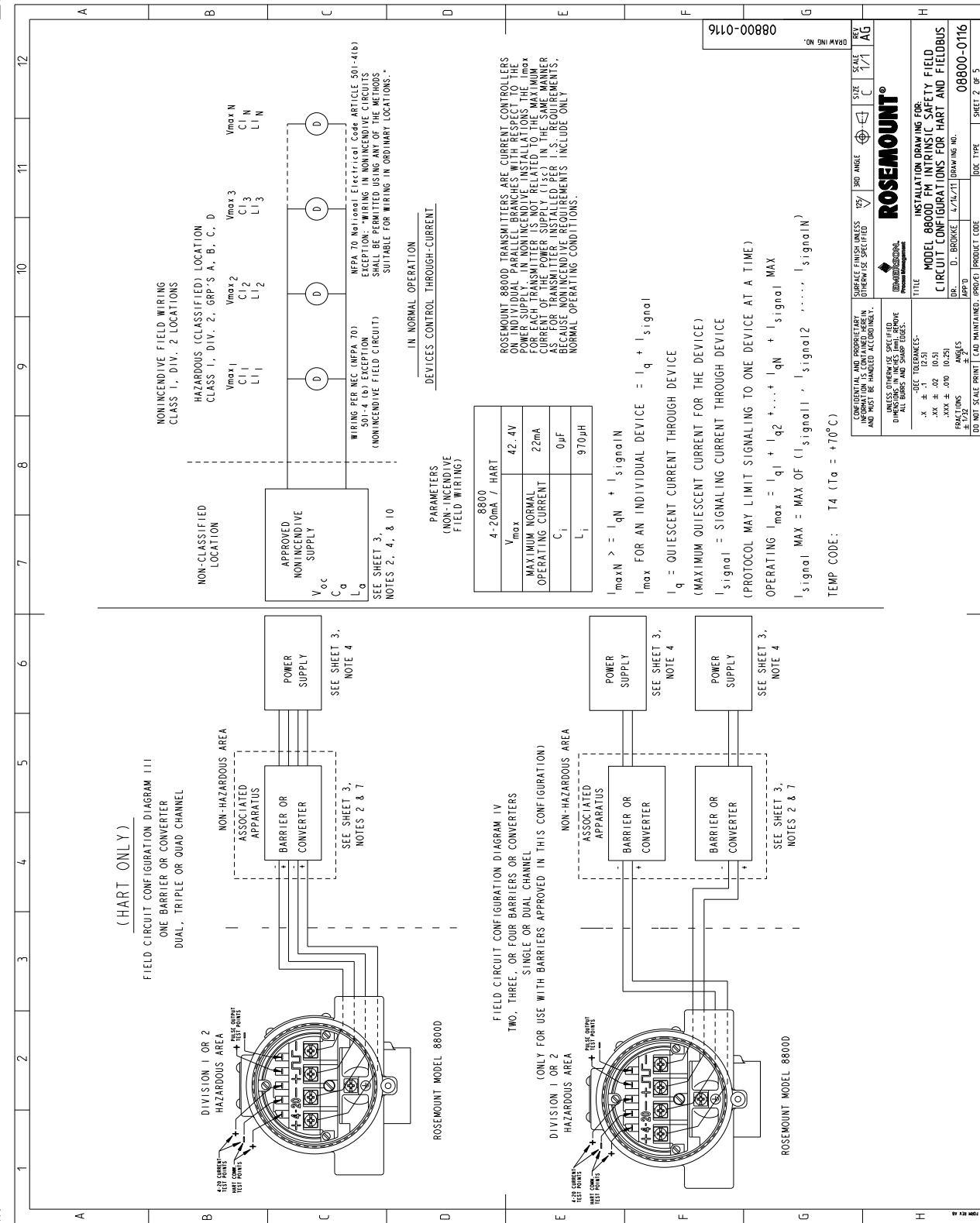
**Figure B-3. FM Intrinsic Safety Field Circuit Configurations for HART and Fieldbus (Sheet 3 of 5)**
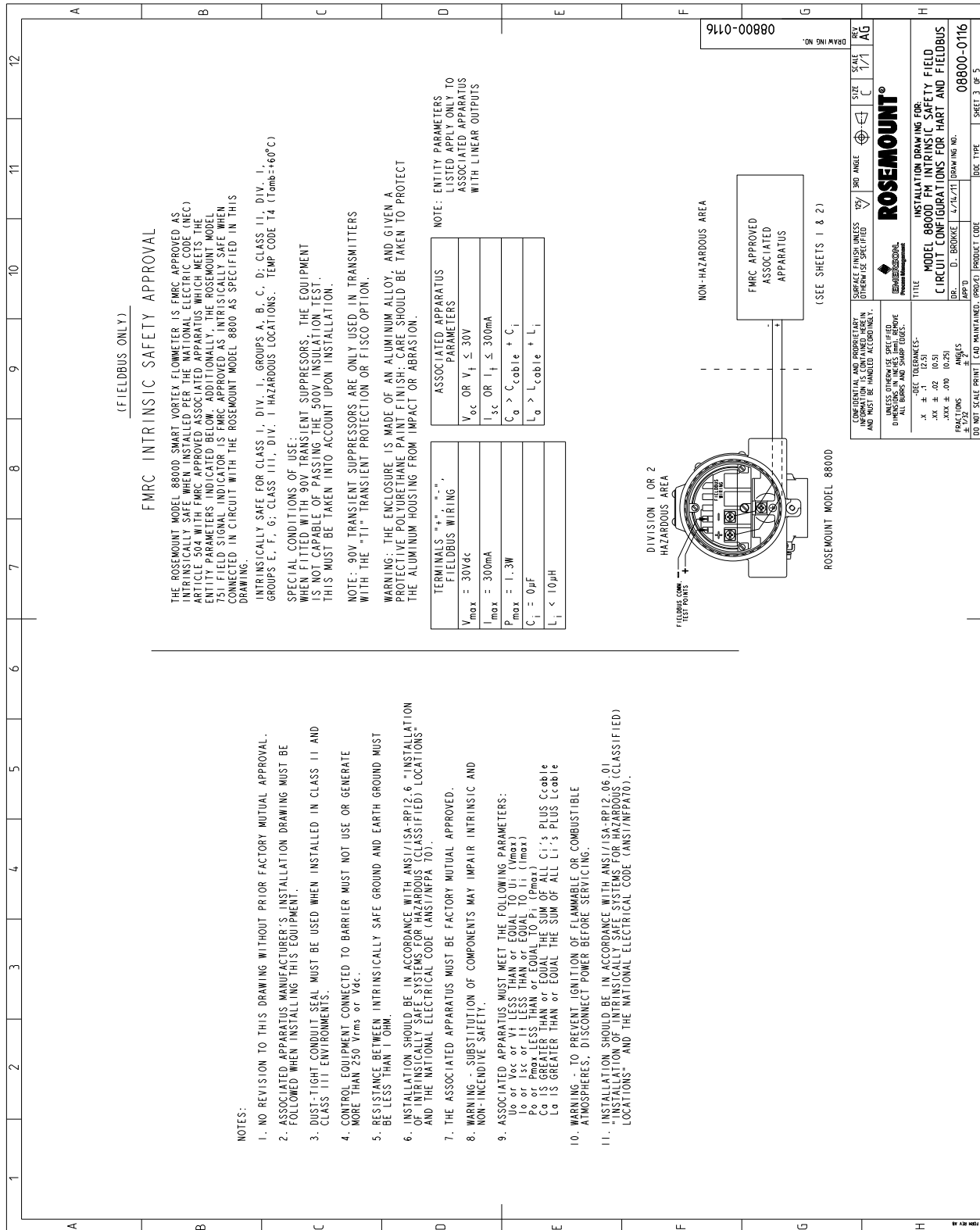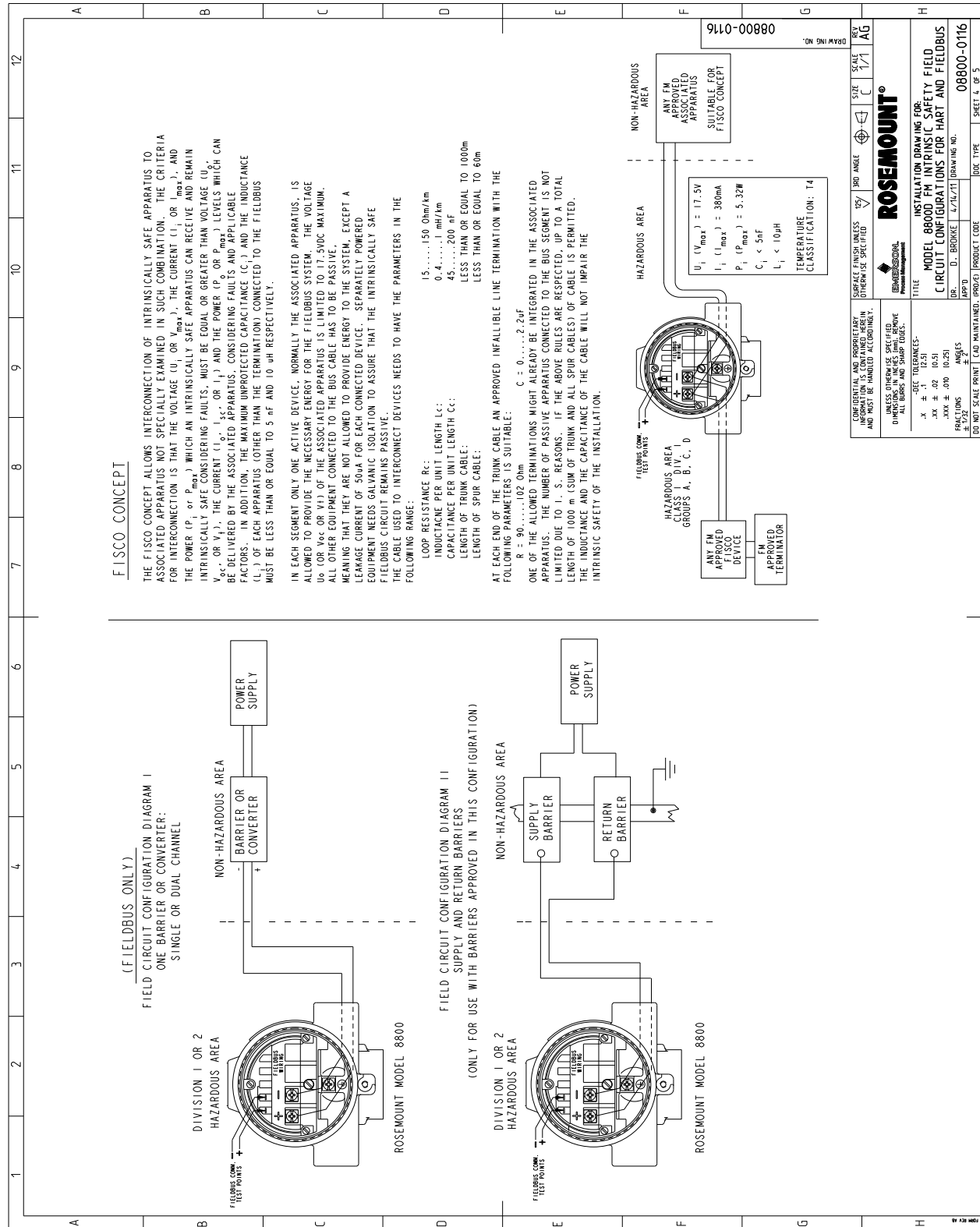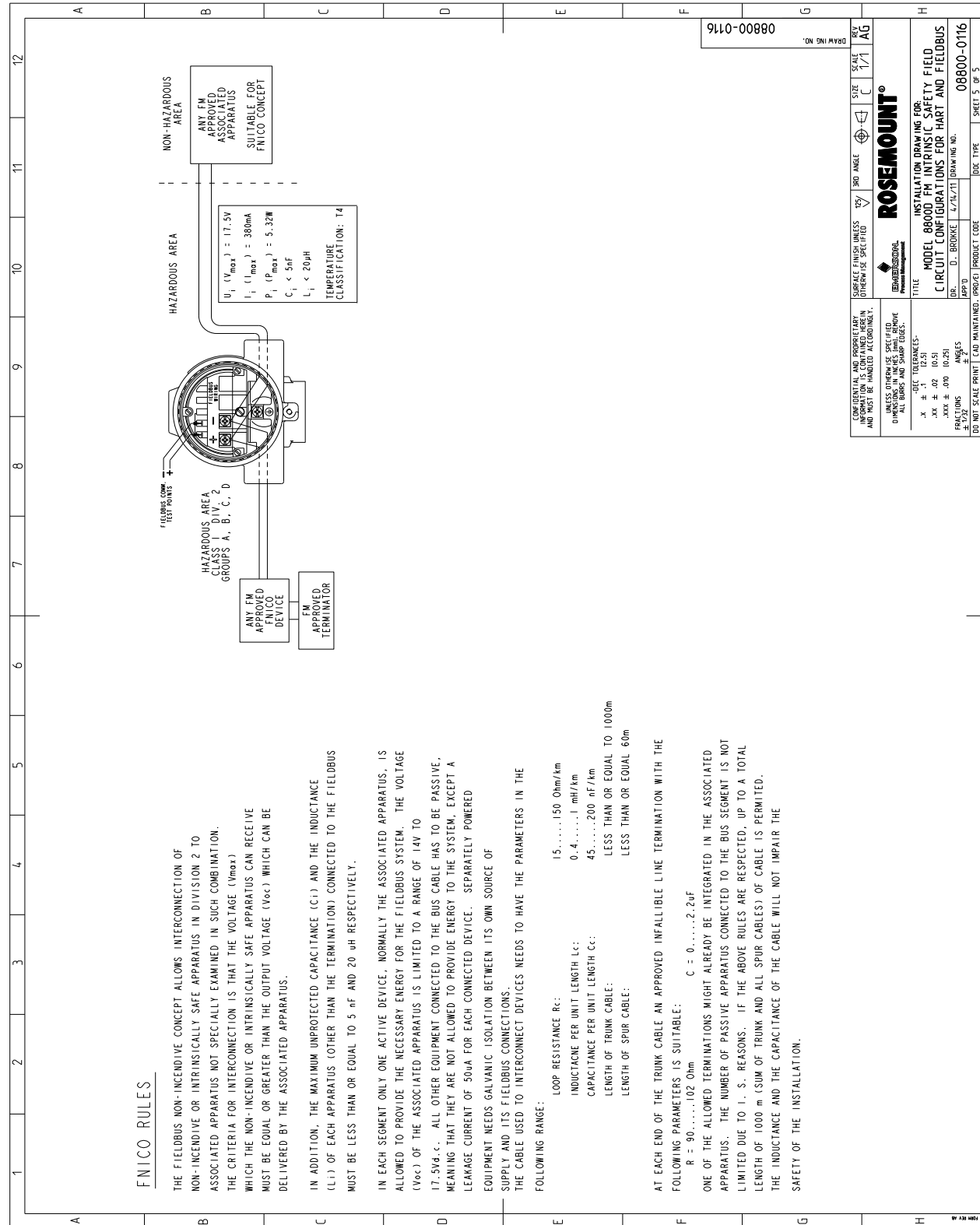
**Figure B-4. FM Intrinsic Safety Field Circuit Configurations for HART and Fieldbus (Sheet 4 of 5)**

**Figure B-5. FM Intrinsic Safety Field Circuit Configurations for HART and Fieldbus (Sheet 5 of 5)**

**Figure B-6. CSA Intrinsic Safety Approval for HART and Fieldbus (Sheet 1 of 8)**

**Figure B-7. CSA Intrinsic Safety Approval for HART and Fieldbus (Sheet 2 of 8)**
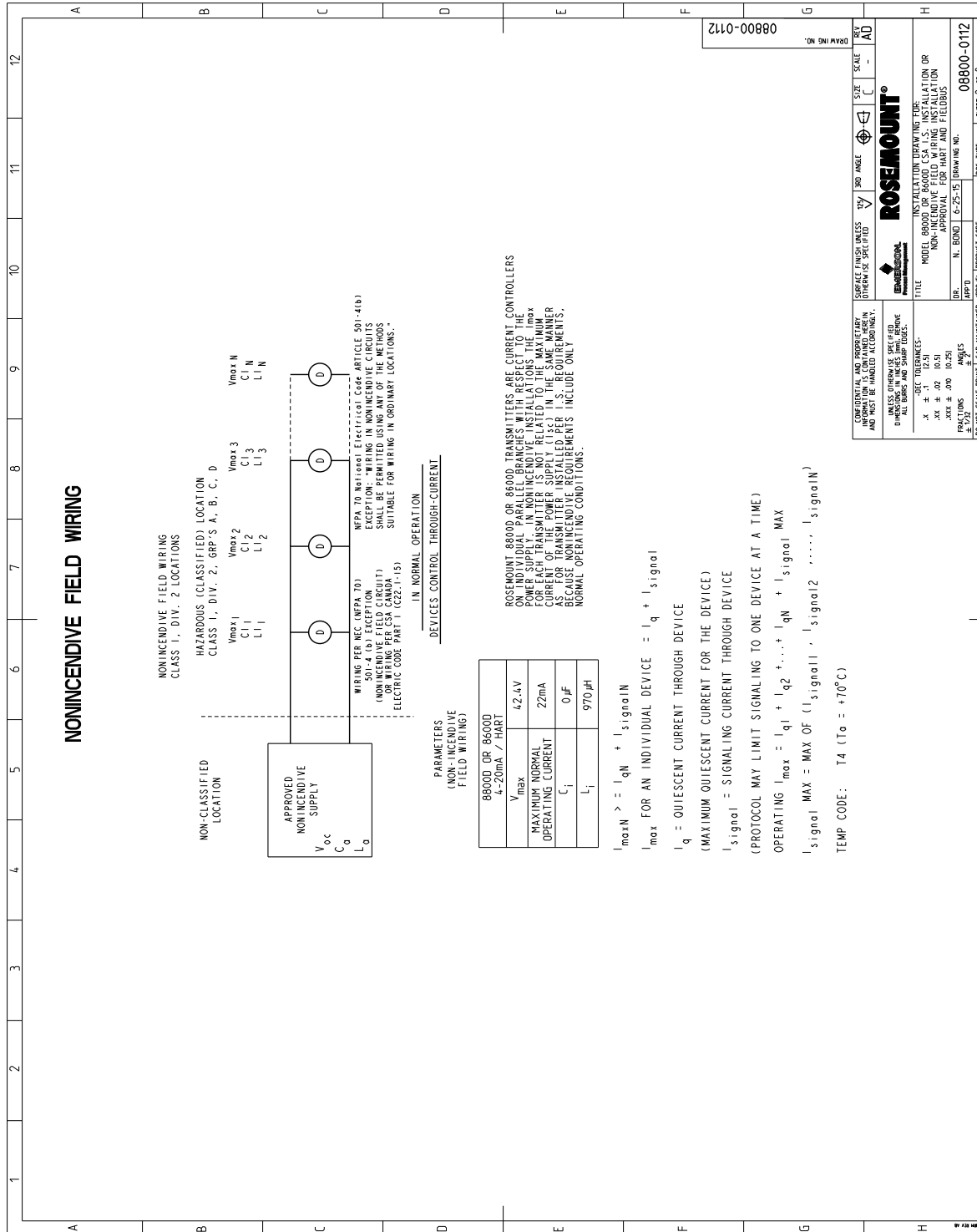
**Figure B-8. CSA Intrinsic Safety Approval for HART and Fieldbus (Sheet 3 of 8)**
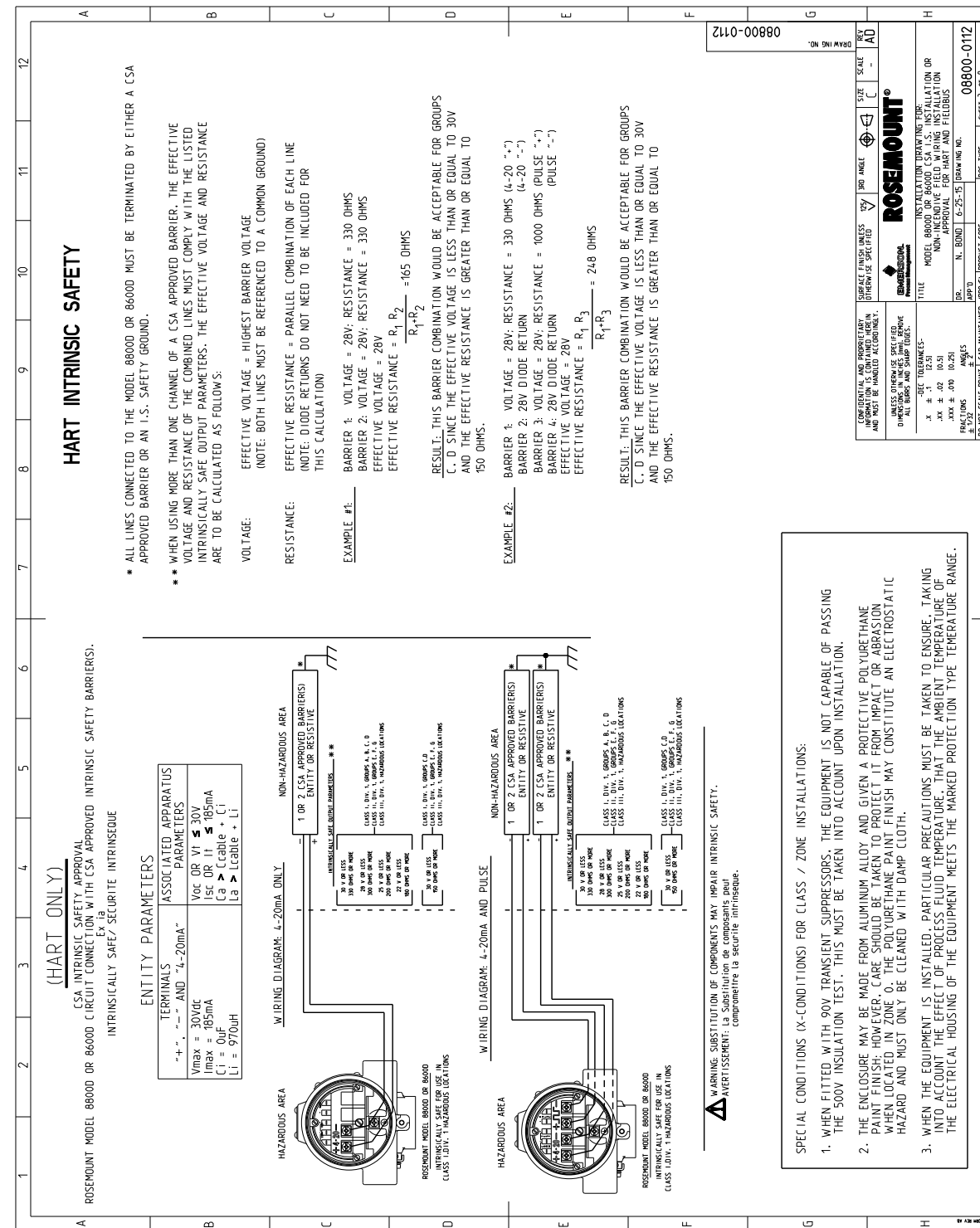
**Figure B-9. CSA Intrinsic Safety Approval for HART and Fieldbus (Sheet 4 of 8)**
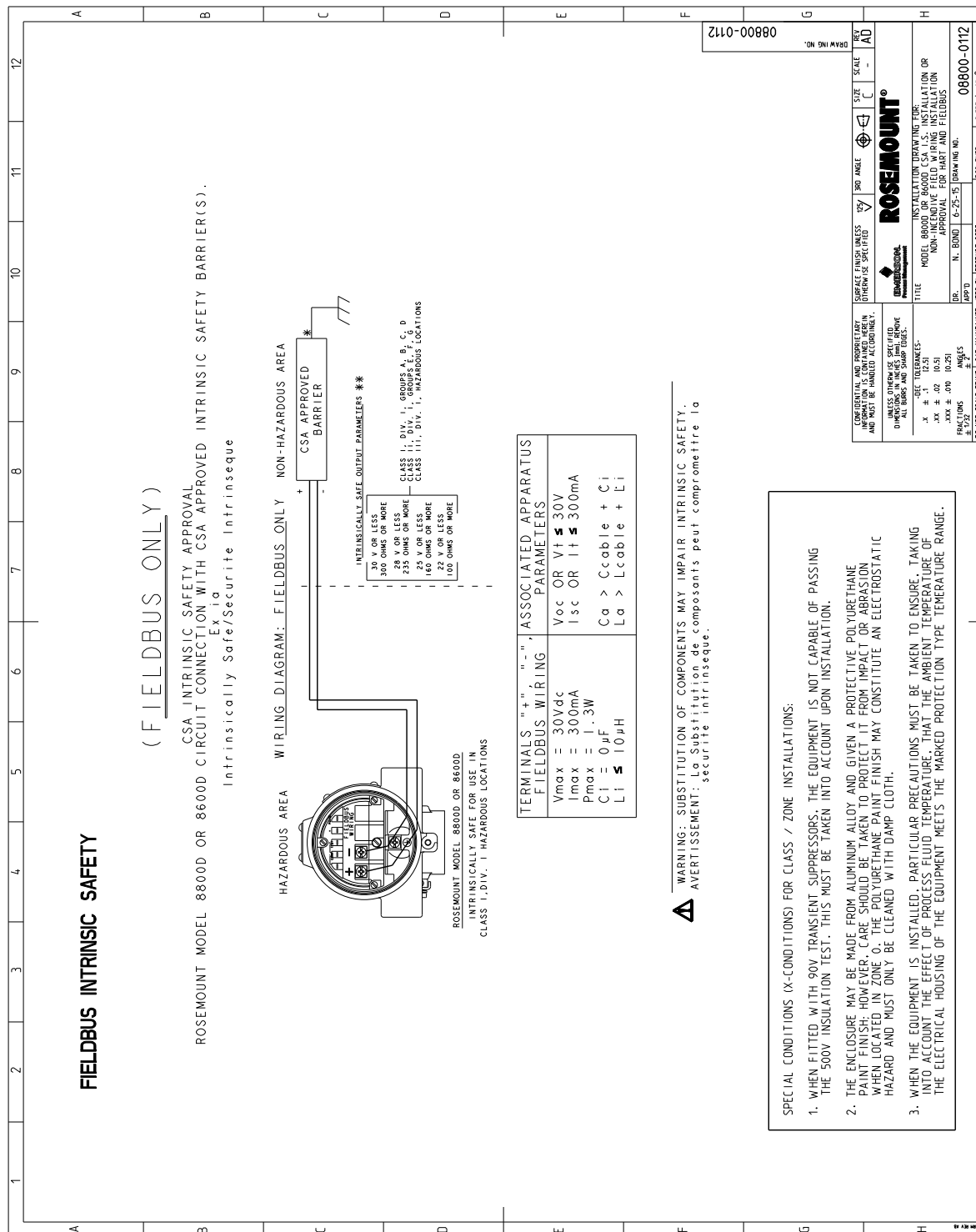
**Figure B-10. CSA Intrinsic Safety Approval for HART and Fieldbus (Sheet 5 of 8)**
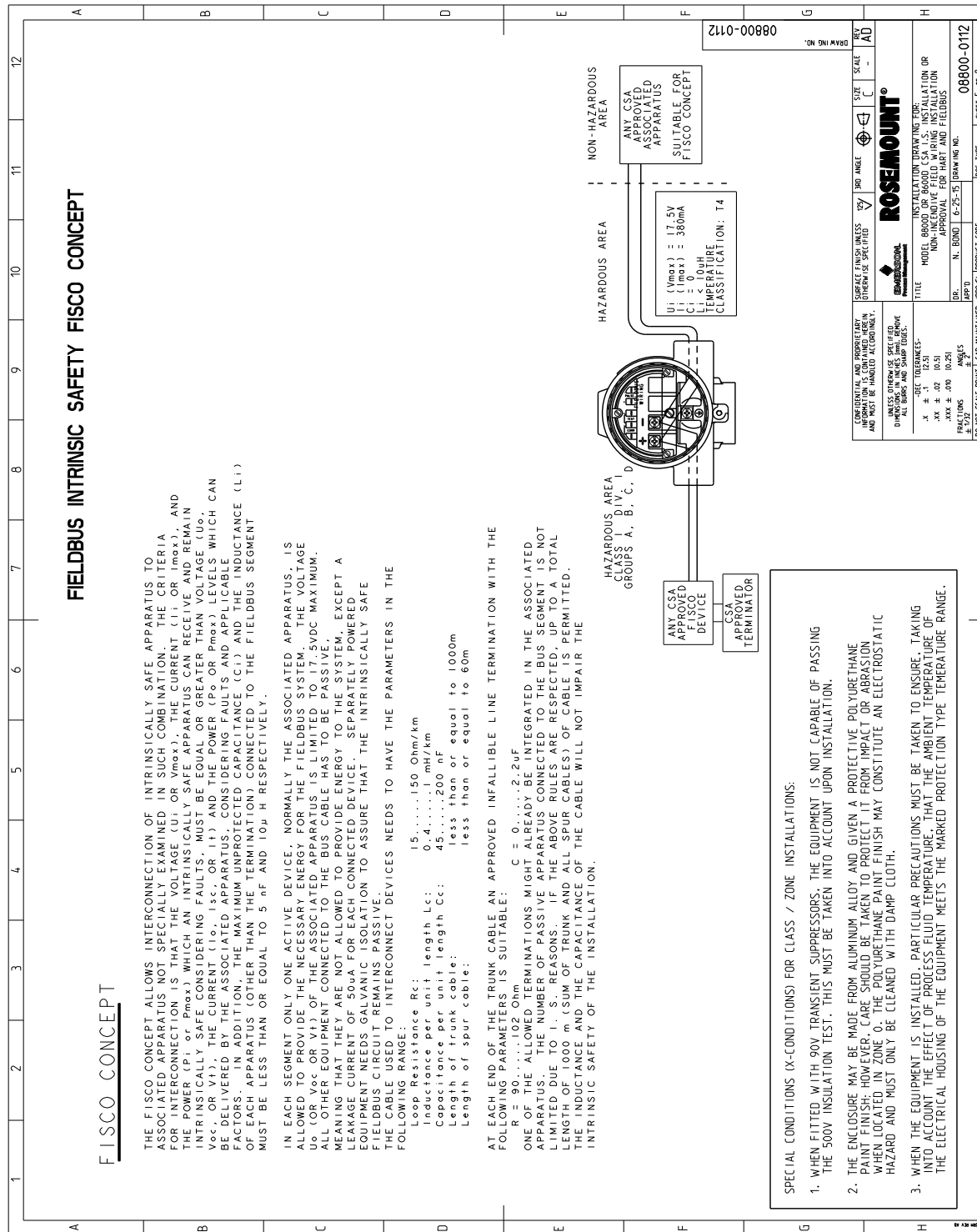
**Figure B-11. CSA Intrinsic Safety Approval for HART and Fieldbus (Sheet 6 of 8)**
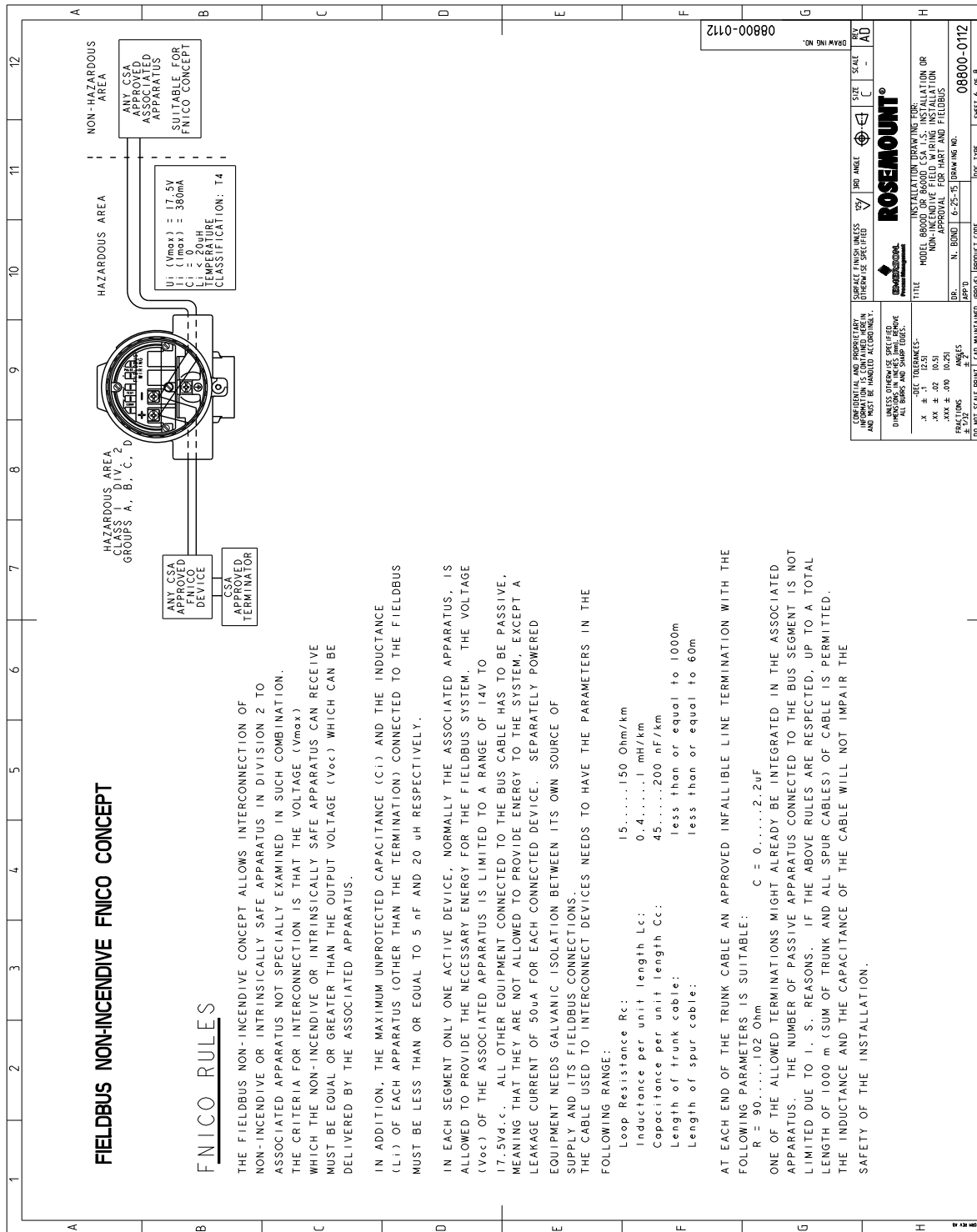
**Figure B-12. CSA Intrinsic Safety Approval for HART and Fieldbus (Sheet 7 of 8)**



| | ORIGINAL MODEL | | REPLACEMENT OF FM MARKED 8800D TRANSMITTERS WITH EQUIVALENT CSA MODEL CODE | |
| --- | --- | --- | --- | --- |
| | | | CSA REPLACEMENT TRANSMITTER EQUIVALENCY | |
| APPROVAL CODE | FM RATING | | APPROVAL CODE | CSA RATING |
| I5 | INTRINSICALLY SAFE FOR CLASS I, II, III DIVISION 1 GROUPS A,B,C,D,E,F,G. NONINCENDIVE FOR CLASS I, DIVISION 2, GROUPS A,B,C,D | | I6, K6 OR KB | INTRINSICALLY SAFE FOR CLASS I, II, III DIVISION 1 GROUPS A,B,C,D,E,F,G. NONINCENDIVE FOR CLASS I, DIVISION 2, GROUPS A,B,C,D |
| E5 | EXPLOSION PROOF FOR CLASS I, DIV 1, GROUPS B, C, D DUST-IGNITION PROOF FOR Class II, III, Div 1, GROUPS E,F, G | | E6, K6 OR KB | EXPLOSION PROOF FOR CLASS I, DIV 1, GROUPS B, C, D DUST-IGNITION PROOF FOR Class II, III, Div 1, GROUPS E,F, G |
| IE | FISCO INTRINSICALLY SAFE | | IF | FISCO INTRINSICALLY SAFE |
| K5 | INTRINSICALLY SAFE FOR CLASS I, II, III DIVISION 1 GROUPS A,B,C,D,E,F,G. NONINCENDIVE FOR CLASS I, DIVISION 2, GROUPS A,B,C,D EXPLOSION PROOF FOR CLASS I, DIV 1, GROUPS B, C, D DUST-IGNITION PROOF FOR Class II, III, Div 1, GROUPS E,F, G | | K6 OR KB | INTRINSICALLY SAFE FOR CLASS I, II, III DIVISION 1 GROUPS A,B,C,D NONINCENDIVE FOR CLASS I, DIVISION 2, GROUPS A,B,C,D EXPLOSION PROOF FOR CLASS I, DIV 1, GROUPS B, C, D DUST-IGNITION PROOF FOR Class II, III, Div 1, GROUPS E,F, G |
| KB | INTRINSICALLY SAFE FOR CLASS I, II, III DIVISION 1 GROUPS A,B,C,D,E,F,G. NONINCENDIVE FOR CLASS I, DIVISION 2, GROUPS A,B,C,D EXPLOSION PROOF FOR CLASS I, DIV 1, GROUPS B, C, D DUST-IGNITION PROOF FOR Class II, III, Div 1, GROUPS E,F, G | | K6 OR KB | INTRINSICALLY SAFE FOR CLASS I, II, III DIVISION 1 GROUPS A,B,C,D NONINCENDIVE FOR CLASS I, DIVISION 2, GROUPS A,B,C,D EXPLOSION PROOF FOR CLASS I, DIV 1, GROUPS B, C, D DUST-IGNITION PROOF FOR Class II, III, Div 1, GROUPS E,F, G |
| Blank | Ordinary Locations | | Blank | Ordinary Locations |

DRAWING NO. 08800-0112
REV AD

ROSEMOUNT®
EMERSON Process Management

TITLE: INSTALLATION DRAWING FOR: MODEL 8800D OR 8600D CSA I.S. INSTALLATION OR NON-INCENDIVE FIELD WIRING INSTALLATION APPROVAL FOR HART AND FIELDBUS

DR. N. BOND 6-25-15 DRAWING NO. 08800-0112
SHEET 7 OF 8

**Figure B-13. CSA Intrinsic Safety Approval for HART and Fieldbus (Sheet 8 of 8)**

# Appendix C    Electronics Verification

## C.1    Safety messages

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Please 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 HART®-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

- 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 of the Model 8800D can be done by either utilizing the internal signal simulation capability or by applying an external signal source to the "TEST FREQ IN" and "GROUND" pins.

Electronics functionality can be verified via two different verification methods:

- Flow Simulation Mode

- Using an External Frequency Generator

Both methods require the use of a Field Communicator or AMS™ Device Manager. It is not required to disconnect the sensor to perform the electronics verification since the transmitter is capable of disconnecting the sensor signal at the input to the electronics. Should the user choose to physically disconnect the sensor from the electronics, refer to Replacing the electronics boards on page 5-78.

**Note**
When the process fluid is set to Tcomp Saturated Steam, and the Primary Variable is mass flow, the simulation is based on the configured fixed process density. The best method for flow simulation in this case is to change the process fluid to gas/steam.

Flow simulation cannot be enabled when the primary variable is Process Temperature.

### C.2.1 Electronics verification using flow simulation mode

| **FastKeys** | 3, 5, 1, 2, 1 |
|---|---|

Electronics verification can be done by utilizing the internal flow simulation functionality. The Rosemount™ 8800D is capable of simulating either a fixed flow rate or a varying flow rate. The amplitude of the simulated flow signal is based on the minimum required process density for the given line size and service type. Either type of simulation (fixed or varying) will effectively disconnect the Rosemount 8800D sensor from the electronics charge amplifier input (see Figure 5-3 on page 5-73) and replace it with the simulated flow signal.

### C.2.2 Fixed flow rate simulation

The fixed flow simulation signal can be entered in either percent of range or flow rate in engineering units. The resulting flow rate and/or shedding frequency can be continuously monitored via a Field Communicator or AMS Device Manager.

### C.2.3 Varying flow rate simulation

The profile of the varying flow simulation signal is a repetitive triangular waveform as illustrated in Figure C-14. The minimum and maximum flowrate can be entered in either percent of range or entered as a flow rate in engineering units. The ramp time can be entered in seconds from a minimum of 0.6 seconds to a maximum of 34951 seconds. The resulting flow rate and/or shedding frequency can be continuously monitored via a Field Communicator or AMS Device Manager.

**Note**
To manually disconnect the sensor for precautionary measures, see Replacing the electronics housing on page 5-80 for details.

**Figure C-14. Profile of Varying Flow Simulation Signal**
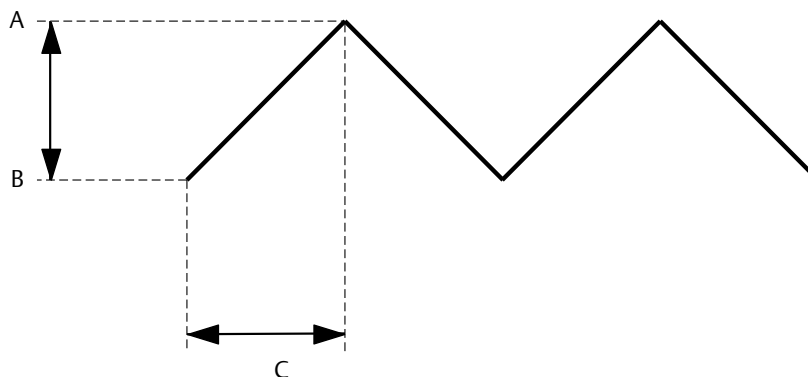


A. Max Flow Rate
B. Min Flow Rate
C. Ramp Time

## C.2.4   Electronics verification using an external frequency generator

If an external frequency source is desirable, then test points on the electronics are available (see Figure C-15).

### Tools needed

- Field Communicator or AMS Device Manager
- Standard sinewave function generator

1.  Remove the electronics compartment cover.

2.  Remove the two screws and the LCD indicator if applicable.

3.  Connect a Field Communicator or AMS Device Manager to the loop.

| **FastKeys** | 3, 5, 1, 2, 1, 3 |
| --- | --- |

4.  Access the flow simulation menu on the communicator and select "Sim Flow External." This item is used with an External Frequency Generator. This will effectively disconnect the Rosemount 8800D sensor input from the charge amplifier input of the electronics (see Figure 5-3 on page 5-73). The simulated flow and/or the shedding frequency values will now be accessible via the Field Communicator or AMS Device Manager.

5.  Connect the sinewave generator to the "TEST FREQ IN" and "GROUND" points as shown in Figure C-15.

6.  Set the sinewave generator amplitude to 2Vpp±10%.

7. Select the desired sinewave generator frequency.

8. Verify the generator frequency against the frequency displayed on the Field Communicator or AMS Device Manager.

| **FastKeys** | 2, 2, 5, 1, 2 |
|---|---|

9. Exit the Flow Simulation Mode.

10. Reconnect the LCD indicator option (if applicable) to the electronics board by replacing and tightening the two screws.

11. Replace and tighten the electronics compartment cover.

**Note**

To manually disconnect the sensor for precautionary measures, see Replacing the electronics housing on page 5-80 for details.

The procedure described above is intended for verifying functionality when the flow sensor is still connected to the transmitter. If the flow sensor is not connected to the transmitter then it may be necessary to attach the sine wave generator to the sensor header (the same connection point use by the flow sensor during normal installation).

**Figure C-15. Test Frequency Output and Chassis Ground Points**
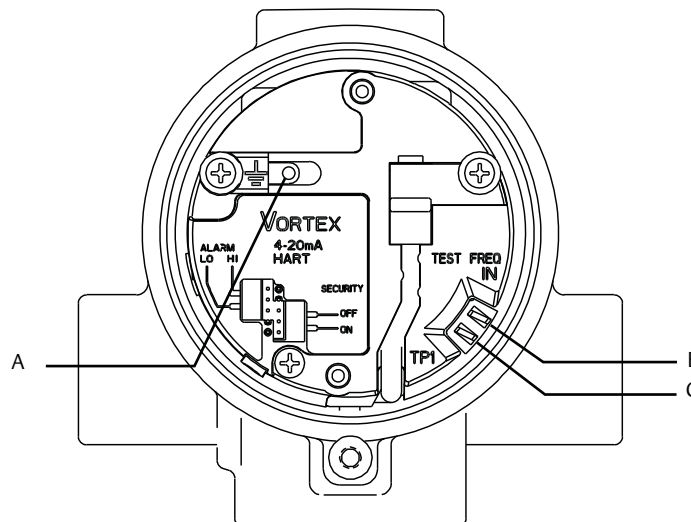


A. Ground connection
B. Test frequency input
C. Test point 1

## C.2.5    Calculating output variables with known input frequency

Use the following equations with a known input frequency for verification of a flow rate or 4–20 mA output within a given calibrated range. Select the proper equation depending on if you are verifying a flow rate, mass flow rate, 4–20 mA output, or special units. Example calculations starting on page 169 may clarify how these equations are used.

### To verify a flow rate

For a given input frequency F (Hz), and K-factor (compensated), find the flow rate Q:

$$Q = F(Hz)/(K \times C_X)$$

where $C_x$ is the unit conversion (Table C-1 on page 168) and K is the compensated K-factor in units of pulses/gallon.

### To verify a standard or normal flow rate

$$Q = F(Hz) \times ((DensityRatio)/(K \times C_X))$$

### To verify a mass flow rate

For a given mass frequency F (Hz), and K-factor (compensated), find the mass flow rate M:

$$M = \frac{F}{(K/\rho) \cdot C}$$

where C is the unit conversion and $\rho$ is density at operating conditions:

$$M = F(Hz)/(KC_X)$$

where $C_x$ is the unit conversion using density ($\rho$) (Table C-1 on page 168).

### To verify a 4–20 mA output

For a given input frequency F (Hz), and K-factor (compensated), find output electrical current I:

$$I = \left( \left[ \frac{F/(K \times C_X) - LRV}{URV - LRV} \right] \times (16) \right) + 4$$

where $C_x$ is the unit conversion (Table C-1 on page 168), URV is the upper range value (user units), and LRV is the lower range value (user units).

### To verify a special units output

For special units, first divide the special unit-conversion factor into the base unit factor $C_x$.

$C_{20}$ = $C_x$/special units conversion factor (Table C-1 on page 168).

## Unit conversion table (user units to GPS)

Use Table C-1 when converting units of measure.

**Table C-1. Unit Conversions**

| $C_x$ | Units (actual) | Conversion factor |
|-------|----------------|-------------------|
| $C_1$ | gal/s | 1.00000E+00 |
| $C_2$ | gal/m | 1.66667E-02 |
| $C_3$ | gal/h | 2.77778E-04 |
| $C_4$ | Impgal/s | 1.20095E+00 |
| $C_5$ | Impgal/m | 2.00158E-02 |
| $C_6$ | Impgal/h | 3.33597E-04 |
| $C_7$ | L/s | 2.64172E-01 |
| $C_8$ | L/m | 4.40287E-03 |
| $C_9$ | L/h | 7.33811E-05 |
| $C_{10}$ | CuMtr/m | 4.40287E+00 |
| $C_{11}$ | CuMtr/h | 7.33811E-02 |
| $C_{12}$ | CuFt/m | 1.24675E-01 |
| $C_{13}$ | CuFt/h | 2.07792E-03 |
| $C_{14}$ | bbl/h | 1.16667E-02 |
| $C_{15}$ | kg/s | $C_{10} \times 60/\rho$ (kg/m$^3$) |
| $C_{16}$ | kg/h | $C_{11}/\rho$ (kg/m$^3$) |
| $C_{17}$ | lb/h | $C_{13}/\rho$ (lb/ft$^3$) |
| $C_{18}$ | shTon/h | $C_{17} \times 2000$ |
| $C_{19}$ | mTon/h | $C_{16} \times 1000$ |
| $C_{20}$ | SPECIAL | $C_x$/(special units conversion factor) |

$\rho$=operating density

## C.3    Examples

The following examples illustrate the flowrate calculations that may be necessary for your application. There are water, saturated steam, and natural gas applications represented in the examples. The first set of three examples is in English units. The second set of three examples is in SI units.

## C.3.1    English units

### Example 1 (English units)

| | |
|---|---|
| Fluid = Water | URV= 500 gpm |
| Line size = 3 inch | LRV= 0 gpm |
| Line pressure= 100 psi | $C_2$ = 1.66667E-02 (from <u>Table C-1 on page 168</u>) |
| Vortex Frequency = 75 Hz | |

K-factor (compensated) = 10.79 pulses/gallon (via Field Communicator or AMS Device Manager)

$$Q = F / (K \times C_2)$$

= 75/(10.79 × 0.0166667)

= 417.1 gpm

Therefore, an input frequency of 75 Hz represents a flow rate of 417.1 gpm in this application.

For a given input frequency, you may also determine the electrical current output. Use the above example with an input frequency of 75 Hz:

URV= 500 gpm               LRV= 0 gpm               $F_{in}$ = 75 Hz

$$I = \left( \left[ \frac{F / (K \times C_2) - LRV}{URV - LRV} \right] \times (16) \right) + 4$$

$$I = \left( \left[ \frac{75 / (10.79 \times 0.0166667) - 0}{500 - 0} \right] \times (16) \right) + 4$$

= 17.35 mA

Therefore, an input frequency of 75 Hz represents an electrical current output of 17.35 mA.

## Example 2 (English units)

| | | | |
|---|---|---|---|
| Fluid | = Saturated Steam | URV | = 40000 lb/hr |
| Line size | = 3 inch | LRV | = 0 lb/hr |
| Line pressure | = 500 psia | $C_{17}$ | = $C_{13}/\rho$ (Table C-1 on page 168) |
| Operating Temperature | = 467 °F | Density ($\rho$) | = 1.078 lb/cu-ft |
| Viscosity | = 0.017 cp | Vortex Frequency | = 400 Hz |
| K-factor (compensated) | = 10.678 pulses/gallon (via Field Communicator or AMS Device Manager) | | |
| M | = F/(K x $C_{17}$) | | |
| | = 400/ {10.678 x ($C_{13}/\rho$)} | | |
| | = 400/{10.678 x (0.00207792/1.078)} | | |
| | = 400/(10.678 x 0.0019276) | | |
| | = 19433.6 lb/hr | | |

Therefore, an input frequency of 400 Hz represents a flow rate of 19433.6 lb/hr in this application.

For a given input frequency, you may also determine the electrical current output. Use the Example 2 on page 170 with an input frequency of 300 Hz:

URV= 40000 lb/hr     LRV= 0 lb/hr     $F_{in}$ = 300 Hz

$$I = \left( \left[ \frac{F/(K \times C_{17}) - LRV}{URV - LRV} \right] \times (16) \right) + 4$$

$$I = \left( \left[ \frac{300/(10.678 \times 0.0019276) - 0}{40000 - 0} \right] \times (16) \right) + 4$$

I = 9.83 mA

Therefore, an input frequency of 300 Hz represents an electrical current output of 9.83 mA.

## Example 3 (English units)

| | | | |
|---|---|---|---|
| Fluid | = Natural gas | URV | = 5833 SCFM |
| Line size | = 3 inch | LRV | = 0 SCFM |
| Line pressure | = 140 psig | $C_{20}$ | = $C_x$/sp. units factor (from Table C-1 on page 168) |
| Operating Temperature | = 50 °F | Density ($\rho$) | = 0.549 lb/cu-ft (operating) |
| Viscosity | = 0.01 cp | Input Frequency | = 700 Hz |
| K-factor (compensated) | | = 10.678 pulses/gallon (via Field Communicator or AMS Device Manager) | |
| Q | | = F/(K x $C_{20}$) where: $C_{20}$ = $C_{12}$/10.71 (Density Ratio) | |
| | | = 700/{10.797 x (0.124675/10.71)} | |
| | | = 5569.4 SCFM | |

Therefore, an input frequency of 700 Hz represents a flow rate of 5569.4 SCFM in this application.

For a given input frequency, you may also determine the electrical current output. Use the above example with an input frequency of 200 Hz.

URV= 5833 SCFM          LRV= 0 SCFM          $F_{in}$ = 200 Hz

$$I = \left( \left[ \frac{F/(K \times C_{20}) - LRV}{URV - LRV} \right] \times (16) \right) + 4$$

$$I = \left( \left[ \frac{200/(10.797 \times 0.011641) - 0}{5833 - 0} \right] \times (16) \right) + 4$$

I = 8.36 mA

Therefore, an input frequency of 200 Hz represents an electrical current output of 8.36 mA.

## C.3.2  SI units

### Example 1 (SI units)

| | | | |
|---|---|---|---|
| Fluid | = Water | URV | = 2000 lpm |
| Line size | = 80 mm | LRV | = 0 lpm |
| Line pressure | = 700 kPas | $C_8$ | = 4.40287E-03 (from Table C-1 on page 168) |
| Operating Temperature | = 60 °F | | |
| Input Frequency | = 80 Hz | | |
| K-factor (compensated) | = 10.772 pulses/gallon (via Field Communicator or AMS Device Manager) | | |
| M | = F/(K x $C_8$) | | |
| | = 80/(10.722 x 0.00440287) | | |
| | = 1694.6 lpm | | |

Therefore, an input frequency of 80 Hz represents a flow rate of 1694.6 lpm in this application.

For a given input frequency, you may also determine the electrical current output. Use the above example with an input frequency of 80 Hz:

URV= 2000 lpm                     LRV= 0 lpm                     $F_{in}$ = 80 Hz

$$ I = \left( \left[ \frac{F/(K \times C_8) - LRV}{URV - LRV} \right] \times (16) \right) + 4 $$

$$ I = \left( \left[ \frac{80/(10.772 \times 0.00440287) - 0}{2000 - 0} \right] \times (16) \right) + 4 $$

I = 17.49 mA

Therefore, an input frequency of 80 Hz represents an electrical current output of 17.49 mA.

## Example 2 (SI units)

| | | | |
|---|---|---|---|
| Fluid | = Saturated Steam | URV | = 3600 kg/hr |
| Line size | = 80 mm | LRV | = 0 kg/hr |
| Line pressure | = 700 kPas | $C_{16}$ | = $C_{11}/\rho$ (from Table C-1 on page 168) |
| Operating Temperature | = 170 °F | Density($\rho$) | = 4.169 kg/cu-mtr (operating) |
| Viscosity | = 0.015 cp | | |
| Input Frequency | = 650 Hz | | |
| K-factor (compensated) | = 10.715 pulses/gallon (via Field Communicator or AMS Device Manager) | | |
| M | = F(Hz) /(K x $C_{16}$) | | |
| | = 650/{10.715 x ($C_{11}/\rho$)} | | |
| | = 650/{10.715 x (0.0733811/4.169)} | | |
| | = 650/(10.715 x 0.017602) | | |
| | = 3446.4 kg/hr | | |

Therefore, an input frequency of 650 Hz represents a flow rate of 3446.4 kg/hr in this application.

For a given input frequency, you may also determine the electrical current output. Use the prior example with an input frequency of 275 Hz:

URV= 3600 kg/hr             LRV= 0 kg/hr             $F_{in}$ = 275 Hz

$$I = \left(\left[\frac{F/(K \times C_{16}) - LRV}{URV - LRV}\right] \times (16)\right) + 4$$

$$I = \left(\left[\frac{275/(10.715 \times 0.017602) - 0}{3600 - 0}\right] \times (16)\right) + 4$$

I = 10.48 mA

Therefore, an input frequency of 275 Hz represents an output electrical current of 10.48 mA.

## Example 3 (SI units)

| | | | |
|---|---|---|---|
| Fluid | = Natural gas | URV | = 10,000 NCMH |
| Line size | = 80 mm | LRV | = 0 NCMH |
| Line pressure | = 1000 KPas | $C_{20}$ | = $C_x$/sp. units factor (from Table C-1 on page 168) |
| Operating Temperature | = 10 °F | Density ($\rho$) | = 9.07754 kg/cu-mtr (operating) |
| Viscosity | = 0.01 cp | Density ratio | = 10.48 |
| Input Frequency | = 700 Hz | | |
| K-factor (compensated) | = 10.797 pulses/gallon (via Field Communicator or AMS Device Manager) | | |
| Q | = F/(K x $C_{20}$) where: $C_{20}$ = $C_{11}$/(Density Ratio) | | |
| | = 700/{10.797 x (.0733811/10.48)} | | |
| | = 9259.2 NCMH | | |

Therefore, an input frequency of 700 Hz represents a flow rate of 9259.2 NCMH in this application.

For a given input frequency, you may also determine the electrical current output. Use the prior example with an input frequency of 375 Hz.

URV= 10000 NCMH          LRV= 0 NCMH          $F_{in}$ = 375 Hz

$$I = \left( \left[ \frac{F/(K \times C_{20}) - LRV}{URV - LRV} \right] \times (16) \right) + 4$$

$$I = \left( \left[ \frac{375/(10.797 \times 0.0070020) - 0}{10000 - 0} \right] \times (16) \right) + 4$$

I = 11.94 mA

Therefore, an input frequency of 375 Hz represents an electrical current output of 11.94 mA.

# Appendix D    HART® Fast Keys

**Table D-1.  Fast Keys for the Rosemount™ 8800D HART 5 Device Revision 1 and Device Revision 2 (DD Revision 1)**

| Function | Fast Keys |
|---|---|
| Alarm Jumper | 1, 4, 2, 1, 3 |
| Analog Output | 1, 4, 2, 1 |
| Auto Adjust Filter | 1, 4, 3, 1, 4 |
| Base Time Unit | 1, 1, 4, 1, 3, 2 |
| Base Volume Unit | 1, 1, 4, 1, 3, 1 |
| Burst Mode | 1, 4, 2, 3, 4 |
| Burst Option | 1, 4, 2, 3, 5 |
| Burst Variable 1 | 1, 4, 2, 3, 6, 1 |
| Burst Variable 2 | 1, 4, 2, 3, 6, 2 |
| Burst Variable 3 | 1, 4, 2, 3, 6, 3 |
| Burst Variable 4 | 1, 4, 2, 3, 6, 4 |
| Burst Xmtr Variables | 1, 4, 2, 3, 6 |
| Conversion Number | 1, 1, 4, 1, 3, 4 |
| D/A Trim | 1, 2, 5 |
| Date | 1, 4, 4, 5 |
| Descriptor | 1, 4, 4, 3 |
| Density Ratio | 1, 3, 2, 4, 1, 1 |
| Device ID | 1, 4, 4, 7, 6 |
| Electronics Temp | 1, 1, 4, 7, 1 |
| Electronics Temp Units | 1, 1, 4, 7, 2 |
| Filter Restore | 1, 4, 3, 3 |
| Final Assembly Number | 1, 4, 4, 7, 5 |
| Fixed Process Density | 1, 3, 2, 4, 2 |
| Fixed Process Temperature | 1, 3, 2, 3 |
| Flange Type | 1, 3, 4 |
| Flow Simulation | 1, 2, 4 |
| Installation Effects | 1, 4, 1, 6 |
| K-Factor (reference) | 1, 3, 3 |
| Local Display | 1, 4, 2, 4 |
| Loop Test | 1, 2, 2 |
| Low Flow Cutoff | 1, 4, 3, 2, 3 |
| Low Pass Filter | 1, 4, 3, 2, 4 |
| LRV | 1, 3, 8, 2 |
| LSL | 1, 3, 8, 5 |
| Manufacturer | 1, 4, 4, 1 |
| Mass Flow | 1, 1, 4, 2, 1 |
| Mass Flow Units | 1, 1, 4, 2, 2 |
| Mating Pipe ID (Inside Diameter) | 1, 3, 5 |
| Message | 1, 4, 4, 4 |
| Meter Body Number | 1, 4, 1, 5 |
| Minimum Span | 1, 3, 8, 3 |
| Num Req Preams | 1, 4, 2, 3, 2 |

| Function | Fast Keys |
|---|---|
| Poll Address | 1, 4, 2, 3, 1 |
| Process Fluid Type | 1, 3, 2, 2 |
| Process Variables | 1, 1 |
| Pulse Output | 1, 4, 2, 2, 1 |
| Pulse Output Test | 1, 4, 2, 2, 2 |
| PV Damping | 1, 3, 9 |
| PV Mapping | 1, 3, 6, 1 |
| PV Percent Range | 1, 1, 2 |
| QV Mapping | 1, 3, 6, 4 |
| Range Values | 1, 3, 8 |
| Review | 1, 5 |
| Revision Numbers | 1, 4, 4, 7 |
| Scaled D/A Trim | 1, 2, 6 |
| Self Test | 1, 2, 1, 5 |
| Signal to Trigger Ratio | 1, 4, 3, 2, 2 |
| STD/Nor Flow Units | 1, 1, 4, 1, 2 |
| Special Units | 1, 1, 4, 1, 3 |
| Status | 1, 2, 1, 1 |
| SV Mapping | 1, 3, 6, 2 |
| Tag | 1, 3, 1 |
| Total | 1, 1, 4, 4, 1 |
| Totalizer Control | 1, 1, 4, 4 |
| Transmitter Mode | 1, 3, 2, 1 |
| TV Mapping | 1, 3, 6, 3 |
| Trigger Level | 1, 4, 3, 2, 5 |
| URV | 1, 3, 8, 1 |
| User Defined Units | 1, 1, 4, 1, 3, 3 |
| USL | 1, 3, 8, 4 |
| Shedding Frequency | 1, 1, 4, 6 |
| Variable Mapping | 1, 3, 6 |
| Velocity Flow | 1, 1, 4, 3 |
| Velocity Flow Base | 1, 1, 4, 3, 3 |
| Volumetric Flow | 1, 1, 4, 1 |
| Wetted Material | 1, 4, 1, 4 |
| Write Protect | 1, 4, 4, 6 |

**Figure D-1. Rosemount 8800D HART 5 Menu Tree for Device Revision 1 and Device Revision 2 (DD Revision 1)**

1. **Device Setup**
2. PV
3. AO
4. LRV
5. URV

1. **Process Variables**
- 1. PV
- 2. PV % Range
- 3. Analog Output
- 4. **View Other Variables**

1. **Volumetric Flow**
2. **Mass Flow**
3. **Velocity Flow**
4. **Totalizer**
5. Pulse Frequency
6. Vortex Frequency
7. **Electronics Temp**
8. **Calc Proc Density**
9. **Process Temp**
 - CJ Temperature

1. Volume Flow
2. Units
3. **Special Units**

1. Base Volume Unit
2. Base Time Unit
3. User Defined Unit
4. Conversion Number

1. Mass Flow
2. Mass Flow Unit

1. Vel. Flow
2. Vel. Flow Unit
3. Velocity Meas Base

1. View Status
2. Config Status
3. Density Test Calc
4. **Min/Max Temps**
5. Self Test
6. Reset Xmtr

1. CJ Temp
2. CJ Temp Units

1. Proc Temp
2. Proc Temp Units
3. T/C Failure Mode

1. Total
2. Start
3. Stop
4. Reset
5. Totalizer Config

1. Min Electr Temp
2. Max Electr Temp

1. Proc Density
2. Density Units

1. Electr Temp
2. Elec Temp Units

2. **Diagnostics and Service**

1. **Test/Status**
2. Loop Test
3. Pulse Output Test
4. **Flow Simulation**
5. D/A Trim
6. Scaled D/A Trim
7. Shed Freq at URV

1. PV
2. Shedding Frequency
3. Configure Flow Simulation
4. Enable Normal Flow
5. Mode

3. **Basic Setup**

1. Tag
2. **Process Config**
3. Reference K Factor
4. Flange Type
5. Mating Pipe ID
6. **Variable Mapping**
7. PV Unit
8. **Range Values**
9. PV Damping
 - Auto Adjust Filter

1. Transmitter Mode
2. Process Fluid
3. Fixed Process Temp
4. **Density / Dens Ratio**

1. **Density Ratio**
2. Fixed Process Density

1. Density Ratio
2. **Calc Density Ratio**

1. Operating Conditions
2. Base Conditions
3. Exit

1. PV is
2. SV is
3. TV is
4. QV is

1. **K Factor**
2. Mating Pipe ID
3. Flange Type
4. Wetted Material
5. Meter Body #
6. Installation Effects

1. Reference K Factor
2. Compensated K Factor

1. URV
2. LRV
3. PV Min Span
4. USL
5. LSL

4. **Detailed Setup**

1. **Characterize Meter**
2. **Configure Outputs**
3. **Signal Processing**
4. **Device Information**

1. **Anlg Output**
2. **Pulse Output**
3. **HART Output**
4. Local Display

1. **Range Values**
2. Loop Test
3. Alarm Jumper
4. D/A Trim
5. Alarm Level Select
6. **Alarm/Sat Levels**
7. Scaled D/A Trim
8. Recall Factory Trim

1. URV
2. LRV
3. PV Min Span
4. USL
5. LSL

1. High Alarm
2. High Saturation
3. Low Saturation
4. Low Alarm

1. **Optimize Flow Range**
2. **Manual Filter Adjust**
3. Filter Restore
4. **Damping**
5. LFC Response

1. PV
2. LFC
3. Sig/Tr
4. Auto Adjust Filter

1. **Pulse Output**
2. Pulse Output Test

1. Off
2. Direct (Shedding)
3. Scaled Volume
4. Scaled Velocity
5. Scaled Mass

1. Poll Address
2. # of Req Preams
3. Num Resp Preams
4. Burst Mode
5. Burst Option
6. **Burst Xmtr Vars**

1. Manufacturer
2. Tag
3. Descriptor
4. Message
5. Date
6. Write Protect
7. Transmitter Options
8. **Revision Numbers**

1. PV
2. Sig/Tr
3. Low Flow Cutoff
4. Low Pass Filter
5. Trigger Level

1. Xmtr Var, Slot 1
2. Xmtr Var, Slot 2
3. Xmtr Var, Slot 3
4. Xmtr Var, Slot 4

1. PV Damping
2. Flow Damping
3. Temperature Damping

1. Universal Rev
2. Transmitter Rev
3. Software Rev
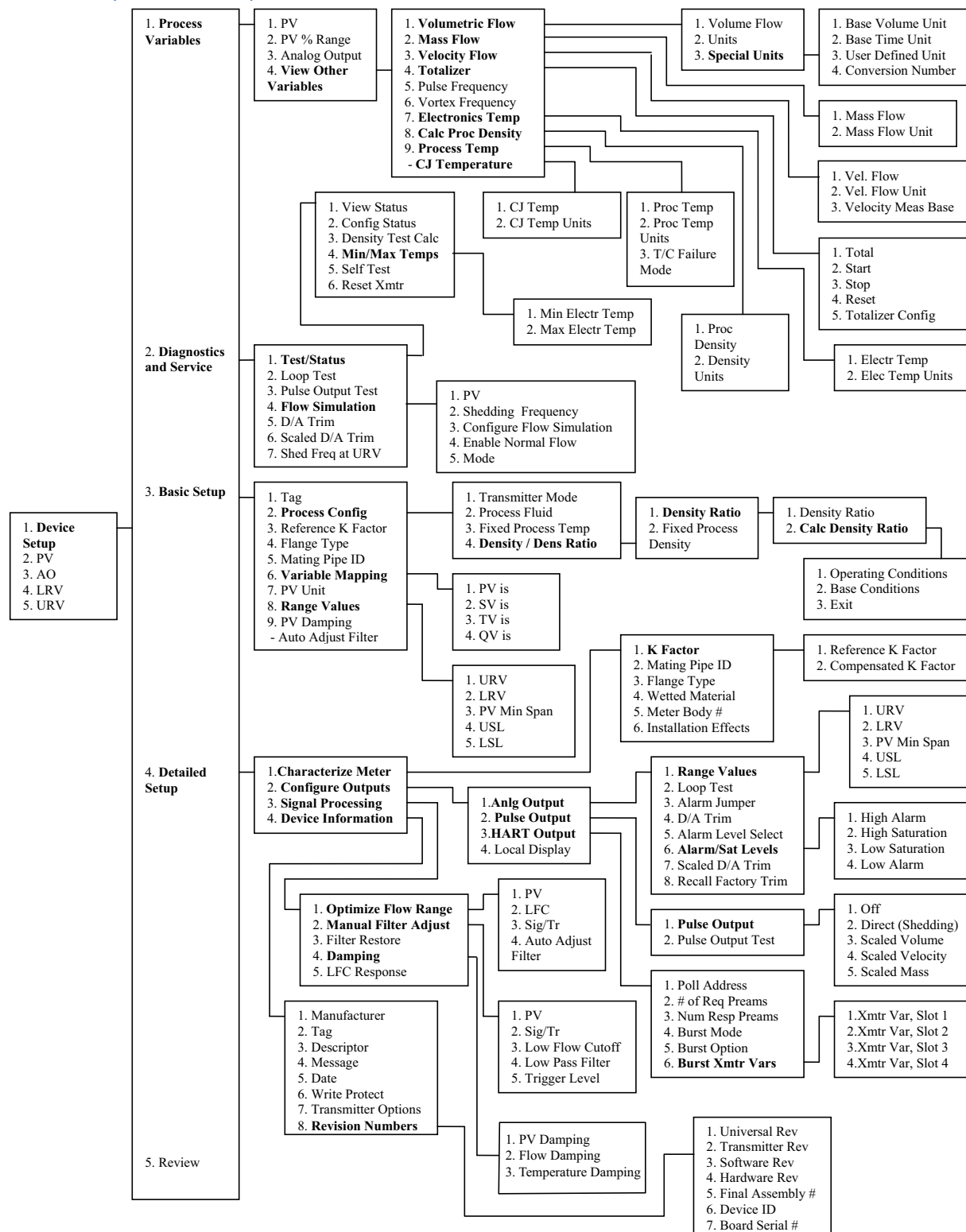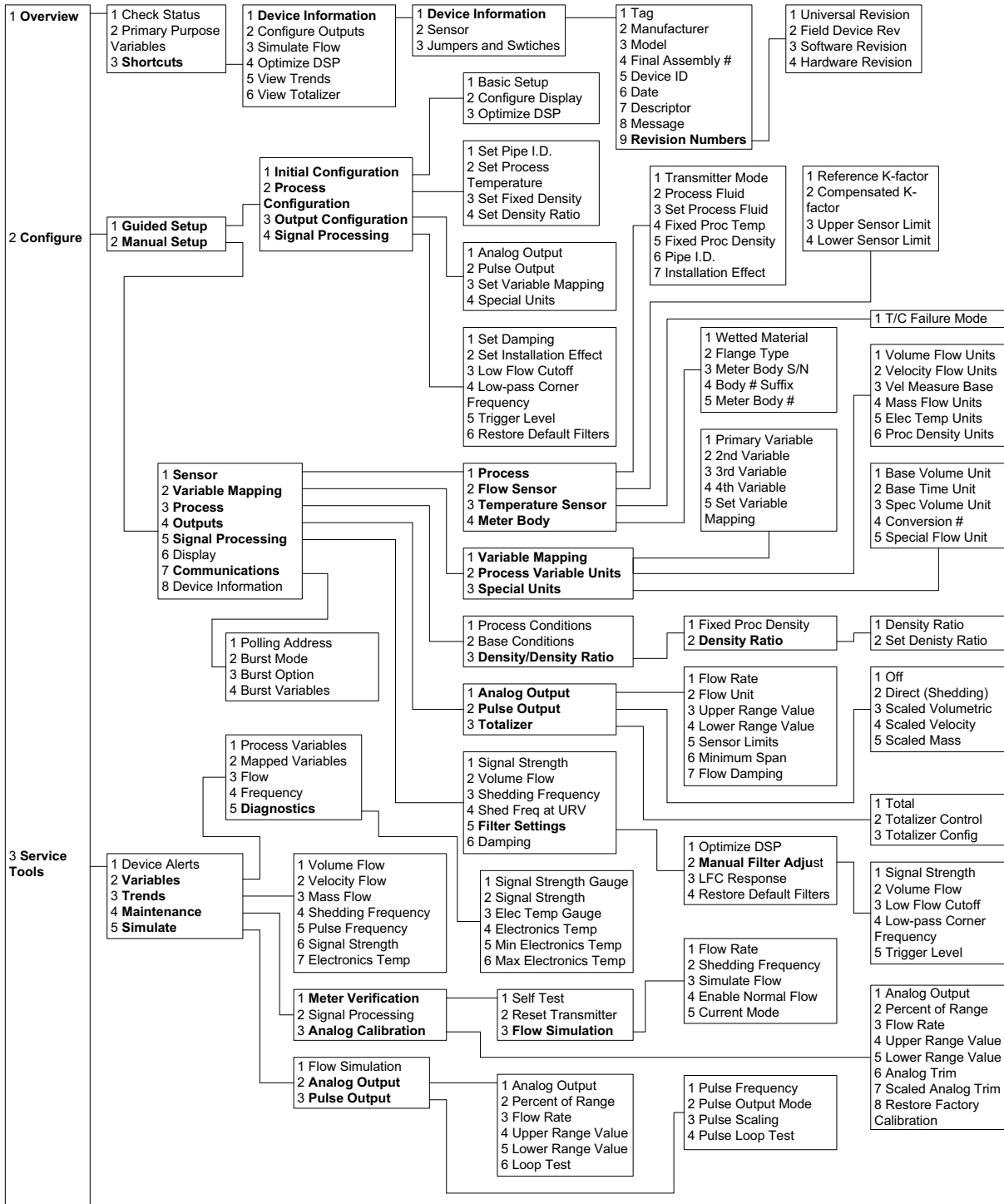4. Hardware Rev
5. Final Assembly #
6. Device ID
7. Board Serial #

5. Review

**Table D-2.  Fast Keys for Rosemount 8800D HART 5 Device Revision 2. (DD Revision 3)**

| Function | Fast Key | Function | Fast Key |
|---|---|---|---|
| Alarm Direction | 1, 3, 1, 3, 2 | Percent of Range | 3, 4, 3, 2 |
| Analog Output | 3, 4, 3, 1 | Polling Address | 2, 2, 7, 1 |
| Analog Trim | 3, 4, 3, 6 | Primary Variable Damping | 2, 1, 4, 1 |
| Base Time Unit | 2, 2, 2, 3, 2 | Primary Variable | 2, 2, 2, 1, 1 |
| Base Volume Unit | 2, 2, 2, 3, 1 | Process Density Units[2] | 2, 2, 2, 2, 6 |
| Burst Mode | 2, 2, 7, 2 | Process Fluid Type | 2, 2, 1, 1, 2 |
| Burst Option | 2, 2, 7, 3 | Process Temp Units[1] | 2, 2, 2, 2, 5 |
| Burst Slot 0 | 2, 2, 7, 4, 1 | Process Variables | 3, 2, 1 |
| Burst Slot 1 | 2, 2, 7, 4, 2 | Pulse Output | 3, 2, 4, 4 |
| Burst Slot 2 | 2, 2, 7, 4, 3 | Pulse Output Test | 3, 5, 3, 4 |
| Burst Slot 3 | 2, 2, 7, 4, 4 | Recall Factory Calibration | 3, 4, 3, 8 |
| Burst Variable Mapping | 2, 2, 7, 4, 5 | Reference K-Factor | 2, 2, 1, 2, 1 |
| Compensated K-Factor | 2, 2, 1, 2, 2 | Reset Transmitter | 3, 4, 1, 2 |
| Conversion Number | 2, 2, 2, 3, 4 | Restore Default Filters | 2, 1, 4, 6 |
| Date | 2, 2, 8, 2, 1 | Revision Numbers | 2, 2, 8, 3 |
| Descriptor | 2, 2, 8, 2, 2 | Scaled Analog Trim | 3, 4, 3, 7 |
| Density Ratio | 2, 2, 3, 3, 2 | 2nd Variable | 2, 2, 2, 1, 2 |
| Device ID | 2, 2, 8, 1, 5 | Self Test | 3, 4, 1, 1 |
| Display | 2, 1, 1, 2 | Set Variable Mapping | 2, 2, 2, 1, 5 |
| Electronics Temp | 3, 2, 5, 4 | Shedding Frequency | 3, 2, 4, 2 |
| Electronics Temp Units[2] | 2, 2, 2, 2, 5 | Signal Strength | 3, 2, 5, 2 |
| Final Assembly Number | 2, 2, 8, 1, 4 | Special Flow Unit | 2, 2, 2, 3, 5 |
| Fixed Process Density | 2, 2, 1, 1, 5 | Special Volume Unit | 2, 2, 2, 3, 3 |
| Fixed Process Temperature | 2, 2, 1, 1, 4 | Status | 1, 1, 1 |
| Flange Type | 2, 2, 1, 4, 2 | Tag | 2, 2, 8, 1, 1 |
| Flow Simulation | 3, 5, 1 | 3rd Variable | 2, 2, 2, 1, 3 |
| 4th Variable | 2, 2, 2, 1, 4 | Total | 1, 3, 6, 1 |
| Installation Effects | 2, 2, 1, 1, 7 | Totalizer Configuration | 1, 3, 6, 3 |
| Lower Range Value | 2, 2, 4, 1, 4 | Totalizer Control | 1, 3, 6, 2 |
| Lower Sensor Limit | 2, 2, 4, 1, 5, 2 | Transmitter Mode | 2, 2, 1, 1, 1 |
| Loop Test | 3, 5, 2, 6 | Trigger Level | 2, 1, 4, 5 |
| Low Flow Cutoff | 2, 1, 4, 3 | Upper Range Value | 2, 2, 4, 1, 3 |
| Low-pass Corner Frequency | 2, 1, 4, 4 | Upper Sensor Limit | 2, 2, 4, 1, 5, 1 |
| Manufacturer | 2, 2, 8, 1, 2 | Velocity Flow | 3, 2, 3, 4 |
| Mass Flow | 3, 2, 3, 6 | Velocity Flow Units | 2, 2, 2, 2, 2 |
| Mass Flow Units | 2, 2, 2, 2, 4 | Velocity Measurement Base | 2, 2, 2, 2, 3 |
| Mating Pipe ID (Inside Diameter) | 2, 2, 1, 1, 6 | Volume Flow | 3, 2, 3, 2 |
| Message | 2, 2, 8, 2, 3 | Volume Flow Units | 2, 2, 2, 2, 1 |
| Meter Body Number | 2, 2, 1, 4, 5 | Wetted Material | 2, 2, 1, 4, 1 |
| Minimum Span | 2, 2, 4, 1, 6 | Write Protect | 2, 2, 8, 1, 6 |
| Optimize DSP | 2, 1, 1, 3 | | |

1.    Process Temp Units is available for units with the MTA option only.
2.    For units with the MTA option: Electronics Temp Units (2, 2, 2, 2, 6) and Process Density Units (2, 2, 2, 2, 7).

### Figure D-2. Menu Tree for the Rosemount 8800D HART 5 Device Revision 2 (DD Revision 3)

**1 Overview**
- 1 Check Status
- 2 Primary Purpose Variables
- 3 **Shortcuts**

**1 Device Information**
- 1 **Device Information**
- 2 Configure Outputs
- 3 Simulate Flow
- 4 Optimize DSP
- 5 View Trends
- 6 View Totalizer

**1 Device Information**
- 1 **Device Information**
- 2 Sensor
- 3 Jumpers and Swtiches

- 1 Tag
- 2 Manufacturer
- 3 Model
- 4 Final Assembly #
- 5 Device ID
- 6 Date
- 7 Descriptor
- 8 Message
- 9 **Revision Numbers**

- 1 Universal Revision
- 2 Field Device Rev
- 3 Software Revision
- 4 Hardware Revision

**2 Configure**
- 1 **Guided Setup**
- 2 **Manual Setup**

- 1 **Initial Configuration**
- 2 **Process Configuration**
- 3 **Output Configuration**
- 4 **Signal Processing**

- 1 Basic Setup
- 2 Configure Display
- 3 Optimize DSP

- 1 Set Pipe I.D.
- 2 Set Process Temperature
- 3 Set Fixed Density
- 4 Set Density Ratio

- 1 Transmitter Mode
- 2 Process Fluid
- 3 Set Process Fluid
- 4 Fixed Proc Temp
- 5 Fixed Proc Density
- 6 Pipe I.D.
- 7 Installation Effect

- 1 Reference K-factor
- 2 Compensated K-factor
- 3 Upper Sensor Limit
- 4 Lower Sensor Limit

- 1 Analog Output
- 2 Pulse Output
- 3 Set Variable Mapping
- 4 Special Units

- 1 T/C Failure Mode

- 1 Set Damping
- 2 Set Installation Effect
- 3 Low Flow Cutoff
- 4 Low-pass Corner Frequency
- 5 Trigger Level
- 6 Restore Default Filters

- 1 Wetted Material
- 2 Flange Type
- 3 Meter Body S/N
- 4 Body # Suffix
- 5 Meter Body #

- 1 Volume Flow Units
- 2 Velocity Flow Units
- 3 Vel Measure Base
- 4 Mass Flow Units
- 5 Elec Temp Units
- 6 Proc Density Units

**3 Service Tools**

- 1 **Sensor**
- 2 **Variable Mapping**
- 3 **Process**
- 4 **Outputs**
- 5 **Signal Processing**
- 6 Display
- 7 **Communications**
- 8 Device Information

- 1 **Process**
- 2 **Flow Sensor**
- 3 **Temperature Sensor**
- 4 **Meter Body**

- 1 Primary Variable
- 2 2nd Variable
- 3 3rd Variable
- 4 4th Variable
- 5 Set Variable Mapping

- 1 Base Volume Unit
- 2 Base Time Unit
- 3 Spec Volume Unit
- 4 Conversion #
- 5 Special Flow Unit

- 1 **Variable Mapping**
- 2 **Process Variable Units**
- 3 **Special Units**

- 1 Polling Address
- 2 Burst Mode
- 3 Burst Option
- 4 Burst Variables

- 1 Process Conditions
- 2 Base Conditions
- 3 **Density/Density Ratio**

- 1 Fixed Proc Density
- 2 **Density Ratio**

- 1 Density Ratio
- 2 Set Denisty Ratio

- 1 **Analog Output**
- 2 **Pulse Output**
- 3 **Totalizer**

- 1 Flow Rate
- 2 Flow Unit
- 3 Upper Range Value
- 4 Lower Range Value
- 5 Sensor Limits
- 6 Minimum Span
- 7 Flow Damping

- 1 Off
- 2 Direct (Shedding)
- 3 Scaled Volumetric
- 4 Scaled Velocity
- 5 Scaled Mass

- 1 Process Variables
- 2 Mapped Variables
- 3 Flow
- 4 Frequency
- 5 **Diagnostics**

- 1 Signal Strength
- 2 Volume Flow
- 3 Shedding Frequency
- 4 Shed Freq at URV
- 5 **Filter Settings**
- 6 Damping

- 1 Total
- 2 Totalizer Control
- 3 Totalizer Config

- 1 Device Alerts
- 2 **Variables**
- 3 **Trends**
- 4 **Maintenance**
- 5 **Simulate**

- 1 Volume Flow
- 2 Velocity Flow
- 3 Mass Flow
- 4 Shedding Frequency
- 5 Pulse Frequency
- 6 Signal Strength
- 7 Electronics Temp

- 1 Signal Strength Gauge
- 2 Signal Strength
- 3 Elec Temp Gauge
- 4 Electronics Temp
- 5 Min Electronics Temp
- 6 Max Electronics Temp

- 1 Optimize DSP
- 2 **Manual Filter Adjust**
- 3 LFC Response
- 4 Restore Default Filters

- 1 Signal Strength
- 2 Volume Flow
- 3 Low Flow Cutoff
- 4 Low-pass Corner Frequency
- 5 Trigger Level

- 1 **Meter Verification**
- 2 Signal Processing
- 3 **Analog Calibration**

- 1 Self Test
- 2 Reset Transmitter
- 3 **Flow Simulation**

- 1 Flow Rate
- 2 Shedding Frequency
- 3 Simulate Flow
- 4 Enable Normal Flow
- 5 Current Mode

- 1 Analog Output
- 2 Percent of Range
- 3 Flow Rate
- 4 Upper Range Value
- 5 Lower Range Value
- 6 Analog Trim
- 7 Scaled Analog Trim
- 8 Restore Factory Calibration

- 1 Flow Simulation
- 2 **Analog Output**
- 3 **Pulse Output**

- 1 Analog Output
- 2 Percent of Range
- 3 Flow Rate
- 4 Upper Range Value
- 5 Lower Range Value
- 6 Loop Test

- 1 Pulse Frequency
- 2 Pulse Output Mode
- 3 Pulse Scaling
- 4 Pulse Loop Test

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