Reference Manual
00809-0100-4004, Rev AA
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# Rosemount 8800D Series Smart Vortex Flowmeter

HART® FIELD COMMUNICATIONS PROTOCOL

ROSEMOUNT®

EMERSON™ Process Management

www.emersonprocess.com/rosemount

# Rosemount 8800D Smart Vortex Flowmeter

**NOTICE**

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

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

**Customer Central**
Technical support, quoting, and order-related questions.

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

**North American Response Center**
Equipment service needs.

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

Outside of the United States, contact your local Rosemount representative.

**⚠CAUTION**

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

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

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# Section 1 Introduction



## HOW TO USE THIS MANUAL

This manual provides installation, configuration, troubleshooting, and other procedures for the use of the Rosemount 8800D Smart Vortex Flowmeter. Specifications and other important information are also included.

**Section 2: Installation**

Contains mechanical and electrical installation instructions.

**Section 3: Configuration**

Contains information on entering and verifying basic configuration parameters.

**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: Reference Data**

Provides reference and specification data.

**Appendix B: Approval Information**

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 9000 certified manufacturing processes.

**Figure 1-1: Rosemount 8800D HART Menu Tree**

Provides command tree, and Fast Key Sequence tables for the HART Communicator when used in conjunction with the Rosemount 8800D.

## 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.

## 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 and creates an alternating sine wave due to the passing vortices, The transmitter measures the frequency of the sine waves and converts it into a flowrate.

This manual is designed to assist in the installation and operation of the rosemount 8800D Vortex Flowmeter.

**⚠WARNING**

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

# Section 2 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 the Appendix on page A-20.

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.

## 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:

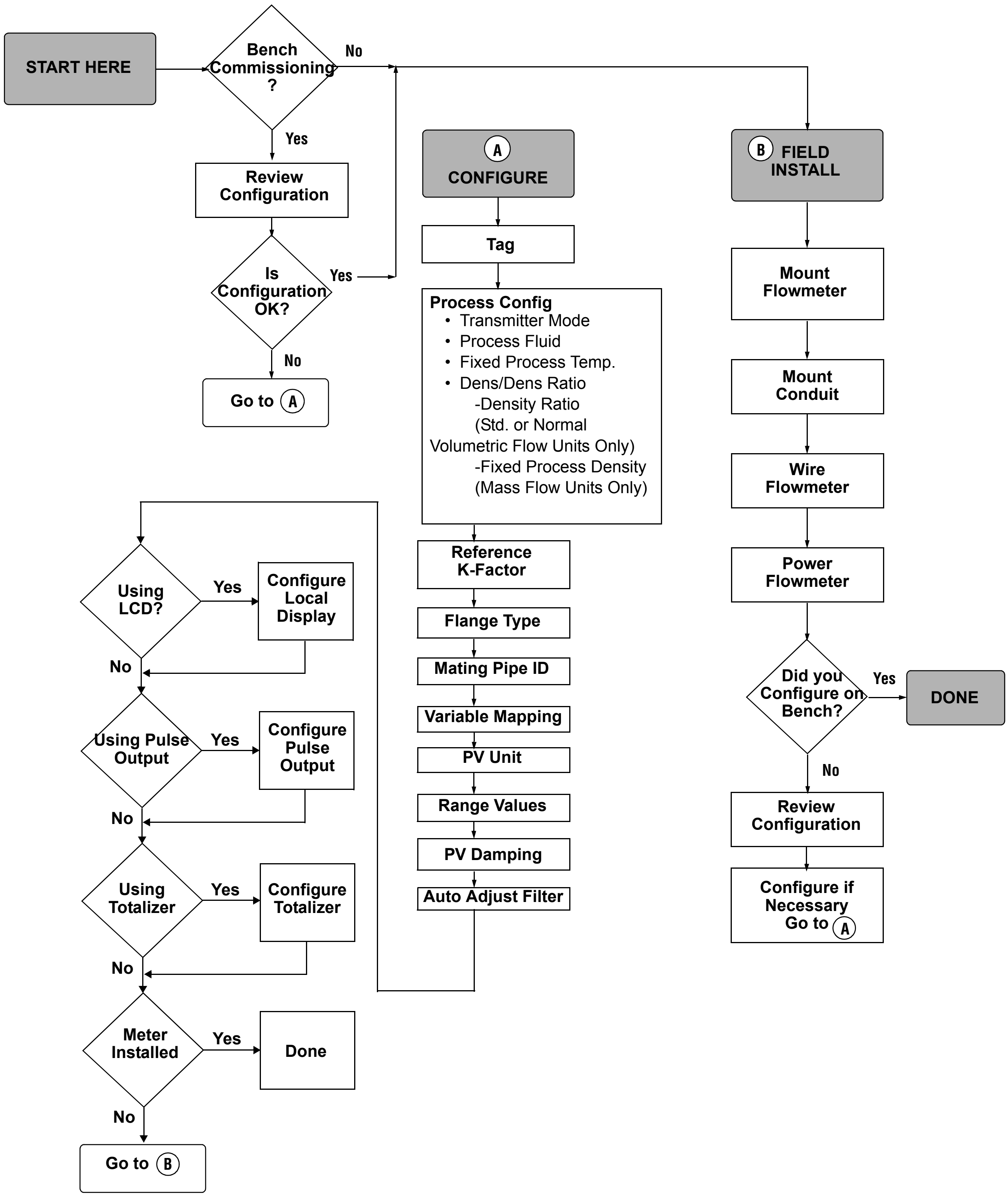
- Do not remove the transmitter cover in explosive atmospheres when the circuit is alive.
- Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify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

**⚠WARNING**

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

- Make sure only qualified personnel perform the installation.

Figure 2-1. Installation Flowchart



## 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 HART® Communicator or Asset Management Solutions™ (AMS) software (or other communications device) to the signal loop in accordance with the specifications for your communicator.

**General Considerations**

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, ease maintenance, and ensure optimum performance.

## Flowmeter Sizing

Correct meter sizing is important for flowmeter performance. The Rosemount 8800D is capable of processing signals from flow applications within the limitations described in Appendix A: Reference Data. Full scale is continuously adjustable within these ranges.

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: Reference Data for sizing data.

Contact your local Rosemount Inc. sales representative to obtain a copy of the Rosemount 8800D Vortex Flowmeter Sizing Program which calculates flowmeter sizes based on user-supplied input.

## 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 profile. Install valves downstream of the meter when possible.

**Vertical Installation**

Vertical 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.

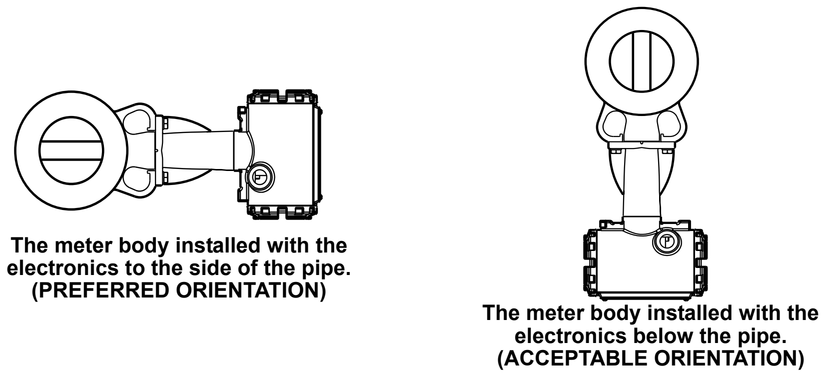
**NOTE**
To ensure that the meter body remains full, avoid downward vertical liquid flows where back pressure is inadequate.

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

### 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 2-2. Insulation may be required around the pipe to maintain an electronics temperature below 185 °F (85 °C).

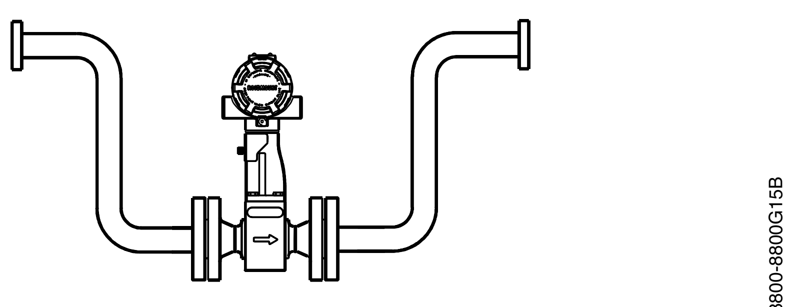
Figure 2-2. Examples of High-Temperature Installations




### Steam Installations

For steam applications, avoid installations, such as the one shown in Figure 2-3. 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 2-3. Avoid This Type of Installation for Steam Applications




### Upstream/Downstream Piping

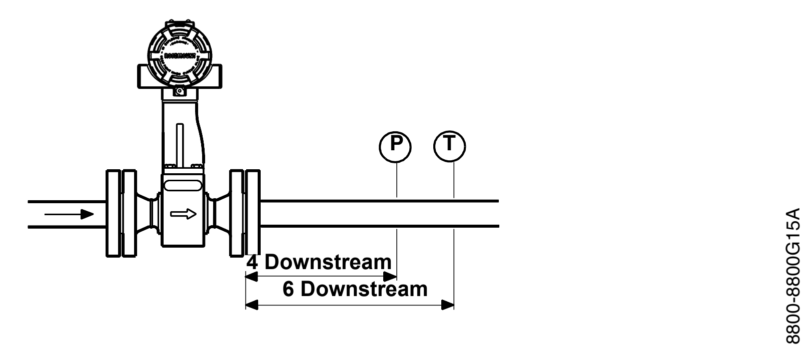
The vortex meter may be installed with a minimum of *ten straight pipe diameters (D) upstream* and *five straight pipe diameters (D) downstream*.

Rated accuracy is based on the number of pipe diameters from an upstream disturbance. An additional 0.5% shift in K-factor may be introduced between 10 D and 35 D, depending on disturbance. For more information on installation effects, see Technical Data Sheet 00816-0100-3250. This effect can also be corrected in the electronics. See “Installation Effect” on page 4-7.

### 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 2-4.

Figure 2-4. Pressure and Temperature Transmitter Location




## 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 Rosemount Sales Representative for more information.

## 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.

# 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 A: Reference Data for specific approval categories.

# HARDWARE CONFIGURATION

The hardware jumpers on the Rosemount 8800D enable you to set the alarm and security. (See Figure 2-5.) To access the jumpers, remove the electronics housing cover from the end of the Rosemount 8800D. If your Rosemount 8800D does not include an LCD indicator, the jumpers are accessible by removing the cover on the electronics side. If your Rosemount 8800D includes an LCD option, the alarm and security jumpers are found on the face of the LCD indicator. (See Figure 2-6 on page 2-7.)

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**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.

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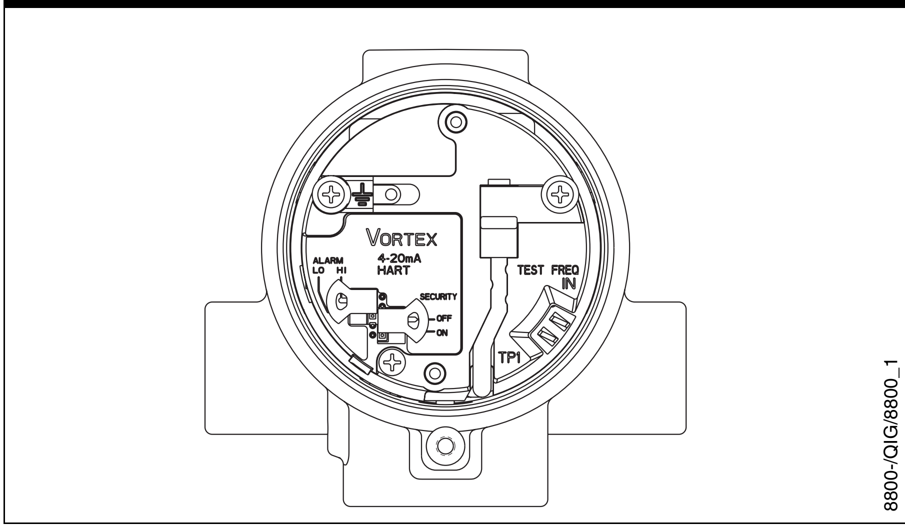
Set these jumpers during the commissioning stage to avoid exposing the electronics to the plant environment.

Figure 2-5. 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 jumper is set per the CDS; the default setting is HIGH.

The failure mode jumper is labeled ALARM and is set to the high position at the factory.

**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 changes, but no actual changes will be permitted. The jumper is set per CDS; the default setting is OFF.

## 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.

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| Level | 4—20 mA Saturation Value | 4—20 mA Alarm Value |
|---|---|---|
| Low | 3.9 mA | ≤ 3.75 mA |
| High | 20.8 mA | ≥ 22.6 mA |

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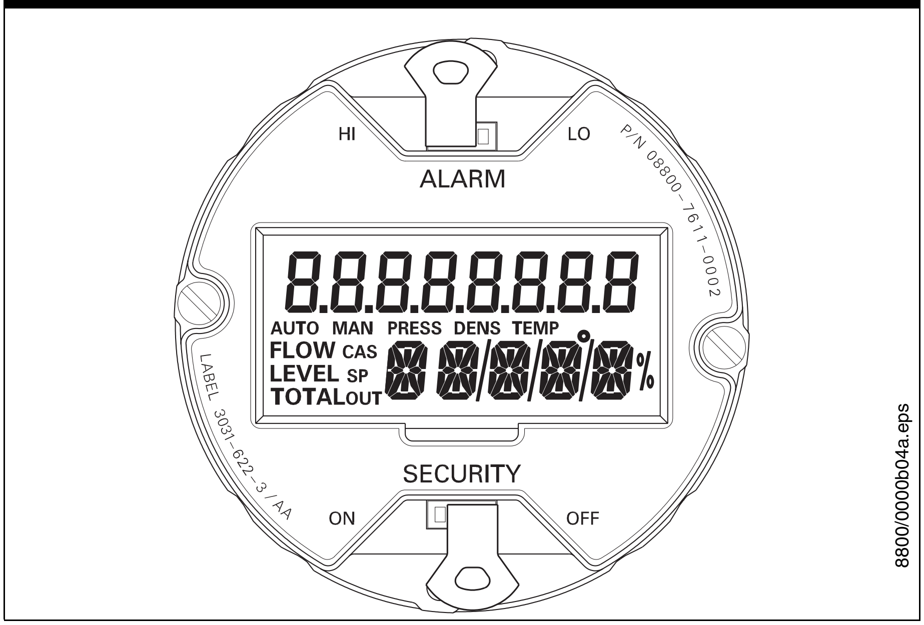
Table 2-1. Analog Output: NAMUR-Compliant Alarm Values vs. Saturation Values

| Level | 4—20 mA Saturation Value | 4—20 mA Alarm Value |
|---|---|---|
| Low | 3.8 mA | ≤ 3.6 mA |
| High | 20.5 mA | ≥ 22.6 mA |

## 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 2-6.

Figure 2-6. LCD Indicator Alarm and Security Jumpers



## METER BODY INSTALLATION TASKS

The installation tasks include detailed mechanical and electrical installation procedures.

### 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.

### 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.

### 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 that 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.

### Flange Bolts

Install the Rosemount 8800D Flowmeter between two conventional pipe flanges, as shown in Figure 2-7 and Figure 2-8 on page 2-11. Table 2-2, 2-3, and 2-4 lists the recommended minimum stud bolt lengths for wafer-style meter body size and different flange ratings.

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Table 2-2. Minimum Recommended Stud Bolt Lengths for Wafer Installation with ASME B16.5 (ANSI) Flanges

| | Minimum Recommended Stud Bolt Lengths (in Inches) for Each Flange Rating | | |
|---|---|---|---|
| **Line Size** | **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 2-3. Minimum Recommended Stud Bolt Lengths for Wafer Installation with DIN Flanges

| | Minimum Recommended Stud Bolt Lengths (in mm) for Each Flange Rating | | | |
|---|---|---|---|---|
| **Line Size** | **PN 16** | **PN 40** | **PN 64** | **PN 100** |
| DN 15 | 160 | 160 | 170 | 170 |
| DN 25 | 160 | 160 | 200 | 200 |
| DN 40 | 200 | 200 | 230 | 230 |
| DN 50 | 220 | 220 | 250 | 270 |
| DN 80 | 230 | 230 | 260 | 280 |
| DN 100 | 240 | 260 | 290 | 310 |
| DN 150 | 270 | 300 | 330 | 350 |
| DN 200 | 320 | 360 | 400 | 420 |

Table 2-4. Minimum Recommended Stud Bolt Lengths for Wafer Installation with JIS Flanges

| | Minimum Recommended Stud Bolt Lengths (in mm) for Each Flange Rating | | |
|---|---|---|---|
| Line Size | 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 |

## 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 that 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 2-7 on page 2-10.

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 that 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 2-5 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 2-9 on page 2-12.
6. Check for leaks at the flanges after tightening the flange bolts.

**NOTES**
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 the ASME Pressure Vessel Code (Section VIII, Division 2) 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 2-5. Dimensions for Spacers

| 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) |

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Figure 2-7. Wafer-Style Flowmeter Installation with Alignment Rings

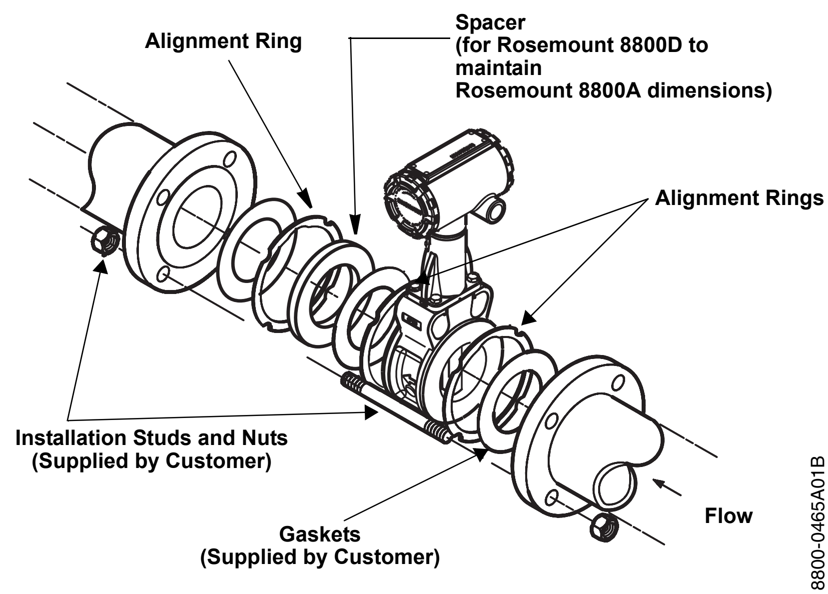
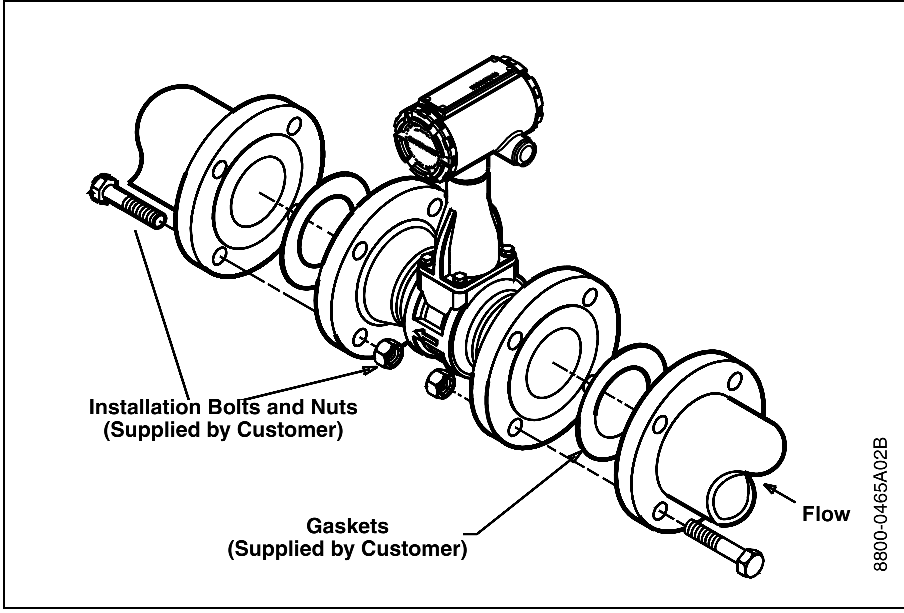


Figure 2-8. Flanged-Style Flowmeter Installation




## 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 2-9.

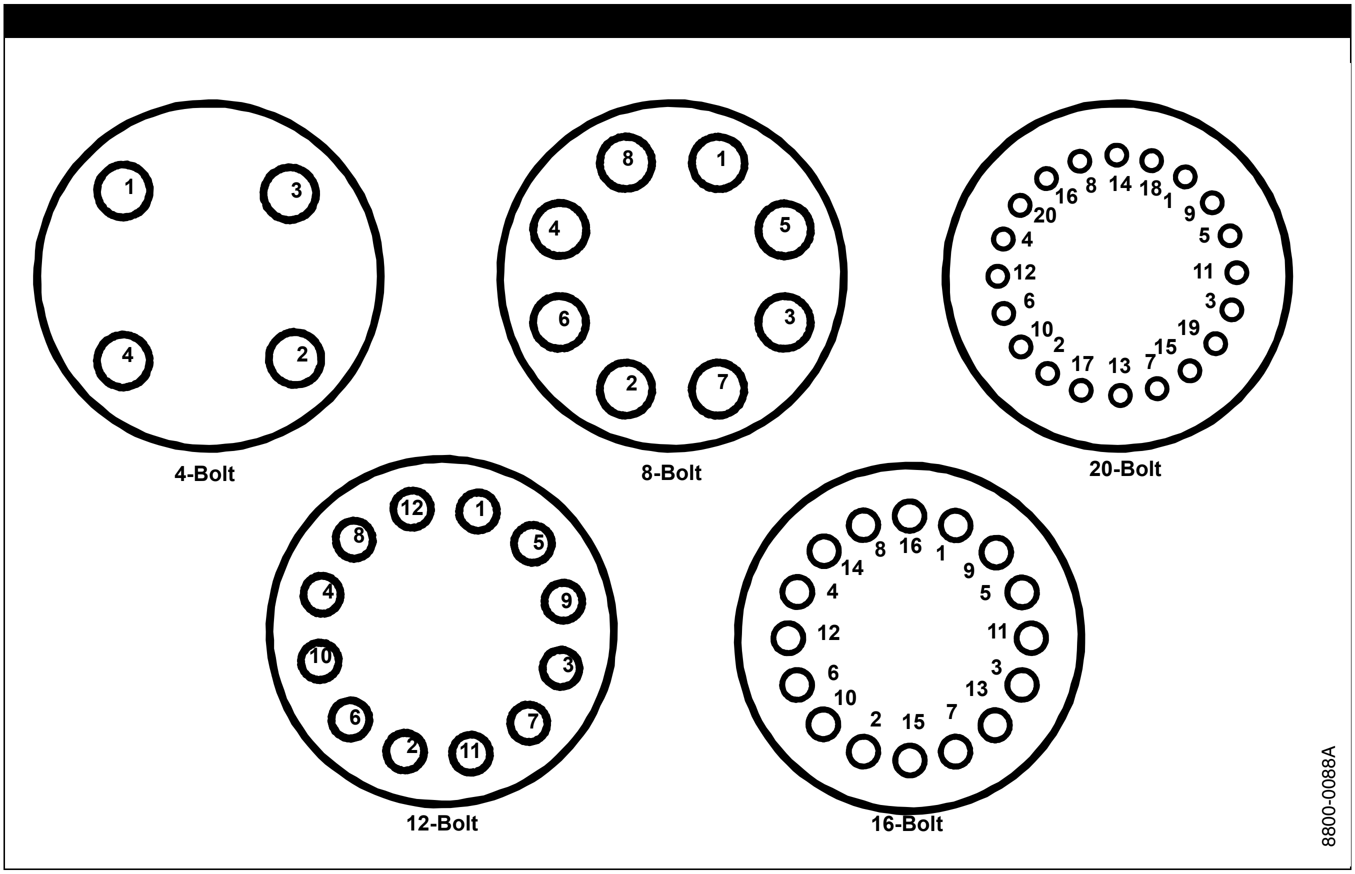
**NOTE**
The required bolt load for sealing the gasket joint is affected by several factors, including operating pressure and gasket material, width, and condition. A number of factors also affect the actual bolt load resulting from a measured torque, including condition of bolt threads, friction between 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 the ASME Pressure Vessel Code (Section VIII, Division 2) 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 temperature sensor is coiled and attached to the electronics bracket. Remove the plastic band holding the sensor to the electronics bracket and insert temperature sensor into the hole at the bottom of the meter body. There is no need to remove opposite end from the electronics. Tighten with 1/2 inch open-end wrench approximately 1$^{1}/_{4}$ turns past finger tight.

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

Figure 2-9. Flange Bolt Torquing Sequence




## Flowmeter Grounding

Grounding is not required in typical vortex applications; however, a good 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 good low impedance ground.

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.

## 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 a bracket that is polyurethane painted carbon steel and one carbon steel u-bolt. See “Reference Data” on page A-1 for dimensional information.

### High-Temperature Installations

Install the meter body so the electronics are positioned to the side of or below the pipe as shown in Figure 2-2 on page 2-4. Insulation may be required around the pipe to maintain a temperature below 185 °F (85 °C).

## Conduit Connections

The electronics housing has two ports for $^1/_2$–14 NPT or M20×1.5 conduit connections. Adapters are also available for PG 13.5 conduit. 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.

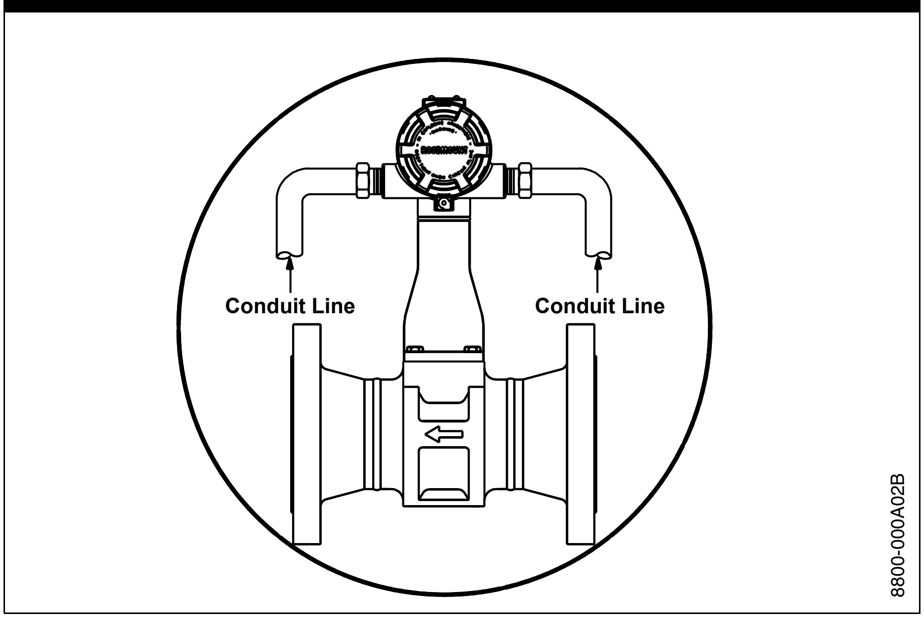
**NOTE**
In some applications it may be necessary to install conduit seals and arrange for conduits to drain to prevent moisture from entering the wiring compartment.

## 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 2-10. Proper Conduit Installation with Rosemount 8800D




## Cable Gland

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

## 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 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 2-23 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 current if a lightning strike occurs.

## 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 a current test connection are above the signal terminals. Figure 2-11 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.

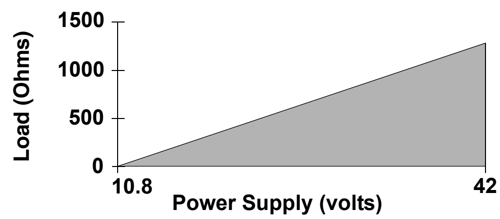
### Power Supply

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 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.

Figure 2-11. Power Supply Load Limitations




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

| Gage Number A.W.G. | Ohms per 1,000 ft (305 m) at 68 °F (20 °C) Equivalent |
|---|---|
| 14 | 2.525 |
| 16 | 4.016 |
| 18 | 6.385 |
| 20 | 10.15 |
| 22 | 16.14 |
| 24 | 25.67 |

### Analog Output

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

To make connections, remove the FIELD TERMINALS side cover of the electronics housing. All power to the flowmeter is supplied over the 4–20 mA signal wiring. Connect the wires as shown in Figure 2-14 on page 2-18.

**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 preferred in all other installations. To ensure communication, wiring should be 24 AWG or larger and not exceed 5,000 ft (1500 m).

### Pulse Output

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

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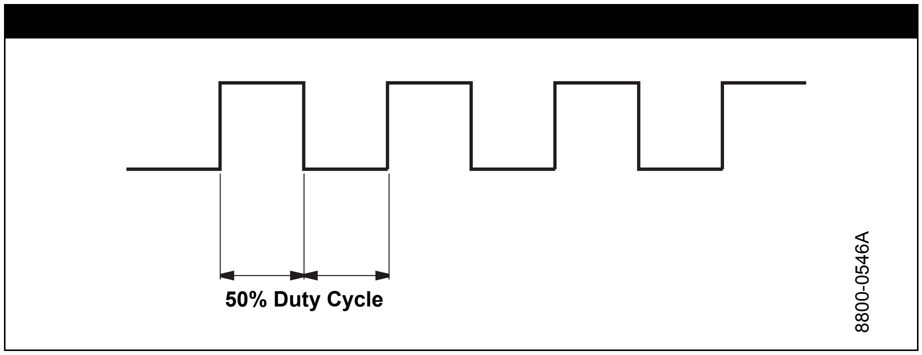
The flowmeter provides an isolated transistor switch-closure frequency output signal proportional to flow, as shown in Figure 2-12. The frequency limits are as follows:

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

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 2-15.

Figure 2-12. Example: The pulse output will maintain a 50 percent duty cycle for all frequencies

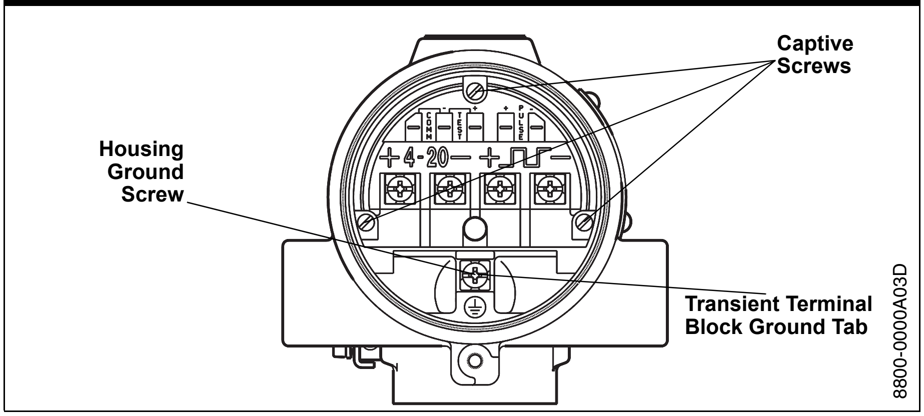



**NOTE**
When using pulse output, be sure to follow these precautions:

- 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 spool.

- 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 ground screw in the bottom center of the terminal block to provide a good ground connection.

Figure 2-13. The Transient Terminal Block




- 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 2-14. 4-20mA Wiring

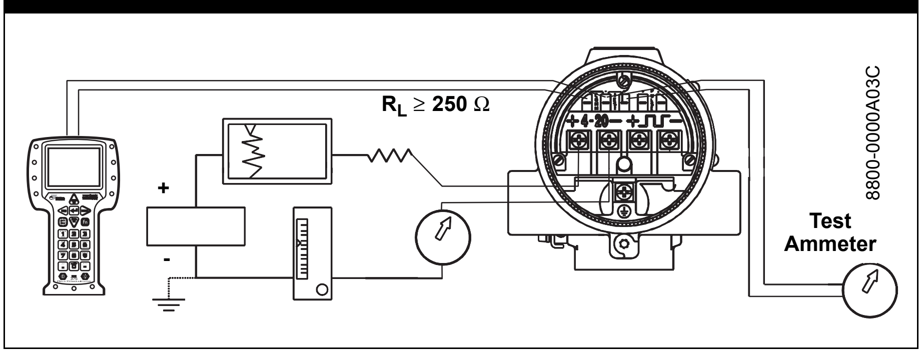
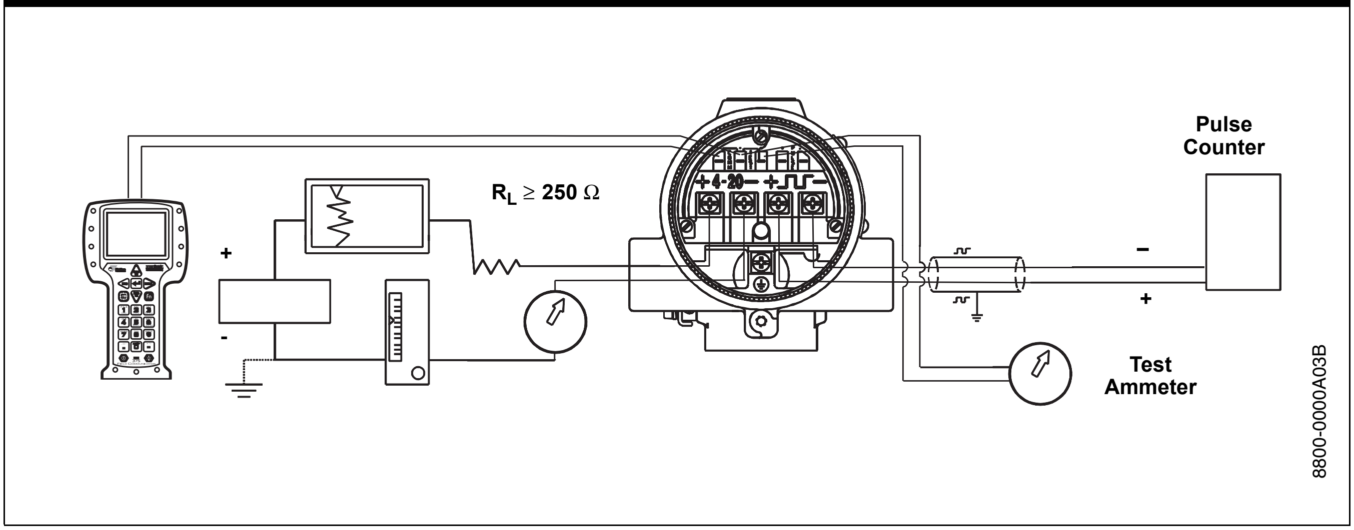


Figure 2-15. 4–20 mA and Pulse Wiring with Electronic Totalizer/ Counter




## Remote Electronics

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

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

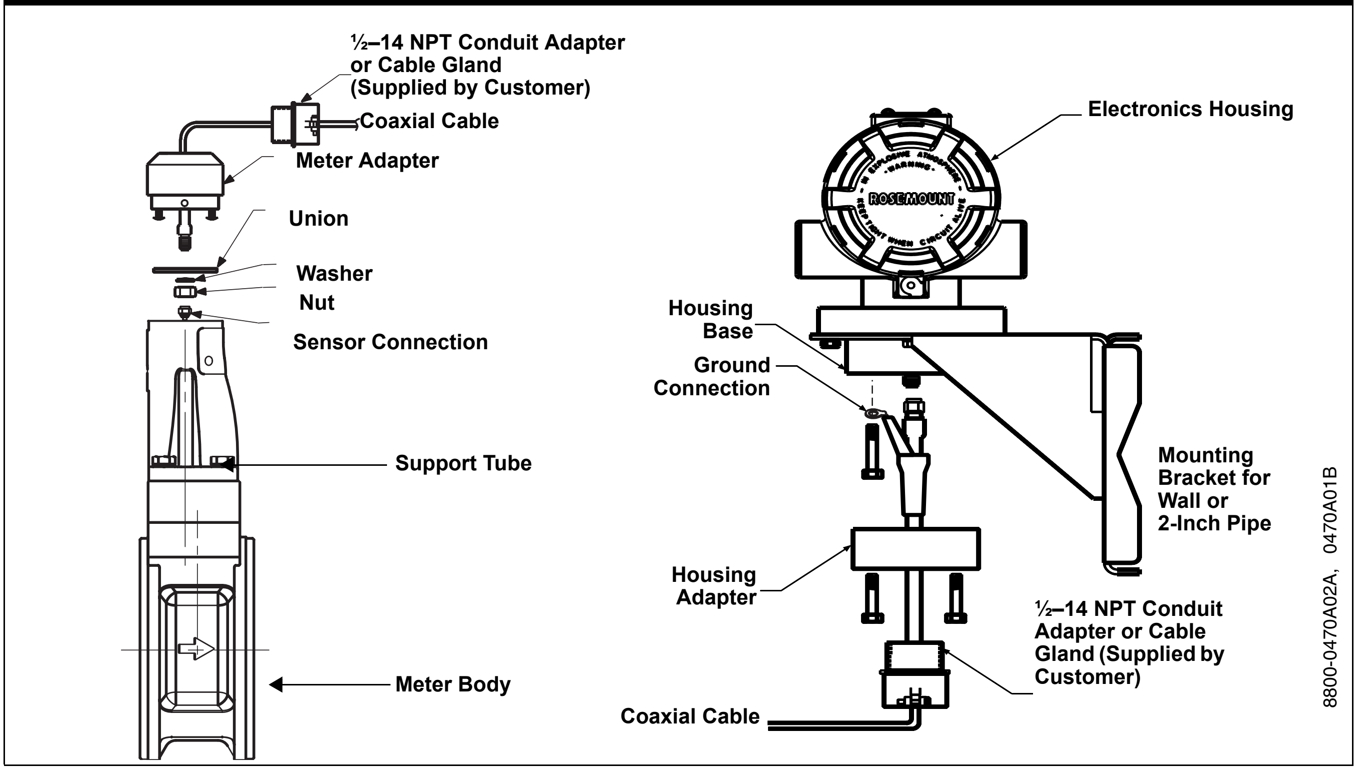
### Mounting

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 2-16 and the following instructions to connect the loose end of the coaxial cable to the electronics housing. (See “Remote Electronics Procedure” on page 5-23 if connecting/disconnecting the meter adapter to the meter body.)

Figure 2-16. Remote Electronics Installation




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 three screws.
11. Tighten the conduit adapter or cable gland to the housing adapter.

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

## Calibration

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

## SOFTWARE CONFIGURATION

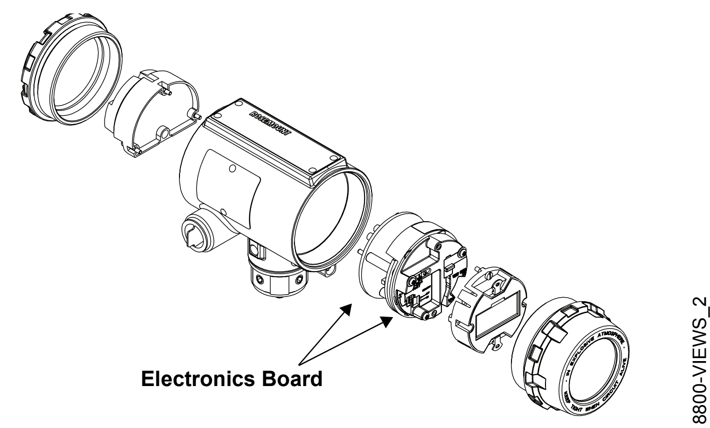
To complete the installation of the Rosemount 8800D Vortex Flowmeter, configure the software to meet the requirements of your application. If the flowmeter was pre-configured at the factory, it may be ready to install. If not, refer to Section 3: Operation.

## OPTIONS

## LCD INDICATOR

The LCD indicator (option M5) provides local indication of the output and abbreviated diagnostic messages governing operation of the flowmeter. The indicator is located on the circuit side of the flowmeter electronics, leaving direct access to the signal terminals. An extended cover is required to accommodate the indicator. Figure 2-17 shows the flowmeter fitted with the LCD indicator and extended cover.

Figure 2-17. Rosemount 8800D with Optional Indicator

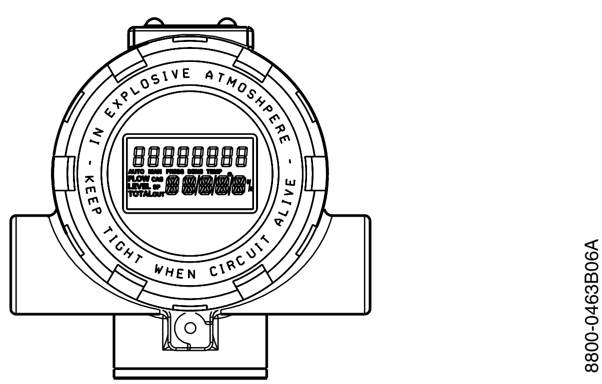


The indicator features an eight-character (and five alphanumeric) liquid crystal display that gives a direct reading of the digital signal from the microprocessor. During normal operation, the display can be configured to alternate between the following readings:

1. Primary variable in engineering units
2. Percent of range
3. Totalized flow
4. 4–20 mA electrical current output
5. Shedding Frequency
6. Electronics Temperature
7. Pulse Output Frequency
8. Process Temperature
   (MTA Option Only)
9. Mass Flow
10. Volume Flow
11. Velocity Flow
12. Calculated Process Density
    (MTA Option Only)

Figure 2-18 shows the indicator display with all segments lit.

Figure 2-18. Optional Liquid Crystal Display




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

## 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 (part number 8800-5640-1002). 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 2-17, 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. One of the four connectors on the back of the indicator assembly must be positioned to fit into the ten-pin connector on the electronic board stack.

Note the following LCD temperature limits:

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

## 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:

ASME B16.5 (ANSI)/IEEE C62.41 - 1980 (IEEE 587) Categories A, B.

3 kA crest (8 × 20 μs).

6 kV crest (1.2 × 50 μs).

6 kV/0.5 kA (0.5 μs, 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.

## 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 (part number 8800-5106-3002 or 8800-5106-3004).

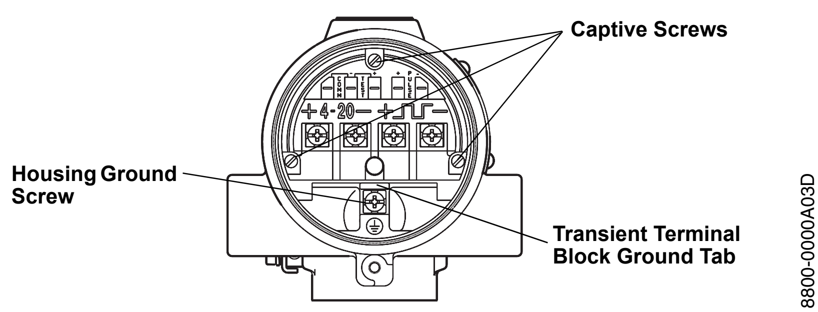
The transient protection kit includes the following:

- 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.
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 2-19. The Transient Terminal Block



# Section 3 Configuration



## REVIEW

| HART Comm. | 1, 5 |
|---|---|

Review the flowmeter configuration parameters set at the factory to ensure accuracy and compatibility with your particular application of the flowmeter. Once you have activated the Review function, scroll through the data list to check each variable in the configuration data list.

The last step of start-up and commissioning is to check the flowmeter output to ensure that the flowmeter is operating properly. Rosemount 8800D digital outputs include: primary variable as a percent of range, analog output, vortex shedding rate, pulse rate, mass flow, volumetric flow, velocity flow, and process temperature.

## PROCESS VARIABLES

| HART Comm. | 1, 1 |
|---|---|

The process variables for the Rosemount 8800D provide 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.

### Primary Variable (PV)

| HART Comm. | 1, 1, 1 |
|---|---|

*PV* – The measured value of the variable mapped to the primary variable. This can be either Temperature (MTA option only) or Flow. Flow variables are available as mass, 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 “View Other Variables” on page 3-2. Use the Process Variable Units function to select the units for your application.

## PV% of Range

| HART Comm. | 1, 1, 2 |
|---|---|

*Percent of Range* — The **primary variable as a percentage of range** provides a gauge as to where the current measurement 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 current flow is 10 gal/min, the percent of range is 50 percent.

## Analog Output

| HART Comm. | 1, 1, 3 |
|---|---|

*Analog Output* — 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 D/A Trim (Digital-to-Analog Trim).

## View Other Variables

| HART Comm. | 1, 1, 4 |
|---|---|

*View Other Variables* — Allows for the viewing and configuration of other variables such as flow units, totalizer operation, and pulse output.

### Volume Flow

| HART Comm. | 1, 1, 4, 1, 1 |
|---|---|

Allows the user to view the current volumetric flow value.

### Volume Flow Units

| HART Comm. | 1, 1, 4, 1, 2 |
|---|---|

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

**Volumetric Units** (1 bbl = 42 gal)

| | |
|---|---|
| gal/s | impgal/s |
| gal/min | impgal/min |
| gal/h | impgal/h |
| gal/d | impgal/d |
| ACFS | L/s |
| ACFM | L/min |
| ACFH | L/h |
| ACFD | L/d |
| bbl/s | ACMS |
| bbl/min | ACMM |
| bbl/h | ACMH |
| bbl/d | ACMD |
| | MACMD |

**Standard/Normal Flow Units**

StdCuft/min

SCFH

NCMM

NmlCum/h

NCMD

---

**NOTE**
When configuring **Standard** or **Normal Flow** units to the volumetric flow, a density ratio must be provided. See the Density/Density Ratio on page 3-9.

---

### Special Units

| | |
|---|---|
| HART Comm. | 1, 1, 4, 1, 3 |

**Special Units** allows you to create flow rate units that are not among the standard options. They can be volumetric only. Configuration of a special unit involves entry of these values: base volume unit, base time unit, user defined unit and conversion number. Suppose you want the Rosemount 8800D to display flow in barrels per minute instead of gallons per minute, and one barrel is equal to 31.0 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 Volume Unit

| | |
|---|---|
| HART Comm. | 1, 1, 4, 1, 3, 1 |

**Base Volume Unit** is the unit from which the conversion is made. You must select one of the HART Communicator defined unit options:

- Gallons (gal)
- Liters (L)
- Imperial gallons (Impgal)
- Cubic meters (Cum)
- Barrels (bbl) where 1 bbl=42 gal
- Cubic Feet (Cuft)

### Base Time Unit

| | |
|---|---|
| HART Comm. | 1, 1, 4, 1, 3, 2 |

**Base Time Unit** provides the time unit from which to calculate the special units. For example, if your special units is a volume per minute, select minutes. Choose from the following units:

- Seconds (s)
- Minutes (min)
- Hours (h)
- Days (d)

### User Defined Unit

| | |
|---|---|
| HART Comm. | 1, 1, 4, 1, 3, 3 |

**User Defined Unit** is a format variable that provides a record of the flow units to which you are converting. The LCD on the Rosemount 8800D will display the actual units you define. The HART communicator will simply display “SPCL.” There are four characters available to store the new units designation.

### Conversion Number

| | |
|---|---|
| HART Comm. | 1, 1, 4, 1, 3, 4 |

**Conversion Number** is 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 you are converting from gallons to barrels and there are 31 gallons in a barrel, the conversion factor is 31. The conversion equation is as follows (where barrels is the new volume unit):

1 gallon = 0.032258 bbl.

## Mass Flow

| | |
|---|---|
| HART Comm. | 1, 1, 4, 2 |

Allows the user to view the current mass flow value and units. Also allows the user to configure the mass flow units.

### Mass Flow

| | |
|---|---|
| HART Comm. | 1, 1, 4, 2, 1 |

Displays the current mass flow value and units.

### Mass Units

| | |
|---|---|
| HART Comm. | 1, 1, 4, 2, 2 |

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

**Mass Flow Units**

| | |
|---|---|
| lb/s | Ston/min |
| lb/min | Ston/h |
| lb/h | Ston/d |
| lb/d | MetTon/min |
| kg/s | MetTon/h |
| kg/min | MetTon/d |
| kg/h | g/s |
| kg/d | g/min |
| | g/h |

---

**NOTE**
If you select a Mass Units option, you must enter process density in your configuration. See the Density/Density Ratio section on page 3-9.

---

### Velocity Flow

| | |
|---|---|
| HART Comm. | 1, 1, 4, 3 |

Allows the user to view the current velocity flow value and units. Also allows the user to configure the velocity flow units.

#### Velocity Flow

| | |
|---|---|
| HART Comm. | 1, 1, 4, 3, 1 |

Displays the current velocity flow value and units.

#### Velocity Units

| | |
|---|---|
| HART Comm. | 1, 1, 4, 3, 2 |

Allows the user to select the velocity units from the available list.
ft/s
m/s

#### Velocity Measured Base

| | |
|---|---|
| HART Comm. | 1, 1, 4, 3, 3 |

**Velocity Measured Base** will determine if the velocity measurement is based on the mating pipe ID or the spool (meter body) ID. This is important for Reducer™ Vortex Applications.

### Totalizer

| | |
|---|---|
| HART Comm. | 1, 1, 4, 4 |

*Totalizer* — **Totalizer** tallies the total amount of liquid or gas that has passed through the flowmeter since the totalizer was last reset.

It enables you to change the settings of the totalizer.

#### Total

| | |
|---|---|
| HART Comm. | 1, 1, 4, 4, 1 |

*Total* — 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

#### Start

| HART Comm. | 1, 1, 4, 4, 2 |
|---|---|

*Start* — Starts the totalizer counting from its current value.

#### Stop

| HART Comm. | 1, 1, 4, 4, 3 |
|---|---|

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

#### Reset

| HART Comm. | 1, 1, 4, 4, 4 |
|---|---|

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

#### Totalizer Config

| HART Comm. | 1, 1, 4, 4, 5 |
|---|---|

*Totalizer Config* — Used to configure the **flow** parameter (volume, mass, velocity).

**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.

### Pulse Frequency

| HART Comm. | 1, 1, 4, 5 |
|---|---|

Allows users to view the pulse output **Frequency** value. To configure the pulse output, refer to the section on pulse output found on page 4-9.

### Vortex Frequency

| HART Comm. | 1, 1, 4, 6 |
|---|---|

Allows users to view the shedding **Frequency** directly off of the sensor.

### Electronics Temperature

| HART Comm. | 1, 1, 4, 7 |
|---|---|

Allows users to view the electronics temp value and units. Also allows the user to configure the units for the electronics temperature.

### Electronics Temperature

| | |
|---|---|
| HART Comm. | 1, 1, 4, 7, 1 |

Displays the current electronics temperature value and units.

### Electronics Temperature Unit

| | |
|---|---|
| HART Comm. | 1, 1, 4, 7, 2 |

Allows the user to select the units for electronics temperature from the available list.

- deg C
- deg F

## Calculated Process Density

| | |
|---|---|
| HART Comm. | 1, 1, 4, 8 |

Allows users to view the calculated process density value when the vortex is configured for temperature compensated steam applications. Also allows the user to configure the calculated density units.

### Process Density

| | |
|---|---|
| HART Comm. | 1, 1, 4, 8, 1 |

Displays the current calculated process density value.

### Density Units

| | |
|---|---|
| HART Comm. | 1, 1, 4, 8, 2 |

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

- g/cucm ($cm^3$)
- g/L
- kg/cum ($m^3$)
- lb/cuft ($ft^3$)
- lb/cuin ($in^3$)

## Process Temperature

| | |
|---|---|
| HART Comm. | 1, 1, 4, 9 |

Allows users to view the process temperature value when the vortex has the temperature sensor option. Also allows the user to configure the process temperature units.

### Process Temperature

| | |
|---|---|
| HART Comm. | 1, 1, 4, 9, 1 |

Displays the current process temperature value.

### Process Temperature Units

| | |
|---|---|
| HART Comm. | 1, 1, 4, 9, 2 |

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

- deg C
- deg F
- deg R
- Kelvin

### T/C Failure Mode

| | |
|---|---|
| HART Comm. | 1, 1, 4, 9, 3 |

Allows the user to configure the temperature sensor failure mode. In the event that the thermocouple 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 page 3-9.

**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.

## Cold Junction (CJ) Temperature

| | |
|---|---|
| HART Comm. | 1, 1, 4, Scroll to bottom of list |

Allows users to view the thermocouple cold junction temperature value when the vortex has the temperature sensor option. Also allows the user to configure the CJ temperature units.

### CJ Temperature

| | |
|---|---|
| HART Comm. | 1, 1, 4, -, 1 |

Displays the current thermocouple cold junction temperature value.

### CJ Temperature Units

| | |
|---|---|
| HART Comm. | 1, 1, 4, -, 1 |

Allows the user to configure the units for the thermocouple cold junction temperature from the available list.

- deg C
- deg F

## BASIC SETUP

| | |
|---|---|
| HART Comm. | 1, 3 |

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.

## Tag

| | |
|---|---|
| HART Comm. | 1, 3, 1 |

**Tag** is 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.

## Process Config

| | |
|---|---|
| HART Comm. | 1, 3, 2 |

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

| | |
|---|---|
| HART Comm. | 1, 3, 2, 1 |

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

Without Temperature Sensor
With Temperature Sensor

### Process Fluid

| | |
|---|---|
| HART Comm. | 1, 3, 2, 2 |

Select the fluid type: either Liquid, Gas/Steam, Tcomp Sat Steam. Tcomp Sat Steam requires the MTA Option and provides a temperature compensated mass flow output for saturated steam.

### Fixed Process Temperature

| | |
|---|---|
| HART Comm. | 1, 3, 2, 3 |

Process Temperature is 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.

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

**NOTE**
The Fixed Process Temperature may also be changed under Calculate Density Ratio.

### Density/Density Ratio

| | |
|---|---|
| HART Comm. | 1, 3, 2, 4 |

When configuring a meter for mass flow units, a density value needs to be entered. When configuring a meter for Standard and Normal Volumetric flow units a density ratio will be required.

### Density Ratio

| | |
|---|---|
| HART Comm. | 1, 3, 2, 4, 1 |

Configure the **Density Ratio** in one of two ways:

1. Enter **Density Ratio** to convert from actual flow rate to standard flow rate.
2. Enter the process and base conditions. (The Rosemount 8800D electronics will then calculate the density ratio for you).

---

**NOTE**
Be careful to calculate and enter the correct conversion factor. Standard flow is calculated with the conversion factor you enter. Any error in the factor entered will result in an error in the standard flow measurement. If pressure and temperature changes over time, use actual volumetric flow units. The Rosemount 8800D does not compensate for changing temperature and pressure.

---

### Density Ratio

| | |
|---|---|
| HART Comm. | 1, 3, 2, 4, 1, 1 |

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

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

$$\text{DensityRatio} = \frac{T_b x P_f x Z_b}{T_f x P_b x Z_f}$$

### Calculate Density Ratio

| | |
|---|---|
| HART Comm. | 1, 3, 2, 4, 1, 2 |

**Calculate Density Ratio** will calculate the density ratio (shown above) based on user entered process and base conditions.

### Operating Conditions

| | |
|---|---|
| HART Comm. | 1, 3, 2, 4, 1, 2, 1 |

$T_f$ = absolute temperature at actual (flowing) conditions in degrees Rankine or Kelvin. (The transmitter will convert from degrees Fahrenheit or degrees Celsius to degrees Rankine or Kelvin respectively.)

$P_f$ = absolute pressure at actual (flowing) conditions psia or KPa absolute. (The transmitter will convert from psi, bar, kg/sqcm, kpa, or mpa to psi or kpa for calculation. Note that pressure values must be absolute.)

$Z_f$ = compressibility at actual (flowing) conditions (dimensionless)

### Base Conditions

| | |
|---|---|
| HART Comm. | 1, 3, 2, 4, 1, 2, 2 |

$T_b$ = absolute temperature at standard (base) conditions degrees Rankine or Kelvin. (The transmitter will convert from degrees Fahrenheit or degrees Celsius to degrees Rankine or Kelvin respectively.)

$P_b$ = absolute pressure at standard (base) conditions psia or KPa absolute. (The transmitter will convert from psi, bar, kg/sqcm, kpa, or mpa to psi or kpa for calculation. Note that pressure values must be absolute.)

$Z_b$ = compressibility at standard (base) conditions (dimensionless)

Example

Configure the Rosemount 8800D to display flow in standard cubic feet per minute (SCFM). (Fluid is hydrogen flowing at conditions of 170 °F and 100 psia.) Assume base conditions of 59 °F and 14.696 psia.)

$$\text{DensityRatio} = \frac{518.57\ °\text{R} \times 100\ \text{psia} \times 1.0006}{629.67\ °\text{R} \times 14.7\ \text{psia} \times 1.0036} = 5.586$$

### Fixed Process Density

| | |
|---|---|
| HART Comm. | 1, 3, 2, 4, 2 |

**Process Density** is required only if you have designated mass units for your flow rate units. You will first be prompted for density units. It is required for the conversion from volumetric units to mass units. For example, if you have set flow units to kg/sec rather than gal/sec, a density is required to convert the measured volumetric flow into the desired mass flow.

**NOTE**
If mass 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 is calculated using this user-entered density, and any error in this number will cause error in the mass flow measurement. If fluid density is changing over time, it is recommended that volumetric flow units be used.

## Reference K-Factor

| | |
|---|---|
| HART Comm. | 1, 3, 3 |

The reference K-factor is a factory calibration number relating the flow through the meter to the shedding frequency measured by the electronics. Every meter manufactured by Emerson is run through a water calibration to determine this value.

## Flange Type

| HART Comm. | 1, 3, 4 |
|---|---|

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

- Wafer
- ANSI 150
- ANSI 150 Reducer
- ANSI 300
- ANSI 300 Reducer
- ANSI 600
- ANSI 600 Reducer
- ANSI 900
- ANSI 900 Reducer
- ANSI 1500
- ANSI 1500 Reducer
- PN10
- PN10 Reducer
- PN16
- PN16 Reducer
- PN25
- PN25 Reducer
- PN40
- PN40 Reducer
- PN64
- PN64 Reducer
- PN100
- PN100 Reducer
- PN160
- PN160 Reducer
- PN250
- PN250 Reducer
- JIS 10K
- JIS 10K Reducer
- JIS 16K/20K
- JIS 16K/20K Reducer
- JIS 40K
- JIS 40K Reducer
- Spcl

## Mating Pipe ID (Inside Diameter)

| HART Comm. | 1, 3, 5 |
|---|---|

The **Pipe ID (Inside Diameter)** of the pipe adjacent to the flow meter can cause entrance effects that may alter flowmeter readings. You must specify the exact inside diameter of the pipe to correct for these effects. Enter the appropriate value for this variable.

Pipe ID values for schedule 10, 40, and 80 piping are given in Table 3 -1. If the piping in your application is not one of these, you may need to contact the manufacturer for exact Pipe ID.

Table 3-1. 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) |
| 6 (150) | 6.357 (161.5) | 6.065 (154.1) | 5.716 (145.2) |
| 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) |

## Variable Mapping

| HART Comm. | 1, 3, 6 |
|---|---|

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

### Primary Variable (PV)

| HART Comm. | 1, 3, 6, 1 |
|---|---|

Selection for this Variable are Mass Flow, Volumetric Flow, Velocity Flow, and Process Temperature. The Primary Variable is the variable mapped to the analog output.

### Secondary Variable (SV)

| HART Comm. | 1, 3, 6, 2 |
|---|---|

Selections for this Variable include all Variables that can be mapped to PV, and also Vortex Frequency, Pulse Output Frequency, Totalizer Value, Calculated Process Density, Electronics Temperature, and Cold Junction (CJ) Temperature.

### Tertiary Variable (TV)

| HART Comm. | 1, 3, 6, 3 |
|---|---|

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

### Quaternary Variable (4V)

| HART Comm. | 1, 3, 6, 4 |
|---|---|

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

## PV Units

| HART Comm. | 1, 3, 7 |
|---|---|

Selections for this include all units available for the selection of PV. This will set the units for the flow rate or process temperature.

## Range Values

| HART Comm. | 1, 3, 8 |
|---|---|

**Range Values** enables you to maximize resolution of 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)

| HART Comm. | 1, 3, 8, 1 |
|---|---|

This is the 20 mA set point for the meter.

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

| HART Comm. | 1, 3, 8, 2 |
|---|---|

This is the 4 mA set point for the meter, and is typically set to 0 when the PV is a Flow Variable.

## PV Damping

| HART Comm. | 1, 3, 9 |
|---|---|

**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. This will not affect the Pulse Output, Total, or other Digital Information.

The default damping value is 2.0 seconds. This can be reset 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.

## Auto Adjust Filter

| HART Comm. | 1, 4, 3, 1, 4 |
|---|---|

The **Auto Adjust Filter** is a function that can be used to optimize the range of the flowmeter based on the density of the fluid. The electronics uses process density to calculate the minimum measurable flow rate, while retaining at least a 4:1 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.

Figure 3-1. HART Communicator Menu Tree for the Rosemount 8800D

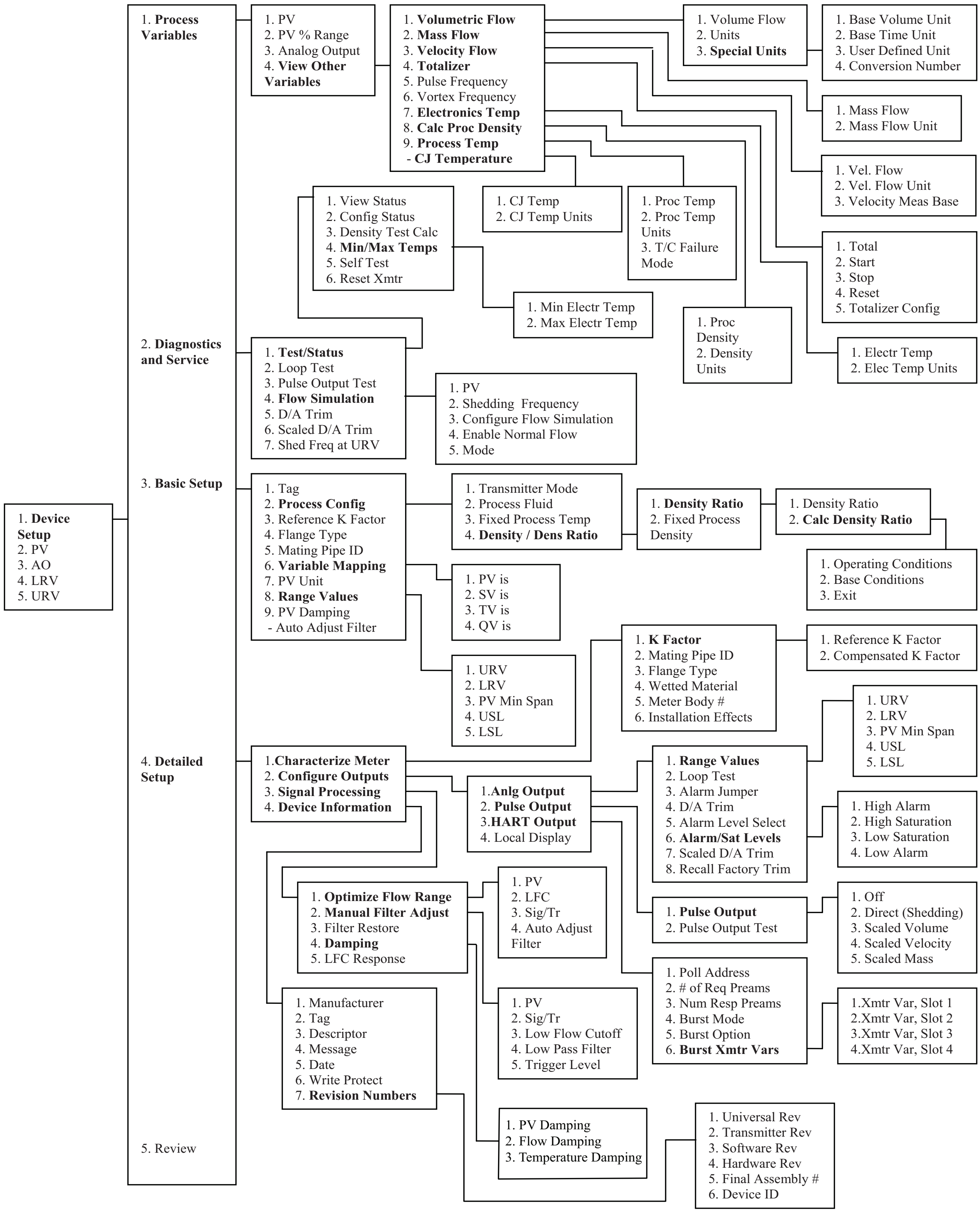


Table 3-2. HART Fast Key Sequences for the Rosemount 8800D

| Function | HART Fast Keys |
|---|---|
| Alarm Jumper | 1, 4, 2, 1, 3 |
| Analog Output | 1, 4, 2, 1 |
| Auto Adjust Filter | 1, 4, 3, 2, 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 Variable | 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, 4, 1 |
| Device ID | 1, 4, 4, 7, 6 |
| Electronics Temp | 1, 1, 4, 7 |
| 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 | 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 |
| 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 | HART 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, 3 |
| 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 |
| Transmitter Test | 1, 2, 1, 3 |
| 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, 5 |
| 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 3-1 and Table 3-2 are the latest versions of the Rosemount 8800D Menu Tree and Fast Key codes.

# 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 HART 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 that they reflect the current application.

## DIAGNOSTICS/SERVICE

| | |
|---|---|
| HART Comm. | 1, 2 |

Use the following 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 the HART Communicator or other HART-based communications device.

### Test/Status

| | |
|---|---|
| HART Comm. | 1, 2, 1 |

Under **Test/Status** choose from View Status or Self Test.

#### View Status

| | |
|---|---|
| HART Comm. | 1, 2, 1, 1 |

Allows you to view any error messages that may have occurred.

#### Configuration Status

| | |
|---|---|
| HART Comm. | 1, 2, 1, 2 |

Configuration status allows you to check the validity of the transmitter configuration

#### Density Test Calc

| | |
|---|---|
| HART Comm. | 1, 2, 1, 3 |

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

#### Min/Max Electronics Temperatures

| | |
|---|---|
| HART Comm. | 1, 2, 1, 4 |

Allows the user to view the minimum and maximum temperatures that the electronics have been exposed to.

##### Min Electronics Temp

| | |
|---|---|
| HART Comm. | 1, 2, 1, 4, 1 |

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

##### Max Electronics Temp

| | |
|---|---|
| HART Comm. | 1, 2, 1, 4, 2 |

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

#### Self Test

| | |
|---|---|
| HART Comm. | 1, 2, 1, 5 |

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.

#### Reset Transmitter

| | |
|---|---|
| HART Comm. | 1, 2, 1, 6 |

Restarts the transmitter - same as cycling power.

### Loop Test

| | |
|---|---|
| HART Comm. | 1, 2, 2 |

**Loop Test** verifies the 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.

### Pulse Output Test

| | |
|---|---|
| HART Comm. | 1, 2, 3 |

**Pulse Output Test** is a fixed frequency mode test that checks the integrity of the pulse loop. It tests that all connections are good and that the pulse output is running on the loop.

### Flow Simulation

| | |
|---|---|
| HART Comm. | 1, 2, 4 |

**Flow Simulation** enables you to check the electronics functionality. This can be verified with either the Flow Simulation Internal or Flow Simulation External method. PV must be Volume Flow, Velocity Flow, or Mass Flow before Flow Simulation can be used.

#### PV

| | |
|---|---|
| HART Comm. | 1, 2, 4, 1 |

Shows the flow value in current engineering units for the flow simulation.

### Shedding Frequency

| | |
|---|---|
| HART Comm. | 1, 2, 4, 2 |

Shows the shedding frequency for the flow simulation.

### Configure Flow Simulation

| | |
|---|---|
| HART Comm. | 1, 2, 4, 3 |

Allows you to configure your flow simulation (internal or external).

#### Simulate Flow Internal

| | |
|---|---|
| HART Comm. | 1, 2, 4, 3, 1 |

The simulate flow internal function will automatically electronically disconnect the sensor and enable you to configure the internal flow simulation (fixed or varying).

#### Fixed Flow

| | |
|---|---|
| HART Comm. | 1, 2, 4, 3, 1, 1 |

The fixed flow simulation signal can be entered in either a percent of range or flow rate in current engineering units. This simulation locks the Vortex in to the specific flow rate entered.

#### Varying Flow

| | |
|---|---|
| HART Comm. | 1, 2, 4, 3, 1, 2 |

The minimum and maximum flowrate can be entered in either percent of range or as a flow rate in current engineering units. The ramp time can be entered in seconds from a minimum of 0.533 seconds to a maximum of 34951 seconds. This simulation causes the Vortex meter to continuously ramp from the minimum entered rate to the maximum entered rate and back over the ramp time.

#### Simulate Flow External

| | |
|---|---|
| HART Comm. | 1, 2, 4, 3, 2 |

Simulate flow external allows you to disconnect the sensor electronically so an external frequency source can be used to test and verify the electronics.

### Enable Normal Flow

| | |
|---|---|
| HART Comm. | 1, 2, 4, 4 |

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

**Mode**

| | |
|---|---|
| HART Comm. | 1, 2, 4, 5 |

Mode allows you to view which flow simulation mode you are in:

- Internal (flow simulation – internal)
- Snsr Offln (flow simulation – external)
- Norm Flow (normal flow operation)

## D/A Trim

| | |
|---|---|
| HART Comm. | 1, 2, 5 |

**D/A Trim (Digital-to-Analog Trim)** enables you to check and trim 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 D/A 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.

## Scaled D/A Trim

| | |
|---|---|
| HART Comm. | 1, 2, 6 |

**Scaled D/A Trim** enables you to calibrate the flowmeter analog output using a different scale than the standard 4-20 mA output scale. Non-scaled D/A Trimming (described above), is typically performed using an ammeter where calibration values are entered in units of milliamperes. Both non-scaled D/A trimming and scaled D/A trimming allow you to trim the 4-20mA output to approximately ±5% of the nominal 4mA end point and ±3% of the nominal 20mA end point. Scaled D/A Trimming 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 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 375) your trim points from 4-20mA to 4-20mA 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.

## Shed Freq at URV

| | |
|---|---|
| HART Comm. | 1, 2, 7 |

**Shed Freq at URV** function gives the shedding frequency corresponding to your URV (URV = Upper Range Value). If the 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.

## ADVANCED FUNCTIONALITY

The Rosemount 8800D enables you to configure the flowmeter for a wider range of applications and special situations. These functions are grouped as follows under Detailed Set-Up:

## DETAILED SET-UP

| | |
|---|---|
| HART Comm. | 1, 4 |

- Characterize Meter
- Configure Outputs
- Signal Processing
- Device Information

## Characterize Meter

| | |
|---|---|
| HART Comm. | 1, 4, 1 |

The Meter Body variables provide configuration data that are unique to your Rosemount 8800D. The settings of these variables can effect the compensated K-factor on which the primary variable is based. This data is provided during factory configuration and should not be changed unless the physical make-up of your Rosemount 8800D is changed.

### K-Factor

| | |
|---|---|
| HART Comm. | 1, 4, 1, 1 |

The HART Communicator provides information on Reference and Compensated **K-factor** values.

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.

### Mating Pipe I.D.

| | |
|---|---|
| HART Comm. | 1, 4, 1, 2 |

The inside diameter of the pipe adjacent to the flow meter can cause entrance effects that may alter flowmeter readings. The exact inside diameter of the pipe must be specified to correct for these effects. Enter the appropriate value for this variable.

**Mating Pipe ID** values for schedule 10, 40, and 80 piping are given in Table 3-1 on page 3-13. If the piping in your application is not one of these, you may need to contact the manufacturer for exact Pipe ID.

### Flange Type

| | |
|---|---|
| HART Comm. | 1, 4, 1, 3 |

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

- Wafer
- ANSI 150
- ANSI 150 Reducer
- ANSI 300
- ANSI 300 Reducer
- ANSI 600
- ANSI 600 Reducer
- ANSI 900
- ANSI 900 Reducer
- ANSI 1500
- ANSI 1500 Reducer
- PN10
- PN10 Reducer
- PN16
- PN16 Reducer
- PN25
- PN25 Reducer
- PN40
- PN40 Reducer
- PN64
- PN64 Reducer
- PN100
- PN100 Reducer
- PN160
- PN160 Reducer
- PN250
- PN250 Reducer
- JIS 10K
- JIS 10K Reducer
- JIS 16K/20K
- JIS 16K/20K Reducer
- JIS 40K
- JIS 40K Reducer
- Spcl

#### Wetted Material

| HART Comm. | 1, 4, 1, 4 |
|---|---|

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

- 316 SST
- Hastelloy-C®
- Carbon Steel
- Spcl

#### Meter Body Number

| HART Comm. | 1, 4, 1, 5 |
|---|---|

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

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

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

#### Installation Effect

| HART Comm. | 1, 4, 1, 6 |
|---|---|

**Installation Effect** enables you to compensate the flowmeter for installation effects. See reference graphs located in Technical Data Sheet 00816-0100-3250 for the percent of K-factor shift based on entrance effects of upstream disturbances. This value is entered as a percentage of the range of -1.5% to +1.5%.

## Configure Outputs

| HART Comm. | 1, 4, 2 |
|---|---|

The Rosemount 8800D is digitally adjusted at the factory using precision equipment to ensure accuracy. You should be able to install and operate the flowmeter without a D/A Trim.

#### Analog Output

| HART Comm. | 1, 4, 2, 1 |
|---|---|

For maximum accuracy, calibrate the analog output and, if necessary, trim for your system loop. The D/A Trim procedure alters the conversion of the digital signal into an analog 4–20 mA output.

##### Range Values

| HART Comm. | 1, 4, 2, 1, 1 |
|---|---|

**Range Values** enables you to maximize resolution of 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.

### Loop Test

| | |
|---|---|
| HART Comm. | 1, 4, 2, 1, 2 |

**Loop Test** verifies the 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.

### Alarm Jumper

| | |
|---|---|
| HART Comm. | 1, 4, 2, 1, 3 |

**Alarm Jumper** lets you verify the alarm jumper setting.

### D/A Trim (Digital-to-Analog Trim)

| | |
|---|---|
| HART Comm. | 1, 4, 2, 1, 4 |

**Digital-to-Analog Trim** enables you to check and trim 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 D/A 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.

### Alarm Level Select

| | |
|---|---|
| HART Comm. | 1, 4, 2, 1, 5 |

Select the **Alarm level** of the transmitter. Either Rosemount standard or NAMUR compliant.

### Alarm / Sat Levels

| | |
|---|---|
| HART Comm. | 1, 4, 2, 1, 6 |

Displays Alarm and Saturation mA output levels.

**NOTE**
Alarm and Saturation levels can be found in the specifications section.

### Scaled D/A Trim

| HART Comm. | 1, 4, 2, 1, 7 |
|---|---|

**Scaled D/A Trim** enables you to calibrate the flowmeter analog output using a different scale than the standard 4-20 mA output scale. Non-scaled D/A Trimming (described above), is typically performed using an ammeter where calibration values are entered in units of milliamperes. Both non-scaled D/A trimming and scaled D/A trimming allow you to trim the 4-20mA output to approximately ±5% of the nominal 4mA end point and ±3% of the nominal 20mA end point. Scaled D/A Trimming 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 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 275) your trim points from 4-20mA to 4-20mA 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.

### Recall Factory Trim

| HART Comm. | 1, 4, 2, 1, 8 |
|---|---|

**Recall Factory Trim** enables you to return to the original factory trim values.

## Pulse Output

| HART Comm. | 1, 4, 2, 2 |
|---|---|

**Pulse Output** enables you to configure the Pulse Output.

**NOTE**
The HART Communicator will allow configuration of the pulse features even if the pulse option (Option P) was not ordered.

### Pulse Output

| HART Comm. | 1, 4, 2, 2, 1 |
|---|---|

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 four methods for configuring the pulse output:

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

**Direct (Shedding Frequency)**

| | |
|---|---|
| HART Comm. | 1, 4, 2, 2, 1, 2 |

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 Volume**

| | |
|---|---|
| HART Comm. | 1, 4, 2, 2, 1, 3 |

This mode allows you to configure 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.)

**Pulse Scaling Rate**

| | |
|---|---|
| HART Comm. | 1, 4, 2, 2, 1, 3, 1 |

Pulse scaling rate allows the user to set a certain volume flow rate to a desired Frequency.

For example:

1. Enter a flow rate of 100 gallons per minute.
2. Enter a frequency of 10,000 Hz.

**Pulse Scaling Unit**

| | |
|---|---|
| HART Comm. | 1, 4, 2, 2, 1, 3, 2 |

Pulse scaling unit allows the user to set one pulse equal to a desired volume.

For example:

1 pulse = 100 gal. Enter 100 for the Flow Rate.

**Scaled Velocity**

| | |
|---|---|
| HART Comm. | 1, 4, 2, 2, 1, 4 |

This mode allows you to configure the pulse output based on a velocity Flow Rate.

**Pulse Scaling Rate**

| | |
|---|---|
| HART Comm. | 1, 4, 2, 2, 1, 4, 1 |

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

For example:

10 ft/sec = 10,000HZ

1. Enter a Flow rate of 10 ft/sec.
2. Enter a Frequency of 10,000HZ.

**Pulse Scaling Unit**

| | |
|---|---|
| HART Comm. | 1, 4, 2, 2, 1, 4, 2 |

Allows the user to set one pulse equal to a desired distance.

For example:

1 pulse = 10 ft. Enter 10 for the distance.

**Scaled Mass**

| | |
|---|---|
| HART Comm. | 1, 4, 2, 2, 1, 5 |

This mode allows you to configure the pulse output based on a mass Flow Rate. If Process Fluid = Tcomp Sat Steam, this is a temperature compensated mass flow.

**Pulse Scaling Rate**

| | |
|---|---|
| HART Comm. | 1, 4, 2, 2, 1, 5, 1 |

Allows the user to set a certain mass 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 Unit**

| | |
|---|---|
| HART Comm. | 1, 4, 2, 2, 1, 5, 2 |

Allows the user to set one pulse equal to a desired mass.

For example:

1 pulse = 1000lbs.

Enter 1000 for the mass.

**Pulse Output Test**

| | |
|---|---|
| HART Comm. | 1, 4, 2, 2, 2 |

**Pulse Output Tes**t is a 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.

**HART Output**

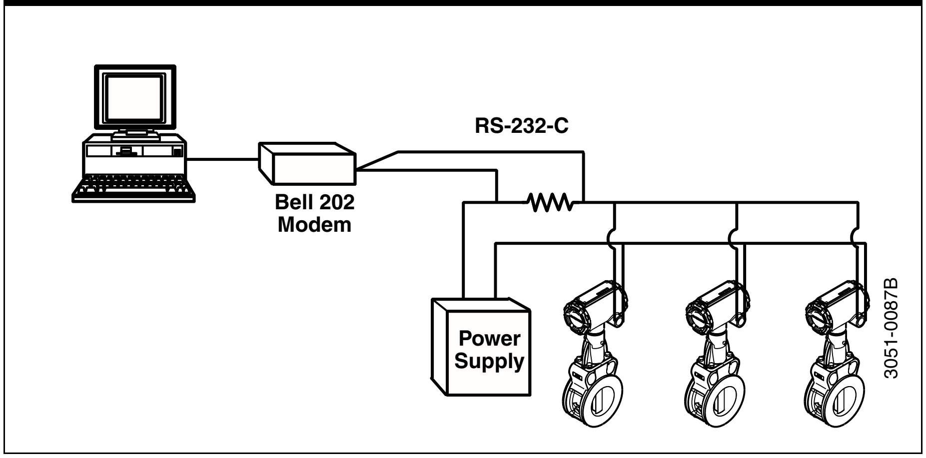
| | |
|---|---|
| HART Comm. | 1, 4, 2, 3 |

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 1-3 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 Multidrop Network




**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 alarm signal.

### Poll Address

| | |
|---|---|
| HART Comm. | 1, 4, 2, 3, 1 |

**Poll Address** enables you to set 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. To set or change the flowmeter address, establish communication with the selected Rosemount 8800D in the loop.

### Auto Poll

| | |
|---|---|
| HART Comm. | 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. If a single connected device has an address other than zero and auto polling is off, the device will not be found either.

**Number of Required Preams**

| | |
|---|---|
| HART Comm. | 1, 4, 2, 3, 2 |

This is the number of preambles required by the 8800D for HART communications.

**Number of Response Preams**

| | |
|---|---|
| HART Comm. | 1, 4, 2, 3, 3 |

This is the number of preambles sent by the transmitter in response to any host request.

**Burst Mode**

| | |
|---|---|
| HART Comm. | 1, 4, 2, 3, 4 |

### 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.

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

| | |
|---|---|
| HART Comm. | 1, 4, 2, 3, 5 |

**Burst Option** enables you to select the variables to broadcast over the burst transmitter. Choose one of the following options:

*PV*–Selects the process variable for broadcast over the burst transmitter.

*Percent Range/Current*–Selects the process variable as percent of range and analog output variables for broadcast over the burst transmitter.

*Process vars/crnt*–Selects the process variables and analog output variables for broadcast over the burst transmitter.

*Dynamic Vars*–Burst all dynamic variables in the transmitter.

*Xmtr Vars*–Allows the user to define custom burst variables. Select variables from the list below:

| |
|---|
| Volume Flow |
| Velocity Flow |
| Mass Flow |
| Vortex Frequency |
| Pulse Output Frequency |
| Totalizer Value |
| Process Temperature |
| Calculated Process Density |
| Electronics Temperature |

### Burst XMTR Vars

| | |
|---|---|
| HART Comm. | 1, 4, 2, 3, 6 |

Allows users to select and define Burst Variables.

### XMTR Variable Slot 1

| | |
|---|---|
| HART Comm. | 1, 4, 2, 3, 6, 1 |

User selected Burst Variable 1.

### XMTR Variable Slot 2

| | |
|---|---|
| HART Comm. | 1, 4, 2, 3, 6, 2 |

User selected Burst Variable 2.

### XMTR Variable Slot 3

| | |
|---|---|
| HART Comm. | 1, 4, 2, 3, 6, 3 |

User selected Burst Variable 3.

### XMTR Variable Slot 4

| | |
|---|---|
| HART Comm. | 1, 4, 2, 3, 6, 4 |

User selected Burst Variable 4.

### Local Display

| HART Comm. | 1, 4, 2, 4 |
|---|---|

The **Local Display** function on the Rosemount 8800D allows you to select which variables are shown on the optional (M5) local display. Choose from the following variables:

- Primary Variable
- Loop Current
- Percent of Range
- Totalizer
- Shedding Frequency
- Mass Flow
- Velocity Flow
- Volumetric Flow
- Pulse Output Frequency
- Electronics Temperature
- Process Temperature (MTA Option Only)
- Calculated Process Density (MTA Option Only)

## Signal Processing

| HART Comm. | 1, 4, 3 |
|---|---|

The Rosemount 8800D and its HART-based communications feature enable you to filter out noise and other frequencies from the transmitter 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 and service type (liquid or gas). 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, 4–20mA trim, pulse scaling factor, process temperature, pipe ID), refer to Section 5: Troubleshooting. Remember that the factory default settings can be re-established at any time with Filter Restore. If problems persist after signal processing adjustments, consult the factory.

### Optimize Flow Range

| | |
|---|---|
| HART Comm. | 1, 4, 3, 1 |

The **Optimize Flow Range** function will automatically set the 8800D filter levels, Low Flow Cutoff (LFC), Trigger Level, and Low Pass Corner Frequency, to optimum settings based on the process density and process fluid type.

#### Primary Variable (PV)

| | |
|---|---|
| HART Comm. | 1, 4, 3, 1, 1 |

**PV** is the actual measured variable rate in the line. On the bench, the PV value should be zero. Check the units on the PV to make sure they are configured correctly. See PV Units if the units format is not correct. Use the **Process Variable Units** function to select the units for your application.

#### Low Flow Cutoff

| | |
|---|---|
| HART Comm. | 1, 4, 3, 1, 2 |

**Low Flow Cutoff** is shown in engineering units.

#### Signal/Trigger Level Ratio *(*Sig/Tr)

| | |
|---|---|
| HART Comm. | 1, 4, 3, 1, 3 |

The **Signal to Trigger Level Ratio** is a 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 ratio should be greater than 4:1. Values greater that 4:1 will allow increased filtering for noisy applications. For ratios greater than 4:1, with sufficient density, the **Auto Adjust Filter** function can be utilized to optimize the measurable range of the flowmeter.

Ratios less than 4:1 may indicate applications with very low densities and/or applications with excessive filtering.

#### Auto Adjust Filter

| | |
|---|---|
| HART Comm. | 1, 4, 3, 1, 4 |

The **Auto Adjust Filter** is a function that can be used to optimize the range of the flowmeter based on the density of the fluid. The electronics uses process density to calculate the minimum measurable flow rate, while retaining at least a 4:1 signal to the trigger level ratio. This function will also reset all of the filters to optimize the flowmeter performance over the new range.

### Manual Filter Adjust

| | |
|---|---|
| HART Comm. | 1, 4, 3, 2 |

**Manual Filter Adjust** allows you to manually adjust the following settings: Low Flow Cutoff, Low Pass Filter, and Trigger Level, while monitoring flow and or sig/tr.

### Primary Variable (PV)

| | |
|---|---|
| HART Comm. | 1, 4, 3, 2, 1 |

**PV** is the actual measured variable. On the bench, the PV value should be zero when the PV is mapped to a flow variable. Check the units on the PV to make sure they are configured correctly. See PV Units if the units format is not correct. Use the **Process Variable Units** function to select the units for your application.

### Signal/Trigger Level Ratio (Sig/Tr)

| | |
|---|---|
| HART Comm. | 1, 4, 3, 2, 2 |

The **Signal to Trigger Level Ratio** is a 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 ratio should be greater than 4:1. Values greater that 4:1 will allow increased filtering for noisy applications. For ratios greater than 4:1, with sufficient density, the Optimize Flow Range function can be utilized to optimize the measurable range of the flowmeter.

Ratios less than 4:1 may indicate applications with very low densities and/or applications with excessive filtering.

### Low Flow Cutoff

| | |
|---|---|
| HART Comm. | 1, 4, 3, 2, 3 |

**Low Flow Cutoff** enables you to adjust 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.

The Low Flow Cutoff offers two modes for adjustment:

- Increase Range
- Decrease No Flow Noise

It also includes a dead band such that once flow goes below the cutoff value, output does not return to the normal flow range until flow goes above the dead band. The dead band extends to approximately 20 percent above the low flow cutoff value. The dead band prevents the output from bouncing between 4mA and normal flow range if the flow rate is near the low flow cutoff value.

### Low Pass Filter

| | |
|---|---|
| HART Comm. | 1, 4, 3, 2, 4 |

The **Low Pass Filter** 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:

- Increase filtering
- Increase sensitivity

#### Trigger Level

| | |
|---|---|
| HART Comm. | 1, 4, 3, 2, 5 |

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

- Increase filtering
- Increase sensitivity

---

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

---

### Filter Restore

| | |
|---|---|
| HART Comm. | 1, 4, 3, 3 |

**Filter Restore** enables you to return all of the signal conditioning variables to their default values. Should the filter settings get confused, select Filter Restore to restore the default settings and provide a new starting point.

### Damping

| | |
|---|---|
| HART Comm. | 1, 4, 3, 4 |

Damping function changes the response time of the flowmeter to smooth variations in output readings caused by rapid changes in input.

The appropriate damping setting can be determined based on the necessary response time, signal stability, and other requirements of the loop dynamics in your system.

#### PV Damping

| | |
|---|---|
| HART Comm. | 1, 4, 3, 4, 1 |

The default damping value is 2.0 seconds. Damping can be reset to any value between 0.2 and 255 seconds when PV is a flow variable or 0.4 to 32 seconds when PV is Process Temperature.

#### Flow Damping

| | |
|---|---|
| HART Comm. | 1, 4, 3, 4, 2 |

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

#### Temperature Damping

| | |
|---|---|
| HART Comm. | 1, 4, 3, 4, 3 |

The default damping value is 2.0 seconds. Temperature Damping can be reset to any value between 0.4 and 32 seconds.

### LFC Response

| | |
|---|---|
| HART Comm. | 1, 4, 3, 5 |

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.

## Device Information

| | |
|---|---|
| HART Comm. | 1, 4, 4 |

Information variables are 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.

### Manufacturer

| | |
|---|---|
| HART Comm. | 1, 4, 4, 1 |

**Manufacturer** is an informational variable provided by the factory. For the Rosemount 8800D, the Manufacturer is Rosemount.

### Tag

| | |
|---|---|
| HART Comm. | 1, 4, 4, 2 |

**Tag** is 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.

### Descriptor

| | |
|---|---|
| HART Comm. | 1, 4, 4, 3 |

**Descriptor** is a 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

| | |
|---|---|
| HART Comm. | 1, 4, 4, 4 |

The **Message** variable 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

| | |
|---|---|
| HART Comm. | 1, 4, 4, 5 |

**Date** is a 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

| | |
|---|---|
| HART Comm. | 1, 4, 4, 6 |

**Write Protect** is a 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.

### Revision Numbers

| | |
|---|---|
| HART Comm. | 1, 4, 4, 7 |

**Revisions Numbers** are fixed informational variables that provide the revision number for different elements of your HART 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 Rev**

| | |
|---|---|
| HART Comm. | 1, 4, 4, 7, 1 |

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

**Transmitter Rev**

| | |
|---|---|
| HART Comm. | 1, 4, 4, 7, 2 |

*Transmitter Rev* – Designates the revision for Rosemount 8800D specific command identification for HART compatibility.

**Software Rev**

| | |
|---|---|
| HART Comm. | 1, 4, 4, 7, 3 |

*Software Rev* – Designates the internal software revision level for the Rosemount 8800D.

**Hardware Rev**

| | |
|---|---|
| HART Comm. | 1, 4, 4, 7, 4 |

*Hardware Rev* – Designates the revision level for the Rosemount 8800D hardware.

**Final Assembly Number**

| | |
|---|---|
| HART Comm. | 1, 4, 4, 7, 5 |

Final Assembly Number – Factory set number that refers to the electronics of your flowmeter. The number is configured into the flowmeter for later reference.

**Device ID**

| | |
|---|---|
| HART Comm. | 1, 4, 4, 7, 6 |

*Device ID* – Factory-defined unique identifier for transmitter identification in the software. Device ID is not user changeable.

# Section 5 Troubleshooting



“Troubleshooting Tables” on page 5-2 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.

## 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 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 that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.

**⚠WARNING**

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. Depressurize flow line before removing the sensor nut.

## TROUBLESHOOTING TABLES

The most common problems experienced by users of the Rosemount 8800D are listed in "Troubleshooting Tables" on page 5-2 along with potential causes of the problem and suggested corrective actions. See the Advanced Troubleshooting section if the problem you are experiencing is not listed here.

| Symptom | Corrective Action | |
|---|---|---|
| Communication problems with HART-based Communicator | • Check for a minimum of 16.8 V dc at transmitter terminals.<br>• Check communications loop with HART-based communicator.<br>• Check for loop resistor (250 to 1000 ohms).<br>• Check for transmitter in multidrop mode. | • Check for transmitter in burst mode.<br>• Remove pulse connection if you have a three wire pulse installation.<br>• Replace electronics. |
| 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" on page 5-3.<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 on page 5-3.: Diagnostic Messages | |
| Flow in Pipe, No Output | Basics<br>• Check to make the sure that 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/density ratio (if required), 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" on page 5-3.<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>• 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.<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" on page 5-16).<br>• Measure sensor capacitance at SMA connector (115-700pF). |

## 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.

## Diagnostic Messages

The following is a list of messages used by the HART Communicator (HC) and their corresponding descriptions. Variable parameters within the text of a message are indicated with <*variable*>.

| Message | Description |
|---|---|
| Add item for ALL device types or only for this ONE device type. | Asks the user whether the hot key item being added should be added for all device types or only for the type of device that is connected. |
| Command not implemented. | The connected device does not support this function. |
| Communication error. | Either a device sends back a response indicating that the message it received was unintelligible, or the HC cannot understand the response from the device. |
| Configuration memory not compatible with connected device. | The configuration stored in memory is incompatible with the device to which a transfer has been requested. |
| Device busy. | The connected device is busy performing another task. |
| Device disconnected. | Device fails to respond to a command. |
| Device write protected. | Device is in write-protect mode. Data can not be written. |
| Device write protected. Do you still want to shut off? | Device is in write-protect mode. Press YES to turn the HC off and lose the unsent data. |
| Display value of variable on hotkey menu? | Asks whether the value of the variable should be displayed adjacent to its label on the hotkey menu if the item being added to the hotkey menu is a variable. |
| Download data from configuration memory to device. | Prompts user to press SEND softkey to initiate a memory to device transfer. |
| Exceed field width. | Indicates that the field width for the current arithmetic variable exceeds the device- specified description edit format. |
| Exceed precision. | Indicates that the precision for the current arithmetic variable exceeds the device- specified description edit format. |
| Ignore next 50 occurrences of status? | Asked after displaying device status. Softkey answer determines whether next 50 occurrences of device status will be ignored or displayed. |
| Illegal character. | An invalid character for the variable type was entered. |
| Illegal date. | The day portion of the date is invalid. |
| Illegal month. | The month portion of the date is invalid. |
| Illegal year. | The year portion of the date is invalid. |
| Incomplete exponent. | The exponent of a scientific notation floating point variable is incomplete. |
| Incomplete field. | The value entered is not complete for the variable type. |
| Looking for a device. | Polling for multidropped devices at addresses 1–15. |
| Mark as read only variable on hotkey menu? | Asks whether the user should be allowed to edit the variable from the hotkey menu if the item being added to the hotkey menu is a variable. |
| No device configuration in configuration memory. | There is no configuration saved in memory available to re-configure off-line or transfer to a device. |
| No device found. | Poll of address zero fails to find a device, or poll of all addresses fails to find a device if auto-poll is enabled. |
| No hotkey menu available for this device. | There is no menu named “hotkey” defined in the device description for this device. |
| No offline devices available. | There are no device descriptions available to be used to configure a device offline. |
| No simulation devices available. | There are no device descriptions available to simulate a device. |
| No UPLOAD_VARIABLES in ddl for this device. | There is no menu named “upload_variables” defined in the device description for this device. This menu is required for offline configuration. |
| No valid items. | The selected menu or edit display contains no valid items. |

| Message | Description |
|---|---|
| OFF KEY DISABLED. | Appears when the user attempts to turn the HC off before sending modified data or before completing a method. |
| Online device disconnected with unsent data. RETRY or OK to lose data. | There is unsent data for a previously connected device. Press RETRY to send data, or press OK to disconnect and lose unsent data. |
| Out of memory for hotkey configuration. Delete unnecessary items. | There is no more memory available to store additional hot key items. Unnecessary items should be deleted to make space available. |
| Overwrite existing configuration memory. | Requests permission to overwrite existing configuration either by a device-to-memory transfer or by an offline configuration. User answers using the soft keys. |
| Press OK. | Press the OK soft key. This message usually appears after an error message from the application or as a result of HART communications. |
| Restore device value? | The edited value that was sent to a device was not properly implemented. Restoring the device value returns the variable to its original value. |
| Save data from device to configuration memory. | Prompts user to press SAVE softkey to initiate a device-to-memory transfer. |
| Saving data to configuration memory. | Data is being transferred from a device to configuration memory. |
| Sending data to device. | Data is being transferred from configuration memory to a device. |
| There are write only variables which have not been edited. Please edit them. | There are write-only variables which have not been set by the user. These variables should be set or invalid values may be sent to the device. |
| There is unsent data. Send it before shutting off? | Press YES to send unsent data and turn the HC off. Press NO to turn the HC off and lose the unsent data. |
| Too few data bytes received. | Command returns fewer data bytes than expected as determined by the device description. |
| Transmitter fault. | Device returns a command response indicating a fault with the connected device. |
| Units for <label> has changed. Unit must be sent before editing, or invalid data will be sent. | The engineering units for this variable have been edited. Send engineering units to the device before editing this variable. |
| Unsent data to online device. SEND or LOSE data. | There is unsent data for a previously connected device which must be sent or thrown away before connecting to another device. |
| Use up/down arrows to change contrast. Press DONE when done. | Gives direction to change the contrast of the HC display. |
| Value out of range. | The user-entered value is either not within the range for the given type and size of variable or not within the min/max specified by the device. |
| <message> occurred reading/writing <label> | Either a read/write command indicates too few data bytes received, transmitter fault, invalid response code, invalid response command, invalid reply data field, or failed pre- or post-read method; or a response code of any class other than SUCCESS is returned reading a particular variable. |
| <label> has an unknown value. Unit must be sent before editing, or invalid data will be sent. | A variable related to this variable has been edited. Send related variable to the device before editing this variable. |

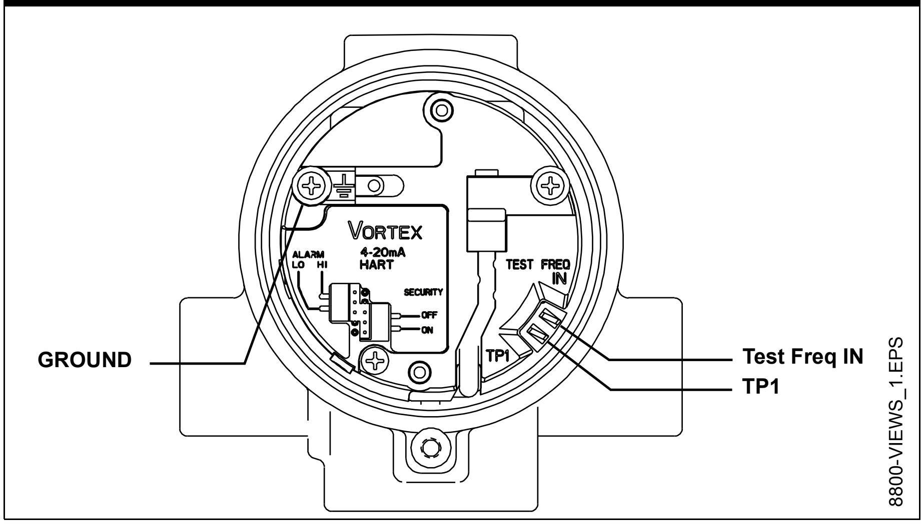
| Message | Description |
|---|---|
| ROM CHECKSUM ERROR | The EPROM memory checksum test has failed. The transmitter will remain in ALARM until the ROM checksum test passes. |
| NV MEM CHECKSUM ERROR | The User Configuration area in Nonvolatile EEPROM memory has failed the checksum test. It is possible 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. |
| 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 SAT STEAM LIMITS | The Process Temperature is above the high limit for Saturated Steam density calculations. This status only occurs when the Process Fluid is Temperature Compensated Saturated Steam. The density calculation will continue using a Process Temperature of 320 °C. |
| PROCESS TEMP BELOW SAT STEAM LIMITS | The Process Temperature is below the low limit for Saturated Steam density calculations. This status only occurs when the Process Fluid is Temperature Compensated Saturated Steam. The density calculation will continue using a Process Temperature of 80 °C. |
| 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. |

## Electronics Test Points

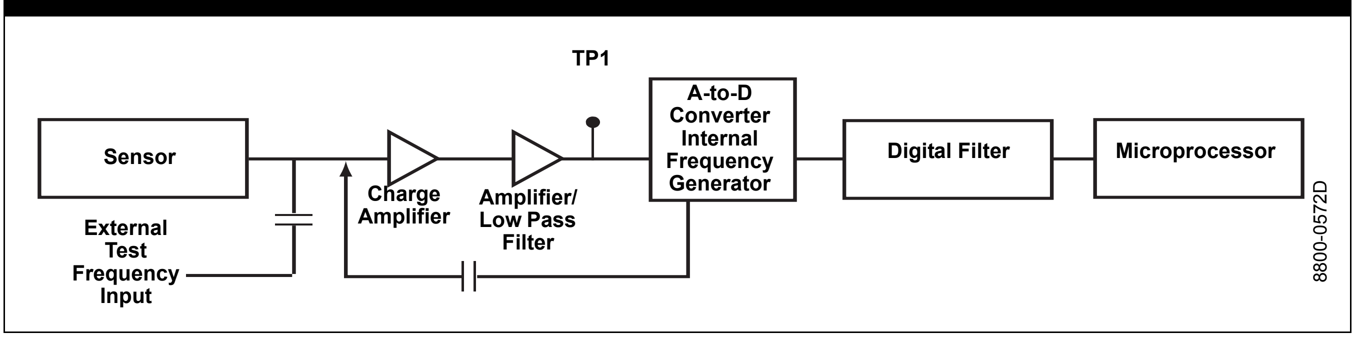
As shown in Figure 5-1, there are several test points located on the electronics.

Figure 5-1. Electronics Test Points




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 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 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



## TP1

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

TP1 is easily measured with standard equipment.

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

Figure 5-3. Clean Signals

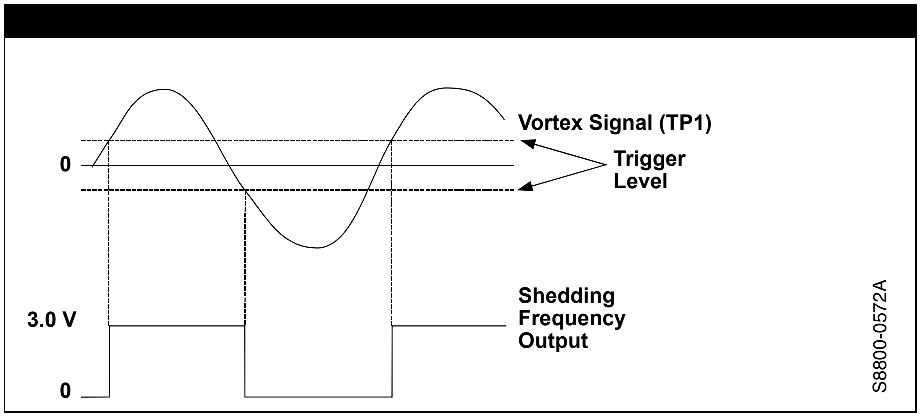



Figure 5-4. Noisy Signals

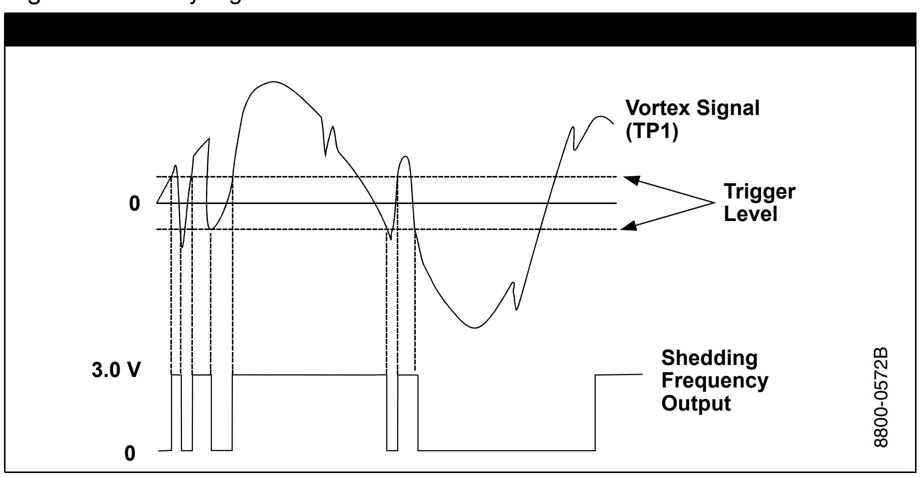
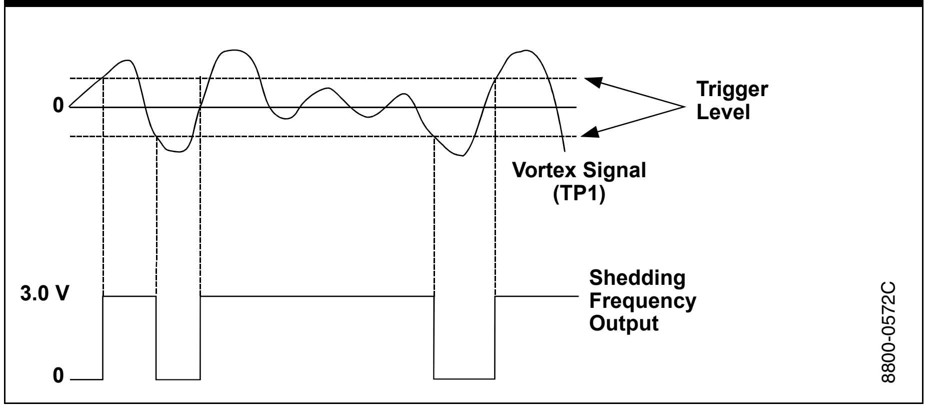


Figure 5-5. Improper Sizing/Filtering



## DIAGNOSTIC MESSAGES ON LCD

In addition to the output, the LCD indicator 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_LOOPV**

The flowmeter electronics has detected insufficient voltage to power the sensor board. Most likely the cause is low voltage at transmitter 4–20 mA terminals. 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 date. This date con 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.

## 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 4-1 for details.

## 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. Direct any questions concerning these procedures or parts to Rosemount Inc.

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

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

## Replacing the Terminal Block in the Housing

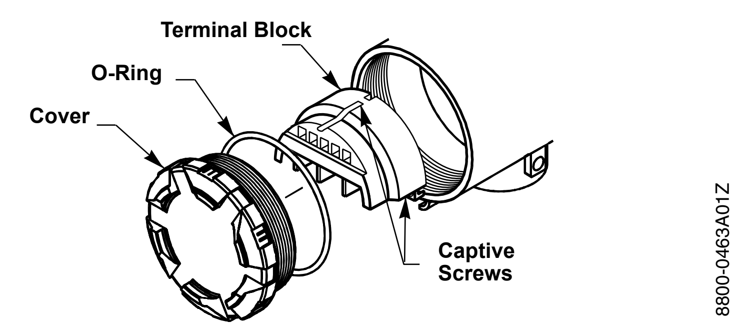
To replace the Field Terminal Block in the housing, you will need a small, flat head screwdriver. Use the following procedure to replace the terminal block in the housing of the Rosemount 8800D.

⚠ **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.

Figure 5-6. Terminal Block Assembly




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

⚠ See Safety Messages on page 5-1 for complete warning information.

### 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 screw alignment if it does not glide into place.
3. Tighten the three captive screws to anchor the terminal block.
4. Connect the wires to the appropriate field terminals.
5. Reinstall and tighten the transient ground screw if you have the transient option (Option T1).
6. Screw on and tighten the cover.

## 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 flat head screwdriver and pliers.

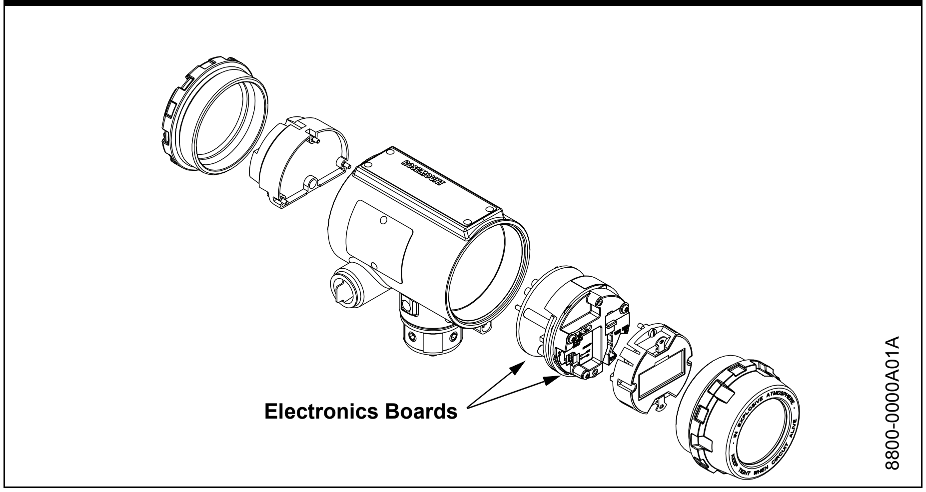
**NOTE**
The electronics boards are electrostatically sensitive. Be sure to observe handling precautions for static-sensitive components.

⚠ **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 cover if you have the LCD option).

Figure 5-7. Electronics Boards Assembly




3. If the meter has the LCD indicator option, loosen the two screws. Remove the LCD 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. 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. Use extreme caution to insert sensor cable clip into the electronics board.
6. Tighten the three captive screws to anchor the two electronics boards. Ensure that the SST washer is under the screw in the 2 o’clock position.
7. Reinsert jumpers into proper location.
8. If the meter has LCD option, insert the connector header into the LCD board.
   a. Remove jumpers from the electronics board.
   b. Put the connector through the bezel on the electronics board.
   c. Carefully press the LCD onto the electronics board.
   d. Tighten the two screws that retain the LCD indicator.
   e. Insert the alarm and security jumpers in the correct location.
9. Replace the electronics board compartment cover.

## Replacing the Electronics Housing

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

**Tools Needed**

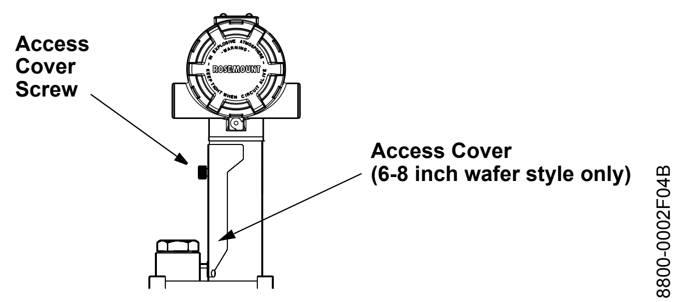
- $^5/_{32}$-inch (4 mm) hex wrench
- $^5/_{16}$-inch open end wrench
- Screwdriver to disconnect wires
- Tools to disconnect conduit

**NOTE**
Remove power before removing the electronics housing.

**Remove the Electronics Housing**

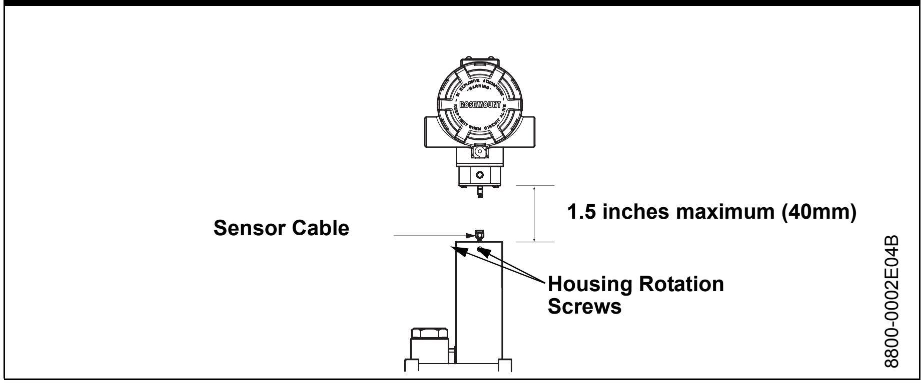
1. Turn off the power to the Rosemount 8800D.
2. Disconnect the wires and conduit from the housing.
3. Loosen the screw on the access cover if present (on the support tube). See Figure 5-8.
4. Remove the access cover.

Figure 5-8. Electronics Housing Access Cover




5. Use a $^5/_{32}$ inch 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. See Figure 5-9.

Figure 5-9. Housing Rotation Screws




6. Slowly pull the electronics housing no more than 1.5 inches (40 mm) from the top of the support tube.
7. Loosen the sensor cable nut from the housing with a 5/16-inch open end wrench. See Figure 5-9.

---

**NOTE**
Lift the electronics housing until the sensor cable nut is exposed. Do not pull the housing more than 1.5 inches (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-inch open end wrench.
4. Place the electronics housing into the top of the support tube.
5. Tighten the housing rotation screws with a hex wrench.
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. Apply power.

## 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.**

**NOTES**
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**

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

There are two different styles of support tubes for the Rosemount 8800D. The removable support tube is for wafer meters $^{1}/_{2}$- through 4-inch (15 through 100 mm) and all flanged meters. The integral support tube is for 6- and 8-inch (150 and 200 mm) wafer meters. The procedure for replacing the sensor contains details for both the removable and integral support tubes.

## Replacing the Sensor: Removable and Integral Support Tubes

The following procedure applies to flowmeters equipped with a removable support tube, i.e. all flanged meters and ½- through 4-inch (DN 15 through 100) wafer meters.

1. De-pressurize the flow line.

**⚠WARNING**

Sensor cavity could contain line pressure if an abnormal failure has occurred inside the meter body. De-pressurize flow line before removing the sensor nut. See Safety Messages on page 5-1 for complete warning information.

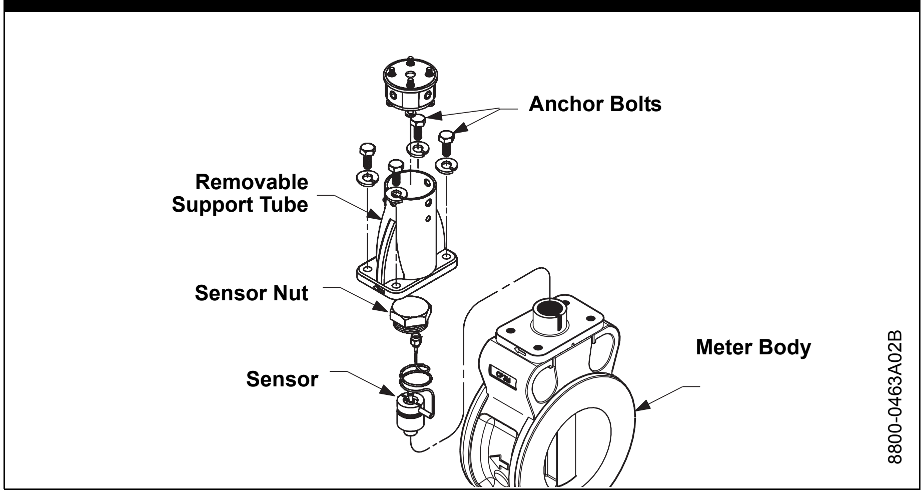
2. Remove the electronics housing (see "Replacing the Electronics Housing" on page 5-15).

- For meters with a removable support tube (1/2- to 4-in. [15 to 100 mm] wafer meters and all flanged meters), follow steps 3-5.

**Removable Support Tube (for 1/2- to 4-in. wafer meters and all flanged meters)**

3. Loosen the four support tube anchor bolts with a 7/16-inch open end wrench. See Figure 5-10.
4. Remove the support tube.

Figure 5-10. Removable Support Tube Assembly



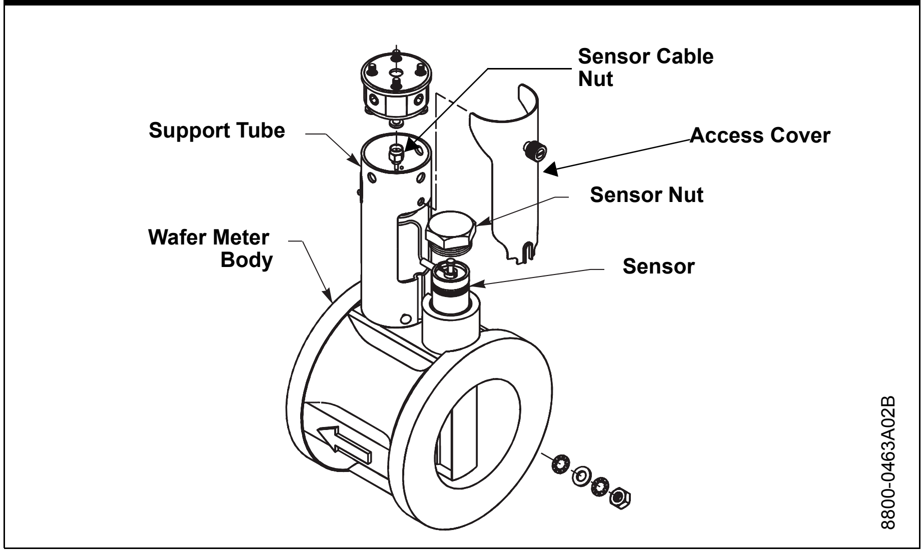

5. Proceed to step 8.

- For meters with an integral support tube, (6- to 8-in. [100 to 200 mm] wafer meters), follow steps 6-7.

**Integral Support Mount (for 6- to 8-in. wafer meters)**

6. Remove access cover. See Figure 5-11.
7. Proceed to step 8.

Figure 5-11. Integral Support Tube Assembly



8. Loosen and remove the sensor nut from the sensor cavity with a 1$^1/_8$-inch open end wrench. (Use a $^3/_4$-inch open end wrench for 3- and 4-inch [80 and 100 mm] SST wafers.)
9. 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.

### 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.

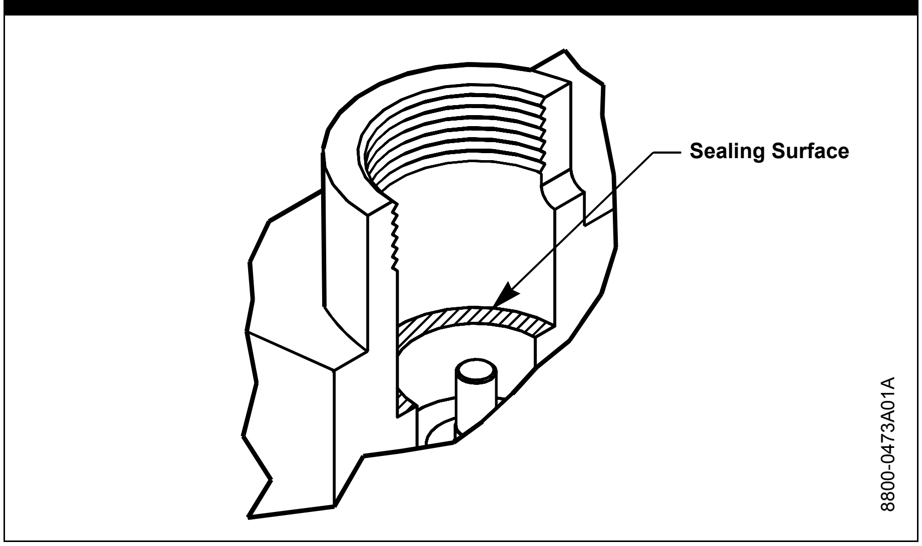
**NOTE**
If you are installing a sensor that has been used before, clean the metal o-ring on the sensor using the procedure below. If you are installing a newly purchased sensor, cleaning the o-ring is not necessary.

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.

**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 5-12. O-Ring Sealing Surface in Sensor Cavity



**Sensor Installation**

1. Carefully place sensor over the post in the sensor cavity.
2. Insure that the sensor is centered on the post. See Figure 5-13 for an example of improper installation and Figure 5-14 for an example of proper installation.

Figure 5-13. Sensor Installation – Improper Alignment

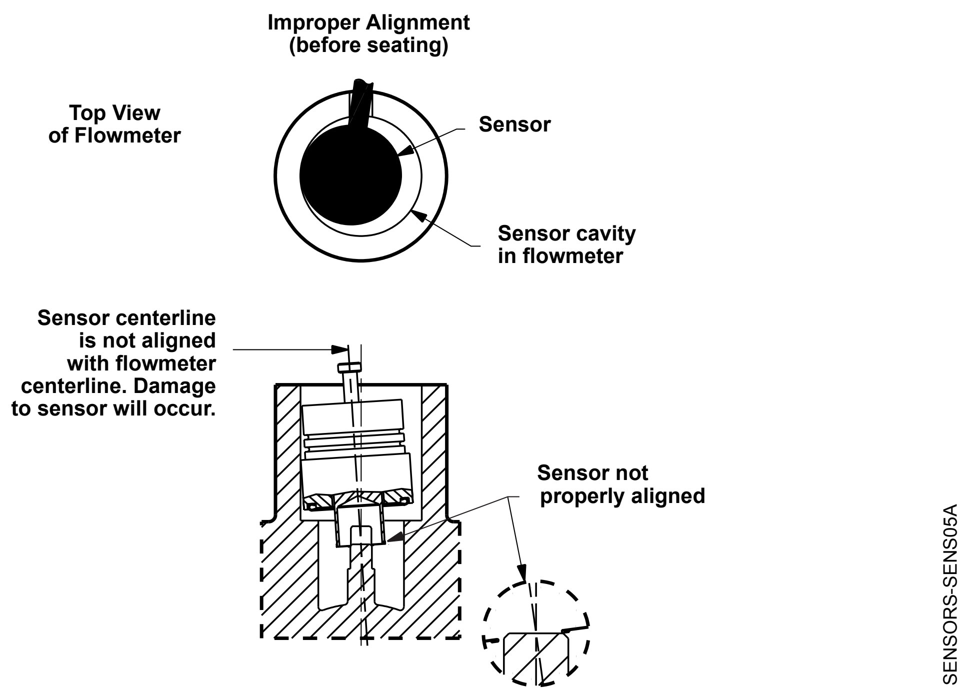
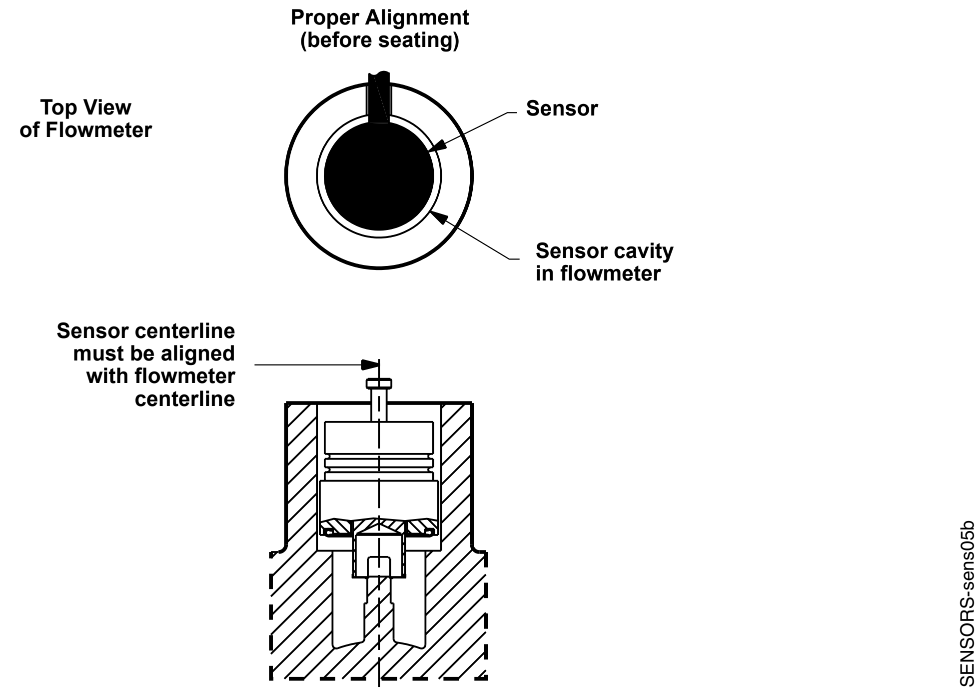
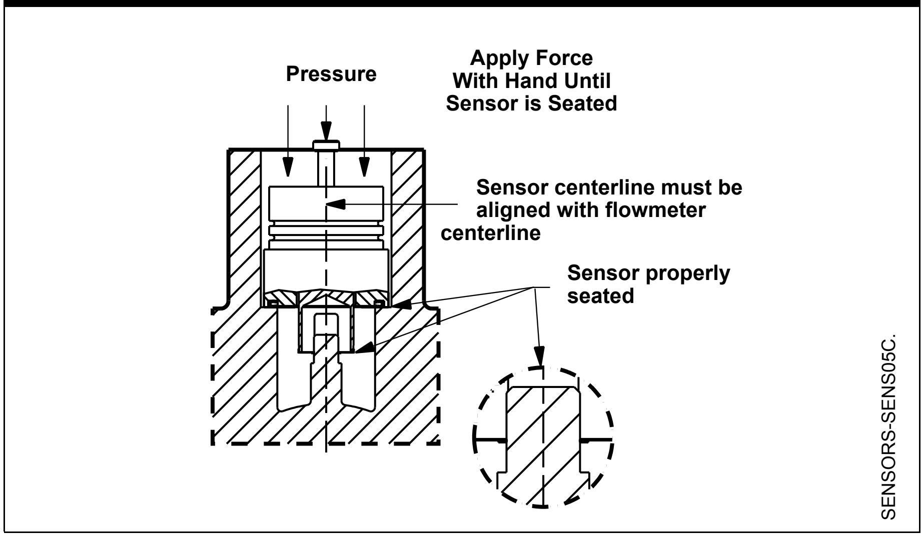


Figure 5-14. Sensor Installation – Proper Alignment




3. Sensor should remain as close to vertical as possible when applying force to seat. See Figure 5-15.

Figure 5-15. Sensor Installation – Applying Force




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$^1/_8$-inch open end torque wrench to 32 ft-lbs (50 ft-lbs for ANSI 1500 meter body). (Use a $^3/_4$-inch open end wrench for 3- and 4-inch [80 and 100 mm] SST wafers).

---

**NOTE**
The sensor nut must be tightened to 32 ft-lbs. for accurate flowmeter operation (50 ft-lbs for ANSI 1500 meter body). Do not over tighten.

---

6. Replace the support tube.
7. Tighten the four bolts that anchor the support tube in place with a $^7/_{16}$-inch open end wrench.
8. Install the flowmeter electronics housing. See Install the Electronics Housing on page 4-16.

## 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 Field Terminal Block (see page 5-12).
- Replacing the Electronics Boards (see page 5-13).
- Replacing the Sensor (see page 5-16).

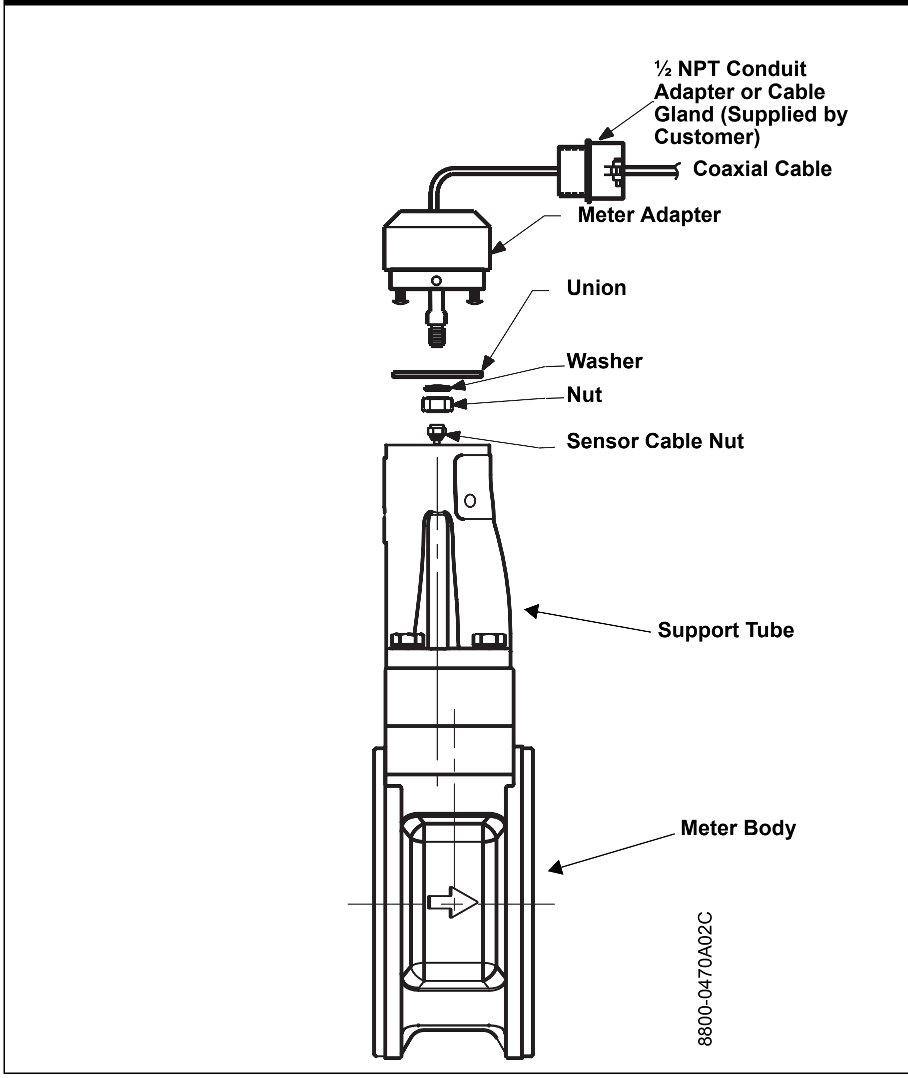
To disconnect the coaxial cable from the meter body and electronics housing, follow the instructions below.

**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 electronics housing with a 5/32 inch hex wrench by turning the screws clockwise (inward) until they will clear the bracket.
3. Slowly pull the meter adapter no more than 1.5 inches (40 mm) from the top of the support tube.
4. Loosen and disconnect the sensor cable nut from the union using a 5/16-inch open end wrench.

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

Figure 5-16. Coaxial Cable Connections



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

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

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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 inch wafer style only).
5. Tighten the conduit adapter or cable gland into the meter adapter.

## Coaxial Cable at the Electronics Housing

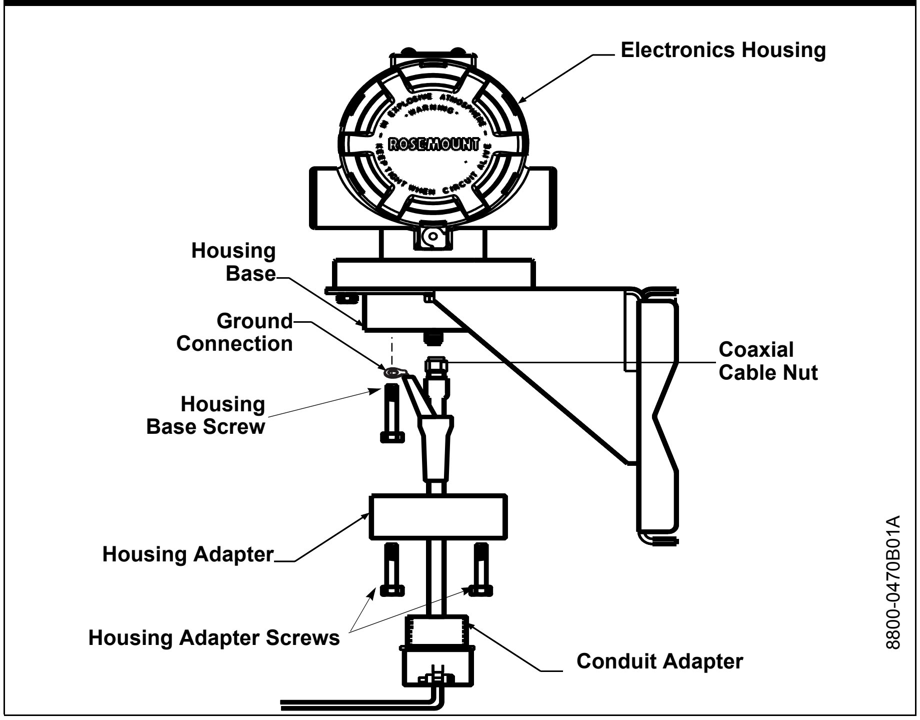
### Disconnect the Coaxial Cable from the Electronics Housing

1. Loosen the three screws from the housing adapter.
2. Remove the adapter from the housing.
3. Loosen and remove the coaxial cable nut from the base of the electronics housing.

### Remove the Coaxial Cable

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

Figure 5-17. Remote Electronics Exploded View




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

### 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.

### Connect the Coaxial Cable

1. Attach and securely tighten the coaxial cable nut to the connection on the electronics housing.
2. Align the housing adapter with the housing and attach with the three housing adapter screws.
3. Tighten the conduit adapter to the housing adapter.

## Changing the Housing Orientation

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

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 $^{5}/_{32}$ inch hex wrench by turning the screws clockwise (inward) until they will 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 $^{5}/_{16}$-inch open end wrench.

**NOTE**
Do not pull the housing more than 1.5 inches (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.

## 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.

## 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 inch 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 allen wrench to remove cap head screw from electronics.
4. Gently pull temperature sensor from electronics.
5. Insert new temperature sensor into electronics housing using care to align pin and cap head screw to align pin.
6. Tightening cap head screw with 2.5 mm allen 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 inch open end wrench until 1.5 turns past finger tight to seat ferrule.
9. Reapply power to Rosemount 8800D.

# Appendix A Reference Data



## SPECIFICATIONS

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

## FUNCTIONAL SPECIFICATIONS

### Service

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

### Line Sizes

**Wafer**

$^1/_2$, 1, 1$^1/_2$, 2, 3, 4, 6, and 8 inches
(DN 15, 25, 40, 50, 80, 100, 150, and 200)

**Flanged and Dual-Sensor Style**

$^1/_2$, 1, 1$^1/_2$, 2, 3, 4, 6, 8, 10, and 12 inches
(DN 15, 25, 40, 50, 80, 100, 150, 200, 250, and 300)

**Reducer**

1, 1$^1/_2$, 2, 3, 4, 6, 8, 10, and 12 inches
(DN 25, 40, 50, 80, 100, 150, 200, 250, and 300)

### Pipe Schedules

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

**NOTE**

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

### Measurable Flow Rates

Capable of processing signals from flow applications which meet the sizing requirements below. To determine the appropriate flowmeter size for an application, process conditions must be within the Reynolds number and velocity limitations for the desired line size provided in Table A-1 on page A-2, Table A-2 on page A-2, Table A-3 on page A-2, and Table A-4 on page A-5.

**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 (ρ), viscosity ($\mu_{cp}$), pipe inside diameter (D), and flow velocity (V).*

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

Table A-1. Minimum Measurable Meter Reynolds Numbers

| Meter Sizes (Inches / DN) | Reynolds Number Limitations |
|---|---|
| 1/2 through 4/15 through 100 | 10000 minimum |
| 6 through 12/150 through 300 | 20000 minimum |

Table A-2. Minimum Measurable Meter Velocities(1)
(Use the larger of the two values)

| | Feet per Second | Meters per Second |
|---|---|---|
| Liquids(2) | $\sqrt{36/\rho}$ or 0.7 | $\sqrt{54/\rho}$ or 0.22 |
| Gases | $\sqrt{36/\rho}$ or 6.5 | $\sqrt{54/\rho}$ or 2.0 |
| **The ρ 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) The minimum measurable velocity for the 10in. line size is 0.94 ft/s (.29m/s) and 1.11 ft/s (.34m/s) for the 12in. line size.*

Table A-3. Maximum Measurable Meter Velocities(1)
(Use the smaller of the two values)

| | Feet per Second | Meters per Second |
|---|---|---|
| Liquids | $\sqrt{90,000/\rho}$ or 25 | $\sqrt{134,000/\rho}$ or 7.6 |
| Gases(2) | $\sqrt{90,000/\rho}$ or 250 | $\sqrt{134,000/\rho}$ or 76 |
| **The ρ 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" to 8"): 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)

## 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 V dc, 120 mA maximum

### Digital Foundation fieldbus signal

Manchester-encoded digital signal that conforms to IEC 1158-2 and ISA 50.02.

## 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, DIN PN 10, 16, 25, 40, 64, 100, and 160, and JIS 10K, 20K, and 40K

### Reducer Style Meter

Rated for ASME B16.5 (ANSI) Class 150, 300, 600, and 900, DIN PN 10, 16, 25, 40, 64, 100, and 160.

### Dual Sensor Style Meter

Rated for ASME B16.5 (ANSI) Class 150, 300, 600, 900, and 1500, DIN PN 10, 16, 25, 40, 64, 100, and 160, and JIS 10K, 20K, and 40K

### Wafer Style Meter

Rated for ASME B16.5 (ANSI) Class 150, 300, and 600, DIN PN 10, 16, 25, 40, 64, and 100, and JIS 10K, 20K, and 40K

## Power Supply

### HART Analog

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

### Foundation fieldbus

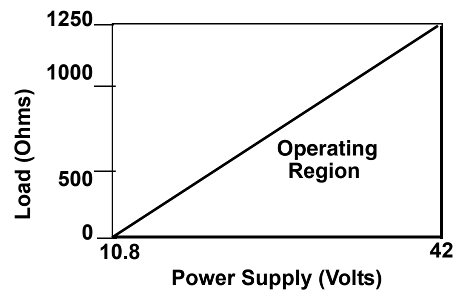
External power supply required. Flowmeter operates on 9 to 32 V dc, 17.8 mA nominal, 20.0 mA maximum.

### 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:




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

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

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### Optional LCD Indicator

The optional LCD indicator is capable of displaying:

- Primary Variable
- Velocity Flow
- Volumetric Flow
- Mass Flow
- Percent of Range
- Analog Output (if applicable)
- Totalizer
- Shedding Frequency
- Pulse Output Frequency
- Electronics Temperature
- Process Temperature (MTA Option Only)
- Calculated Process Density (MTA Option Only)

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 10 and 12 in (250 and 300 mm) line sizes and 6 and 8 in (150 and 200 mm) with 900# or 1500# Flanges, A for Rosemount 8800DD is the same as Rosemount 8800DF.*

### Minimum Back 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 back 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 |
| High | 22.6 |
| NAMUR Low | 3.60 |
| NAMUR High | 22.6 |

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.

#### Foundation fieldbus

The AI block allows the user to configure the alarm to HI-HI, HI, LO, or LO-LO with a variety of priority levels.

### 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 |
| High | 20.8 |
| NAMUR Low | 3.8 |
| NAMUR High | 20.5 |

### Damping

Flow Damping adjustable between 0.2 and 255 seconds.

Process Temperature Damping adjustable between 4.0 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 four (4) seconds plus the response time to rated accuracy from power up (less than 7 seconds with the MTA Option).

#### Foundation fieldbus

Performance within specifications no greater than 10.0 seconds after power is applied.

### 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:
ASME B16.5 (ANSI)/IEEE C62.41 - 1980
(IEEE 587) Categories A, B
3 kA crest (8 × 20 µs)
6 kV crest (1.2 × 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 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 (in the scaled pulse mode only).

## Humidity Limits

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

## Overrange 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.

### Foundation fieldbus

For liquid service type, the transducer block digital output will continue to a nominal value of 25 ft/s. After that, the status associated with the transducer block output will go to UNCERTAIN. Above a nominal value of 30 ft/s, the status will go to BAD.

For gas/steam service, the transducer block digital output will continue to a nominal value of 220 ft/s for 0.5 and 1.0 in. line sizes and a nominal value of 250 ft/s for 1.5–12 in. line sizes. After that, the status associated with the transducer block output will go to UNCERTAIN. Above a nominal value of 300 ft/s for all line sizes, the status will go to BAD.

## 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.

## Status (FOUNDATION fieldbus only)

If self-diagnostics detect a transmitter failure, the status of the measurement will inform the control system. Status may also set the PID output to a safe value.

## Schedule Entries (FOUNDATION fieldbus only)

Six (6)

## Links (FOUNDATION fieldbus only)

Twelve (12)

**Virtual Communications Relationships (VCRs) (FOUNDATION fieldbus only)**

Two (2) predefined (F6, F7)
Four (4) configured (see Table A-5)

Table A-5. Block Information.

| Block | Base Index | Execution Time (Milliseconds) |
|---|---|---|
| Resource (RB) | 300 | — |
| Transducer (TB) | 400 | — |
| Analog Input (AI) | 1,000 | 20 |
| Proportional/ Integral/Derivative (PID) | 10,000 | 25 |
| Integrator (INT) | 12,000 | 20 |

Table A-6. Typical pipe velocity ranges for 8800D and 8800DR[(1)]

| Process Line Size (Inches/ DN) | Vortex Meter [(2)] | Liquid Velocity Ranges (ft/s) | Liquid Velocity Ranges (m/s) | Gas Velocity Ranges (ft/s) | Gas Velocity Ranges (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-6 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 tables 2 and 3. Velocities are referenced in schedule 40 pipe.*
*(2) Velocity range of the Rosemount 8800DW is the same as Rosemount 8800DF.*

Table A-7. Water Flow Rate Limits for the Rosemount 8800D and 8800DR[(1)]

| Process Line Size (Inches/ DN) | Vortex Meter [(2)] | Minimum and Maximum Measurable Water Flow Rates*: Gallons/Minute | Minimum and Maximum Measurable Water Flow Rates*: 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 |
| ***Conditions: 77 °F (25 °C) and 14.7 psia (1.01 bar absolute)** | | | |

*(1) Table A-7 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 tables 2 and 3.*
*(2) Velocity range of the 8800DW is the same as 8800DF.*

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

| Process Pressure | 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 | max | 27.9 | 47.3 | Not | Not | 79.2 | 134 | 27.9 | 47.3 |
| (0 bar G) | min | 3.86 | 6.56 | Available | Available | 7.81 | 13.3 | 3.86 | 6.56 |
| 50 psig | max | 27.9 | 47.3 | Not | Not | 79.2 | 134 | 27.9 | 47.3 |
| (3,45 bar G) | min | 1.31 | 2.22 | Available | Available | 3.72 | 6.32 | 1.31 | 2.22 |
| 100 psig | max | 27.9 | 47.3 | Not | Not | 79.2 | 134 | 27.9 | 47.3 |
| (6,89 bar G) | min | 0.98 | 1.66 | Available | Available | 2.80 | 4.75 | 0.98 | 1.66 |
| 150 psig | max | 27.9 | 47.3 | Not | Not | 79.2 | 134 | 27.9 | 47.3 |
| (10,3 bar G) | min | 0.82 | 1.41 | Available | Available | 2.34 | 3.98 | 0.82 | 1.41 |
| 200 psig | max | 27.9 | 47.3 | Not | Not | 79.2 | 134 | 27.9 | 47.3 |
| (13,8 bar G) | min | 0.82 | 1.41 | Available | Available | 2.34 | 3.98 | 0.82 | 1.41 |
| 300 psig | max | 27.9 | 47.3 | Not | Not | 79.2 | 134 | 27.9 | 47.3 |
| (20,7 bar G) | min | 0.82 | 1.41 | Available | Available | 2.34 | 3.98 | 0.82 | 1.41 |
| 400 psig | max | 25.7 | 43.9 | Not | Not | 73.0 | 124 | 25.7 | 43.9 |
| (27,6 bar G) | min | 0.82 | 1.41 | Available | Available | 2.34 | 3.98 | 0.82 | 1.41 |
| 500 psig | max | 23.0 | 39.4 | Not | Not | 66.0 | 112 | 23.0 | 39.4 |
| (34,5 bar G) | min | 0.82 | 1.41 | Available | Available | 2.34 | 3.98 | 0.82 | 1.41 |

Table A-9. Air Flow Rate Limits at 59 °F (15 °C)

| Process Pressure | Flow Rate Limits | Minimum and Maximum Air Flow Rates for line sizes 1$^1/_2$ 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 | max | 212 | 360 | 79.2 | 134 | 349 | 593 | 212 | 360 |
| (0 bar G) | min | 18.4 | 31.2 | 7.81 | 13.3 | 30.3 | 51.5 | 18.4 | 31.2 |
| 50 psig | max | 212 | 360 | 79.2 | 134 | 349 | 593 | 212 | 360 |
| (3,45 bar G) | min | 8.76 | 14.9 | 3.72 | 6.32 | 14.5 | 24.6 | 8.76 | 14.9 |
| 100 psig | max | 212 | 360 | 79.2 | 134 | 349 | 593 | 212 | 360 |
| (6,89 bar G) | min | 6.58 | 11.2 | 2.80 | 4.75 | 10.8 | 18.3 | 6.58 | 11.2 |
| 150 psig | max | 212 | 360 | 79.2 | 134 | 349 | 593 | 212 | 360 |
| (10,3 bar G) | min | 5.51 | 9.36 | 2.34 | 3.98 | 9.09 | 15.4 | 5.51 | 9.36 |
| 200 psig | max | 212 | 360 | 79.2 | 134 | 349 | 593 | 212 | 360 |
| (13,8 bar G) | min | 5.51 | 9.36 | 2.34 | 3.98 | 9.09 | 15.4 | 5.51 | 9.36 |
| 300 psig | max | 198 | 337 | 79.2 | 134 | 326 | 554 | 198 | 337 |
| (20,7 bar G) | min | 5.51 | 9.36 | 2.34 | 3.98 | 9.09 | 15.4 | 5.51 | 9.36 |
| 400 psig | max | 172 | 293 | 73.0 | 124 | 284 | 483 | 172 | 293 |
| (27,6 bar G) | min | 5.51 | 9.36 | 2.34 | 3.98 | 9.09 | 15.4 | 5.51 | 9.36 |
| 500 psig | max | 154 | 262 | 66.0 | 112 | 254 | 432 | 154 | 262 |
| (34,5 bar G) | min | 5.51 | 9.36 | 2.34 | 3.98 | 9.09 | 15.4 | 5.51 | 9.36 |

Table A-10. Air Flow Rate Limits at 59 °F (15 °C)

| Process Pressure | 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 | max | 770 | 1308 | 349 | 593 | 1326 | 2253 | 770 | 1308 |
| (0 bar G) | min | 66.8 | 114 | 30.3 | 51.5 | 115 | 195 | 66.8 | 114 |
| 50 psig | max | 770 | 1308 | 349 | 593 | 1326 | 2253 | 770 | 1308 |
| (3,45 bar G) | min | 31.8 | 54.1 | 14.5 | 24.6 | 54.8 | 93.2 | 31.8 | 54.1 |
| 100 psig | max | 770 | 1308 | 349 | 593 | 1326 | 2253 | 770 | 1308 |
| (6,89 bar G) | min | 23.9 | 40.6 | 10.8 | 18.3 | 41.1 | 69.8 | 23.9 | 40.6 |
| 150 psig | max | 770 | 1308 | 349 | 593 | 1326 | 2253 | 770 | 1308 |
| (10,3 bar G) | min | 20.0 | 34.0 | 9.09 | 15.4 | 34.5 | 58.6 | 20.0 | 34.0 |
| 200 psig | max | 770 | 1308 | 349 | 593 | 1326 | 2253 | 770 | 1308 |
| (13,8 bar G) | min | 20.0 | 34.0 | 9.09 | 15.4 | 34.5 | 58.6 | 20.0 | 34.0 |
| 300 psig | max | 718 | 1220 | 326 | 554 | 1237 | 2102 | 718 | 1220 |
| (20,7 bar G) | min | 20.0 | 34.0 | 9.09 | 15.4 | 34.5 | 58.6 | 20.0 | 34.0 |
| 400 psig | max | 625 | 1062 | 284 | 483 | 1076 | 1828 | 625 | 1062 |
| (27,6 bar G) | min | 20.0 | 34.0 | 9.09 | 15.4 | 34.5 | 58.6 | 20.0 | 34.0 |
| 500 psig | max | 560 | 951 | 254 | 432 | 964 | 1638 | 560 | 951 |
| (34,5 bar G) | min | 20.0 | 34.0 | 9.09 | 15.4 | 34.5 | 58.6 | 20.0 | 34.0 |

Table A-11. Air Flow Rate Limits at 59 °F (15 °C)

| Process Pressure | 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 | max | 3009 | 5112 | 1326 | 2253 | 5211 | 8853 | 3009 | 5112 |
| (0 bar G) | min | 261 | 443 | 115 | 195 | 452 | 768 | 261 | 443 |
| 50 psig | max | 3009 | 5112 | 1326 | 2253 | 5211 | 8853 | 3009 | 5112 |
| (3,45 bar G) | min | 124 | 211 | 54.8 | 93.2 | 215 | 365 | 124 | 211 |
| 100 psig | max | 3009 | 5112 | 1326 | 2253 | 5211 | 8853 | 3009 | 5112 |
| (6,89 bar G) | min | 93.3 | 159 | 41.1 | 69.8 | 162 | 276 | 93.3 | 159 |
| 150 psig | max | 3009 | 5112 | 1326 | 2253 | 5211 | 8853 | 3009 | 5112 |
| (10,3 bar G) | min | 78.2 | 133 | 34.5 | 58.6 | 135 | 229 | 78.2 | 133 |
| 200 psig | max | 3009 | 5112 | 1326 | 2253 | 5211 | 8853 | 3009 | 5112 |
| (13,8 bar G) | min | 78.2 | 133 | 34.5 | 58.6 | 135 | 229 | 78.2 | 133 |
| 300 psig | max | 2807 | 4769 | 1237 | 2102 | 4862 | 8260 | 2807 | 4769 |
| (20,7 bar G) | min | 78.2 | 133 | 34.5 | 58.6 | 135 | 229 | 78.2 | 133 |
| 400 psig | max | 2442 | 4149 | 1076 | 1828 | 4228 | 7183 | 2442 | 4149 |
| (27,6 bar G) | min | 78.2 | 133 | 34.5 | 58.6 | 136 | 229 | 78.2 | 133 |
| 500 psig | max | 2188 | 3717 | 964 | 1638 | 3789 | 6437 | 2188 | 3717 |
| (34,5 bar G) | min | 78.2 | 133 | 34.5 | 58.6 | 136 | 229 | 78.2 | 133 |

Table A-12. Air Flow Rate Limits at 59 °F (15 °C)

| Process Pressure | 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 | max | 8214 | 13956 | 5211 | 8853 | 11781 | 20016 | 8214 | 13956 |
| (0 bar G) | min | 712.9 | 1211 | 452 | 768 | 1022 | 1736 | 712.9 | 1211 |
| 50 psig | max | 8214 | 13956 | 5211 | 8853 | 11781 | 20016 | 8214 | 13956 |
| (3,45 bar G) | min | 339.5 | 577 | 215 | 365 | 486.9 | 827 | 339.5 | 577 |
| 100 psig | max | 8214 | 13956 | 5211 | 8853 | 11781 | 20016 | 8214 | 13956 |
| (6,89 bar G) | min | 254.7 | 433 | 162 | 276 | 365.4 | 621 | 254.7 | 433 |
| 150 psig | max | 8214 | 13956 | 5211 | 8853 | 11781 | 20016 | 8214 | 13956 |
| (10,3 bar G) | min | 213.6 | 363 | 135 | 229 | 306.3 | 520 | 213.6 | 363 |
| 200 psig | max | 8214 | 13956 | 5211 | 8853 | 11781 | 20016 | 8214 | 13956 |
| (13,8 bar G) | min | 213.6 | 363 | 135 | 229 | 306.3 | 520 | 213.6 | 363 |
| 300 psig | max | 7664 | 13021 | 4862 | 8260 | 10992 | 18675 | 7664 | 13021 |
| (20,7 bar G) | min | 213.6 | 363 | 135 | 229 | 306.3 | 520 | 213.6 | 363 |
| 400 psig | max | 6664 | 11322 | 4228 | 7183 | 9559 | 16241 | 6664 | 11322 |
| (27,6 bar G) | min | 213.6 | 363 | 136 | 229 | 306.3 | 520 | 213.6 | 363 |
| 500 psig | max | 5972 | 10146 | 3789 | 6437 | 8565 | 14552 | 5972 | 10146 |
| (34,5 bar G) | min | 213.6 | 363 | 136 | 229 | 306.3 | 520 | 213.6 | 363 |

**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 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-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 1/2 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 | max | 120 | 54.6 | Not | Not | 342 | 155 | 120 | 54.6 |
| (1,03 bar G) | min | 12.8 | 5.81 | Available | Available | 34.8 | 15.8 | 12.8 | 5.81 |
| 25 psig | max | 158 | 71.7 | Not | Not | 449 | 203 | 158 | 71.7 |
| (1,72 bar G) | min | 14.0 | 6.35 | Available | Available | 39.9 | 18.1 | 14.0 | 6.35 |
| 50 psig | max | 250 | 113 | Not | Not | 711 | 322 | 250 | 113 |
| (3,45 bar G) | min | 17.6 | 8.00 | Available | Available | 50.1 | 22.7 | 17.6 | 8.00 |
| 100 psig | max | 429 | 194 | Not | Not | 1221 | 554 | 429 | 194 |
| (6,89 bar G) | min | 23.1 | 10.5 | Available | Available | 65.7 | 29.8 | 23.1 | 10.5 |
| 150 psig | max | 606 | 275 | Not | Not | 1724 | 782 | 606 | 275 |
| (10,3 bar G) | min | 27.4 | 12.5 | Available | Available | 78.1 | 35.4 | 27.4 | 12.5 |
| 200 psig | max | 782 | 354 | Not | Not | 2225 | 1009 | 782 | 354 |
| (13,8 bar G) | min | 31.2 | 14.1 | Available | Available | 88.7 | 40.2 | 31.2 | 14.1 |
| 300 psig | max | 1135 | 515 | Not | Not | 3229 | 1464 | 1135 | 515 |
| (20,7 bar G) | min | 37.6 | 17.0 | Available | Available | 107 | 48.5 | 37.6 | 17.0 |
| 400 psig | max | 1492 | 676 | Not | Not | 4244 | 1925 | 1492 | 676 |
| (27,6 bar G) | min | 44.1 | 20.0 | Available | Available | 125 | 56.7 | 44.1 | 20.0 |
| 500 psig | max | 1855 | 841 | Not | Not | 5277 | 2393 | 1855 | 841 |
| (34,5 bar G) | min | 54.8 | 24.9 | Available | Available | 156 | 70.7 | 54.8 | 24.9 |

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

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

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

Table A-17. 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 | max | 35519 | 16111 | 22534 | 10221 | 50994 | 23130 | 35519 | 16111 |
| (1,03 bar G) | min | 3175 | 1440 | 2015 | 914 | 4554 | 2066 | 3175 | 1440 |
| 25 psig | max | 46618 | 21146 | 29575 | 13415 | 66862 | 30328 | 46618 | 21146 |
| (1,72 bar G) | min | 4570 | 2073 | 2308 | 1047 | 5218 | 2367 | 4570 | 2073 |
| 50 psig | max | 73748 | 33452 | 46787 | 21222 | 105774 | 47978 | 73748 | 33452 |
| (3,45 bar G) | min | 4575 | 2075 | 2903 | 1317 | 6562 | 2976 | 4575 | 2075 |
| 100 psig | max | 126660 | 57452 | 80356 | 36449 | 181663 | 82401 | 126660 | 57452 |
| (6,89 bar G) | min | 5996 | 2720 | 3804 | 1725 | 8600 | 3901 | 5996 | 2720 |
| 150 psig | max | 178808 | 81106 | 113440 | 51455 | 256457 | 116327 | 178808 | 81106 |
| (10,3 bar G) | min | 7125 | 3232 | 4520 | 2050 | 10218 | 4635 | 7125 | 3232 |
| 200 psig | max | 230722 | 104654 | 146375 | 66395 | 330915 | 150101 | 230722 | 104654 |
| (13,8 bar G) | min | 8092 | 3670 | 5134 | 2329 | 11607 | 5265 | 8092 | 3670 |
| 300 psig | max | 334810 | 151867 | 212411 | 96348 | 480203 | 217816 | 334810 | 151867 |
| (20,7 bar G) | min | 9749 | 4422 | 6185 | 2805 | 13983 | 6343 | 9749 | 4422 |
| 400 psig | max | 440085 | 199619 | 279200 | 126643 | 631195 | 286305 | 440085 | 199619 |
| (27,6 bar G) | min | 11442 | 5190 | 7259 | 3293 | 16411 | 7444 | 11442 | 5190 |
| 500 psig | max | 547165 | 248190 | 347134 | 157457 | 784775 | 355968 | 547165 | 248190 |
| (34,5 bar G) | min | 14226 | 6453 | 9025 | 4094 | 20404 | 9255 | 14226 | 6453 |

## PERFORMANCE SPECIFICATIONS

*The following performance specifications are for all Rosemount models except where noted. Digital performance specifications applicable to both Digital HART and FOUNDATION fieldbus 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**
±1.35% of rate
Note: The accuracy for the 8800DR, line sizes 6 to 12 inch (150 to 300mm), is ±1.50% 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" to 8"):
max velocity of 100 ft/s (30.5 m/s)

**NOTE**
For 1/2-in. through 4-in. (15 mm through 100 mm) line sizes, as the meter Reynolds number decreases below the stated limit to 10000, the positive limit of the accuracy error band will increase to 2.1% for the pulse output. Example: +2.1% to –0.65% for liquids.

### Process Temperature Accuracy

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

### Mass Flow Accuracy for Temperature Compensated Mass Flow

2.0% of rate (Typical)

### Repeatability

± 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-18 indicates the percent change in K-factor per 100 °F (55.5 °C) in process temperature from reference temperature of 77 °F (25 °C).

Table A-18. Process Temperature Effect

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

### Ambient Temperature Effect

#### Digital 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. At or near the minimum liquid flow rate in a normal pipe mounted installation, the maximum vibration should be 0.087-inch (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-inch (1,09 mm) double amplitude displacement or 1/2 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

#### 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.

#### Foundation fieldbus and Digital HART

No affect on the values that are being given if using HART digital signal or FOUNDATION fieldbus.

### Magnetic-Field Interference

#### HART Analog

Output error less than ±0.025% of span at 30 A/m (rms); meets IEC 60770-1984, Section 6.2.9.

#### Foundation fieldbus

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

### Series Mode Noise Rejection

#### HART Analog

Output error less than ±0.025% of span at 1 V rms, 60 Hz; meets IEC 60770-1984, Section 6.2.4.2.

#### Foundation fieldbus

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

### Common Mode Noise Rejection

#### HART Analog

Output error less than ±0.025% of span at 30 V rms, 60 Hz; meets IEC 60770-1984, Section 6.2.4.1.

#### Foundation fieldbus

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

### Power Supply Effect

#### HART Analog

Less than 0.005% of span per volt

#### Foundation fieldbus

No effect on accuracy.

## PHYSICAL SPECIFICATIONS

### NACE Compliance

Materials of Construction meet NACE material recommendations per MR0175-2003 for sour oilfield production environments. Materials of construction also meet NACE recommendations per MR0103-2003 for corrosive petroleum refining environments. MR0103 compliance requires Q25 option in model code.

### Electrical Connections

$^{1}/_{2}$ –14 NPT, PG 13.5, or M20 × 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)

**Paint**
Polyurethane

**Cover O-rings**
Buna-N

**Flanges**
316/316L lap joint

### Process-Wetted Materials

**Meter Body**
316L wrought stainless and CF-3M cast stainless or N06022 wrought Nickel Alloy and CW2M cast Nickel Alloy. Other material grades available. Consult factory for other materials of construction.

**Flanges**
316/316L stainless steel
Nickel Alloy N06022 Weld Neck

**Collars**
Nickel Alloy N06022

**Surface Finish of Flanges and Collars**
Standard: 125 to 250 μ inches
(3.1 to 6.3 μ meters) Ra roughness

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
DIN: PN 10, 16, 25, 40, 64, 100, 160
JIS: 10K, 20K, and 40K

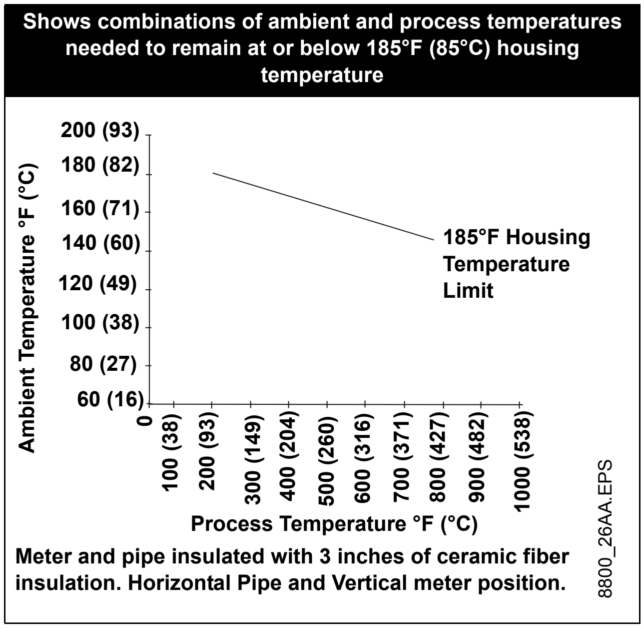
### Mounting

**Integral (Standard)**
Electronics are mounted on meter body.

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

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

Figure A-1. Rosemount 8800 Vortex Flowmeter Ambient/process temperature limits




### Pipe Length Requirements

The vortex meter may be installed with a minimum of ten straight pipe diameters (D) upstream and five straight pipe diameters (D) downstream by following the K-factor corrections as described in the Technical Data Sheet (00816-0100-3250) on Installation Effects. No K-factor correction is required if 35 diameters upstream (35D) and 10 diameters downstream (10D) are available.

### Tagging

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

### 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.

## DIMENSIONAL DRAWINGS

FIGURE 1. Flanged-Style Flowmeter Dimensional Drawings (1/2-through 12-in./15 through 300 mm Line Sizes)

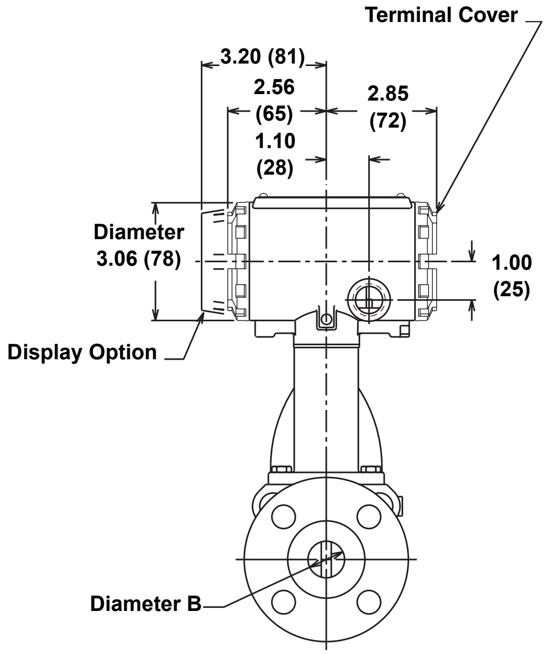
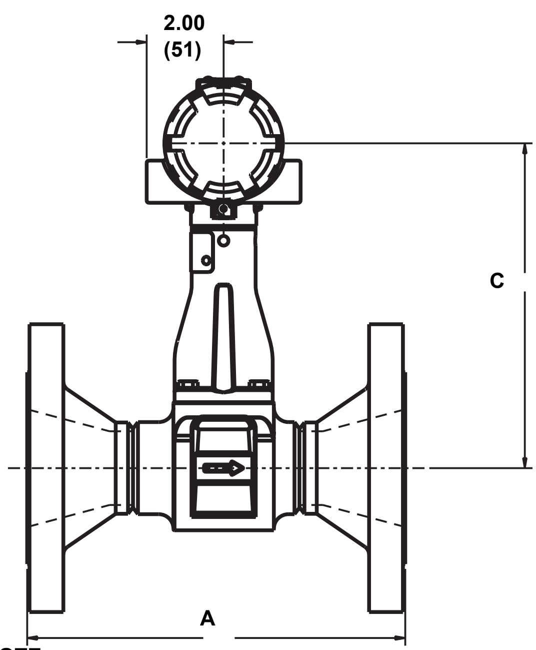
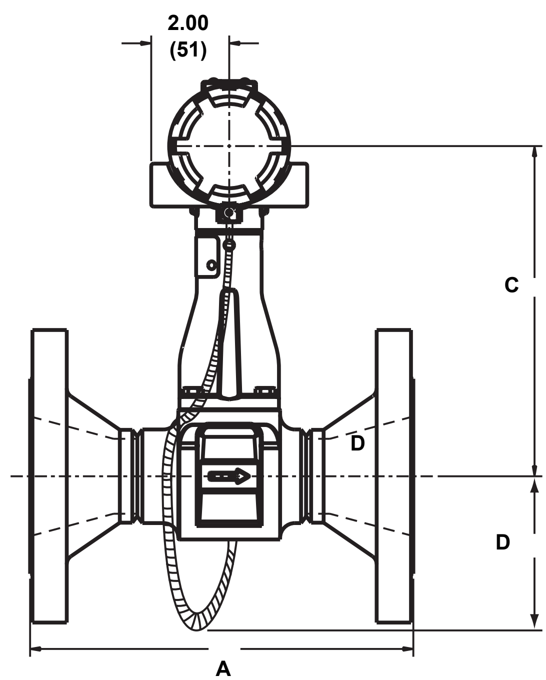



Diagram illustrated without MTA Option




**NOTE**
**Dimensions are in inches (millimeters)**

Diagram illustrated with MTA Option




8800-8800_30AA, 8800_31AA.EPS

Table A-19. Flanged-Style Flowmeter (1/2-through 2in./15 through 50 mm Line Sizes)

| Nominal Size Inch (mm) | Flange Rating | Face-to-face A Inch (mm)(1) | A-ANSI RTJ Inch (mm) | Diameter B Inch (mm)(2) | C Inch (mm)(3) | D Inch (mm) | Weight(4) lb (kg) |
|---|---|---|---|---|---|---|---|
| ½ (15) | Class 150 | 6.9 (175) | – | 0.54 (13,7) | 7.6 (193) | | 9.1 (4,1) |
| | Class 300 | 7.2 (183) | 7.7 (196) | 0.54 (13,7) | 7.6 (193) | | 10.4 (4,7) |
| | Class 600 | 7.7 (196) | 7.7 (196) | 0.54 (13,7) | 7.6 (193) | | 10.8 (4,9) |
| | Class 900 | 8.4 (213) | 8.4 (213) | 0.54 (13,7) | 7.6 (193) | | 15.3 (6,9) |
| | PN 16/40 | 6.1 (155) | – | 0.54 (13,7) | 7.6 (193) | | 10.4 (4,7) |
| | PN 100 | 6.6 (168) | – | 0.54 (13,7) | 7.6 (193) | | 12.3 (5,6) |
| | JIS 10K/20K | 6.3 (160) | – | 0.54 (13,7) | 7.6 (193) | | 10.1 (4,5) |
| | JIS 40K | 7.3 (185) | – | 0.54 (13,7) | 7.6 (193) | | 13.5 (6,1) |
| 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) | | 24.3 (11,0) |
| | Class 1500 | 9.4 (239) | 9.4 (239) | 0.95 (24,1) | 7.7 (196) | | 24.3 (11,0) |
| | PN 16/40 | 6.3 (160) | – | 0.95 (24,1) | 7.7 (196) | | 13.5 (6,1) |
| | PN 100 | 7.7 (195) | – | 0.95 (24,1) | 7.7 (196) | | 19.5 (8,8) |
| | PN 160 | 7.7 (195) | – | 0.95 (24,1) | 7.7 (196) | | 19.5 (8,8) |
| | JIS 10K/20K | 6.5 (165) | – | 0.95 (24,1) | 7.7 (196) | | 13.7 (6,2) |
| | JIS 40K | 7.9 (200) | – | 0.95 (24,1) | 7.7 (196) | | 17.4 (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 | 9.4 (239) | 9.4 (239) | 1.49 (37,8) | 8.1 (206) | | 25.3 (11,5) |
| | Class 900 | 10.4 (264) | 10.4 (264) | 1.49 (37,8) | 8.1 (206) | | 36.3 (16,5) |
| | Class 1500 | 10.4 (264) | 10.4 (264) | 1.49 (37,8) | 8.1 (206) | | 36.6 (16,6) |
| | PN 16/40 | 6.9 (175) | – | 1.49 (37,8) | 8.1 (206) | | 19.3 (8,8) |
| | PN 100 | 8.2 (208) | – | 1.49 (37,8) | 8.1 (206) | | 27.9 (12,7) |
| | PN 160 | 8.4 (213) | – | 1.49 (37,8) | 8.1 (206) | | 29.3 (13,3) |
| | JIS 10K/20K | 7.3 (185) | – | 1.49 (37,8) | 8.1 (206) | | 18.6 (8,4) |
| | JIS 40K | 8.5 (215) | – | 1.49 (37,8) | 8.1 (206) | | 25.6 (11,6) |
| 2 (50) | Class 150 | 9.3 (236) | 9.8 (249) | 1.92 (48,8) | 8.5 (216) | 4.7 (119) | 22.0 (10,0) |
| | Class 300 | 9.8 (249) | 10.4 (264) | 1.92 (48,8) | 8.5 (216) | 4.7 (119) | 26.0 (11,8) |
| | Class 600 | 10.5 (267) | 10.7 (271) | 1.92 (48,8) | 8.5 (216) | 4.7 (119) | 29.6 (13,4) |
| | Class 900 | 12.8 (325) | 12.9 (328) | 1.92 (48,8) | 8.5 (216) | 4.7 (119) | 59.4 (26,9) |
| | Class 1500 | 12.8 (325) | 12.9 (328) | 1.79 (45,5) | 8.5 (216) | – | 59.4 (26,9) |
| | PN 16/40 | 8.0 (203) | – | 1.92 (48,8) | 8.5 (216) | 4.7 (119) | 23.0 (10,4) |
| | PN 64 | 9.2 (234) | – | 1.92 (48,8) | 8.5 (216) | 4.7 (119) | 30.6 (13,9) |
| | PN 100 | 9.6 (244) | – | 1.92 (48,8) | 8.5 (216) | 4.7 (119) | 36.4 (16,5) |
| | PN 160 | 10.2 (259) | – | 1.92 (48,8) | 8.5 (216) | – | 38.7 (17,6) |
| | JIS 10K | 7.7 (195) | – | 1.92 (48,8) | 8.5 (216) | 4.7 (119) | 19.5 (8,8) |
| | JIS 20K | 8.3 (210) | – | 1.92 (48,8) | 8.5 (216) | 4.7 (119) | 20.1 (9,1) |
| | JIS 40K | 9.8 (249) | – | 1.92 (48,8) | 8.5 (216) | 4.7 (119) | 28.3 (12,8) |

*(1) ±0.14 inch (3.6 mm)*
*(2) ±0.03 inch (0.8 mm)*
*(3) ±0.20 inch (5.1 mm)*
*(4) Add 0.2 lb (0,1 kg) for display option*

Table A-20. Flanged-Style Flowmeter (3-through 6-in./80 through 150mm Line Sizes) (Refer to previous drawing)

| Nominal Size Inch (mm) | Flange Rating | Face-to-face A Inch (mm)(1) | A ANSI RTJ Inch (mm) | Diameter B Inch (mm)(2) | C Inch (mm)(3) | D Inch (mm) | Weight(4) lb (kg) |
|---|---|---|---|---|---|---|---|
| 3 (80) | Class 150 | 9.9 (251) | 10.4 (264) | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 36.9 (16,7) |
| | Class 300 | 10.6 (269) | 11.2 (284) | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 46.1 (20,9) |
| | Class 600 | 11.4 (290) | 11.5 (292) | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 52.1 (26,6) |
| | Class 900 | 12.9 (328) | 13.0 (330) | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 75.5 (34,2) |
| | Class 1500 | 14.1 (358) | 14.2 (361) | 2.66 (67,6) | 9.1 (231) | – | 105.8 (48,0) |
| | PN 16/40 | 8.9 (226) | – | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 36.3 (16,5) |
| | PN 64 | 10.0 (254) | – | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 45.1 (20,5) |
| | PN 100 | 10.5 (267) | – | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 54.4 (24,7) |
| | PN 160 | 11.2 (284) | – | 2.87 (72,9) | 9.1 (231) | – | 59.6 (27,0) |
| | JIS 10K | 7.9 (200) | – | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 27.6 (12,5) |
| | JIS 20K | 9.3 (235) | – | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 35.0 (15,9) |
| | JIS 40K | 11.0 (280) | – | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 50.0 (22,7) |
| 4 (100) | Class 150 | 10.3 (262) | 10.8 (274) | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 50.7 (23,0) |
| | Class 300 | 11.0 (279) | 11.6 (295) | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 70.8 (32,1) |
| | Class 600 | 12.8 (325) | 12.9 (328) | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 96.5 (43,8) |
| | Class 900 | 13.8 (351) | 13.9 (353) | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 119.7 (54,3) |
| | Class 1500 | 14.5 (368) | 14.6 (371) | 3.43 (87,1) | 9.6 (244) | – | 157.9 (71,6) |
| | PN 16 | 8.4 (213) | – | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 40.1 (18,2) |
| | PN 40 | 9.4 (239) | – | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 49.2 (22,3) |
| | PN 64 | 10.4 (264) | – | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 62.1 (28,2) |
| | PN 100 | 11.3 (287) | – | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 78.5 (35,6) |
| | PN 160 | 12.1 (307) | – | 3.79 (96,3) | 9.6 (244) | – | 85.8 (38,9) |
| | JIS 10K | 8.7 (220) | – | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 37.0 (16,8) |
| | JIS 20K | 8.7 (220) | – | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 44.9 (20,4) |
| | JIS 40K | 11.8 (300) | – | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 75.3 (34,2) |
| 6 (150) | Class 150 | 11.6 (295) | 12.1 (307) | 5.7 (144,8) | 10.8 (274) | 7.4 (187) | 90.0 (40,8) |
| | Class 300 | 12.4 (315) | 13.0 (330) | 5.7 (144,8) | 10.8 (274) | 7.4 (187) | 129.5 (58,7) |
| | Class 600 | 14.3 (363) | 14.5 (368) | 5.7 (144,8) | 10.8 (274) | 7.4 (187) | 195.5 (88,7) |
| | Class 900 | 16.1 (409) | 16.2 (411) | 5.14 (130,6) | 10.8 (274) | – | 253.7 (115,1) |
| | Class 1500 | 18.6 (472) | 18.8 (478) | 5.14 (130,6) | 10.8 (274) | – | 376.0 (170.6) |
| | PN 16 | 8.9 (226) | – | 5.7 (144,8) | 10.8 (274) | 7.4 (187) | 75.6 (34,3) |
| | PN 40 | 10.5 (267) | – | 5.7 (144,8) | 10.8 (274) | 7.4 (187) | 95.3 (43,2) |
| | PN 64 | 12.1 (307) | – | 5.7 (144,8) | 10.8 (274) | 7.4 (187) | 138.8 (63,0) |
| | PN 100 | 13.7 (348) | – | 5.7 (144,8) | 10.8 (274) | 7.4 (187) | 168.5 (76,4) |
| | JIS 10K | 10.6 (270) | – | 5.7 (144,8) | 10.8 (274) | 7.4 (187) | 79.8 (36,2) |
| | JIS 20K | 10.6 (270) | – | 5.7 (144,8) | 10.8 (274) | 7.4 (187) | 97.7 (44,3) |
| | JIS 40K | 14.2 (360) | – | 5.7 (144,8) | 10.8 (274) | 7.4 (187) | 175.9 (79,8) |

*(1) ±0.14 inch (3.6 mm)*
*(2) ±0.03 inch (0.8 mm)*
*(3) ±0.20 inch (5.1 mm)*
*(4) Add 0.2 lb (0,1 kg) for display option.*

Table A-21. Flanged-Style Flowmeter (8-through 12-in./200 through 300mm Line Sizes) (Refer to previous drawing)

| Nominal Size Inch (mm) | Flange Rating | Face-to-face A Inch (mm)(1) | A ANSI RTJ Inch (mm) | Diameter B Inch (mm)(2) | C Inch (mm)(3) | D Inch (mm) | Weight(4) lb (kg) |
|---|---|---|---|---|---|---|---|
| 8 (200) | Class 150 | 13.6 (345) | 14.1 (358) | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 139.6 (63,3) |
| | Class 300 | 14.3 (363) | 15.0 (381) | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 196.2 (89,0) |
| | Class 600 | 16.6 (422) | 16.7 (424) | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 295.0 (133,8) |
| | Class 900 | 18.8 (478) | 19.0 (483) | 6.62 (168,1) | 11.7 (297) | – | 420.4 (190,7) |
| | Class 1500 | 22.8 (579) | 23.2 (589) | 6.62 (168,1) | 11.7 (297) | – | 646.0 (293,0) |
| | PN 10 | 10.5 (266) | – | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 109.6 (49,7) |
| | PN 16 | 10.5 (266) | – | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 108.5 (49,2) |
| | PN 25 | 11.9 (302) | – | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 136.3 (61,8) |
| | PN 40 | 12.5 (318) | – | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 154.8 (70,2) |
| | PN 64 | 14.2 (361) | – | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 214.6 (97,3) |
| | PN 100 | 15.8 (401) | – | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 279.9 (127) |
| | JIS 10K | 12.2 (310) | – | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 109.9 (49,9) |
| | JIS 20K | 12.2 (310) | – | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 134.3 (60,9) |
| | JIS 40K | 16.5 (420) | – | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 255.7 (116) |
| 10 (250) | Class 150 | 14.6 (371) | 15.1 (384) | 9.56 (243) | 12.8 (325) | 9.3 (236) | 197.2 (89) |
| | Class 300 | 15.8 (401) | 16.4 (417) | 9.56 (243) | 12.8 (325) | 9.3 (236) | 285.2 (129) |
| | Class 600 | 19.1 (485) | 19.2 (488) | 9.56 (243) | 12.8 (325) | 9.3 (236) | 475.3 (216) |
| | PN 10 | 11.9 (302) | – | 9.56 (243) | 12.8 (325) | 9.3 (236) | 156.3 (71) |
| | PN 16 | 12.1 (307) | – | 9.56 (243) | 12.8 (325) | 9.3 (236) | 161.1 (73) |
| | PN 25 | 13.5 (343) | – | 9.56 (243) | 12.8 (325) | 9.3 (236) | 197.4 (90) |
| | PN 40 | 14.8 (376) | – | 9.56 (243) | 12.8 (325) | 9.3 (236) | 245.3 (111) |
| | PN 64 | 16.4 (417) | – | 9.56 (243) | 12.8 (325) | 9.3 (236) | 306.3 (139) |
| | PN 100 | 18.9 (480) | – | 9.56 (243) | 12.8 (325) | 9.3 (236) | 443.0 (201) |
| | JIS 10K | 14.6 (371) | – | 9.56 (243) | 12.8 (325) | 9.3 (236) | 173.3 (79) |
| | JIS 20K | 14.6 (371) | – | 9.56 (243) | 12.8 (325) | 9.3 (236) | 220.5 (100) |
| | JIS 40K | 18.1 (460) | – | 9.56 (243) | 12.8 (325) | 9.3 (236) | 377.3 (171) |
| 12 (300) | Class 150 | 16.8 (427) | 17.3 (439) | 11.38 (289) | 13.7 (348) | 10.1 (256) | 296.0 (134) |
| | Class 300 | 18.0 (457) | 18.7 (475) | 11.38 (289) | 13.7 (348) | 10.1 (256) | 413.2 (187) |
| | Class 600 | 20.5 (521) | 20.7 (526) | 11.38 (289) | 13.7 (348) | 10.1 (256) | 592.2 (269) |
| | PN 10 | 13.2 (335) | – | 11.38 (289) | 13.7 (348) | 10.1 (256) | 203.1 (92) |
| | PN 16 | 13.9 (353) | – | 11.38 (289) | 13.7 (348) | 10.1 (256) | 223.4 (101) |
| | PN 25 | 15.0 (381) | – | 11.38 (289) | 13.7 (348) | 10.1 (256) | 267.8 (121) |
| | PN 40 | 16.9 (429) | – | 11.38 (289) | 13.7 (348) | 10.1 (256) | 345.7 (157) |
| | PN 64 | 18.8 (478) | – | 11.38 (289) | 13.7 (348) | 10.1 (256) | 428.5 (194) |
| | PN 100 | 21.2 (538) | – | 11.38 (289) | 13.7 (348) | 10.1 (256) | 640.8 (291) |
| | JIS 10K | 15.7 (399) | – | 11.38 (289) | 13.7 (348) | 10.1 (256) | 224.5 (102) |
| | JIS 20K | 15.7 (399) | – | 11.38 (289) | 13.7 (348) | 10.1 (256) | 287.1 (130) |
| | JIS 40K | 19.7 (500) | – | 11.38 (289) | 13.7 (348) | 10.1 (256) | 504.7 (229) |

*(1) ±0.14 inch (3.6 mm)*
*(2) ±0.03 inch (0.8 mm)*
*(3) ±0.20 inch (5.1 mm)*
*(4) Add 0.2 lb (0,1 kg) for display option.*

Figure A-2. Rosemount 8800DR Reducer™ Flowmeter Dimensional Drawings (1-through 12-in./25 through 300 mm Line Sizes)

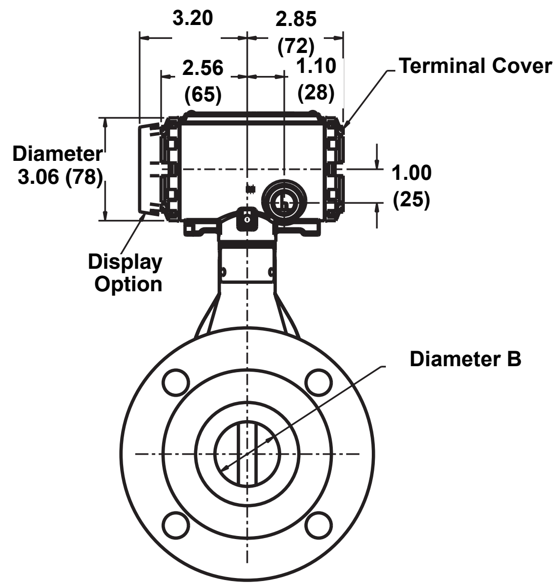



Diagram illustrated without MTA Option

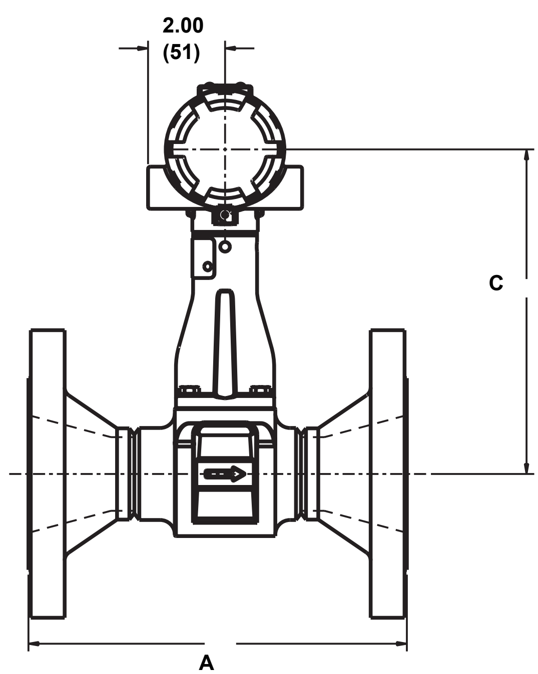
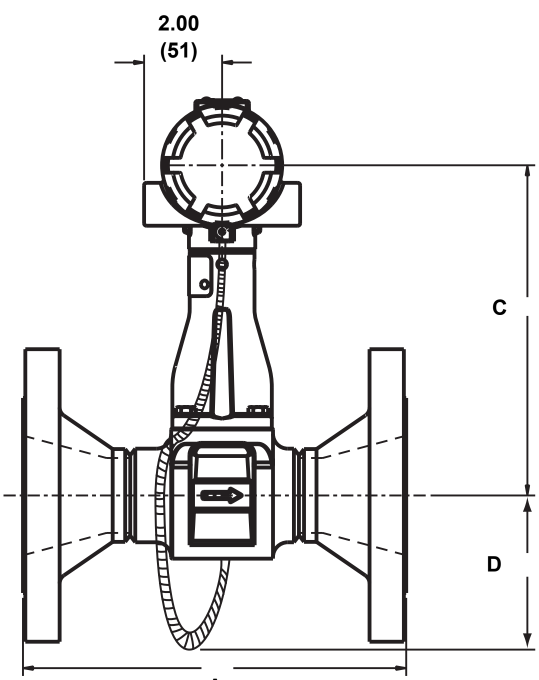



Diagram illustrated with MTA Option




8800_22a, 8800_22ab

**NOTE**
**Dimensions are in inches (millimeters)**

Table A-22. Reducer Flowmeter (1-through 3in./25 through 80 mm Line Sizes)

| Nominal Size Inch (mm) | Flange Rating | Face-to-face A Inch (mm)(1) | A-ANSI RTJ Inch (mm) | Diameter B Inch (mm)(2) | C Inch (mm)(3) | D Inch (mm) | Weight(4) 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 | 6.3 (160) | – | 0.54 (13,7) | 7.6 (193) | – | 12.64 (5,73) |
| | PN 100 | 7.7 (195) | – | 0.54 (13,7) | 7.6 (193) | – | 18.44 (8,36) |
| | PN 160 | 7.7 (195) | – | 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 | 9.4 (239) | 9.4 (239) | 0.95 (24,1) | 7.7 (196) | – | 23.77 (10,78) |
| | Class 900 | 10.4 (264) | 10.4 (264) | 0.95 (24,1) | 7.7 (196) | – | 34.98 (15,87) |
| | PN 16/40 | 6.9 (175) | – | 0.95 (24,1) | 7.7 (196) | – | 17.50 (7,94) |
| | PN 100 | 8.2 (208) | – | 0.95 (24,1) | 7.7 (196) | – | 26.20 (11,88) |
| | PN 160 | 8.4 (213) | – | 0.95 (24,1) | 7.7 (196) | – | 27.67 (12,55) |
| 2 (50) | Class 150 | 9.3 (236) | 9.8 (249) | 1.49 (37,8) | 8.1 (206) | – | 22.61 (10,26) |
| | Class 300 | 9.8 (249) | 10.4 (264) | 1.49 (37,8) | 8.1 (206) | – | 26.76 (12,14) |
| | Class 600 | 10.5 (267) | 10.7 (271) | 1.49 (37,8) | 8.1 (206) | – | 30.59 (13,88) |
| | Class 900 | 12.8 (325) | 12.9 (328) | 1.49 (37,8) | 8.1 (206) | – | 60.76 (27,56) |
| | PN 16/40 | 8.0 (203) | – | 1.49 (37,8) | 8.1 (206) | – | 23.52 (10,67) |
| | PN 64 | 9.2 (234) | – | 1.49 (37,8) | 8.1 (206) | – | 31.28 (14,19) |
| | PN 100 | 9.6 (244 | – | 1.49 (37,8) | 8.1 (206) | – | 37.25 (16,90) |
| | PN 160 | 10.2 (259) | – | 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) | 4.7 (119) | 33.15 (15,04) |
| | Class 300 | 10.6 (269) | 11.2 (284) | 1.92 (48,8) | 8.5 (216) | 4.7 (119) | 42.66 (19,35) |
| | Class 600 | 11.4 (290) | 11.5 (292) | 1.92 (48,8) | 8.5 (216) | 4.7 (119) | 49.46 (22,43) |
| | Class 900 | 12.9 (328) | 13.0 (330) | 1.92 (48,8) | 8.5 (216) | 4.7 (119) | 73.28 (33,24) |
| | PN 16/40 | 8.9 (226) | – | 1.92 (48,8) | 8.5 (216) | 4.7 (119) | 33.30 (15,10) |
| | PN 64 | 10.0 (254) | – | 1.92 (48,8) | 8.5 (216) | 4.7 (119) | 42.45 (19,25) |
| | PN 100 | 10.5 (267) | – | 1.92 (48,8) | 8.5 (216) | 4.7 (119) | 52.21 (23,68) |
| | PN 160 | 11.2 (284) | – | 1.92 (48,8) | 8.5 (216) | 4.7 (119) | 57.94 (26,28) |

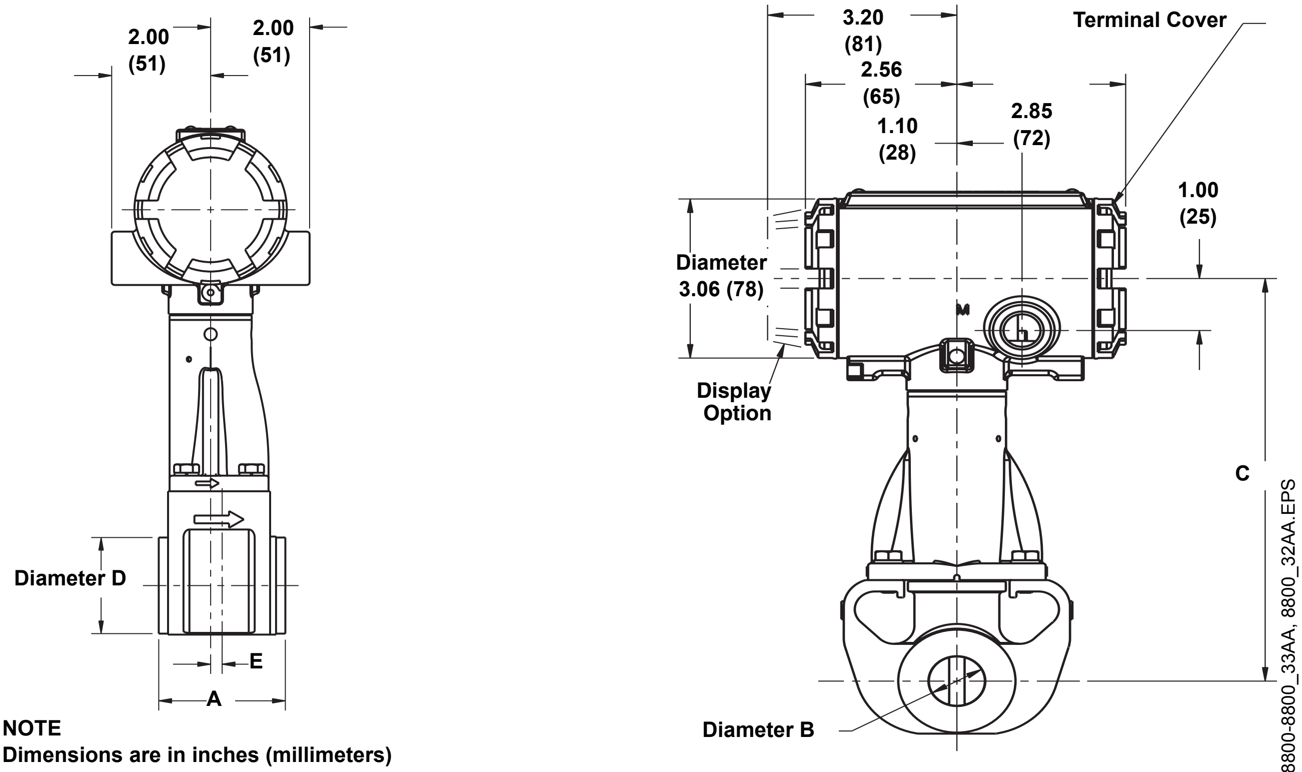
*(1) ±0.14 inch (3.6 mm)*
*(2) ±0.03 inch (0.8 mm)*
*(3) ±0.20 inch (5.1 mm)*
*(4) Add 0.2 lb (0,1 kg) for display option.*

Table A-23. Reducer Flowmeter (4-through 12-in./100 through 300mm Line Sizes) (Refer to previous drawing)

| Nominal Size Inch (mm) | Flange Rating | Face-to-face A Inch (mm)(1) | A ANSI RTJ Inch (mm) | Diameter B Inch (mm)(2) | C Inch (mm)(3) | D Inch (mm) | Weight(4) lb (kg) |
|---|---|---|---|---|---|---|---|
| 4 (100) | Class 150 | 10.3 (262) | 10.8 (274) | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 46.33 (21,01) |
| | Class 300 | 11.0 (279) | 11.6 (295) | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 67.04 (30,41) |
| | Class 600 | 12.8 (325) | 12.9 (328) | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 94.26 (42,76) |
| | Class 900 | 13.8 (351) | 13.9 (353) | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 118.04 (53,54) |
| | PN 16 | 8.4 (213) | – | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 36.36 (16,49) |
| | PN 40 | 9.4 (239) | – | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 45.89 (20,81) |
| | PN 64 | 10.4 (264) | – | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 59.72 (27,09) |
| | PN 100 | 11.3 (287) | – | 2.87 (72,9) | 9.1 (231) | 5.3 (134) | 76.73 (34,80) |
| | PN 160 | 12.1 (307) | – | 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) | 5.9 (149) | 70.27 (31,87) |
| | Class 300 | 12.4 (315 | 13.0 (330) | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 113.09 (51,30) |
| | Class 600 | 14.3 (363) | 14.5 (368) | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 185.13 (83,97) |
| | Class 900 | 16.1 (409) | 16.2 (411) | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 246.33 (111,73) |
| | PN 16 | 8.9 (226) | – | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 59.20 (26,85) |
| | PN 40 | 10.5 (267) | – | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 81.94 (37,17) |
| | PN 64 | 12.1 (307) | – | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 125.36 (56,86) |
| | PN 100 | 13.7 (348) | – | 3.79 (96,3) | 9.6 (244) | 5.9 (149) | 162.29 (73,61) |
| | PN 160 | 14.7 (373) | – | 3.79 (96,3) | 9.6 (244) | – | 187.91 (85,23) |
| 8 (200) | Class 150 | 13.6 (345) | 14.1 (358) | 5.70 (144,8) | 10.8 (274) | 7.4 (187) | 133.14 (60,39) |
| | Class 300 | 14.3 (363) | 15.0 (381) | 5.70 (144,8) | 10.8 (274) | 7.4 (187) | 195.54 (88,69) |
| | Class 600 | 16.6 (422) | 16.7 (424) | 5.70 (144,8) | 10.8 (274) | 7.4 (187) | 305.18 (138,43) |
| | PN 10 | 10.5 (266) | – | 5.70 (144,8) | 10.8 (274) | 7.4 (187) | 100.92 (45,78) |
| | PN 16 | 10.5 (266) | – | 5.70 (144,8) | 10.8 (274) | 7.4 (187) | 100.92 (45,78) |
| | PN 25 | 11.9 (302) | – | 5.70 (144,8) | 10.8 (274) | 7.4 (187) | 134.05 (60,80) |
| | PN 40 | 12.5 (318) | – | 5.70 (144,8) | 10.8 (274) | 7.4 (187) | 155.00 (70,31) |
| | PN 64 | 14.2 (361) | – | 5.70 (144,8) | 10.8 (274) | 7.4 (187) | 220.68 (100,10) |
| | PN 100 | 15.8 (401) | – | 5.70 (144,8) | 10.8 (274) | 7.4 (187) | 292.93 (132,87) |
| 10 (250) | Class 150 | 14.6 (371) | 15.1 (384) | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 182.45 (82,76) |
| | Class 300 | 15.8 (401) | 16.4 (417) | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 281.66 (127,76) |
| | Class 600 | 19.1 (485) | 19.2 (488) | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 489.89 (222,21) |
| | PN 10 | 11.9 (302) | – | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 138.63 (62,88) |
| | PN 16 | 12.1 (307) | – | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 148.58 (67,39) |
| | PN 25 | 13.5 (343) | – | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 191.00 (86,64) |
| | PN 40 | 14.8 (376) | – | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 245.85 (111,52) |
| | PN 64 | 16.4 (417) | – | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 314.13 (142,49) |
| | PN 100 | 18.9 (480) | – | 7.55 (191,8) | 11.7 (297) | 8.3 (210) | 463.49 (210,24) |
| 12 (300) | Class 150 | 16.8 (427) | 17.3 (439) | 9.56 (242,8) | 12.8 (325) | 9.3 (236) | 281.98 (127,90) |
| | Class 300 | 18.0 (457) | 18.7 (475) | 9.56 (242,8) | 12.8 (325) | 9.3 (236) | 412.18 (186,96) |
| | Class 600 | 20.5 (521) | 20.7 (526) | 9.56 (242,8) | 12.8 (325) | 9.3 (236) | 609.89 (296,64) |
| | PN 10 | 13.2 (335) | – | 9.56 (242,8) | 12.8 (325) | 9.3 (236) | 188.28 (85,40) |
| | PN 16 | 13.9 (353) | – | 9.56 (242,8) | 12.8 (325) | 9.3 (236) | 211.79 (96,07) |
| | PN 25 | 15.0 (381) | – | 9.56 (242,8) | 12.8 (325) | 9.3 (236) | 262.45 (119,05) |
| | PN 40 | 16.9 (429) | – | 9.56 (242,8) | 12.8 (325) | 9.3 (236) | 349.92 (158,72) |
| | PN 64 | 18.8 (478) | – | 9.56 (242,8) | 12.8 (325) | 9.3 (236) | 444.21 (201,49) |
| | PN 100 | 21.2 (538) | – | 9.56 (242,8) | 12.8 (325) | 9.3 (236) | 672.07 (304,85) |

*(1) ±0.14 inch (3.6 mm)*
*(2) ±0.03 inch (0.8 mm)*
*(3) ±0.20 inch (5.1 mm)*
*(4) Add 0.2 lb (0,1 kg) for display option.*

Figure A-3. Wafer-Style Dimensional Drawings (1/2-through 8 in./15 through 200 mm Line Sizes)




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

Table A-24. Rosemount 8800D Wafer-Style Meter

| Nominal Size Inch (mm) | Face-to-face A Inch (mm)(1) | Diameter B Inch (mm)(2) | C Inch (mm)(3) | Diameter D Inch (mm) | E Inch (mm) | Weight lb (kg)(4) |
|---|---|---|---|---|---|---|
| ½ (15) | 2.56 (65) | 0.54 (13,7) | 7.63 (194) | 1.38 (35,1) | 0.23 (5,9) | 7.3 (3,3) |
| 1 (25) | 2.56 (65) | 0.95 (24,1) | 7.74 (197) | 1.98 (50,3) | 0.23 (5,9) | 7.4 (3,4) |
| 1½ (40) | 2.56 (65) | 1.49 (37,8) | 8.14 (207) | 2.87 (72,9) | 0.18 (4,6) | 10.0 (4,5) |
| 2 (50) | 2.56 (65) | 1.92 (49) | 8.85 (225) | 3.86 (98) | 0.12 (3) | 10.6 (4,8) |
| 3 (80) | 2.56 (65) | 2.87 (73) | 9.62 (244) | 5.00 (127) | 0.25 (6) | 13.6 (6,2) |
| 4 (100) | 3.42 (87) | 3.79 (96) | 10.48 (266) | 6.20 (158) | 0.44 (11) | 21.4 (9,7) |
| 6 (150) | 4.99 (127) | 5.70 (145) | 10.75 (273) | 8.50 (216) | 1.11 (28) | 49.1 (22,3) |
| 8 (200) | 6.60 (168) | 7.55 (192) | 11.67 (296) | 10.62 (270) | 0.89 (23) | 85 (38,6) |

*(1) ±0.04 inch (1.0 mm)*
*(2) ±0.03 inch (0.8 mm)*
*(3) ±0.20 inch (5.1 mm)*
*(4) Add 0.2 lb (0,1 kg) for display option.*

Figure A-4. Vortex Dual-Sensor Style Flowmeter Dimensional Drawings (6 - 8 in (150 - 200mm) with 900# or 1500# flanges. See Figure 6.)

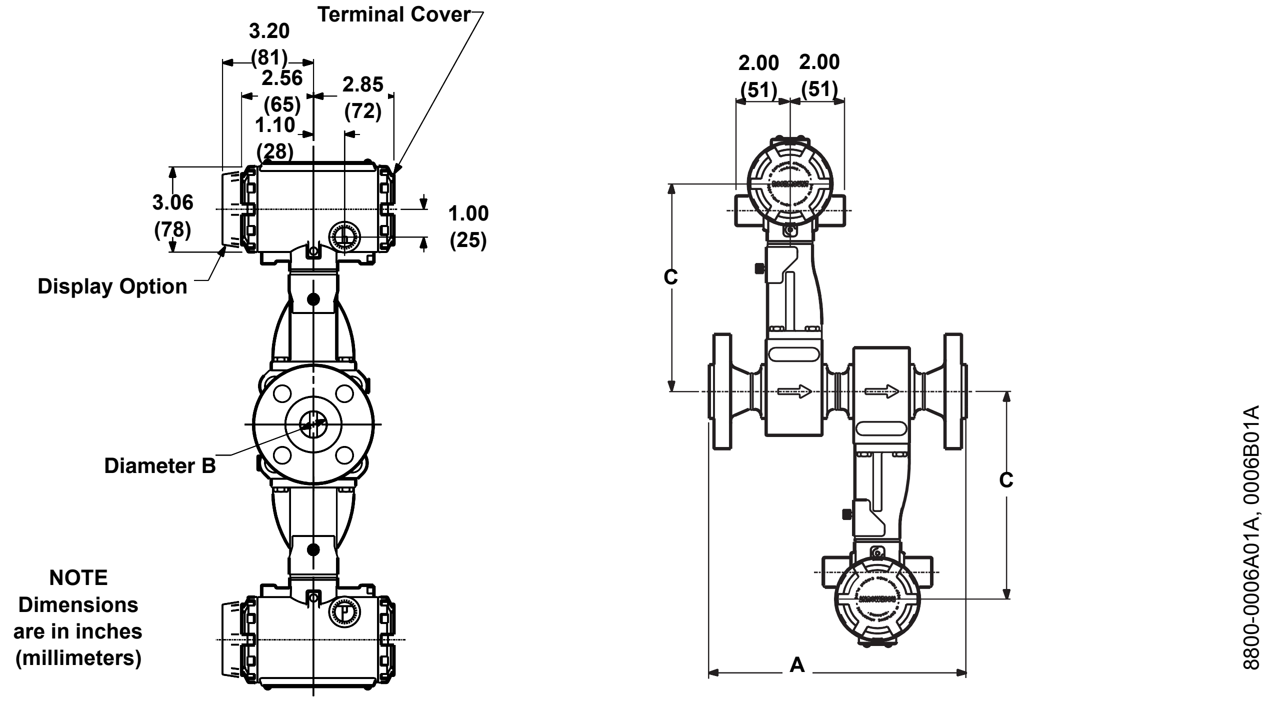



Figure A-5. Vortex Dual-Sensor Style Flowmeter Dimensional Drawings (6 - 8 in (150 - 200mm) with 900# or 1500# flanges and all 10 - 12 in. (250-300mm) line sizes)

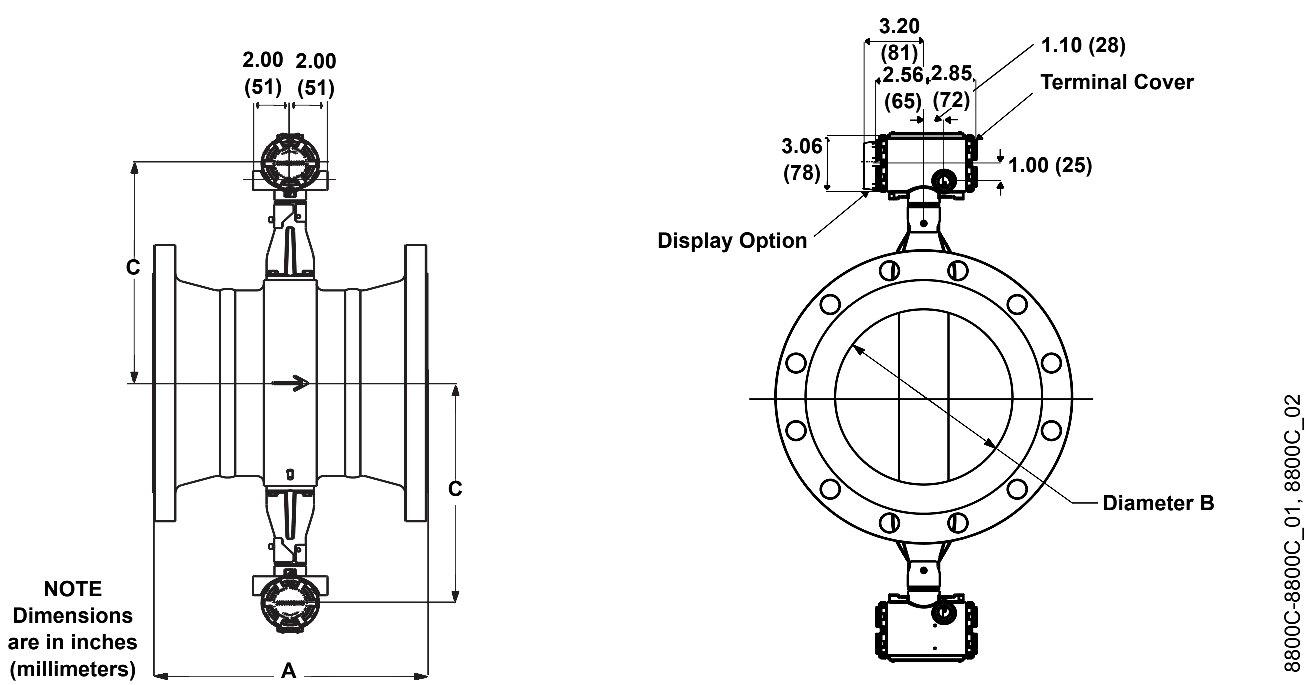


Table A-25. Vortex Dual-Sensor Style Flowmeter (1/2-through 3-in./15 through 80 mm Line Sizes)

| Nominal Size Inch (mm) | Flange Rating | Face-to-face A Inch (mm)(1) | A ANSI RTJ Inch (mm) | Diameter B Inch (mm)(2) | C Inch (mm)(3) | Weight lb (kg)(4) |
|---|---|---|---|---|---|---|
| ½ (15) | Class 150 | 12.0 (305) | – | 0.54 (13,7) | 7.6 (193) | 16.2 (7,4) |
| | Class 300 | 12.3 (312) | 12.8 (325) | 0.54 (13,7) | 7.6 (193) | 17.4 (7,9) |
| | Class 600 | 12.8 (325) | 12.8 (325) | 0.54 (13,7) | 7.6 (193) | 17.9 (8,1) |
| | Class 900 | 13.5 (343) | 13.5 (343) | 0.54 (13,7) | 7.6 (193) | 22.4 (10.2) |
| | PN 16/40 | 11.2 (284) | – | 0.54 (13,7) | 7.6 (193) | 17.2 (7,8) |
| | PN 100 | 11.8 (300) | – | 0.54 (13,7) | 7.6 (193) | 19.2 (8,7) |
| | JIS 10K/20K | 11.4 (290) | – | 0.54 (13,7) | 7.6 (193) | 17.1 (7,8) |
| | JIS 40K | 12.4 (315) | – | 0.54 (13,7) | 7.6 (193) | 20.6 (9,3) |
| 1 (25) | Class 150 | 15.1 (384) | 15.6 (396) | 0.95 (24,1) | 7.7 (196) | 19.8 (9,0) |
| | Class 300 | 15.6 (396) | 16.1 (409) | 0.95 (24,1) | 7.7 (196) | 22.5 (10,2) |
| | Class 600 | 16.1 (409) | 16.1 (409) | 0.95 (24,1) | 7.7 (196) | 23.3 (10,6) |
| | Class 900 | 17.0 (432) | 17.0 (432) | 0.95 (24,1) | 7.7 (196) | 31.8 (14,4) |
| | Class 1500 | 17.0 (432) | 17.0 (432) | 0.95 (24,1) | 7.7 (196) | 31.8 (14,4) |
| | PN 16/40 | 13.9 (353) | – | 0.95 (24,1) | 7.7 (196) | 21.0 (9,5) |
| | PN 100 | 15.3 (389) | – | 0.95 (24,1) | 7.7 (196) | 27.0 (12,3) |
| | PN 160 | 15.3 (389) | – | 0.95 (24,1) | 7.7 (196) | 27.0 (12,3) |
| | JIS 10K/20K | 14.1 (358) | – | 0.95 (24,1) | 7.7 (196) | 22.1 (10,0) |
| | JIS 40K | 15.5 (394) | – | 0.95 (24,1) | 7.7 (196) | 25.8 (11,7) |
| 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 | 12.5 (318) | 12.5 (318) | 1.49 (37,8) | 8.1 (206) | 34.8 (15,8) |
| | Class 900 | 13.5 (343) | 13.5 (343) | 1.49 (37,8) | 8.1 (206) | 45.7 (20,7) |
| | Class 1500 | 13.5 (343) | 13.5 (343) | 1.49 (37,8) | 8.1 (206) | 45.7 (20,7) |
| | PN 16/40 | 10.0 (254) | – | 1.49 (37,8) | 8.1 (206) | 28.7 (13,0) |
| | PN 100 | 11.3 (287) | – | 1.49 (37,8) | 8.1 (206) | 37.4 (17,0) |
| | PN 160 | 11.5 (292) | – | 1.49 (37,8) | 8.1 (206) | 38.8 (17,6) |
| | JIS 10K/20K | 10.4 (264) | – | 1.49 (37,8) | 8.1 (206) | 27.9 (12,6) |
| | JIS 40K | 11.5 (292) | – | 1.49 (37,8) | 8.1 (206) | 34.9 (15,8) |
| 2 (50) | Class 150 | 13.0 (330) | 13.6 (345) | 1.92 (48,8) | 8.5 (216) | 31.9 (14,5) |
| | Class 300 | 13.6 (345) | 14.1 (358) | 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) | 39.5 (17,9) |
| | Class 900 | 16.6 (422) | 16.7 (424) | 1.92 (48,8) | 8.5 (216) | 69.2 (31,4) |
| | Class 1500 | 15.6 (396) | 15.7 (399) | 1.67 (42.4) | 8.5 (216) | 72.0 (32.6) |
| | PN 16/40 | 11.8 (300) | – | 1.92 (48,8) | 8.5 (216) | 32.9 (14,9) |
| | PN 64 | 12.9 (328) | – | 1.92 (48,8) | 8.5 (216) | 40.5 (18,4) |
| | PN 100 | 13.4 (340) | – | 1.92 (48,8) | 8.5 (216) | 46.2 (21,0) |
| | PN 160 | 14.0 (356) | – | 1.92 (48,8) | 8.5 (216) | 48.5 (22,0) |
| | JIS 10K | 11.5 (292) | – | 1.92 (48,8) | 8.5 (216) | 29.1 (13,2) |
| | JIS 20K | 12.1 (307) | – | 1.92 (48,8) | 8.5 (216) | 29.7 (13,5) |
| | JIS 40K | 13.6 (345) | – | 1.92 (48,8) | 8.5 (216) | 37.9 (17,2) |
| 3 (80) | Class 150 | 14.3 (363) | 14.8 (376) | 2.87 (72,9) | 9.1 (231) | 50.3 (22,8) |
| | Class 300 | 15.0 (381) | 15.7 (399) | 2.87 (72,9) | 9.1 (231) | 59.5 (27,0) |
| | Class 600 | 15.8 (401) | 15.8 (401) | 2.87 (72,9) | 9.1 (231) | 65.5 (29,7) |
| | Class 900 | 17.3 (439) | 17.4 (442) | 2.87 (72,9) | 9.1 (231) | 88.9 (40,3) |
| | Class 1500 | 18.5 (470) | 18.6 (472) | 2.60 (66.0) | 9.1 (232) | 123.0 (55.8) |
| | PN 16/40 | 13.4 (340) | – | 2.87 (72,9) | 9.1 (231) | 49.7 (22,5) |
| | PN 64 | 14.5 (367) | – | 2.87 (72,9) | 9.1 (231) | 58.5 (26,5) |
| | PN 100 | 14.9 (378) | – | 2.87 (72,9) | 9.1 (231) | 67.8 (30,8) |
| | PN 160 | 15.6 (396) | – | 2.87 (72,9) | 9.1 (231) | 73.0 (33,1) |
| | JIS 10K | 12.3 (312) | – | 2.87 (72,9) | 9.1 (231) | 41.0 (18,6) |
| | JIS 20K | 13.7 (348) | – | 2.87 (72,9) | 9.1 (231) | 48.4 (22,0) |
| | JIS 40K | 15.5 (394) | – | 2.87 (72,9) | 9.1 (231) | 63.4 (28,8) |

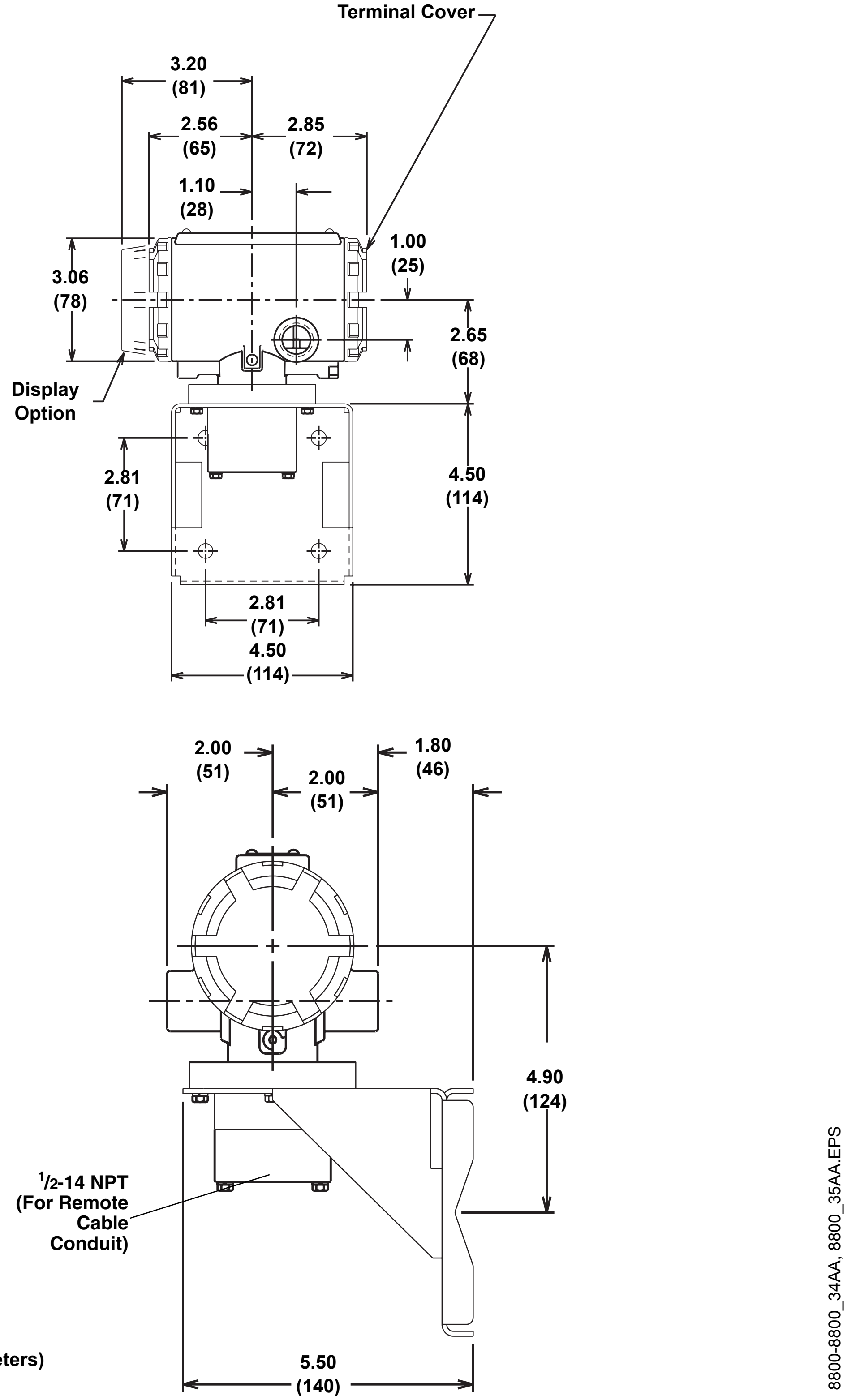
*(1) ±0.14 inch (3.6 mm)*
*(2) ±0.03 inch (0.8 mm)*
*(3) ±0.20 inch (5.1 mm)*
*(4) Add 0.4 lb (0,2 kg) for display option.*

Table A-26. Vortex Dual-Sensor Style Flowmeter (4- through 12-in./100 through 300 mm Line Sizes)

| Nominal Size Inch (mm) | Flange Rating | Face-to-face A Inch (mm)(1) | A ANSI RTJ Inch (mm) | Diameter B Inch (mm)(2) | C Inch (mm)(3) | Weight lb (kg)(4) |
|---|---|---|---|---|---|---|
| 4 (100) | Class 150 | 15.2 (386) | 15.7 (399) | 3.79 (96,3) | 9.6 (244) | 68.1 (30,9) |
| | Class 300 | 16.0 (406) | 16.6 (422) | 3.79 (96,3) | 9.6 (244) | 88.2 (40,0) |
| | Class 600 | 17.7 (450) | 17.7 (450) | 3.79 (96,3) | 9.6 (244) | 113.9 (51,7) |
| | Class 900 | 18.7 (475) | 18.9 (480) | 3.79 (96,3) | 9.6 (244) | 137.1 (62,2) |
| | Class 1500 | 20.0 (509) | 20.2 (512) | 3.40 (86.4) | 9.6 (244) | 182 (82.6) |
| | PN 16 | 13.3 (338) | – | 3.79 (96,3) | 9.6 (244) | 57.6 (26,1) |
| | PN 40 | 14.4 (366) | – | 3.79 (96,3) | 9.6 (244) | 66.6 (30,2) |
| | PN 64 | 15.4 (391) | – | 3.79 (96,3) | 9.6 (244) | 79.6 (36,1) |
| | PN 100 | 16.3 (414) | – | 3.79 (96,3) | 9.6 (244) | 95.9 (43,5) |
| | PN 160 | 17.1 (434) | – | 3.79 (96,3) | 9.6 (244) | 103.2 (46,8) |
| | JIS 10K | 13.6 (345) | – | 3.79 (96,3) | 9.6 (244) | 55.4 (25,1) |
| | JIS 20K | 13.6 (345) | – | 3.79 (96,3) | 9.6 (244) | 63.2 (28,7) |
| | JIS 40K | 16.8 (427) | – | 3.79 (96,3) | 9.6 (244) | 93.7 (42,5) |
| 6 (150) | Class 150 | 19.4 (493) | 19.9 (505) | 5.7 (144,8) | 10.8 (274) | 126.4 (57,3) |
| | Class 300 | 20.2 (513) | 20.8 (528) | 5.7 (144,8) | 10.8 (274) | 165.9 (75,3) |
| | Class 600 | 22.2 (564) | 22.3 (566) | 5.7 (144,8) | 10.8 (274) | 231.9 (105,2) |
| | Class 900 | 16.1 (409) | 16.2 (411) | 5.14 (130.6) | 10.8 (274) | 266 (120.6) |
| | Class 1500 | 18.6 (472) | 18.8 (478) | 5.14 (130.6) | 10.8 (274) | 378 (171.4) |
| | PN 16 | 16.8 (427) | – | 5.7 (144,8) | 10.8 (274) | 112.0 (50,8) |
| | PN 40 | 18.3 (465) | – | 5.7 (144,8) | 10.8 (274) | 131.7 (59,7) |
| | PN 64 | 19.9 (505) | – | 5.7 (144,8) | 10.8 (274) | 175.2 (79,5) |
| | PN 100 | 21.5 (546) | – | 5.7 (144,8) | 10.8 (274) | 204.8 (92,9) |
| | JIS 10K | 18.5 (470) | – | 5.7 (144,8) | 10.8 (274) | 124.0 (56,2) |
| | JIS 20K | 18.5 (470) | – | 5.7 (144,8) | 10.8 (274) | 141.9 (64,4) |
| | JIS 40K | 22.0 (559) | – | 5.7 (144,8) | 10.8 (274) | 220.1 (99,8) |
| 8 (200) | Class 150 | 24.0 (610) | 24.5 (622) | 7.55 (191,8) | 11.7 (297) | 190.1 (86,2) |
| | Class 300 | 24.8 (630) | 25.4 (645) | 7.55 (191,8) | 11.7 (297) | 246.7 (111,9) |
| | Class 600 | 27.0 (686) | 27.1 (688) | 7.55 (191,8) | 11.7 (297) | 345.5 (156,7) |
| | Class 900 | 18.4 (467) | 19.0 (483) | 6.62 (168,1) | 11.7 (297) | 479 (217.3) |
| | Class 1500 | 22.8 (580) | 23.2 (589) | 6.62 (168,1) | 11.7 (297) | 637 (288.9) |
| | PN 10 | 20.9 (531) | – | 7.55 (191,8) | 11.7 (297) | 160.2 (72,7) |
| | PN 16 | 20.9 (531) | – | 7.55 (191,8) | 11.7 (297) | 159.0 (72,1) |
| | PN 25 | 22.3 (566) | – | 7.55 (191,8) | 11.7 (297) | 186.9 (83,4) |
| | PN 40 | 22.9 (582) | – | 7.55 (191,8) | 11.7 (297) | 205.4 (93,2) |
| | PN 64 | 24.7 (627) | – | 7.55 (191,8) | 11.7 (297) | 265.1 (120,2) |
| | PN 100 | 26.3 (668) | – | 7.55 (191,8) | 11.7 (297) | 330.4 (149,9) |
| | JIS 10K | 22.6 (574) | – | 7.55 (191,8) | 11.7 (297) | 178.2 (80,8) |
| | JIS 20K | 22.6 (574) | – | 7.55 (191,8) | 11.7 (297) | 202.6 (91,9) |
| | JIS 40K | 27.0 (686) | – | 7.55 (191,8) | 11.7 (297) | 324.0 (147,0) |
| 10 (250) | Class 150 | 14.6 (371) | 15.1 (384) | 9.56 (243) | 12.8 (325) | 201.5 (91) |
| | Class 300 | 15.8 (401) | 16.4 (417) | 9.56 (243) | 12.8 (325) | 289.5 (131) |
| | Class 600 | 19.1 (485) | 19.2 (488) | 9.56 (243) | 12.8 (325) | 479.6 (218) |
| | PN 10 | 11.9 (302) | – | 9.56 (243) | 12.8 (325) | 160.6 (73) |
| | PN 16 | 12.1 (307) | – | 9.56 (243) | 12.8 (325) | 165.4 (75) |
| | PN 25 | 13.5 (343) | – | 9.56 (243) | 12.8 (325) | 210.7 (96) |
| | PN 40 | 14.8 (376) | – | 9.56 (243) | 12.8 (325) | 249.6 (113) |
| | PN 64 | 16.4 (417) | – | 9.56 (243) | 12.8 (325) | 310.6 (141) |
| | PN 100 | 18.9 (480) | – | 9.56 (243) | 12.8 (325) | 447.3 (203) |
| | JIS 10K | 14.6 (371) | – | 9.56 (243) | 12.8 (325) | 177.6 (81) |
| | JIS 20K | 14.6 (371) | – | 9.56 (243) | 12.8 (325) | 224.8 (102) |
| | JIS 40K | 18.1 (460) | – | 9.56 (243) | 12.8 (325) | 381.6 (173) |
| 12 (300) | Class 150 | 16.8 (427) | 17.3 (439) | 11.38 (289) | 13.7 (348) | 300.3 (136) |
| | Class 300 | 18.0 (457) | 18.7 (475) | 11.38 (289) | 13.7 (348) | 417.5 (189) |
| | Class 600 | 20.5 (521) | 20.7 (526) | 11.38 (289) | 13.7 (348) | 596.5 (271) |
| | PN 10 | 13.2 (335) | – | 11.38 (289) | 13.7 (348) | 207.4 (94) |
| | PN 16 | 13.9 (353) | – | 11.38 (289) | 13.7 (348) | 227.7 (103) |
| | PN 25 | 15.0 (381) | – | 11.38 (289) | 13.7 (348) | 272.1 (123) |
| | PN 40 | 16.9 (429) | – | 11.38 (289) | 13.7 (348) | 350.0 (159) |
| | PN 64 | 18.8 (478) | – | 11.38 (289) | 13.7 (348) | 432.8 (196) |
| | PN 100 | 21.2 (538) | – | 11.38 (289) | 13.7 (348) | 645.1 (293) |
| | JIS 10K | 15.7 (399) | – | 11.38 (289) | 13.7 (348) | 228.8 (104) |
| | JIS 20K | 15.7 (399) | – | 11.38 (289) | 13.7 (348) | 291.4 (132) |
| | JIS 40K | 19.7 (500) | – | 11.38 (289) | 13.7 (348) | 508.9 (231) |

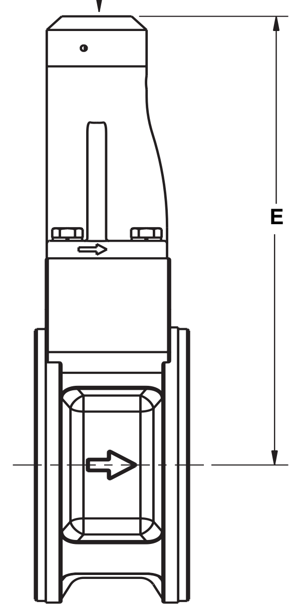
*(1) ±0.14 inch (3.6 mm)*
*(2) ±0.03 inch (0.8 mm)*
*(3) ±0.20 inch (5.1 mm)*
*(4) Add 0.4 Lb (0,2 kg) for display option.*

Figure A-6. Dimensional Drawings for Remote Mount Transmitters




**NOTE**
**Dimensions are in inches (millimeters)**

Figure A-7. Dimensional Drawings for Remote Mount Wafer-Style Flowmeters (1/2-through 8-inch/15 through 200 mm Line Sizes)

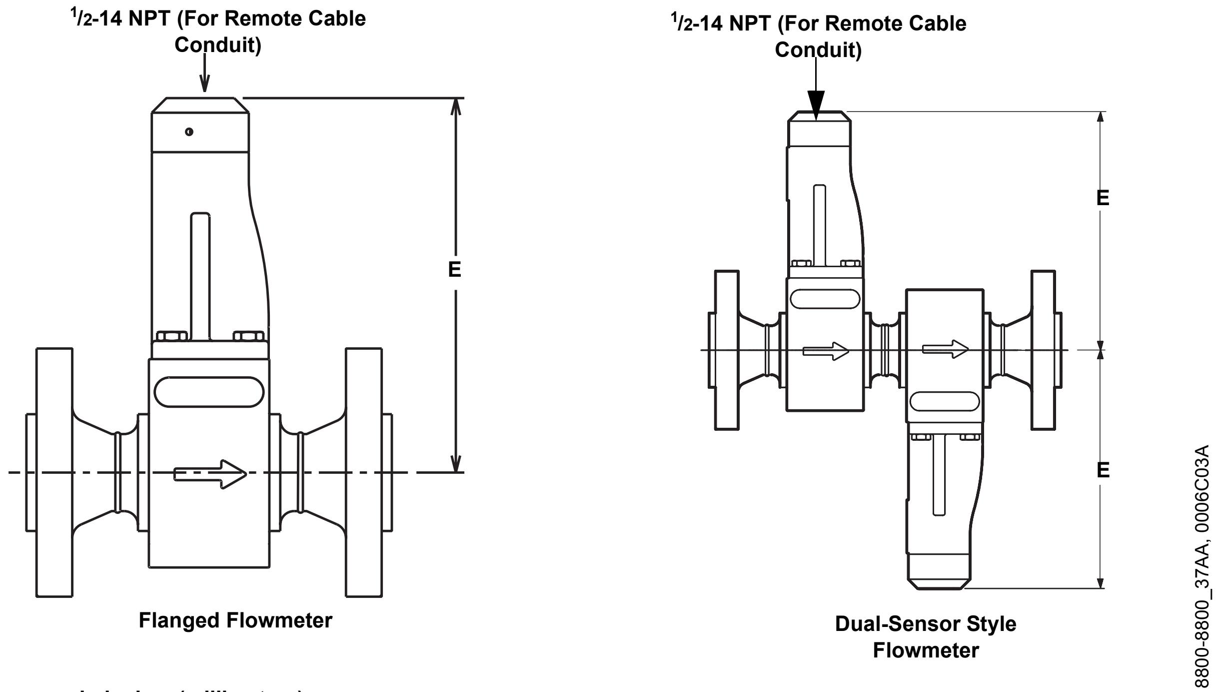



**NOTE**
**Dimensions are in inches (millimeters)**

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

| Nominal Size Inch (mm) | E Wafer Style Inch (mm) |
|---|---|
| ½ (15) | 6.4 (163) |
| 1 (25) | 6.5 (165) |
| 1½ (40) | 6.9 (175) |
| 2 (50) | 7.6 (193) |
| 3 (80) | 8.3 (211) |
| 4 (100) | 9.2 (234) |
| 6 (150) | 9.5 (241) |
| 8 (200) | 10.4 (264) |

Figure A-8. Dimensional Drawings for Flanged-and Dual Sensor Flanged-Style Remote Mount Flowmeters (1/2-through 12-inch/15 through 300 mm Line Sizes)




**NOTE**
**Dimensions are in inches (millimeters)**

Table A-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) |

## ORDERING INFORMATION

| Model | Product Description |
|---|---|
| 8800D | Vortex Flowmeter |
| **Code** | **Meter Style** |
| W | Wafer style |
| F | Flanged style |
| R | Reducer Style (Flanged style only) |
| D | Dual-sensor style (Flanged style only) |
| **Code** | **Line Size** |
| 005 | 1/2 Inch (15 mm) (Not available for Rosemount 8800DR) |
| 010 | 1 Inch (25 mm) |
| 015 | 1 1/2 Inches (40 mm) |
| 020 | 2 Inches (50 mm) |
| 030 | 3 Inches (80 mm) |
| 040 | 4 Inches (100 mm) |
| 060 | 6 Inches (150 mm) |
| 080 | 8 Inches (200 mm) |
| 100 | 10 Inches (250mm) |
| 120 | 12 Inches (300mm) |
| **Code** | **Wetted Materials** |
| S | 316L wrought stainless and CF-3M cast stainless |
| H | UNS N06022 wrought Nickel Alloy; CW2M cast Nickel Alloy<br>*Note: See Table A-29 on page A-37* |
| Other wetted materials are available. Consult factory for details. | |
| **Code** | **Flange or Alignment Ring Size** |
| A1 | ASME B16.5 (ANSI) RF Class 150 |
| A3 | ASME B16.5 (ANSI) RF Class 300 |
| A6 | ASME B16.5 (ANSI) RF Class 600 |
| A7(1) | ASME B16.5 (ANSI) RF Class 900 |
| A8(2) | ASME B16.5 (ANSI) RF Class 1500 |
| B1 | ASME B16.5 (ANSI) RTJ Class 150 for flange-style only |
| B3 | ASME B16.5 (ANSI) RTJ Class 300 for flange-style only |
| B6 | ASME B16.5 (ANSI) RTJ Class 600 for flange-style only |
| B7(1) | ASME B16.5 (ANSI) RTJ Class 900 for flange-style only |
| B8(2) | ASME B16.5 (ANSI) RTJ Class 1500 for flange-style only |
| C1 | ASME B16.5 (ANSI) RF Class 150, smooth finish |
| C3 | ASME B16.5 (ANSI) RF Class 300, smooth finish |
| C6 | ASME B16.5 (ANSI) RF Class 600, smooth finish |
| C7(1) | ASME B16.5 (ANSI) RF Class 900, smooth finish |
| D0 | DIN PN 10 2526-Type D |
| D1 | DIN PN 16 (PN 10/16 for wafer-style)2526-Type D |
| D2 | DIN PN 25 2526-Type D |
| D3 | DIN PN 40 (PN 25/40 for wafer-style) 2526-Type D |
| D4 | DIN PN 64 2526-Type D |
| D6 | DIN PN 100 2526-Type D |
| D7(1) | DIN PN 160 2526-Type D |
| G0 | DIN PN 10 2512-Type N for flange-style only |
| G1 | DIN PN 16 2512-Type N for flange-style only |
| G2 | DIN PN 25 2512-Type N for flange-style only |
| G3 | DIN PN 40 2512-Type N for flange-style only |
| G4 | DIN PN 64 2512-Type N for flange-style only |
| G6 | DIN PN 100 2512-Type N for flange-style only |
| G7(1) | DIN PN 160 2512-Type N for flange-style only |

**Continued on Next Page**

| Code | Flange or Alignment Ring Size |
|---|---|
| H0 | DIN PN 10 2526-Type E |
| H1 | DIN PN 16 (PN 10/16 for wafer-style) 2526-Type E |
| H2 | DIN PN 25 2526-Type E |
| H3 | DIN PN 40 (PN 25/40 for wafer-style) 2526-Type E |
| H4 | DIN PN 64 2526-Type E |
| H6 | DIN PN 100 2526-Type E |
| H7(1) | DIN PN 160 2526-Type E |
| J1 | JIS 10K |
| J2 | JIS 20K |
| J4 | JIS 40K |
| **Code** | **Sensor Process Temperature Range** |
| N | Standard: -40 to 450°F (-40 to 232°C) |
| E | Extended: -330 to 800°F (-200 to 427°C) |
| **Code** | **Conduit Entry** |
| 1 | $^1/_2$ -14 NPT |
| 2 | M20 × 1.5 |
| 3 | PG 13.5 |
| **Code** | **Outputs** |
| D | 4-20 mA digital electronics (HART® protocol) |
| P | 4-20 mA digital electronics (HART® protocol) with scaled pulse |
| F(3) | FOUNDATION fieldbus digital signal (Consult factory for availability.) |
| **Code** | **Calibration** |
| 1 | Flow calibration |
| **Code** | **Options** |
| | **Multivariable Options** |
| MTA(4) | Multivariable output with Integral Temperature Sensor |
| | **Hazardous Locations Certifications** |
| E5 | Factory Mutual (FM) Explosion Proof Approval |
| I5 | Factory Mutual (FM) intrinsic Safety Approval |
| K5 | Factory Mutual (FM) E5 and I5 Combination Approval |
| E6 | Canadian Standards Association (CSA) Explosion Proof Approval |
| I6 | Canadian Standards Association (CSA) Intrinsic Safety Approval |
| K6 | Canadian Standards Association (CSA) E6 and I6 Combination Approval |
| KB | FM and CSA K5 and K6 Combination Approval |
| E1 | ATEX Flameproof Approval |
| I1 | ATEX Intrinsic Safety Approval |
| N1 | ATEX Type n Approval |
| ND | ATEX Dust Approval |
| K1 | ATEX E1, I1, N1, ND Combination Approval |
| E7 | IECEx Flameproof Approval |
| I7 | IECEx Intrinsic Safety Approval |
| N7 | IECEx Type n Approval |
| K7 | IECEx E7, I7, and N7 Combination Approval |
| E3 | NEPSI Explosion Proof Approval |
| I3 | NEPSI Intrinsic Safety Approval |
| K3 | NEPSI E3 and I3 Combination Approval |
| | **Plantweb Functionality** |
| A01 | Basic Control: One Proportional/Integral/Derivative (PID) Function Block |
| | **Conduit Electrical Connector** |
| GE(5) | M12, 4-pin, Male Connector (*eurofast*®) |
| GM Figure 5 | A size Mini, 4-pin, Male Connector (*minifast*®) |

**Continued on Next Page**

| | **Options Continued** |
|---|---|
| | **Other Options** |
| M5 | LCD indicator |
| P2 | Cleaning for special services |
| C4(6) | NAMUR alarm and saturation values, high alarm |
| CN(6) | NAMUR alarm and saturation values, low alarm |
| R10 | Remote electronics with 10 ft (3,0 m) cable |
| R20 | Remote electronics with 20 ft (6,1 m) cable |
| R30 | Remote electronics with 30 ft (9,1 m) cable |
| RXX(7) | Remote electronics with customer-specified cable length (up to 75 ft (23 m) maximum) |
| T1 | Transient protection terminal block |
| V5 (8) | External ground screw assembly |
| | **Certification Options** |
| Q4 | Calibration data sheet per ISO 10474 3.1B and EN 10204 3.1 |
| Q8 | Material traceability certification per ISO 10474 3.1B and EN 10204 3.1 |
| Q14(9) | German TRB 801 Nr.45 certification per ISO 10474 3.1B and EN 10204 3.1 |
| Q25 | NACE MR0103 Certificate of Compliance |
| Q69(10) | Inspection certificate weld examination (wafer) per ISO 10474 3.1B and EN 10204 3.1 |
| Q70 | Inspection certificate weld examination (flanged) per ISO 10474 3.1B and EN 10204 3.1 |
| Q71 | Inspection certification weld examination (flanged) per ISO 10474 3.1B (includes x-rays) and EN 10204 3.1 |
| **Code** | **Quick Installation Guide (QIG) Language Options (Default is English)** |
| YA | Danish QIG |
| YB | Hungarian QIG |
| YC | Czech QIG |
| YD | Dutch QIG |
| YF | French QIG |
| YG | German QIG |
| YH | Finnish QIG |
| YI | Italian QIG |
| YN | Norwegian QIG |
| YO | Polish QIG |
| YP | Portuguese QIG |
| YR | Russian QIG |
| YS | Spanish QIG |
| YW | Swedish QIG |
| **Typical Model Number: 8800D F 020 S A1 N 1 D 1 M5** | |

*(1) Available on flanged and dual style meters from 1/2” - 8” (15-200 mm) and Reducer style meters from 1” - 6” (25-150 mm).*
*(2) Only available for stainless steel flange and dual style meters from 1” - 8” (25-200 mm).*
*(3) Includes two analog input (AI) function blocks, 1 Integrator (INT) function block, and Backup Link Active Scheduler.*
*(4) Available in Stainless Steel only. Available with Rosemount 8800DF from 2-in (50 mm) through 12-in. (300 mm). Available with 8800DR from 3-in (80 mm) through 12-in (300 mm). Not available with 8800DW or 8800DD. Not available with flange codes A7, A8, B7, B8, C7, C8, D7, D8, G7, G8, H7, H8. Not available with remote mount. Not available with FOUNDATION fieldbus.*
*(5) Not available with certain hazardous location certifications. Contact a Rosemount representative for details.*
*(6) NAMUR compliant operation and the alarm latch options are pre-set at the factory and cannot be changed to standard operation in the field.*
*(7) XX is a customer specified length in feet.*
*(8) V5 only available with no approval or E5, I5, K5, E6, I6, K6 and KB; it is standard with the other approvals.*
*(9) Q14 is not available with flange codes A7, A8, B7, B8, C7, D7, G7, H7, 10in.-12in. meters, and 8800DR Reducer Vortex.*
*(10) Q69 available for all Nickel Alloy C wafers and stainless steel wafers in line sizes 1/2-in. (15 mm), 6-in. (150 mm), and 8-in. (200 mm).*

Table A-29. Method of Construction for the 8800DF in Nickel Alloy C

| Line Size | A1 | A3 | A6 | A7 | D1 | D3 | D4 | D6 | D7 |
|---|---|---|---|---|---|---|---|---|---|
| ½ (15) | C | C | C | W | W | W | NA | W | W |
| 1 (25) | C | C | C | W | W | W | NA | W | W |
| 1½ (40) | C | C | C | W | W | W | NA | W | W |
| 2 (50) | C | C | C | W | C | C | W | W | W |
| 3 (80) | C | C | C | W | C | C | W | W | W |
| 4 (100) | C | C | C | W | C | C | W | W | W |
| 6 (150) | W | W | W | CF | W | W | W | W | CF |
| 8 (200) | W | W | W | CF | W | W | W | W | CF |
| 10 (250) | W | W | W | NA | W | W | W | W | NA |
| 12 (300) | W | W | W | NA | W | W | W | W | NA |

C = Nickel Alloy collar and 316 SST lap flange. If weld neck flange is required, V0022 can be ordered.
W = Nickel Alloy weld neck flange.
CF = Consult Factory
NA = Not Available
All 8800DR Reducer Vortex Meters with Nickel Alloy C materials of construction use weld neck flanges.

# Appendix B Approval Information



## PRODUCT CERTIFICATIONS

### Approved Manufacturing Locations

Rosemount Inc. — Eden Prairie, Minnesota, USA

Emerson Process Management BV - Veenendaal, The Netherlands

## EUROPEAN DIRECTIVE INFORMATION

The CE Declaration of Conformity for all applicable European directives for this product can be found on our website at www.rosemount.com. A hard copy may be obtained by contacting our local sales office.

### ATEX Directive

Rosemount Inc. complies with the ATEX Directive.

#### Flameproof enclosure EEx d protection type in accordance with EN50018

- 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 EEx d metal cable gland or metal blanking plug.
- Do not exceed the energy level, which is stated on the approval label.

#### Type n protection type in accordance with EN50021

Closing of entries in the device must be carried out using the appropriate EExe or EExn metal cable gland and metal blanking plug or any appropriate ATEX approved cable gland and blanking plug with IP66 rating certified by an EU approved certification body.

## EUROPEAN PRESSURE EQUIPMENT DIRECTIVE (PED)

**Rosemount 8800 Vortex Flowmeter**
**Line Size 40 mm to 300 mm**

Certificate Number PED-H-100

CE 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 – IV, use module H for conformity assessment procedures.

**Rosemount 8800 Vortex Flowmeter**
**Line Size 15 mm and 25 mm**

Sound Engineering Practice

Flowmeters that are SEP or Category I with Explosion-Proof protection are outside the scope of PED and cannot be marked for compliance with PED.

# HAZARDOUS LOCATION CERTIFICATIONS

## Rosemount 8800D with HART Protocol

## North American Certifications

### Factory Mutual (FM)

**E5** Explosion-Proof for Class I, Division 1, Groups B, C, and D;
Dust-ignition proof for Class II/III, Division 1, Groups E, F, and G;
Temp Code T6 ($T_a$ = -50°C to 70°C)
Conduit Seal not required
Enclosure Type 4X.

**I5** Intrinsically safe for use in Class I, Division 1, Groups A, B, C, and D; Class I, Zone 0, AEx ia IIC T4 (Ta = 70°C);
Class II/III, Division 1, Groups E, F, and G locations when connected in accordance with Rosemount drawings 08800-0116;

Non-incendive for Class I, Division 2, Groups A, B, C, and D and Suitable for Class I, Division 2, Groups A, B, C, and D, with non-incendive field wiring (NIFW) when installed in accordance with Rosemount drawing 08800-0116;

Temperature code T4 (Ta = 70°C)
Enclosure Type 4X.

**K5** E5 and I5 Combination

### 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; Temp Code T5 (TA = 70°C) Class I Zone1; Ex d (ia) T6 (-50°C ≤Ta ≤70°C)
Factory sealed.
Suitable for Class I, Division 2, Groups A, B, C, and D; Temp Code T3C.
Enclosure Type 4X.

**I6** Intrinsically safe for Class I, Division 1, Groups A, B, C, and D; When connected in accordance with Rosemount drawing 08800-0112;
Temperature code T3C
Enclosure Type 4X.

**K6** E6 and I6 Combination

## European Certifications

### ATEX Intrinsic Safety

**I1** Certification No. Baseefa05ATEX0084X
ATEX Marking Ex II 1 G
EEx ia IIC T5 (-60°C ≤$T_a$ ≤40°C)
EEx ia IIC T4 (-60°C ≤$T_a$ ≤70°C)
Input Parameters:
$U_i$ = 30 VDC
$I_i$(1) = 185 mA
$P_i$(1) = 1.0 W
$C_i$ = 0 μF
$L_i$ = 0.97 mH
CE 0575

*(1) Total for transmitter*

**SPECIAL CONDITIONS**
The apparatus is not capable of withstanding the 500V insulation test required by clause 6.4.12 of EN50020. This must be considered during installation.

### ATEX Type N Certification

**N1** Certification No. Baseefa05ATEX0085X
ATEX Marking Ⓔx II 3 G
EEx nL II T5 (-40°C ≤$T_a$ ≤70°C)
Input Parameters:
$U_i$ = 42 V dc Max
$C_i$ = 0 µF
$L_i$ = 0.97 mH

**SPECIAL CONDITIONS**
The apparatus is not capable of withstanding the 500V insulation test required by clause 9.1 of EN50021. This must be taken into account when installing the apparatus.

### ATEX Flameproof Certification

**E1** Certification No. KEMA99ATEX3852X
ATEX Marking Remote Mount:
Transmitter: Ⓔx II 2(1) G
EEx d [ia]IIC T6 (-50°C ≤$T_a$ ≤70°C)
Meter Body: Ⓔx II 1 G
EEx ia IIC T6 (-50°C ≤$T_a$ ≤70°C)
ATEX Marking Integral Mount: Ⓔx II 1/2 G
EEx d [ia] IIC T6 (-50°C ≤$T_a$ ≤70°C)
CE 0575
V = 42 Vdc Max
Um = 250V

**SPECIAL CONDITIONS**
When the equipment is installed, precautions must be taken to ensure, taking into account the effect of the fluid temperature, that the ambient temperature of the electrical parts of the equipment is comprised between -50°C and 70°C. The remote mounted sensor may only be connected to the transmitter with the associated cable, supplied by the manufacturer.

### ATEX Dust Certification

**ND** Certification No. Baseefa05ATEX0086
ATEX Marking Ⓔx II 1 D T90°C (-20°C ≤$T_a$ ≤70°C)
Ui = 42 V dc
CE 0575

**K1** E1, I1, N1 and ND Combination

## International IECEx Certifications

### Intrinsic Safety

**I7** Certification No. IECEx BAS 05.0028X
Ex ia IIC T5 (-60°C ≤$T_a$ ≤40°C)
Ex ia IIC T4 (-60°C ≤$T_a$ ≤70°C)
Input Parameters:
$U_i$ = 30 VDC
$I_i$ = 185 mA
$P_i$ = 1.0 W
$C_i$ = 0 µF
$L_i$ = 0.97 mH

**SPECIAL CONDITIONS**
The apparatus is not capable of withstanding the 500V test as defined in clause 6.4.12 of IEC 60079-11. This must be considered during installation.

**Type N Certification**

**N7** Certification No. IECEx BAS 05.0029
Ex nC IIC T5 (-40°C ≤ $T_a$ ≤ 70°C)
Ui = 42 V dc

**Flameproof Certification**

**E7** Certification No. IECEx KEM 05.0017X
Marking Remote Mount:
Transmitter: Ex d [ia] IIC T6 (-50°C ≤ $T_a$ ≤ 70°C)
Meter Body: Ex ia IIC T6 (-50°C ≤ $T_a$ ≤ 70°C)
Marking Integral Mount: Ex d [ia] IIC T6
(-50°C ≤ $T_a$ ≤ 70°C)
V = 42 Vdc Max
Um = 250V

**SPECIAL CONDITIONS**
When the equipment is installed, particular precautions must be taken to ensure, taking into account the effect of the process fluid temperature, that the ambient temperature of the electrical parts of the equipment is comprised between -50°C and 70°C.
The remote mounted sensor shall only be connected to the transmitter with the associated cable, supplied by the manufacturer.

**K7** E7, I7, and N7 Combination

## Chinese Certifications (NEPSI)

**Flameproof Certification**

E3 Certification No. GYJ06296X (RTC) or
GYJ06297X (Pudong China)
Ex d (ia) T6 (-50°C to 70°C)

**Intrinsic Safety**

**I3** Certification No. GYJ06218 (Pudong China)
Ex ia IIC T4/T5
Input Parameters:
$U_i$ = 30 VDC
$I_i$ = 185 mA
$P_i$ = 1.0 W
$C_i$ = 0
$L_i$ = 0.97 mH

**K3** E3 and I3 Combination

## Other Certifications

**KB** E5, I5, E6, and I6 Combination

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| REVISIONS | | | | |
|---|---|---|---|---|
| REV | DESCRIPTION | CHG. NO. | APP'D | DATE |
| AB | ADD FIELDBUS STANDARD I.S. AND FISCO | RTC1021467 | K.C.L. | 3/29/06 |

(HART ONLY)

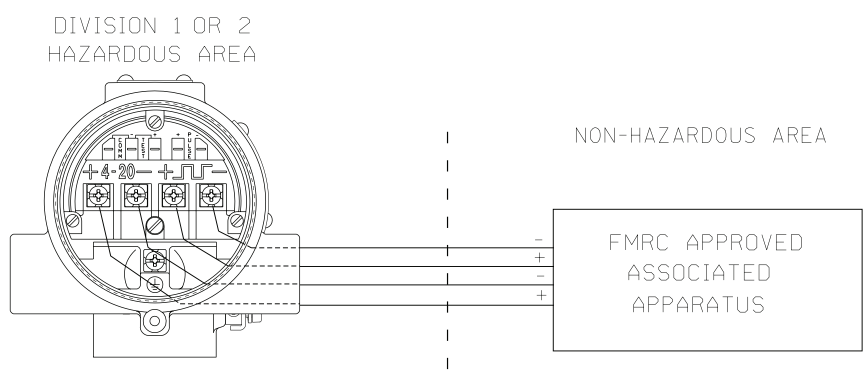
# FMRC INTRINSIC SAFETY APPROVAL

THE ROSEMOUNT MODEL 8800 SMART VORTEX FLOWMETER IS FMRC APPROVED AS INTRINSICALLY SAFE WHEN INSTALLED PER THE NATIONAL ELECTRIC CODE (NEC) ARTICLE 504 WITH FMRC APPROVED ASSOCIATED APPARATUS WHICH MEETS THE ENTITY PARAMETERS INDICATED BELOW. ADDITIONALLY, THE ROSEMOUNT MODEL 751 FIELD SIGNAL INDICATOR IS FMRC APPROVED AS INTRISICALLY SAFE WHEN CONNECTED IN CIRCUIT WITH THE ROSEMOUNT MODEL 8800 AS SPECIFIED IN THIS DRAWING.

INTRINSICALLY SAFE FOR CLASS I, DIV. 1, GROUPS A, B, C, D; CLASS II, DIV. 1, GROUPS E, F, G; CLASS III, DIV. 1 HAZARDOUS LOCATIONS. TEMP CODE T4 (Tamb=+70°C)

| TERMINALS "+", "-", AND "4-20 mA" | ASSOCIATED APPARATUS PARAMETERS |
|---|---|
| Vmax = 30Vdc | Voc OR Vt ≤ 30V |
| Imax = 185mA | Isc OR It ≤ 185mA |
| Pmax = 1.0W | |
| Ci = 0μF | Ca > Ccable + Ci |
| Li = 970μH | La > Lcable + Li |

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




(SEE SHEETS 2 & 3)
(SEE SHEET 5, NOTES 2 & 7)

CAD MAINTAINED (MicroStation)

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES. MACHINE SURFACE FINISH 125

-TOLERANCE-
.X ± .1 [2,5]
.XX ± .02 [0,5]
.XXX ± .010 [0,25]
FRACTIONS ± 1/32 ANGLES ± 2°

DO NOT SCALE PRINT

Form Rev AC

CONTRACT NO.

DR. D. BROKKE 1/17/05
CHK'D
APP'D. J. DREIER 1/17/05
APP'D. GOVT.

EMERSON. Process Management — ROSEMOUNT®
8200 Market Boulevard • Chanhassen, MN 55317 USA

TITLE INSTALLATION DRAWING FOR:
MODEL 8800D FM INTRINSIC SAFETY FIELD CIRCUIT CONFIGURATIONS FOR HART AND FIELDBUS

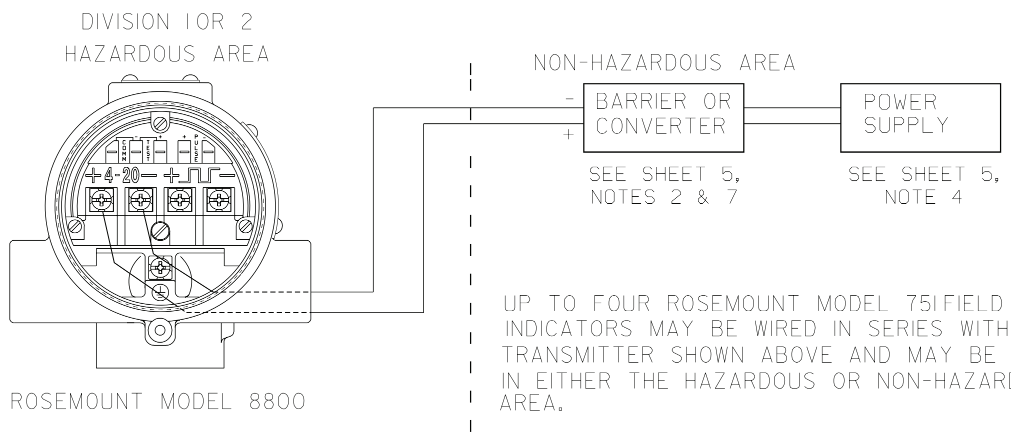
SIZE A | FSCM NO | DWG NO. 08800-0116
SCALE N/A | WT. | SHEET 1 OF 8

REVISIONS

| REV | DESCRIPTION | CHG. NO. | APP'D | DATE |
|---|---|---|---|---|
| AB | | | | |

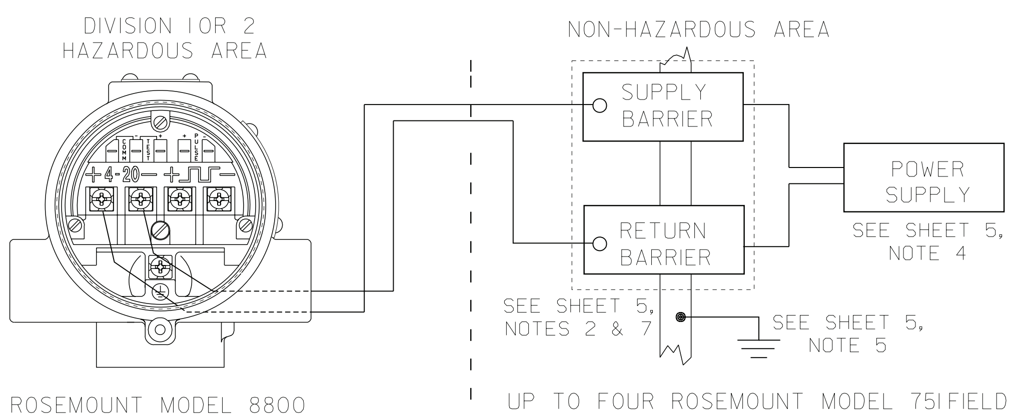
(HART ONLY)

FIELD CIRCUIT CONFIGURATION DIAGRAM I
ONE BARRIER OR CONVERTER:
SINGLE OR DUAL CHANNEL




UP TO FOUR ROSEMOUNT MODEL 751 FIELD SIGNAL INDICATORS MAY BE WIRED IN SERIES WITH THE TRANSMITTER SHOWN ABOVE AND MAY BE LOCATED IN EITHER THE HAZARDOUS OR NON-HAZARDOUS AREA.

FIELD CIRCUIT CONFIGURATION DIAGRAM II
SUPPLY AND RETURN BARRIERS
(ONLY FOR USE WITH BARRIERS APPROVED IN THIS CONFIGURATION)




UP TO FOUR ROSEMOUNT MODEL 751 FIELD SIGNAL INDICATORS MAY BE WIRED IN SERIES WITH THE TRANSMITTER SHOWN ABOVE AND MAY BE LOCATED IN EITHER THE HAZARDOUS OR NON-HAZARDOUS AREA.

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| DR. | SIZE A | FSCM NO | DWG NO. 08800-0116 |
|---|---|---|---|
| ISSUED | SCALE N/A | WT. | SHEET 2 OF 8 |

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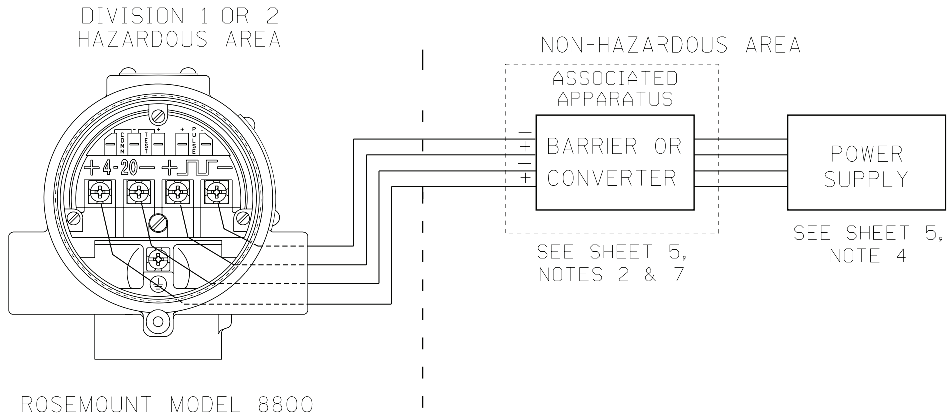
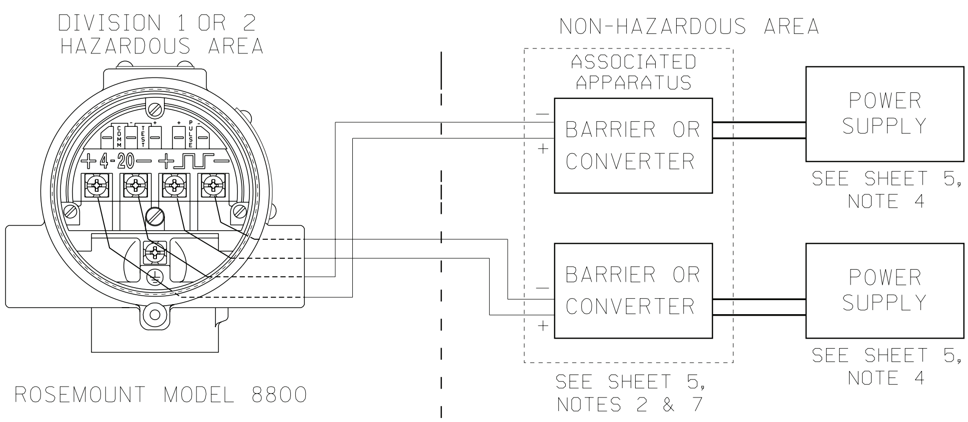
| REVISIONS | | | | |
|---|---|---|---|---|
| REV | DESCRIPTION | CHG. NO. | APP'D | DATE |
| AB | | | | |

(HART ONLY)

FIELD CIRCUIT CONFIGURATION DIAGRAM III
ONE BARRIER OR CONVERTER
DUAL, TRIPLE OR QUAD CHANNEL




FIELD CIRCUIT CONFIGURATION DIAGRAM IV
TWO, THREE, OR FOUR BARRIERS OR CONVERTERS
SINGLE OR DUAL CHANNEL
(ONLY FOR USE WITH BARRIERS APPROVED IN THIS CONFIGURATION)

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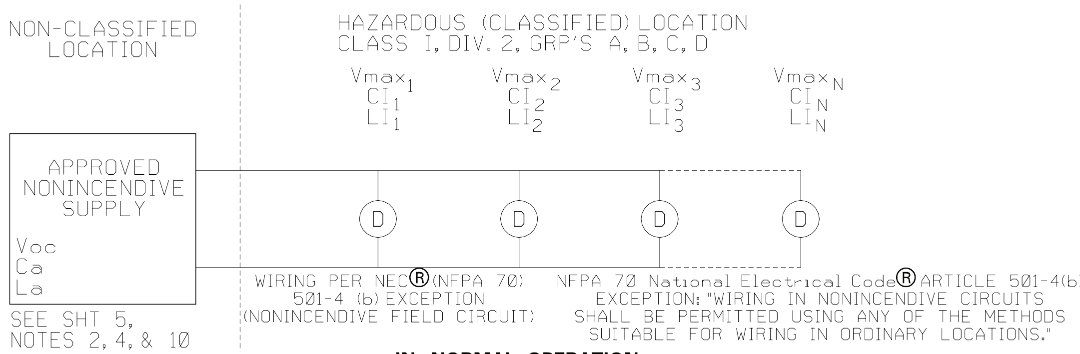
| | | | |
|---|---|---|---|
| DR. | SIZE A | FSCM NO | DWG NO. 08800-0116 |
| ISSUED | SCALE N/A | WT. | SHEET 3 OF 8 |

Form Rev AC

| REVISIONS | | | | |
|---|---|---|---|---|
| REV | DESCRIPTION | CHG. NO. | APP'D | DATE |
| AB | | | | |

NONINCENDIVE FIELD WIRING
CLASS I, DIV. 2 LOCATIONS




**IN NORMAL OPERATION**

**DEVICES CONTROL THROUGH-CURRENT**

| PARAMETERS (NON-INCENDIVE FIELD WIRING) | DEVICE 8800 4-20mA / HART |
|---|---|
| Vmax | 42.4v |
| Maximum normal operating current | 22mA |
| Ci | 0uF |
| Li | 970uH |

$Imax_N >= Iq_N + Isignal_N$

ROSEMOUNT 8800 TRANSMITTERS ARE CURRENT CONTROLLERS ON INDIVIDUAL PARALLEL BRANCHES WITH RESPECT TO THE POWER SUPPLY. IN NONINCENDIVE INSTALLATIONS THE Imax FOR EACH TRANSMITTER IS NOT RELATED TO THE MAXIMUM CURRENT OF THE POWER SUPPLY (Isc) IN THE SAME MANNER AS FOR TRANSMITTER INSTALLED PER I.S. REQUIREMENTS, BECAUSE NONINCENDIVE REQUIREMENTS INCLUDE ONLY NORMAL OPERATING CONDITIONS.

Imax for an individual device = Iq + Isignal

Iq =Quiescent current through device
(Maximum quiescent current for the device)

Isignal =Signaling current through device
(Protocol may limit signaling to one device at a time)

Operating $Imax = Iq_1 + Iq_2 + ... + Iq_N + I_{signal}\ max$

$I_{signal}\ max$ = Max. of $(Isignal_1, Isignal_2, ...., Isignal_N)$

TEMP CODE: T4 (Ta = +70°C)

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| | | | |
|---|---|---|---|
| DR. | SIZE A | FSCM NO | DWG NO. 08800-0116 |
| ISSUED | SCALE N/A | WT. | SHEET 4 OF 8 |

Form Rev AC

| REVISIONS | | | | |
|---|---|---|---|---|
| REV | DESCRIPTION | CHG. NO. | APP'D | DATE |
| AB | | | | |

NOTES:

1. NO REVISION TO THIS DRAWING WITHOUT PRIOR FACTORY MUTUAL APPROVAL.
2. ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.
3. DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.
4. CONTROL EQUIPMENT CONNECTED TO BARRIER MUST NOT USE OR GENERATE MORE THAN 250 Vrms or Vdc.
5. RESISTANCE BETWEEN INTRINSICALLY SAFE GROUND AND EARTH GROUND MUST BE LESS THAN 1 OHM.
6. INSTALLATION SHOULD BE IN ACCORDANCE WITH ANSI/ISA-RP12.6 "INSTALLATION OF INTRINSICALLY SAFE SYSTEMS FOR HAZARDOUS (CLASSIFIED) LOCATIONS" AND THE NATIONAL ELECTRICAL CODE (ANSI/NFPA 70).
7. THE ASSOCIATED APPARATUS MUST BE FACTORY MUTUAL APPROVED.
8. WARNING - SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC AND NON-INCENDIVE SAFETY.
9. ASSOCIATED APPARATUS MUST MEET THE FOLLOWING PARAMETERS:
   - $U_o$ or $V_{oc}$ or $V_t$ LESS THAN or EQUAL TO $U_I$ ($V_{max}$)
   - $I_o$ or $I_{sc}$ or $I_t$ LESS THAN or EQUAL TO $I_I$ ($I_{max}$)
   - $P_o$ or $P_{max}$ LESS THAN or EQUAL TO $P_I$ ($P_{max}$)
   - $C_a$ IS GREATER THAN or EQUAL THE SUM OF ALL $C_I$'s PLUS $C_{cable}$
   - $L_a$ IS GREATER THAN or EQUAL THE SUM OF ALL $L_I$'s PLUS $L_{cable}$
10. WARNING - TO PREVENT IGNITION OF FLAMMABLE OR COMBUSTIBLE ATMOSPHERES, DISCONNECT POWER BEFORE SERVICING.

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| | | | | |
|---|---|---|---|---|
| DR. | SIZE A | FSCM NO | DWG NO. | 08800-0116 |
| ISSUED | SCALE N/A | WT. | | SHEET 5 OF 8 |

Form Rev AC

REVISIONS

| REV | DESCRIPTION | CHG. NO. | APP'D | DATE |
|---|---|---|---|---|
| AB | | | | |

(FIELDBUS ONLY)

# FMRC INTRINSIC SAFETY APPROVAL

THE ROSEMOUNT MODEL 8800 SMART VORTEX FLOWMETER IS FMRC APPROVED AS INTRINSICALLY SAFE WHEN INSTALLED PER THE NATIONAL ELECTRIC CODE (NEC) ARTICLE 504 WITH FMRC APPROVED ASSOCIATED APPARATUS WHICH MEETS THE ENTITY PARAMETERS INDICATED BELOW. ADDITIONALLY, THE ROSEMOUNT MODEL 751 FIELD SIGNAL INDICATOR IS FMRC APPROVED AS INTRISICALLY SAFE WHEN CONNECTED IN CIRCUIT WITH THE ROSEMOUNT MODEL 8800 AS SPECIFIED IN THIS DRAWING.

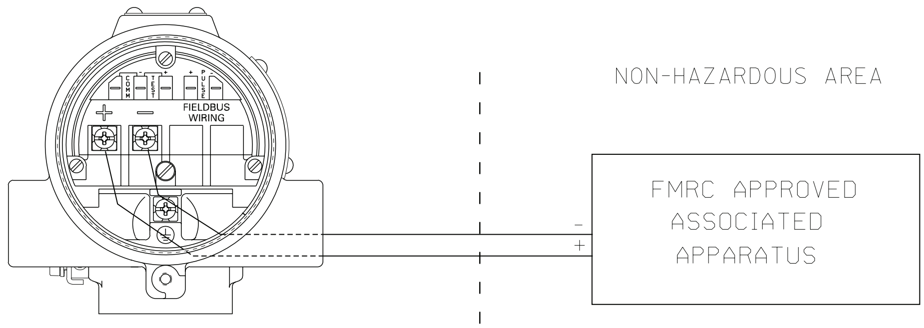
INTRINSICALLY SAFE FOR CLASS I, DIV. 1, GROUPS A, B, C, D; CLASS II, DIV. 1, GROUPS E, F, G; CLASS III, DIV. 1 HAZARDOUS LOCATIONS. TEMP CODE T4 ($T_{amb}$=+40°C)

| TERMINALS "+", "-", FIELDBUS WIRING | ASSOCIATED APPARATUS PARAMETERS |
|---|---|
| $V_{max}$ = 30Vdc | $V_{oc}$ OR $V_t \leq$ 30V |
| $I_{max}$ = 300mA | $I_{sc}$ OR $I_t \leq$ 300mA |
| $P_{max}$ = 1.3W | |
| $C_i$ = 0μF | $C_a > C_{cable} + C_i$ |
| $L_i$ < 10μH | $L_a > L_{cable} + L_i$ |

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

DIVISION 1 OR 2
HAZARDOUS AREA

NON-HAZARDOUS AREA




ROSEMOUNT MODEL 8800

(SEE SHEETS 2 & 3)

Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317 USA

CAD MAINTAINED (MicroStation)

DR.

ISSUED

SIZE A | FSCM NO | DWG NO. 08800-0116

SCALE N/A | WT. | SHEET 6 OF 8

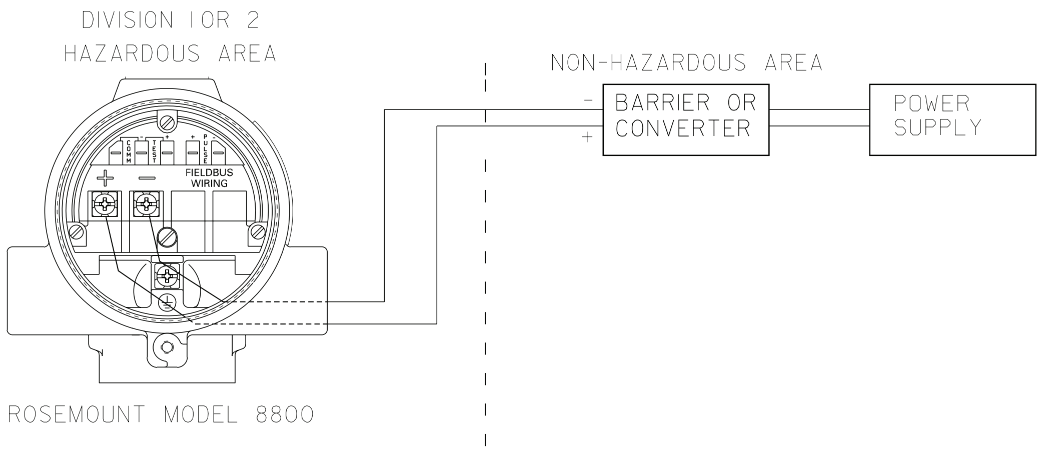
Form Rev AC

REVISIONS

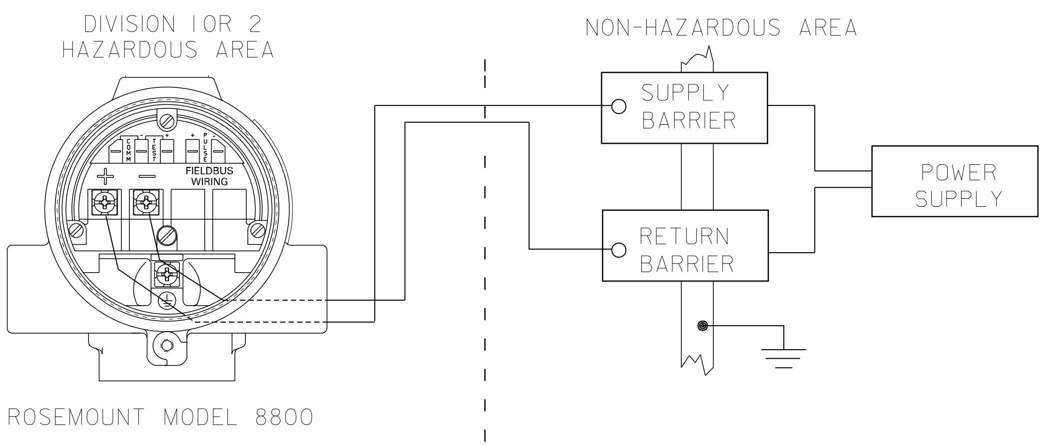
| REV | DESCRIPTION | CHG. NO. | APP'D | DATE |
|---|---|---|---|---|
| AB | | | | |

(FIELDBUS ONLY)

FIELD CIRCUIT CONFIGURATION DIAGRAM I
ONE BARRIER OR CONVERTER:
SINGLE OR DUAL CHANNEL




FIELD CIRCUIT CONFIGURATION DIAGRAM II
SUPPLY AND RETURN BARRIERS
(ONLY FOR USE WITH BARRIERS APPROVED IN THIS CONFIGURATION)

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CAD MAINTAINED (MicroStation)

DR.

ISSUED

SIZE A | FSCM NO | DWG NO. 08800-0116

SCALE N/A | WT. | SHEET 7 OF 8

Form Rev AC

| REVISIONS | | | | |
|---|---|---|---|---|
| REV | DESCRIPTION | CHG. NO. | APP'D | DATE |
| AB | | | | |

## FISCO CONCEPT

THE FISCO CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIALLY EXAMINED IN SUCH COMBINATION. THE CRITERIA FOR INTERCONNECTION IS THAT THE VOLTAGE ($U_i$ OR Vmax), THE CURRENT ($I_i$ OR Imax), AND THE POWER ($P_i$ or Pmax) WHICH AN INTRINSICALLY SAFE APPARATUS CAN RECEIVE AND REMAIN INTRINSICALLY SAFE CONSIDERING FAULTS, MUST BE EQUAL OR GREATER THAN VOLTAGE (Uo, Voc, OR Vt), THE CURRENT (Io, Isc, OR It) AND THE POWER (Po OR Pmax) LEVELS WHICH CAN BE DELIVERED BY THE ASSOCIATED APPARATUS, CONSIDERING FAULTS AND APPLICABLE FACTORS. IN ADDITION, THE MAXIMUM UNPROTECTED CAPACITANCE ($C_i$) AND THE INDUCTANCE ($L_i$) OF EACH APPARATUS (OTHER THAN THE TERMINATION) CONNECTED TO THE FIELDBUS MUST BE LESS THAN OR EQUAL TO 5 nF AND 10 μH RESPECTIVELY.

IN EACH SEGMENT ONLY ONE ACTIVE DEVICE, NORMALLY THE ASSOCIATED APPARATUS, IS ALLOWED TO PROVIDE THE NECESSARY ENERGY FOR THE FIELDBUS SYSTEM. THE VOLTAGE Uo (OR Voc OR Vt) OF THE ASSOCIATED APPARATUS IS LIMITED TO 17.5VDC MAXIMUM.
ALL OTHER EQUIPMENT CONNECTED TO THE BUS CABLE HAS TO BE PASSIVE, MEANING THAT THEY ARE NOT ALLOWED TO PROVIDE ENERGY TO THE SYSTEM, EXCEPT A LEAKAGE CURRENT OF 50uA FOR EACH CONNECTED DEVICE. SEPARATELY POWERED EQUIPMENT NEEDS GALVANIC ISOLATION TO ASSURE THAT THE INTRINSICALLY SAFE FIELDBUS CIRCUIT REMAINS PASSIVE.
THE CABLE USED TO INTERCONNECT DEVICES NEEDS TO HAVE THE PARAMETERS IN THE FOLLOWING RANGE:

| | |
|---|---|
| Loop Resistance R': | 15.....150 Ohm/km |
| Inductance per unit length L': | 0.4.....1 mH/km |
| Capacitance per unit length C': | 80.....200 nF |

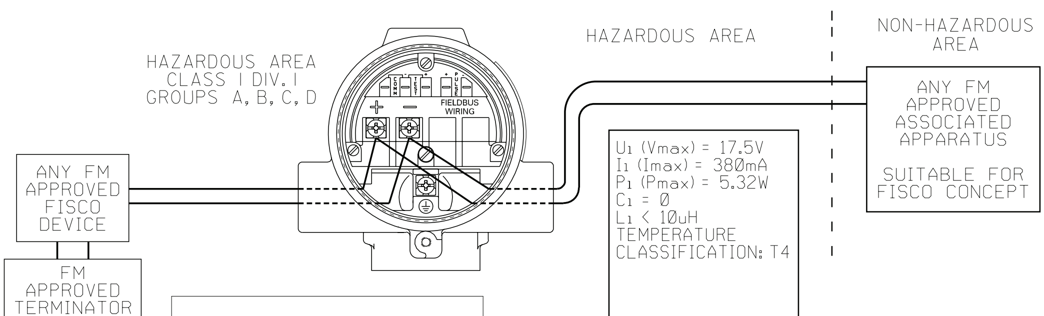
C' = C' line/line + 0.5C' line/screen, if both lines are floating, or
C' = C' line/line + C' line/screen, if the screen is connected to one line

| | |
|---|---|
| Length of trunk cable: | less than or equal to 1000m |
| Length of spur cable: | less than or equal to 30m |
| Length of spur splice: | less than or equal to 1m |

AT EACH END OF THE TRUNK CABLE AN APPROVED INFALLIBLE LINE TERMINATION WITH THE FOLLOWING PARAMETERS IS SUITABLE:

R = 90.....100 Ohm    C = 0.....2.2uF

ONE OF THE ALLOWED TERMINATIONS MIGHT ALREADY BE INTEGRATED IN THE ASSOCIATED APPARATUS. THE NUMBER OF PASSIVE APPARATUS CONNECTED TO THE BUS SEGMENT IS NOT LIMITED DUE TO I.S. REASONS. IF THE ABOVE RULES ARE RESPECTED, UP TO A TOTAL LENGTH OF 1000 m (SUM OF TRUNK AND ALL SPUR CABLES) OF CABLE IS PERMITTED.
THE INDUCTANCE AND THE CAPACITANCE OF THE CABLE WILL NOT IMPAIR THE INTRINSIC SAFETY OF THE INSTALLATION.

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CAD MAINTAINED (MicroStation)

| | | | | |
|---|---|---|---|---|
| DR. | SIZE A | FSCM NO | DWG NO. | 08800-0116 |
| ISSUED | SCALE N/A | WT. | | SHEET 8 OF 8 |

Form Rev AC

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| ZONE | REV | DESCRIPTION | CHG. NO. | APP'D | DATE |
| | AB | ADD FF AND FISCO | RTC1021467 | K.C.L. | 3/29/06 |

TABULATION

DASH NO.

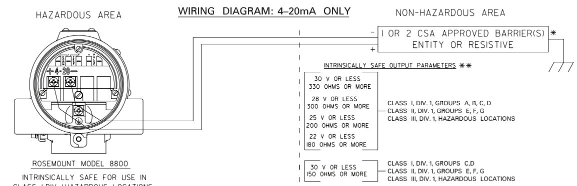
## (HART ONLY)

CSA INTRINSIC SAFETY APPROVAL
ROSEMOUNT MODEL 8800 CIRCUIT CONNECTION WITH CSA APPROVED INTRINSIC SAFETY BARRIER(S).
Ex ia
Intrinsically Safe / Sécurité Intrinsèque

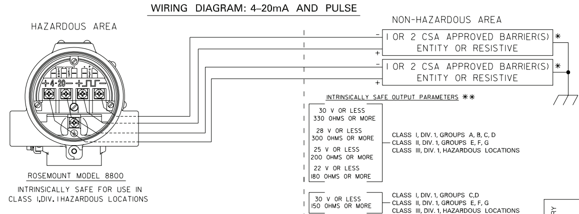
**ENTITY PARAMETERS**

| TERMINALS "+","–" AND "4–20mA" | ASSOCIATED APPARATUS PARAMETERS |
|---|---|
| Vmax = 30Vdc | Voc OR Vt ≤ 30V |
| Imax = 185mA | Isc OR It ≤ 185mA |
| Ci = 0uF | Ca > Ccable + Ci |
| Li = 970uH | La > Lcable + Li |

WIRING DIAGRAM: 4–20mA ONLY




WIRING DIAGRAM: 4–20mA AND PULSE




WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
AVERTISSEMENT: La Substitution de composants peut compromettre la securite intrinseque.

NOTES:

* ALL LINES CONNECTED TO THE MODEL 8800 MUST BE TERMINATED BY EITHER A CSA APPROVED BARRIER OR AN I.S. SAFETY GROUND.

** WHEN USING MORE THAN ONE CHANNEL OF A CSA APPROVED BARRIER, THE EFFECTIVE VOLTAGE AND RESISTANCE OF THE COMBINED LINES MUST COMPLY WITH THE LISTED INTRINSICALLY SAFE OUTPUT PARAMETERS. THE EFFECTIVE VOLTAGE AND RESISTANCE ARE TO BE CALCULATED AS FOLLOWS:

VOLTAGE: EFFECTIVE VOLTAGE = HIGHEST BARRIER VOLTAGE
(NOTE: BOTH LINES MUST BE REFERENCED TO A COMMON GROUND)

RESISTANCE: EFFECTIVE RESISTANCE = PARALLEL COMBINATION OF EACH LINE
(NOTE: DIODE RETURNS DO NOT NEED TO BE INCLUDED FOR THIS CALCULATION)

EXAMPLE #1: BARRIER 1: VOLTAGE = 28V; RESISTANCE = 330 OHMS
BARRIER 2: VOLTAGE = 28V; RESISTANCE = 330 OHMS
EFFECTIVE VOLTAGE = 28V
EFFECTIVE RESISTANCE = $\frac{R_1 R_2}{R_1 + R_2}$ = 165 OHMS

RESULT: THIS BARRIER COMBINATION WOULD BE ACCEPTABLE FOR GROUPS C, D SINCE THE EFFECTIVE VOLTAGE IS LESS THAN OR EQUAL TO 30V AND THE EFFECTIVE RESISTANCE IS GREATER THAN OR EQUAL TO 150 OHMS.

EXAMPLE #2: BARRIER 1: VOLTAGE = 28V; RESISTANCE = 330 OHMS (4-20 "+")
BARRIER 2: 28V DIODE RETURN (4-20 "-")
BARRIER 3: VOLTAGE = 28V; RESISTANCE = 1000 OHMS (PULSE "+")
BARRIER 4: 28V DIODE RETURN (PULSE "-")
EFFECTIVE VOLTAGE = 28V
EFFECTIVE RESISTANCE = $\frac{R_1 R_3}{R_1 + R_3}$ = 248 OHMS

RESULT: THIS BARRIER COMBINATION WOULD BE ACCEPTABLE FOR GROUPS C, D SINCE THE EFFECTIVE VOLTAGE IS LESS THAN OR EQUAL TO 30V AND THE EFFECTIVE RESISTANCE IS GREATER THAN OR EQUAL TO 150 OHMS.

CAD MAINTAINED (MicroStation)

CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY.

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES. MACHINE SURFACE FINISH 125

-TOLERANCE-
.X ± .1 [2,5]
.XX ± .02 [0,5]
.XXX ± .010 [0,25]
FRACTIONS ± 1/32 ANGLES ± 2°

DO NOT SCALE PRINT

CONTRACT NO.

| | | |
|---|---|---|
| DR. | D. BROKKE | 1/24/05 |
| CHK'D. | | |
| APP'D | K. LIESMAKI | 2/1/05 |
| APP'D GOVT. | | |

EMERSON. Process Management — ROSEMOUNT® 8200 Market Boulevard • Chanhassen, MN 55317 USA

TITLE INSTALLATION DRAWING FOR:
MODEL 8800D CSA INTRINSIC SAFETY APPROVAL FOR HART AND FIELDBUS

| SIZE | FSCM NO | DWG NO. |
|---|---|---|
| B | | 08800-0112 |

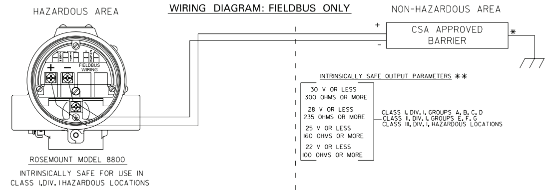
SCALE N/A WT. ——— SHEET 1 OF 2

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| ZONE | REV | DESCRIPTION | CHG. NO. | APP'D | DATE |
| | AB | | | | |

## (FIELDBUS ONLY)

CSA INTRINSIC SAFETY APPROVAL
ROSEMOUNT MODEL 8800 CIRCUIT CONNECTION WITH CSA APPROVED INTRINSIC SAFETY BARRIER(S).
Ex ia
Intrinsically Safe/Sécurité Intrinseque

WIRING DIAGRAM: FIELDBUS ONLY




| TERMINALS "+", "-", FIELDBUS WIRING | ASSOCIATED APPARATUS PARAMETERS |
|---|---|
| Vmax = 30Vdc<br>Imax = 300mA<br>Pmax = 1.3W<br>Ci = 0µF<br>Li < 10µH | Voc OR Vt ≤ 30V<br>Isc OR It ≤ 300mA<br><br>Ca > Ccable + Ci<br>La > Lcable + Li |

WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
AVERTISSEMENT: La Substitution de composants peut compromettre la securite intrinseque.

## FISCO CONCEPT

THE FISCO CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIALLY EXAMINED IN SUCH COMBINATION. THE CRITERIA FOR INTERCONNECTION IS THAT THE VOLTAGE ($U_i$ OR Vmax), THE CURRENT ($I_i$ OR Imax), AND THE POWER ($P_i$ or Pmax) WHICH AN INTRINSICALLY SAFE APPARATUS CAN RECEIVE AND REMAIN INTRINSICALLY SAFE CONSIDERING FAULTS, MUST BE EQUAL OR GREATER THAN VOLTAGE ($U_o$, Voc, OR Vt), THE CURRENT ($I_o$, Isc, OR It) AND THE POWER ($P_o$ OR Pmax) LEVELS WHICH CAN BE DELIVERED BY THE ASSOCIATED APPARATUS, CONSIDERING FAULTS AND APPLICABLE FACTORS. IN ADDITION, THE MAXIMUM UNPROTECTED CAPACITANCE ($C_i$) AND THE INDUCTANCE ($L_i$) OF EACH APPARATUS (OTHER THAN THE TERMINATION) CONNECTED TO THE FIELDBUS SEGMENT MUST BE LESS THAN OR EQUAL TO 5 nF AND 10 µH RESPECTIVELY.

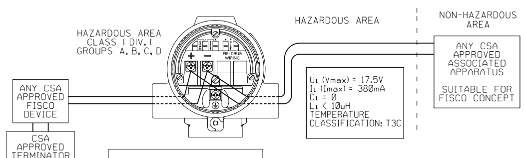
IN EACH SEGMENT ONLY ONE ACTIVE DEVICE, NORMALLY THE ASSOCIATED APPARATUS, IS ALLOWED TO PROVIDE THE NECESSARY ENERGY FOR THE FIELDBUS SYSTEM. THE VOLTAGE $U_o$ (OR Voc OR Vt) OF THE ASSOCIATED APPARATUS IS LIMITED TO 17.5VDC MAXIMUM.
ALL OTHER EQUIPMENT CONNECTED TO THE BUS CABLE HAS TO BE PASSIVE, MEANING THAT THEY ARE NOT ALLOWED TO PROVIDE ENERGY TO THE SYSTEM, EXCEPT A LEAKAGE CURRENT OF 50uA FOR EACH CONNECTED DEVICE. SEPARATELY POWERED EQUIPMENT NEEDS GALVANIC ISOLATION TO ASSURE THAT THE INTRINSICALLY SAFE FIELDBUS CIRCUIT REMAINS PASSIVE.
THE CABLE USED TO INTERCONNECT DEVICES NEEDS TO HAVE THE PARAMETERS IN THE FOLLOWING RANGE:

| | |
|---|---|
| Loop Resistance R': | 15.....150 Ohm/km |
| Inductance per unit length L': | 0.4.....1 mH/km |
| Capacitance per unit length C': | 80.....200 nF |

C' = C' line/line + 0.5C' line/screen, if both lines are floating, or
C' = C' line/line + C' line/screen, if the screen is connected to one line

| | |
|---|---|
| Length of trunk cable: | less than or equal to 1000m |
| Length of spur cable: | less than or equal to 30m |
| Length of spur splice: | less than or equal to 1m |

AT EACH END OF THE TRUNK CABLE AN APPROVED INFALLIBLE LINE TERMINATION WITH THE FOLLOWING PARAMETERS IS SUITABLE:
R = 90.....100 Ohm    C = 0.....2.2uF
ONE OF THE ALLOWED TERMINATIONS MIGHT ALREADY BE INTEGRATED IN THE ASSOCIATED APPARATUS. THE NUMBER OF PASSIVE APPARATUS CONNECTED TO THE BUS SEGMENT IS NOT LIMITED DUE TO I. S. REASONS. IF THE ABOVE RULES ARE RESPECTED, UP TO A TOTAL LENGTH OF 1000 m (SUM OF TRUNK AND ALL SPUR CABLES) OF CABLE IS PERMITTED. THE INDUCTANCE AND THE CAPACITANCE OF THE CABLE WILL NOT IMPAIR THE INTRINSIC SAFETY OF THE INSTALLATION.

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CAD MAINTAINED (MicroStation)

| | | | |
|---|---|---|---|
| DR. | SIZE B | FSCM NO | DWG NO. 08800-0112 |
| ISSUED | SCALE N/A | WT. ——— | SHEET 2 OF 2 |

# Appendix C 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.

## 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 that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.

**⚠WARNING**

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.

## ELECTRONICS VERIFICATION

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 Handheld communicator or AMS. 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 Housing** on page 5-15.

### Electronics Verification Using Flow Simulation Mode

| HART Comm. | 1, 2, 4, 3, 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 Model 8800D sensor from the electronics charge amplifier input (see Figure 5-2 on page 5-7) and replace it with the simulated flow signal. There is no need to select 2 "Sensor Offline."

### Fixed Flow Rate Simulation

| HART Comm. | 1, 2, 4, 3, 1, 1 |
|---|---|

The fixed flow simulation signal can be entered in either percent of range or flow rate in the current engineering units. The resulting flow rate and/or shedding frequency can be continuously monitored via a Handheld Communicator or AMS.

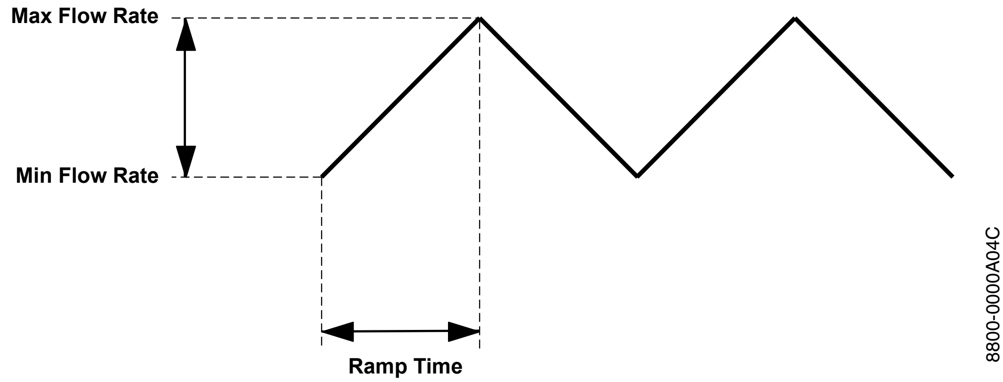
### Varying Flow Rate Simulation

| HART Comm. | 1, 2, 4, 3, 1, 2 |
|---|---|

The profile of the varying flow simulation signal is a repetitive triangular waveform as illustrated in Figure C-1. The minimum and maximum flowrate can be entered in either percent of range or entered as a flow rate in the current engineering units. The ramp time can be entered in seconds from a minimum of 0.533 seconds to a maximum of 34951 seconds. The resulting flow rate and/or shedding frequency can be continuously monitored via a Handheld Communicator or AMS.

**NOTE**
To manually disconnect the sensor for precautionary measures, see **Replacing the Electronics Housing** on page 5-15 for details.

Figure C-1. Profile of Varying Flow Simulation Signal.




## 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-2).

**Tools Needed**

- Handheld Communicator or AMS
- Standard sinewave generator

1. Remove the electronics compartment cover.
2. Remove the two screws and the LCD indicator if applicable.
3. Connect a Handheld Communicator or AMS to the loop.
4. Access the flow simulation menu on the communicator and select "Flow Sim External." This item is used with an External Frequency Generator. This will effectively disconnect the Model 8800D sensor input from the charge amplifier input of the electronics (see Figure 5-2 on page 5-7). The simulated flow and/or the shedding frequency values will now be accessible via the Handheld Communicator or AMS.

| HART Comm. | 1, 2, 4, 3, 2 |
|---|---|

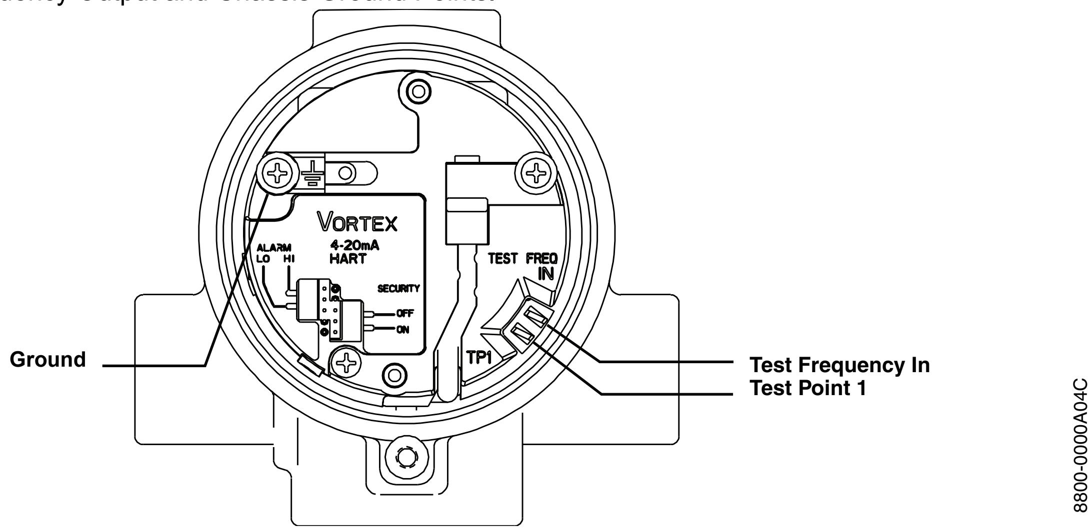
5. Connect the sinewave generator to the "TEST FREQ IN" and "GROUND" points as shown in Figure C-2.
6. Set the sinewave generator amplitude to 2Vpp±10%.
7. Select the desired sinewave generator frequency.
8. Verify the generator frequency against the frequency displayed on the Handheld Communicator or AMS.
9. Exit the Flow Simulation Mode.

| HART Comm. | 1, 2, 4, 4 |
|---|---|

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 5-15 for details.

Figure C-2. Test Frequency Output and Chassis Ground Points.




## 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 -6 may clarify how these equations are used.

**To Verify a Flow Rate**

For a given 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 D-C-1 on page -5).

**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 C-5).

**To Verify a 4–20 mA Output**

For a given input frequency F (Hz), and K-factor (compensated), find output current I:

$$I = \left(\left[\frac{(F(Hz)/\ K \times C_X) - LRV}{URV - LRV}\right](16)\right) + 4$$

where $C_x$ is the unit conversion (Table C-1 on page C-5), 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 $C_x$.

$C_{20} = C_x$/sp. units conv. factor (Table C-1 on page C-5).

**Unit Conversion Table (User Units to GPS)**
Use the following table to assist with calculated frequencies when using user defined units.

Table C-1. Unit Conversions

| $C_x$ | Units (act) | Conversion Factor |
|---|---|---|
| $C_1$ | 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 | $C_{10}$*60/ρ |
| $C_{16}$ | kg/h | $C_{11}$/ρ |
| $C_{17}$ | lb/h | $C_{13}$/ρ |
| $C_{18}$ | shTon/h | $C_{17} \times 2000$ |
| $C_{19}$ | mTon/h | $C_{16} \times 1000$ |
| $C_{20}$ | SPECIAL | $C_x$/special units conversion factor* |

ρ=*operating density*
* *Special units conversion factor*

## EXAMPLES

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

### English Units

**Example 1 (English units)**

| | |
|---|---|
| Fluid = Water | URV= 500 gpm |
| Line size = 3 in. | LRV= 0 gpm |
| Line press.= 100 psig | $C_2$ = 1.66667E-02 (from Table C-1 on page C-5) |

Vortex Frequency = 75 Hz

K-factor (compensated) = 10.79 (via HART communicator or AMS)

$$Q = F(Hz) / (K \times C_2)$$

= 75.00/(10.79 × 0.0166667)

= 417.1 gpm

Therefore, an input frequency of 75.00 Hz represents a flow rate of 417.1 gpm in this application.

For a given input frequency, you may also determine the current output. Use the above example with an input frequency of 75.00 Hz:

URV= 500 gpm LRV= 0 gpm $F_{in}$ = 75.00 Hz

$$I = \left(\left[\frac{F(Hz) / (K \times C_2) - LRV}{URV - LRV}\right] \times (16)\right) + 4$$

$$I = \left(\left[\frac{75.00 / (10.79 \times 0.0166667) - 0}{500 - 0}\right] \times (16)\right) + 4$$

= 17.34 mA

Therefore, an input frequency of 75.00 Hz represents a current output of 17.34 mA.

**Example 2 (English units)**

| | |
|---|---|
| Fluid = Saturated Steam | URV = 40000 lb/hr |
| Line size = 3 in. | LRV= 0 lb/hr |
| Line press. = 500 psia | $C_{17}$ = $C_{13}$/r (Table C-1 on page C-5) |
| Temp op. = 467 °F | Density (r) = 1.078 lb/cu-ft |
| Viscosity = 0.017 cp | Vortex Frequency = 400 Hz |

K-factor (compensated) = 10.678 (via HART communicator or AMS)

M = F(Hz) /(K 3 $C_{17}$)

= 400/ {10.678 3 ($C_{13}$/r)}

= 400/{10.678 3 (0.00207792/1.078)}

= 400/(10.678 3 0.0019276)

= 19271.2 lb/hr

Therefore, an input frequency of 400 Hz represents a flow rate of 19271.2 lb/hr in this application.

For a given input frequency, you may also determine the current output. Use the example on page C-6 with an input frequency of 300 Hz:

URV= 40000 lb/hr LRV= 0 lb/hr $F_{in}$(Hz) = 300.00

$$I = \left(\left[\frac{F(Hz) / (K \times C_{17}) - LRV}{URV - LRV}\right] \times (16)\right) + 4$$

$$I = \left(\left[\frac{300 / ((10.678 \times 0.0019276) - 0)}{4000 - 0}\right] \times (16)\right) + 4$$

= 9.83 mA

Therefore, an input frequency of 300.00 Hz represents a current output of 9.83 mA.

**Example 3 (English units)**

Fluid = Natural gas URV = 5833 SCFM

Line size = 3 in. LRV= 0 SCFM

Line press. = 140 psig $C_{20} = C_x$/sp. units factor (from Table C-1 on page C-5)

Temp op. = 50 °F Density ($\rho$) = 0.549 lb/cu-ft (oper)

Viscosity = 0.01 cp

K-factor (compensated) = 10.797 (via HART communicator or AMS)

$Q = F(Hz) / (K \times C_{20})$ where $C_{20} = C_{12}/10.71$

= 700/{10.797 × (0.124675/10.71)}

= 5569.4 SCFM

Therefore, an input frequency of 700.00 Hz represents a flow rate of 5569.4 SCFM in this application.

For a given input frequency, you may also determine the current output. Use the above example with an input frequency of 200 Hz.

URV= 5833 SCFM LRV= 0 SCFM $F_{in}$ (Hz) = 200.00

$$I = \left(\left[\frac{F(Hz) / (K \times C_{20}) - LRV}{URV - LRV}\right] \times (16)\right) + 4$$

$$I = \left(\left[\frac{200 / ((10797 \times 0.011641) - 0)}{5833 - 0}\right] \times (16)\right) + 4$$

= 8.36 mA

Therefore, an input frequency of 200.00 represents a current output of 8.36 mA.

## SI Units

**Example 1 (SI units)**

Fluid = Water URV= 2000 lpm

Line size = 80 mm LRV= 0 lpm

Line press. = 700 kPag $C_8$ = 4.40287E-03 (from Table C-1 on page C-5)

Temp op. = 60 °C

K-factor (compensated) = 10.772 (via HART communicator or AMS)

Q = F (Hz)/(K × $C_8$)

= 80/(10.722 × 0.00440287)

= 1686.8 lpm

Therefore, an input frequency of 80.00 Hz represents a flow rate of 1686.8 lpm in this application.

For a given input frequency, you may also determine the current output. Use the above example with an input frequency of 80.00 Hz:

URV= 2000 lpm LRV= 0 lpm $F_{in}$ (Hz) = 80.00

$$I = \left( \left[ \frac{F(Hz) / (K \times C_8) - LRV}{URV - LRV} \right] \times (16) \right) + 4$$

$$I = \left( \left[ \frac{80 / ((10.772 \times 0.00440287) - 0)}{2000 - 0} \right] \times (16) \right) + 4$$

= 17.49 mA

Therefore, an input frequency of 80.00 Hz represents a 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 press.= 700 kPag $C_{16} = C_{11}/\rho$ (from Table C-1 on page C-5)

Temp op. = 170 °C Density($\rho$) = 4.169 kg/cu-mtr (oper)

Viscosity = 0.015 cp

K-factor (compensated) = 10.715 (via HART communicator or AMS)

M = F(Hz) /(K × $C_{16}$)

= 650/{10.715 × ($C_{11}/\rho$)}

= 650/{10.715 × (0.0733811/4.169)}

= 650/(10.715 × 0.017602)

= 3446.4 kg/hr

Therefore, an input frequency of 650.00 Hz represents a flow rate of 3446.4 kg/hr in this application.

For a given input frequency, you may also determine the current output. Use the prior example with an input frequency of 275 Hz:

URV= 3600 kg/hr LRV= 0 kg/hr $F_{in}(Hz)$ = 275

$$I = \left(\left[\frac{F(Hz)/\ K \times C_{16} - LRV}{URV - LRV}\right] \times (16)\right) + 4$$

$$I = \left(\left[\frac{275/\ ((10.715 \times 0.017602) - 0)}{3600 - 0}\right] \times (16)\right) + 4$$

= 10.48 mA

Therefore, an input frequency of 275.00 Hz represents an output current of 10.48 mA.

**Example 3 (SI units)**

| | |
|---|---|
| Fluid = Natural Gas | URV = 10,000 NCMH |
| Line size = 80 mm | LRV= 0 NCMH |
| Line press. = 1000 kPag | $C_{20} = C_x$/sp. units factor (from Table C-1 on page C-5) |
| Temp op. = 10 °C | Density($\rho$) = 9.07754 kg/cu-mtr (oper) |
| Viscosity = 0.01 cp | |

K-factor(compensated) = 10.797 (via HART communicator or AMS)

$$Q = F(Hz)/\ (K \times C_{20})$$ where $C_{20}=C_{11}/10.48$

= 700/{10.797 × (.0733811/10.48)}

= 9259.2 NCMH

Therefore, an input frequency of 700.00 Hz represents a flow rate of 9259.2 NCMH in this application.

For a given input frequency, you may also determine the current output. Use the above example at the 8.0 mA point:

URV= 10000 NCMH LRV= 0 NCMH $F_{in}(Hz)$ = 375.00

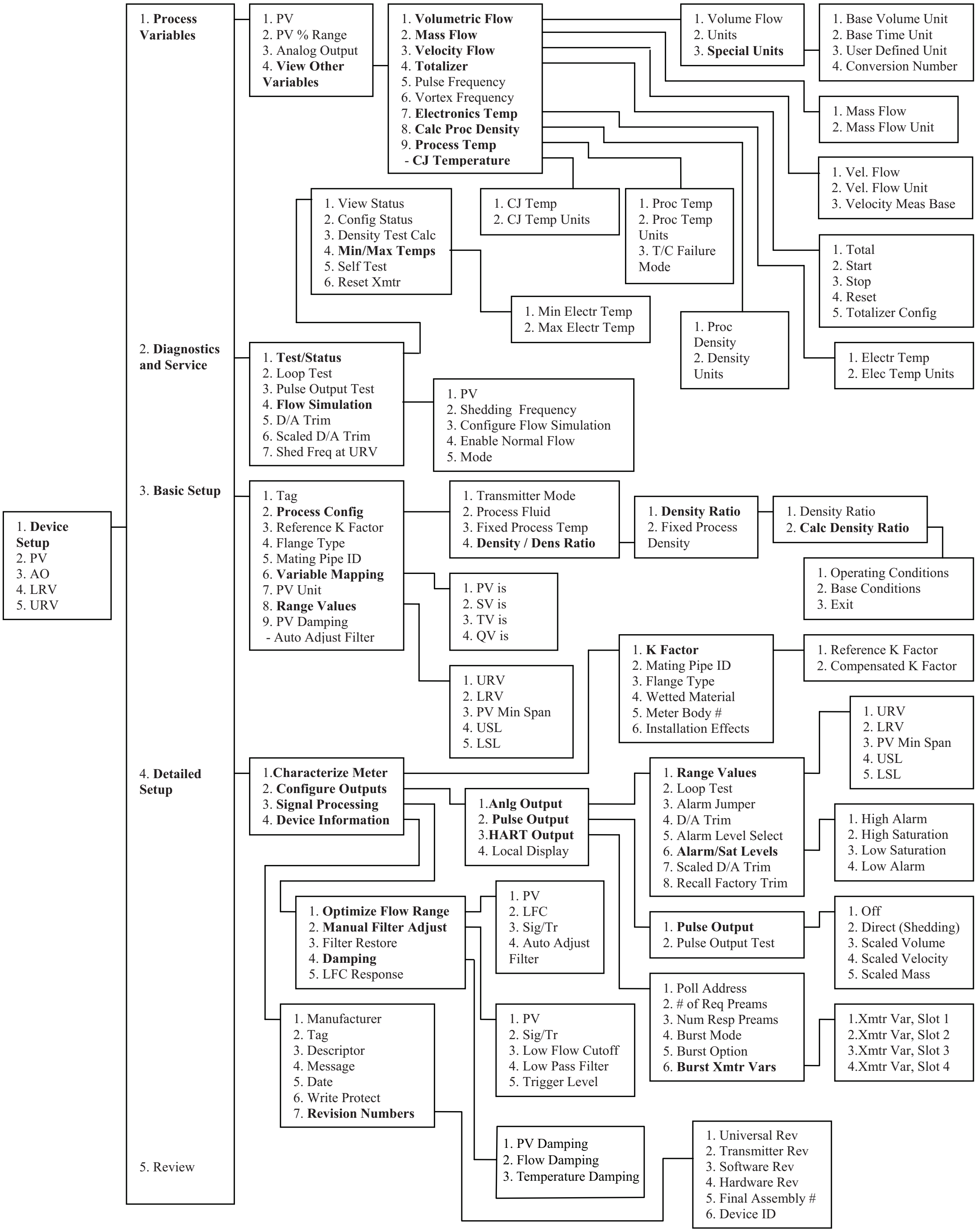
$$I = \left(\left[\frac{F(Hz)/\ (K \times C_{20}) - LRV}{URV - LRV}\right] \times (16)\right) + 4$$

$$I = \left(\left[\frac{375/\ ((10.797 \times 0.0070020) - 0)}{10000 - 0}\right] \times (16)\right) + 4$$

= 11.94 mA

Therefore, an input frequency of 375.00 Hz represents a current output of 11.94 mA.

Figure 1-1. Rosemount 8800D HART Menu Tree



**T**



**U**



**V**



**W**

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