

Rosemount™ 8600 Series Utility™ Vortex Flowmeter



The Rosemount 8600 Vortex delivers superior reliability for general purpose applications.

- Rosemount reliability—the Rosemount 8600 Vortex improves reliability over traditional flow metering technology.
- Vibration immunity—mass balancing of the sensor system, and Adaptive Digital Signal Processing (ADSP) provide vibration immunity.
- Simplified Troubleshooting - Device Diagnostics enable field verification of Meter Electronics and meter verification.

Rosemount™ 8600 MultiVariable™ Vortex reduces installation costs, simplifies installation, and improves performance in saturated steam

Multivariable vortex design

Incorporates temperature sensor into the vortex meter using the shedder bar as a thermowell, which keeps the temperature sensor isolated from process for easy verification and replacement.

Temperature compensated capability for saturated steam

Calculates density from measured process temperature and uses the calculated density to provide a temperature compensated mass flow.

Increased performance in saturated steam

Performance in saturated steam is improved due to the fact that the electronics will be compensating for changes in the process temperature.

Reduces installed costs

MultiVariable vortex eliminates the need for an external thermowell and temperature sensor.

Output options

Can map independent variables to analog output, pulse output, or HART® burst variables.

Available with flow computer for additional functionality

Integrate the MultiVariable vortex with a pressure transmitter for full pressure and temperature compensation of superheated steam and various gases.

Remote mount electronics

Also available with remote mounted electronics up to 75 ft. (23 m).

When you integrate the Multivariable vortex with a Rosemount Flow Computer, you get:

- Remote communications
- Heat calculations
- Remote totalization
- Peak demand calculation
- Datalogging capabilities

For more information on the Rosemount Flow Computer, see the Rosemount Flow Computer [Product Data Sheet](#).



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Specifications

The following specifications are for the Rosemount 8600 except where noted.

Functional specifications

Process fluids

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

Line sizes

Flanged style

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

Pipe schedules

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

Note

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

Measurable flow rates

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

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

Note

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

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

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

Table 1. Minimum Measurable Meter Reynolds Numbers

| Meter sizes (Inches/DN) | Reynolds number limitations |
|-----------------------------|-----------------------------|
| 1 through 4/25 through 100 | 5000 minimum |
| 6 through 8/150 through 200 | |

Table 2. Minimum Measurable Meter Velocities⁽¹⁾

| | Feet per second | Meters per second |
|--|------------------|-------------------|
| Liquids | $\sqrt{36/\rho}$ | $\sqrt{54/\rho}$ |
| Gases | $\sqrt{36/\rho}$ | $\sqrt{54/\rho}$ |
| The ρ is the process fluid density at flowing conditions in lb/ft³ for ft/s and kg/m³ for m/s | | |

1. Velocities are referenced to schedule 40 pipe.

Table 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 | $\sqrt{90,000/\rho}$ or 250 | $\sqrt{134,000/\rho}$ or 76 |
| The ρ is the process fluid density at flowing conditions in lb/ft³ for ft/s and kg/m³ for m/s | | |

1. Velocities are referenced to schedule 40 pipe.

Process temperature limits

Standard

-58 to 482 °F (-50 to 250 °C)

Output signals

4–20 mA HART digital signal

Superimposed on 4–20 mA signal

Optional scalable pulse output

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

Analog output adjustment

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

Scalable frequency adjustment

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

Ambient temperature limits

Operating

-58 to 185 °F (-50 to 85 °C)
 -4 to 185 °F (-20 to 85 °C) for flowmeters with local indicator

Storage

-58 to 250 °F (-50 to 121 °C)
 -50 to 185 °F (-46 to 85 °C) for flowmeters with local indicator

Pressure limits

Flange style meter

Rated for ASME B16.5 (ANSI) Class 150, 300, EN 1092-1 PN 16 and 40.

Power supply

HART analog

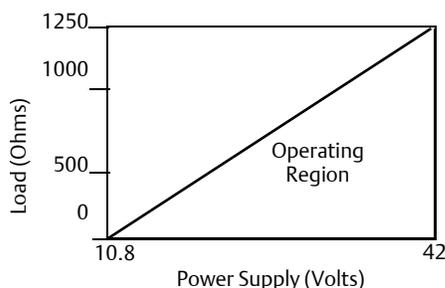
External power supply required. Flowmeter operates on 10.8 to 42 Vdc terminal voltage (with 250-ohm minimum load required for HART communications, 16.8 Vdc power supply is required).

Power consumption

One watt maximum

Load limitations (HART analog)

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



$$R_{max} = 41.7(V_{ps} - 10.8)$$

V_{ps} = Power Supply Voltage (Volts)

R_{max} = Maximum Loop Resistance (Ohms)

Note

HART communication requires a minimum loop resistance of 250 ohms.

Optional LCD display

The optional LCD display is capable of displaying:

- Primary Variable
- Velocity Flow
- Volumetric Flow
- Mass Flow
- Percent of Range
- Analog Output
- Totalizer
- Shedding Frequency
- Pulse Output Frequency (if applicable)
- 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; IP66

Permanent pressure loss

The approximate permanent pressure loss (PPL) from the Rosemount 8600 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:

r_f = Density at operating conditions (lb/ft³ or kg/m³)

Q = Actual volumetric flow rate (Gas = ft³/min or m³/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 the following table:

Table 4. Determining the PPL

| Meter style | English units | | SI units | |
|-------------|-----------------------|-----------------------|---------------------|------------------|
| | A _{Liquid} | A _{Gas} | A _{Liquid} | A _{Gas} |
| 8600 F | 3.43 10 ⁻⁵ | 1.93 10 ⁻³ | 0.425 | 118 |

Minimum upstream 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 upstream pressure should be:

$$P = 2.9 \cdot \Delta P + 1.3 \cdot p_v \text{ or } P = 2.9 \cdot \Delta P + p_v + 0.5 \text{ psia (3.45 kPa)}$$

(use the smaller of the two results)

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

ΔP = 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 following values:

| Signal | Value |
|------------|-------|
| Low | 3.75 |
| High | 21.75 |
| 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.

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.

| Saturation | Value |
|------------|-------|
| 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 0.4 and 32.0 seconds (MTA Option Only).

Response time

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

Turn-on time

HART analog

Less than four (4) seconds plus the response time to rated accuracy from power up (less than 7 seconds with the MTA Option).

Transient protection

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

The transient terminal block meets the following specifications:
IEEE C62.41 - 2002 Category B
3 kA crest (8 3 20 μ s)
6 kV crest (1.2 3 50 μ s)
6 kV/0.5 kA (0.5 μ s, 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.

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.

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.

Typical flow ranges

Tables 5 through 9 show typical flow ranges for some common process fluids with default filter settings. Consult your local sales representative to obtain a computer sizing program that describes in greater detail the flow range for an application.

Table 5. Typical pipe velocity ranges for 8600⁽¹⁾

| Process line size (Inches/ DN) | Vortex meter | Liquid velocity ranges | | Gas velocity ranges | |
|-----------------------------------|--------------|------------------------|-------------|---------------------|--------------|
| | | (ft/s) | (m/s) | (ft/s) | (m/s) |
| 1/ 25 | 8600F010 | 0.70 to 25.0 | 0.21 to 7.6 | 6.50 to 250.0 | 1.98 to 76.2 |
| 1½/ 40 | 8600F015 | 0.70 to 25.0 | 0.21 to 7.6 | 6.50 to 250.0 | 1.98 to 76.2 |
| 2/ 50 | 8600F020 | 0.70 to 25.0 | 0.21 to 7.6 | 6.50 to 250.0 | 1.98 to 76.2 |
| 3/ 80 | 8600F030 | 0.70 to 25.0 | 0.21 to 7.6 | 6.50 to 250.0 | 1.98 to 76.2 |
| 4/ 100 | 8600F040 | 0.70 to 25.0 | 0.21 to 7.6 | 6.50 to 250.0 | 1.98 to 76.2 |
| 6/ 150 | 8600F060 | 0.70 to 25.0 | 0.21 to 7.6 | 6.50 to 250.0 | 1.98 to 76.2 |
| 8/ 200 | 8600F080 | 0.70 to 25.0 | 0.21 to 7.6 | 6.50 to 250.0 | 1.98 to 76.2 |

1. Table 5 is a reference of pipe velocities that can be measured for the standard Rosemount 8600. It does not consider density limitations, as described in Table 2 and 3. Velocities are referenced in schedule 40 pipe.

Table 6. Water Flow Rate Limits for the Rosemount 8600⁽¹⁾

| Process line size (Inches/ DN) | Vortex meter | Minimum and maximum measurable water flow rates* | |
|-----------------------------------|--------------|--|-------------------|
| | | Gallons/Minute | Cubic Meters/Hour |
| 1/ 25 | 8600F010 | 2.96 to 67.3 | 0.67 to 15.3 |
| 1½/ 40 | 8600F015 | 4.83 to 158 | 1.10 to 35.9 |
| 2/ 50 | 8600F020 | 7.96 to 261 | 1.81 to 59.4 |
| 3/ 80 | 8600F030 | 17.5 to 576 | 4.00 to 130 |
| 4/ 100 | 8600F040 | 30.2 to 992 | 6.86 to 225 |
| 6/ 150 | 8600F060 | 68.5 to 2251 | 15.6 to 511 |
| 8/ 200 | 8600F080 | 119 to 3898 | 27.0 to 885 |

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

1. Table 6 is a reference of flow rates that can be measured for the standard Rosemount 8600. It does not consider density limitations, as described in Table 2 and 3.

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

| Process pressure | Flow rate limits | Minimum and maximum air flow rates for line sizes 1-in./DN 25 through 2-in./DN 50 | | | | | |
|-----------------------|------------------|--|------|----------------|------|----------------|------|
| | | 1-in./DN 25 | | 1½-in./DN 40 | | 2-in./DN 50 | |
| | | Rosemount 8600 | | Rosemount 8600 | | Rosemount 8600 | |
| | | ACFM | ACMH | ACFM | ACMH | ACFM | ACMH |
| 0 psig (0 bar G) | max | 79.2 | 134 | 212 | 360 | 349 | 593 |
| | min | 9.71 | 16.5 | 18.4 | 31.2 | 30.3 | 51.5 |
| 50 psig (3.45 bar G) | max | 79.2 | 134 | 212 | 360 | 349 | 593 |
| | min | 3.72 | 6.32 | 8.76 | 14.9 | 14.5 | 24.6 |
| 100 psig (6.89 bar G) | max | 79.2 | 134 | 212 | 360 | 349 | 593 |
| | min | 2.80 | 4.75 | 6.58 | 11.2 | 10.8 | 18.3 |
| 150 psig (10.3 bar G) | max | 79.2 | 134 | 212 | 360 | 349 | 593 |
| | min | 2.34 | 3.98 | 5.51 | 9.36 | 9.09 | 15.4 |
| 200 psig (13.8 bar G) | max | 79.2 | 134 | 212 | 360 | 349 | 593 |
| | min | 2.34 | 3.98 | 5.51 | 9.36 | 9.09 | 15.4 |
| 300 psig (20.7 bar G) | max | 79.2 | 134 | 198 | 337 | 326 | 554 |
| | min | 2.34 | 3.98 | 5.51 | 9.36 | 9.09 | 15.4 |
| 400 psig (27.6 bar G) | max | 73.0 | 124 | 172 | 293 | 284 | 483 |
| | min | 2.34 | 3.98 | 5.51 | 9.36 | 9.09 | 15.4 |
| 500 psig (34.5 bar G) | max | 66.0 | 112 | 154 | 262 | 254 | 432 |
| | min | 2.34 | 3.98 | 5.51 | 9.36 | 9.09 | 15.4 |

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

| Process pressure | Flow rate limits | Minimum and maximum air flow rates for line sizes 3-in./DN 80 through 4-in./DN 100 | | | |
|-----------------------|------------------|---|------|----------------|------|
| | | 3-in./DN 80 | | 4-in./DN 100 | |
| | | Rosemount 8600 | | Rosemount 8600 | |
| | | ACFM | ACMH | ACFM | ACMH |
| 0 psig (0 bar G) | max | 770 | 1308 | 1326 | 2253 |
| | min | 66.8 | 114 | 115 | 195 |
| 50 psig (3.45 bar G) | max | 770 | 1308 | 1326 | 2253 |
| | min | 31.8 | 54.1 | 54.8 | 93.2 |
| 100 psig (6.89 bar G) | max | 770 | 1308 | 1326 | 2253 |
| | min | 23.9 | 40.6 | 41.1 | 69.8 |
| 150 psig (10.3 bar G) | max | 770 | 1308 | 1326 | 2253 |
| | min | 20.0 | 34.0 | 34.5 | 58.6 |
| 200 psig (13.8 bar G) | max | 770 | 1308 | 1326 | 2253 |
| | min | 20.0 | 34.0 | 34.5 | 58.6 |
| 300 psig (20.7 bar G) | max | 718 | 1220 | 1237 | 2102 |
| | min | 20.0 | 34.0 | 34.5 | 58.6 |
| 400 psig (27.6 bar G) | max | 625 | 1062 | 1076 | 1828 |
| | min | 20.0 | 34.0 | 34.5 | 58.6 |
| 500 psig (34.5 bar G) | max | 560 | 951 | 964 | 1638 |
| | min | 20.0 | 34.0 | 34.5 | 58.6 |

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

| Process pressure | Flow rate limits | Minimum and maximum air flow rates for line sizes 6-in./DN 150 through 8-in./DN 200 | | | |
|-----------------------|------------------|--|------|----------------|------|
| | | 6-in./DN 150 | | 8-in./DN 200 | |
| | | Rosemount 8600 | | Rosemount 8600 | |
| | | ACFM | ACMH | ACFM | ACMH |
| 0 psig (0 bar G) | max | 3009 | 5112 | 5211 | 8853 |
| | min | 261 | 443 | 452 | 768 |
| 50 psig (3.45 bar G) | max | 3009 | 5112 | 5211 | 8853 |
| | min | 124 | 211 | 215 | 365 |
| 100 psig (6.89 bar G) | max | 3009 | 5112 | 5211 | 8853 |
| | min | 93.3 | 159 | 162 | 276 |
| 150 psig (10.3 bar G) | max | 3009 | 5112 | 5211 | 8853 |
| | min | 78.2 | 133 | 135 | 229 |
| 200 psig (13.8 bar G) | max | 3009 | 5112 | 5211 | 8853 |
| | min | 78.2 | 133 | 135 | 229 |
| 300 psig (20.7 bar G) | max | 2807 | 4769 | 4862 | 8260 |
| | min | 78.2 | 133 | 135 | 229 |
| 400 psig (27.6 bar G) | max | 2442 | 4149 | 4228 | 7183 |
| | min | 78.2 | 133 | 136 | 229 |
| 500 psig (34.5 bar G) | max | 2188 | 3717 | 3789 | 6437 |
| | min | 78.2 | 133 | 136 | 229 |

Notes

The Rosemount 8600 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 (for example: 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:

$$\text{Standard Flow Rate} = \text{Actual Flow Rate} \times \text{Density Ratio}$$

$$\text{Density Ratio} = \text{Density at Actual (Operating) Conditions} / \text{Density at Standard Conditions}$$

Table 10. 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-in./DN 25 through 2-in./DN 50 | | | | | |
|----------------------|------------------|--|-------|----------------|-------|----------------|-------|
| | | 1-in./DN 25 | | 1½-in./DN 40 | | 2-in./DN 50 | |
| | | Rosemount 8600 | | Rosemount 8600 | | Rosemount 8600 | |
| | | lb/hr | kg/hr | lb/hr | kg/hr | lb/hr | kg/hr |
| 15 psig (1.03 bar G) | max | 342 | 155 | 917 | 416 | 1511 | 685 |
| | min | 34.8 | 15.8 | 82.0 | 37.2 | 135 | 61.2 |
| 25 psig (1.72 bar G) | max | 449 | 203 | 1204 | 546 | 1983 | 899 |
| | min | 39.9 | 18.1 | 93.9 | 42.6 | 155 | 70.2 |
| 50 psig (3.45 bar G) | max | 711 | 322 | 1904 | 864 | 3138 | 1423 |
| | min | 50.1 | 22.7 | 118 | 53.4 | 195 | 88.3 |

Table 10. 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-in./DN 25 through 2-in./DN 50 | | | | | |
|-----------------------|------------------|---|-------|----------------|-------|----------------|-------|
| | | 1-in./DN 25 | | 1½-in./DN 40 | | 2-in./DN 50 | |
| | | Rosemount 8600 | | Rosemount 8600 | | Rosemount 8600 | |
| | | lb/hr | kg/hr | lb/hr | kg/hr | lb/hr | kg/hr |
| 100 psig (6.89 bar G) | max | 1221 | 554 | 3270 | 1483 | 5389 | 2444 |
| | min | 65.7 | 29.8 | 155 | 70.1 | 255 | 116 |
| 150 psig (10.3 bar G) | max | 1724 | 782 | 4616 | 2094 | 7609 | 3451 |
| | min | 78.1 | 35.4 | 184 | 83.2 | 303 | 137 |
| 200 psig (13.8 bar G) | max | 2225 | 1009 | 5956 | 2702 | 9818 | 4453 |
| | min | 88.7 | 40.2 | 209 | 94.5 | 344 | 156 |
| 300 psig (20.7 bar G) | max | 3229 | 1464 | 8644 | 3921 | 14248 | 6463 |
| | min | 107 | 48.5 | 252 | 114 | 415 | 189 |
| 400 psig (27.6 bar G) | max | 4244 | 1925 | 11362 | 5154 | 18727 | 8494 |
| | min | 125 | 56.7 | 295 | 134 | 487 | 221 |
| 500 psig (34.5 bar G) | max | 5277 | 2393 | 14126 | 6407 | 23284 | 10561 |
| | min | 156 | 70.7 | 367 | 167 | 605 | 274 |

Table 11. 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-in./DN 80 through 4-in./DN 100 | | | |
|-----------------------|------------------|--|-------|----------------|-------|
| | | 3-in./DN 80 | | 4-in./DN 100 | |
| | | Rosemount 8600 | | Rosemount 8600 | |
| | | lb/hr | kg/hr | lb/hr | kg/hr |
| 15 psig (1.03 bar G) | max | 3330 | 1510 | 5734 | 2601 |
| | min | 298 | 135 | 513 | 233 |
| 25 psig (1.72 bar G) | max | 4370 | 1982 | 7526 | 3414 |
| | min | 341 | 155 | 587 | 267 |
| 50 psig (3.45 bar G) | max | 6914 | 3136 | 11905 | 5400 |
| | min | 429 | 195 | 739 | 335 |
| 100 psig (6.89 bar G) | max | 11874 | 5386 | 20448 | 9275 |
| | min | 562 | 255 | 968 | 439 |
| 150 psig (10.3 bar G) | max | 16763 | 7603 | 28866 | 13093 |
| | min | 668 | 303 | 1150 | 522 |
| 200 psig (13.8 bar G) | max | 21630 | 9811 | 37247 | 16895 |
| | min | 759 | 344 | 1307 | 593 |
| 300 psig (20.7 bar G) | max | 31389 | 14237 | 54052 | 24517 |
| | min | 914 | 415 | 1574 | 714 |
| 400 psig (27.6 bar G) | max | 41258 | 18714 | 71047 | 32226 |
| | min | 1073 | 487 | 1847 | 838 |
| 500 psig (34.5 bar G) | max | 51297 | 23267 | 88334 | 40068 |
| | min | 1334 | 605 | 2297 | 1042 |

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

| Process Pressure | Flow rate limits | Minimum and maximum saturated steam flow rates for line sizes 6-in./DN 150 through 8-in./DN 200 | | | |
|--------------------------|------------------|---|-------|----------------|--------|
| | | 6-in./DN 150 | | 8-in./DN 200 | |
| | | Rosemount 8600 | | Rosemount 8600 | |
| | | lb/hr | kg/hr | lb/hr | kg/hr |
| 15 psig (1.03 bar G) | max | 13013 | 5903 | 22534 | 10221 |
| | min | 1163 | 528 | 2015 | 914 |
| 25 psig (1.72 bar G) | max | 17080 | 7747 | 29575 | 13415 |
| | min | 1333 | 605 | 2308 | 1047 |
| 50 psig (3.45 bar G) | max | 27019 | 12255 | 46787 | 21222 |
| | min | 1676 | 760 | 2903 | 1317 |
| 100 psig (6.89 bar G) | max | 46405 | 21049 | 80356 | 36449 |
| | min | 2197 | 996 | 3804 | 1725 |
| 150 psig (10.3 bar G) | max | 65611 | 29761 | 113440 | 51455 |
| | min | 2610 | 1184 | 4520 | 2050 |
| 200 psig (13.8 bar G) | max | 84530 | 38342 | 146375 | 66395 |
| | min | 2965 | 1345 | 5134 | 2329 |
| 300 psig (20.7 bar G) | max | 122666 | 55640 | 212411 | 96348 |
| | min | 3572 | 1620 | 6185 | 2805 |
| 400 psig (27.6 bar G) | max | 161236 | 73135 | 279200 | 126643 |
| | min | 4192 | 1901 | 7259 | 3293 |
| 500 psig (34.5 bar G) | max | 200468 | 90931 | 347134 | 157457 |
| | min | 5212 | 2364 | 9025 | 4094 |

Performance specifications

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

Flow accuracy

Includes linearity, hysteresis, and repeatability.

Liquids - for Reynolds numbers over 20,000

Digital and pulse output

±0.75% 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% of rate

Analog output

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

Note

As the meter maximum velocity exceeds 125ft/sec (38m/sec) the accuracy error band will increase linearly to ±1.5% up to 250ft/sec (76m/sec).

Note

As the meter Reynolds numbers decrease below the stated limit to 10,000, the accuracy error band will increase linearly to ±3.0%. For Reynolds numbers down to 5,000, the accuracy error band will increase linearly from ±3.0% to ±10.0%.

Process Temperature Accuracy

2.2 °F (1.2 °C)

Note

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

Mass flow accuracy for temperature compensated mass flow

Digital and Pulse Output

±2.0% of rate (Nominal)

Nominal conditions include temperature variation in saturation and superheat at 150 psig (10 bar-g) and above.

For pressure below 150 psig (10 bar-g), add 0.08% of uncertainty for every 15 psi (1 bar) below 150 psig (10 bar-g).

Analog output

Same as pulse output plus an additional 0.025% of span

Repeatability

±0.2% of actual flow rate

Stability

±0.2% of rate over one year

Process temperature effect

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

Table 13 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 13. Process Temperature Effect

| Percent change in K-Factor per 100 °F (55.5 °C) | |
|---|--------|
| < 77 °F (25 °C) | + 0.23 |
| > 77 °F (25 °C) | - 0.27 |

Ambient temperature effect

Digital and pulse outputs

No effect

Analog output

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

Vibration effect

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

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

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

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

Vibration specifications

Integral aluminum housings and remote aluminum housings

At or near the minimum liquid flow rate in a normal pipe mounted installation, the maximum vibration should be 0.087-in. (2.21 mm) double amplitude displacement or 1 g acceleration, whichever is smaller. At or near the minimum gas flow rate in a normal pipe mounted installation, the maximum vibration should be 0.043-in. (1.09 mm) double amplitude displacement or 1/2 g acceleration, whichever is smaller.

Mounting position effect

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

EMI/RFI effect

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

HART analog

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

HART digital

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

Magnetic-field interference

HART analog

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

Series mode noise rejection

HART analog

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

Common mode noise rejection

HART analog

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

Power supply effect

HART analog

Less than 0.005% of span per volt

Physical specifications

Note

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

Electrical connections

1/2 -14 NPT or M20 3 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

Temperature sensor (MTA option)

Type-N Thermocouple

Process-wetted materials

Meter body and flanges

CF-8M cast stainless steel.

Sensor material

CF-3M cast stainless steel.

Gasket

Graphite with 316 stainless steel insert

Process connections

Mounts between the following flange configurations:

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

EN 1092-1 PN16, 40 Type B1

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 pipe mount bracket with one 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).

Pipe length requirements

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

Rated Accuracy is based on the number of pipe diameter from an upstream disturbance. No K-factor correction is required if the meter is installed with 35 D upstream and 10 D downstream.

Tagging

The flowmeter will be tagged at no charge. All tags are stainless steel. The standard tag is permanently attached to the flowmeter. Character height is 1/16-in. (1.6 mm). A wired-on tag is available on request. Wire on tags can contain five lines with up to 28 characters per line.

Flow calibration information

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

Product Certifications

Approved manufacturing locations

Emerson Process Management Flow Technologies Company,
Ltd - Nanjing, Jiangsu Province, P.R. China

International certifications (IECEX)

I.S. certification

IEC 60079-0: 2011 Edition: 6.0

IEC 60079-11: 2011-06 Edition: 6.0

- I7** Certification No. IECEx BAS 12.0053X
Ex ia IIC T4 Ga (-60 °C ≤ Ta ≤ +70 °C)
- U_i = 30 VDC
 - I_i = 185mA
 - P_i = 1.0W
 - C_i = 0µF
 - L_i = 0.97mH

Special Conditions for Safe Use (X):

- When fitted with the 90V transient suppressors, the equipment is not capable of passing the 500V insulation test. This must be taken into account upon installation.
- The enclosure may be made from aluminum alloy with a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion when located in Zone 0.
- When the equipment is installed, particular precautions must be taken to ensure, taking into account the effect of process fluid temperature, that the ambient temperature of the electrical housing of the equipment meets the marked protection type temperature range.

Type 'n' certification

IEC 60079-0: 2011 Edition: 6.0

IEC 60079-11: 2011-06 Edition: 6.0

IEC 60079-15: 2010 Edition: 4

- N7** Certification No. IECEx BAS 12.0054X
Ex nA ic IIC T5 Gc (-40 °C ≤ Ta ≤ +70 °C)
- Maximum Working Voltage = 42Vdc

Special Conditions for Safe Use (X):

- When fitted with the 90V transient suppressors, the equipment is not capable of passing the 500V insulation test. This must be taken into account upon installation.
- When the equipment is installed, particular precautions must be taken to ensure, taking into account the effect of process fluid temperature, that the ambient temperature of the electrical housing of the equipment meets the marked protection type temperature range.

Flameproof certification

IEC 60079-0: 2007 Edition: 5

IEC 60079-1: 2007-04 Edition: 6

IEC 60079-11: 2011 Edition: 6

IEC 60079-26: 2006 Edition: 2

E7 Certification No. IECEx DEK 11.0022X

Integral Transmitter marked:

Ex d [ia] IIC T6 Ga/Gb

Remote Transmitter marked:

Ex d [ia Ga] IIC T6 Gb

Remote Sensor marked:

Ex ia IIC T6 Ga

Ambient temperature range: -50 °C ≤ Ta ≤ 70 °C

Power Supply: 42 Vdc Max.

Transmitter Um=250 V

Remote mounted sensor: in type of protection Ex ia IIC, only to be connected to the associated Model 8600 Vortex Flowmeter electronics.

The maximum length of the interconnecting cable is 152 m (500 ft).

Special Conditions for Safe Use (X):

- For information regarding the dimensions of the flameproof joints, the manufacturer shall be contacted.
- The Flowmeter is provided with special fasteners of property class A2-70 or A4-70.
- Units marked with "Warning: Electrostatic Charging Hazard" may use non-conductive paint thicker than 0.2 mm. Precautions shall be taken to avoid ignition due to electrostatic charge of the enclosure.
- When the equipment is installed, precautions must be taken to ensure, taken into account the effect of the process fluid temperature, that the ambient temperature of the electrical parts of the equipment lies between -50 °C and +70 °C.

Chinese certifications (NEPSI)

Flameproof certification

GB3836.1– 2010

GB3836.2– 2010

GB3836.4– 2010

GB3836.20– 2010

E3 Certification No. GYJ16.1280X
 Ex d ia IIC T6 Ga/Gb (-50 °C ≤ Ta ≤ +70 °C)
 Process temperature range: -202 °C to +427 °C
 Power Supply: 42 Vdc Max.
 Transmitter Um=250 V

Special Conditions for Safe Use (X):

1. The maximum allowable length of the interconnecting cable between transmitter and sensor is 152m. The cable shall also be provided by Rosemount Inc., or by Emerson Process Management Co., Ltd., or by Emerson Process Management Flow Technologies., Ltd.
2. Suitable heat-resisting cables rated at least +80 °C shall be used when the temperature of the cable entry around exceed +60 °C.
3. Dimensions of flameproof joints are other than the relevant minimum or maximum specified in Table 3 of GB3836.2-2010. Please contact manufacturer for details.
4. The Flowmeter is provided with special fasteners of property class A2-70 or A4-70.
5. Any friction should be prevented in order to avoid the risk of electrostatic charge on the enclosure due to non-conductive paint.
6. The earthing terminal should be connected to the ground reliably at site.
7. Do not open when energized.
8. The cable entry holes have to be connected by means of suitable entry device or stopping plugs with type of protection of Ex db IIC, the cable entry device and stopping plugs are approved in accordance with GB3836.1-2010 and GB3836.2-2010, and which are covered by a separate examination certificate, any unused entry hole is to be fitted with type of protection of Ex db IIC flameproof stopping plug.
9. Users are forbidden to change the configuration to ensure the explosion protection performance of the equipment. Any faults shall be settled with experts from the manufacturer.
10. Precautions shall be taken to ensure that the electronic parts are within permissible ambient temperature considering the effect of the allowed fluid temperature.
11. During installation, operation and maintenance, users shall comply with the relevant requirements of the product instruction manual, GB3836.13-1997 "Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres", GB3836.15-2000 "Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous areas (other than mines)", GB3836.16-2006 "Electrical apparatus for explosive gas atmospheres Part 16: Inspection and maintenance of electrical installation (other than mines)", and GB50257-1996 "Code for construction and acceptance of electrical device for explosion atmospheres and fire hazard electrical equipment installation engineering".

I.S. certification

GB3836.1- 2010
 GB3836.4- 2010
 GB3836.20- 2010

I3 Certification No. GYJ12.1239X
 Ex ia IIC T4 Ga (-60 °C ≤ Ta ≤ +70 °C)

$U_i = 30 \text{ Vdc}$

$I_i = 185 \text{ mA}$

$P_i = 1.0 \text{ W}$

$C_i = 0\mu\text{F}$

$L_i = 0.97\text{mH}$

Special Conditions for Safe Use (X):

1. The maximum allowable length of the interconnecting cable between transmitter and sensor is 152m. The cable shall also be provided by manufacturer.
2. When transient protection terminal block (The Other Option is T1) applied to this product, during installation, users shall comply with Clause 12.2.4 in GB3836.15-2000 "Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous areas (other than mines)."
3. Suitable heat-resisting cables rated at least +80 °C shall be used when the temperature of the cable entry around exceed +60 °C.
4. Only be connected to the certified associated apparatus, the Vortex Flowmeter could be used in the explosive atmosphere. The connection should be complied with the requirements of the manual of the associated apparatus and the Vortex Flowmeter.
5. The enclosure should be taken to protect it from impact.
6. Any friction should be prevented in order to avoid the risk of electrostatic charge on the enclosure due to non-conductive paint.
7. The cable with shield is suitable for connection, and the shield should be connected to earth.
8. The enclosure shall be kept from the dust, but the dust shall not be blown by compressed air.
9. The cable entry holes have to be connected by means of suitable cable entry, the way of being installed shall be ensure that the equipment satisfies degree of protection IP66 according to GB4208-2008.
10. Users are forbidden to change the configuration to ensure the explosion protection performance of the equipment. Any faults shall be settled with experts from the manufacturer.
11. Precautions shall be taken to ensure that the electronic parts are within permissible ambient temperature considering the effect of the allowed fluid temperature.

12. During installation, operation and maintenance, users shall comply with the relevant requirements of the product instruction manual, GB3836.13-1997 “Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres”, GB3836.15-2000 “Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous areas (other than mines)”, GB3836.16-2006 “Electrical apparatus for explosive gas atmospheres Part 16: Inspection and maintenance of electrical installation (other than mines)”, and GB50257-1996 “Code for construction and acceptance of electrical device for explosion atmospheres and fire hazard electrical equipment installation engineering”.

Type ‘n’ certification

- N3** Certification No. GYJ12.1240X
 Ex nA ic IIC T5 Gc (-40 °C ≤ Ta ≤ +70 °C)
 Maximum working voltage 42 Vdc

Special Conditions for Safe Use (X):

1. The maximum allowable length of the interconnecting cable between transmitter and sensor is 152m. The cable shall also be provided by the manufacturer.
2. Suitable heat-resisting cables rated at least +80 °C shall be used when the temperature of the cable entry around exceed +60 °C.
3. When transient protection terminal block (The Other Option is T1) applied to this product, during installation, users shall comply with Clause 12.2.4 in GB3836.15-2000 “Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous areas (other than mines).”
4. Any friction should be prevented in order to avoid the risk of electrostatic charge on the enclosure due to non-conductive paint.
5. Do not open when energized.
6. The cable entry holes have to be connected by means of suitable cable entry, the way of being installed shall be ensure that the equipment satisfies degree of protection IP54 according to GB4208-2008.
7. Users are forbidden to change the configuration to ensure the explosion protection performance of the equipment. Any faults shall be settled with experts from the manufacturer.
8. Precautions shall be taken to ensure that the electronic parts are within permissible ambient temperature considering the effect of the allowed fluid temperature.

9. During installation, operation and maintenance, users shall comply with the relevant requirements of the product instruction manual, GB3836.13-1997 “Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres”, GB3836.15-2000 “Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous areas (other than mines)”, GB3836.16-2006 “Electrical apparatus for explosive gas atmospheres Part 16: Inspection and maintenance of electrical installation (other than mines)”, and GB50257-1996 “Code for construction and acceptance of electrical device for explosion atmospheres and fire hazard electrical equipment installation engineering”.

European certifications (ATEX)

I.S. certification

EN 60079-0: 2012 +A11: 2013

EN 60079-11: 2012

- I1** Certification No. Baseefa12ATEX0179X
 ATEX Marking:  II 1 G
 Ex ia IIC T4 Ga (-60 °C ≤ Ta ≤ +70 °C)
 U_i = 30 VDC
 I_i = 185 mA
 P_i = 1.0 W
 C_i = 0uF
 L_i = 0.97 mH

Special Conditions for Safe Use (X):

1. When fitted with 90V transient suppressors, the equipment is not capable of passing the 500V isolation test. This must be taken into account upon installation.
2. The enclosure may be made from aluminum alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion when located in Zone 0.
3. When the equipment is installed, particular precautions must be taken to ensure taking into account the effect of process fluid temperature, that the ambient temperature of the electrical housing of the equipment meets the marked protection type temperature range.

Type 'n' certification

EN 60079-0: 2012 + A11: 2013

EN 60079-11: 2012

EN 60079-15: 2010

N1 Certification No. Baseefa12ATEX0180X
 ATEX Marking:  II 3 G
 Ex nA ic IIC T5 Gc (-40 °C ≤ Ta ≤ +70 °C)
 Maximum Working Voltage = 42 Vdc

Special Conditions for Safe Use (X):

1. When fitted with 90V transient suppressors, the equipment is not capable of passing the 500V isolation test. This must be taken into account upon installation.
2. When the equipment is installed, particular precautions must be taken to ensure, taking into account the effect of process fluid temperature, that the ambient temperature of the electrical housing of the equipment meets the marked protection type temperature range.

Flameproof certification

EN 60079-0: 2009

EN 60079-1: 2007

EN 60079-11: 2012

EN 60079-26: 2007

E1 Certification No. DEKRA12ATEX0189X
 Integral Transmitter marked:
 ATEX Marking:  II 1/2 G
 Ex d [ia] IIC T6 Ga/Gb
 Remote Transmitter marked:
 ATEX Marking:  II 2(1) G
 Ex d [ia Ga] IIC T6 Gb
 Remote Sensor marked:
 ATEX Marking:  II 1 G
 Ex ia IIC T6 Ga

Ambient temperature range: -50 °C ≤ Ta ≤ 70 °C

Maximum Working Voltage = 42 Vdc

Transmitter Um = 250V

Remote mounted sensor: in type of protection Ex ia IIC,
 only to be connected to the associated Model 8600 Vortex
 Flow meter electronics.

The maximum allowable length of the interconnecting
 cable is 152 m (500-ft.)

Special Conditions for Safe Use (X):

1. For information regarding the dimensions of the flameproof joints the manufacturer shall be contacted.
2. The Flowmeter shall be provided with special fasteners of property class A2-70 or A4-70.
3. Units marked with "Warning: Electrostatic Charging Hazard" may use non-conductive paint thicker than 0.2 mm. Precautions shall be taken to avoid ignition due to electrostatic charge on the enclosure.

EurAsian Conformity (EAC)

This section addresses compliance with the requirements of technical regulations of the Customs Union.

- TR CU 020/2011—Electromagnetic compatibility of technical means
- TR CU 032/2013—On the safety of equipment operating under excessive pressure
- TR CU 012/2011—About the safety of equipment for use in potentially explosive atmospheres

GOST R IEC 60079-0-2011, GOST R IEC 60079-1-2011, GOST R IEC 60079-11-2010, GOST R IEC 60079-15-2010, GOST 31610.26-2002/IEC 60079-26:2006

E8 Type of protection flameproof enclosure «d» with intrinsically safe flow sensor

Ex marking of the integral installation:

Ga/Gb Ex d [ia] IIC T6 X (-50°C ≤ Ta ≤ 70°C)

Ex marking of the remote installation:

Electronics module:

1Ex d [ia Ga] IIC T6 Gb X (-50°C ≤ Ta ≤ 70°C)

Flow sensor:

0Ex ia IIC T6 Ga X (-50°C ≤ Ta ≤ 70°C)

Electrical parameters:

Maximum DC supply voltage (with output signal 4-20 mA
 HART/pulse) 42 V

Special Conditions for Safe Use (X):

1. For flowmeters with Ex marking 0Ex ia IIC T6 Ga X, Ga / Gb Ex d [ia] IIC T6 X and transmitter with Ex marking 1Ex d [ia Ga] IIC T6 Gb X cabling in explosive area must be conducted according to requirements of IEC 60079-14-2011. Sheath cables must be designed for a maximum ambient temperature;.
2. Remote installation should be made only with special coaxial cable provided by the manufacturer of flowmeters.

3. When the equipment is installed, particular precautions must be taken to ensure, taking into account the effect of process fluid temperature, that the ambient temperature of the electrical housing of the equipment meets the marked protection type temperature range.
4. Precautions shall be taken to avoid ignition due to electrostatic charge on the enclosure.

I8 Type of protection "intrinsically safe circuit" level «ia»

Ex marking:

0Ex ia IIC T4 Ga X

Ambient temperature range:

Flowmeters with pulse output signals,
4-20 mA /HART (-60°C ≤ Ta ≤ 70°C)

Input intrinsically safe parameters

| Intrinsically safe parameters | Output signal |
|-------------------------------|-------------------|
| | 4-20mA/HART Pulse |
| Ui, ⁽¹⁾ V | 30 |
| Ii, ⁽¹⁾ mA | 185 |
| Pi, ⁽¹⁾ W | 1 |
| Li, uH | 970 |
| Ci, nF | 0 |

1. Applicable values Ui, Ii are limited by the maximum input power Pi. It is not allowed to apply max values of Ui, Ii at the same time.

Special Conditions for Safe Use (X):

1. Power supply of flowmeters with Ex marking 0Ex ia IIC T4 Ga X must be implemented through intrinsically safe barriers having certificate of conformity for appropriate subgroups of electrical equipment.
2. Inductance and capacitance of intrinsically safe circuits of flowmeters with Ex marking 0Ex ia IIC T4 Ga X, with given parameters connecting cables must not exceed maximum values shown on the intrinsically safe barrier from the side of explosive zone.
3. When the equipment is installed, particular precautions must be taken to ensure, taking into account the effect of process fluid temperature, that the ambient temperature of the electrical housing of the equipment meets the marked protection type temperature range.
4. When fitted with the 90V transient suppressors, the equipment is not capable of passing the 500V insulation test. This must be taken into account upon installation.
5. The enclosure may be made from aluminium alloy with a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion when located in Zone 0.

N8 Type of protection «n» and "intrinsically safe" level «ic»

Ex marking:

2Ex nA ic IIC T5 Gc X (-40°C ≤ Ta ≤ 70°C)

Electrical parameters:

The maximum DC voltage (with output 4-20 mA HART/pulse) 42V

Special Conditions for Safe Use (X):

1. When the equipment is installed, particular precautions must be taken to ensure, taking into account the effect of process fluid temperature, that the ambient temperature of the electrical housing of the equipment meets the marked protection type temperature range;
2. When fitted with the 90V transient suppressors, the equipment is not capable of passing the 500V insulation test. This must be taken into account upon installation;

K8 Combination of E8, I8, N8

Canadian Standards Association (CSA)

This section addresses compliance with the requirements of technical regulations of the Canadian Standards Association

E6 Explosion proof- Intrinsically safe for Class 1, Division 1, Groups B, C, and D;
Ex d[ia] IIC T6 Gb / Class I, Zone 1, AEx d[ia] IIC T6 Gb
Dust ignition proof for Class II/III, Division 1, Groups E, F, and G;
Temperature Code T6 (-50°C ≤ Ta ≤ 70°C)
Factory Sealed; Dual Seal; Enclosure Type 4X, IP66
Install per drawing 08800-0112

I6 Intrinsically safe for use in Class I, II, III Division 1, Groups A, B, C, D, E, F, and G;
Ex ia IIC T4 Ga SECURITE INTRINSIQUE; Class I, Zone 0, AEx ia IIC T4 Ga.
Non-incendive for Class I, Division 2, Groups A,B,C, and D;
Temperature Code T4 (-50°C ≤ Ta ≤ 70°C) 4-20 mA HART
Dual Seal; Enclosure Type 4X, IP66
Install per drawing 08800-0112

Combined Canadian Certifications (CSA)

K6 E6 and I6 Combination

Special Conditions for Safe Use (X):

1. When fitted with 90V transient suppressors (T1 option), the equipment is not capable of passing the 500V insulation test. This must be taken into account upon installation.
2. The Model 8600D Vortex Flowmeter when ordered with aluminum electronics housing is considered to constitute a potential risk of ignition by impact or friction. Care should be taken into account during installation and use to prevent impact or friction.

Dimensional drawings

Figure 1. Flanged-Style Flowmeter—Line Sizes 1- through 8-in. (25 through 200 mm)

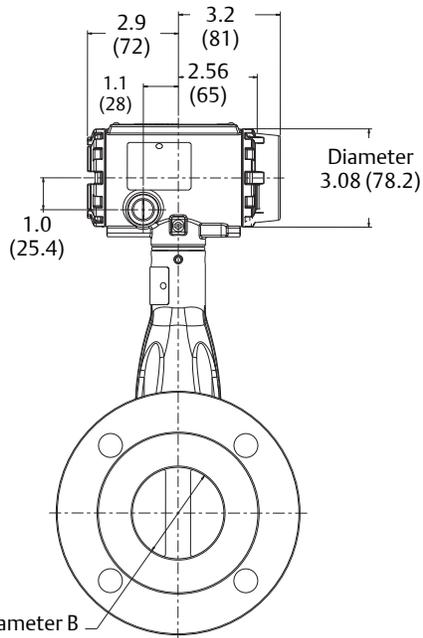


Diagram illustrated without MTA Option

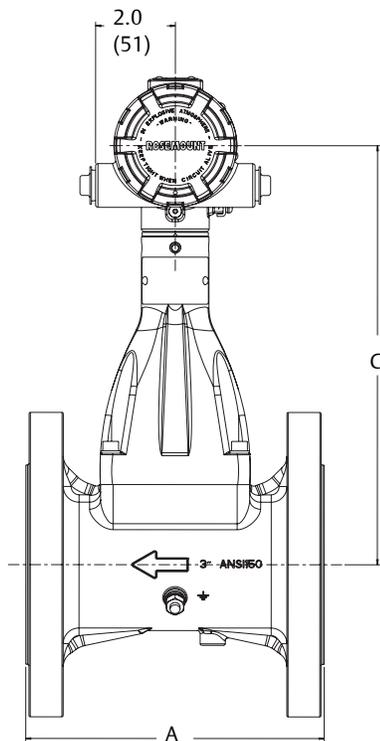
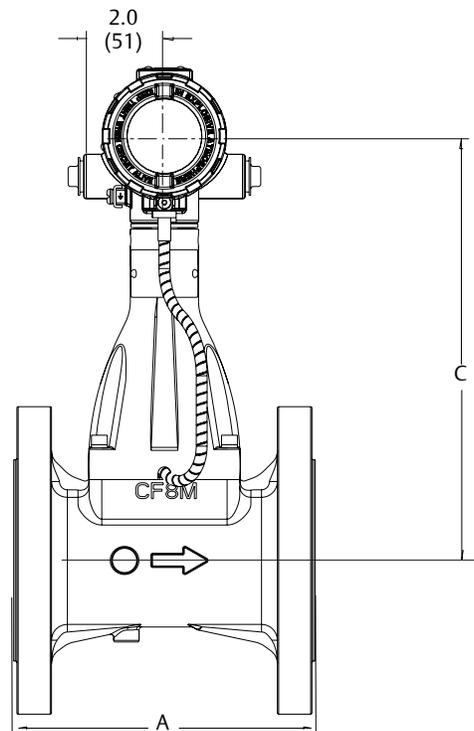


Diagram illustrated with MTA Option



Note: Dimensions are in inches (millimeters).

Table 14. Flanged-Style Flowmeter—Line Sizes 1- through 2-in. (25 through 50 mm)

| Nominal size in. (mm) | Flange rating | Face-to-face A in. (mm) | Diameter B in. (mm) | C in. (mm) | Weight ⁽¹⁾ lb (kg) |
|-----------------------|---------------|-------------------------|---------------------|------------|-------------------------------|
| 1 (25) | ANSI 150 | 5.9 (150) | 0.95 (24,1) | 9.6 (244) | 13 (5.9) |
| | ANSI 300 | 6.7 (170) | 0.95 (24,1) | 9.6 (244) | 15.4 (7,0) |
| | PN 16/40 | 6.1 (156) | 0.95 (24,1) | 9.6 (244) | 14.8 (6.7) |
| 1 1/2 (40) | ANSI 150 | 5.9 (150) | 1.49 (37,8) | 8.1 (250) | 15.7 (7.1) |
| | ANSI 300 | 7.1 (180) | 1.49 (37,8) | 8.1 (250) | 21.4 (9.7) |
| | PN 16/40 | 7.1 (180) | 1.49 (37,8) | 8.1 (250) | 18.7 (8.5) |
| 2 (50) | ANSI 150 | 6.7 (170) | 1.92 (48,8) | 10 (254) | 20.5 (9.3) |
| | ANSI 300 | 7.1 (180) | 1.92 (48,8) | 10 (254) | 24.5 (11.1) |
| | PN 16/40 | 6.7 (170) | 1.92 (48,8) | 10 (254) | 22.7 (10.3) |

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

Table 15. Flanged-Style Flowmeter—Line Sizes 3- to 6-in. (80 mm to 150 mm) (Refer to Figure 1)

| Nominal size in. (mm) | Flange rating | Face-to-face A in. (mm) | Diameter B in. (mm) | C in. (mm) | Weight ⁽¹⁾ lb (kg) |
|-----------------------|---------------|-------------------------|---------------------|------------|-------------------------------|
| 3 (80) | ANSI 150 | 7.5 (190) | 2.87 (72,9) | 10.7 (271) | 33.1 (15,0) |
| | ANSI 300 | 8.8 (224) | 2.87 (72,9) | 10.6 (268) | 41.4 (18,8) |
| | PN 16/40 | 7.9 (200) | 2.87 (72,9) | 10.6 (268) | 34.4 (15.6) |
| 4 (100) | ANSI 150 | 7.5 (190) | 3.79 (96,3) | 11.1 (281) | 42.8 (19.6) |
| | ANSI 300 | 8.7 (220) | 3.79 (96,3) | 11.1 (281) | 63.1 (28.6) |
| | PN 16 | 7.5 (190) | 3.79 (96,3) | 11.1 (281) | 42.8 (19.6) |
| | PN 40 | 8.7 (220) | 3.79 (96,3) | 11.1 (281) | 43.4 (19.7) |
| 6 (150) | ANSI 150 | 9.8 (250) | 5.7 (144,8) | 12.1 (307) | 69.9 (31.7) |
| | ANSI 300 | 10.6 (270) | 5.7 (144,8) | 12.1 (307) | 161.8 (73.4) |
| | PN 16 | 9.8 (250) | 5.7 (144,8) | 12.1 (307) | 69.9 (31.7) |
| | PN 40 | 10.6 (270) | 5.7 (144,8) | 12.1 (307) | 130.5 (59.2) |

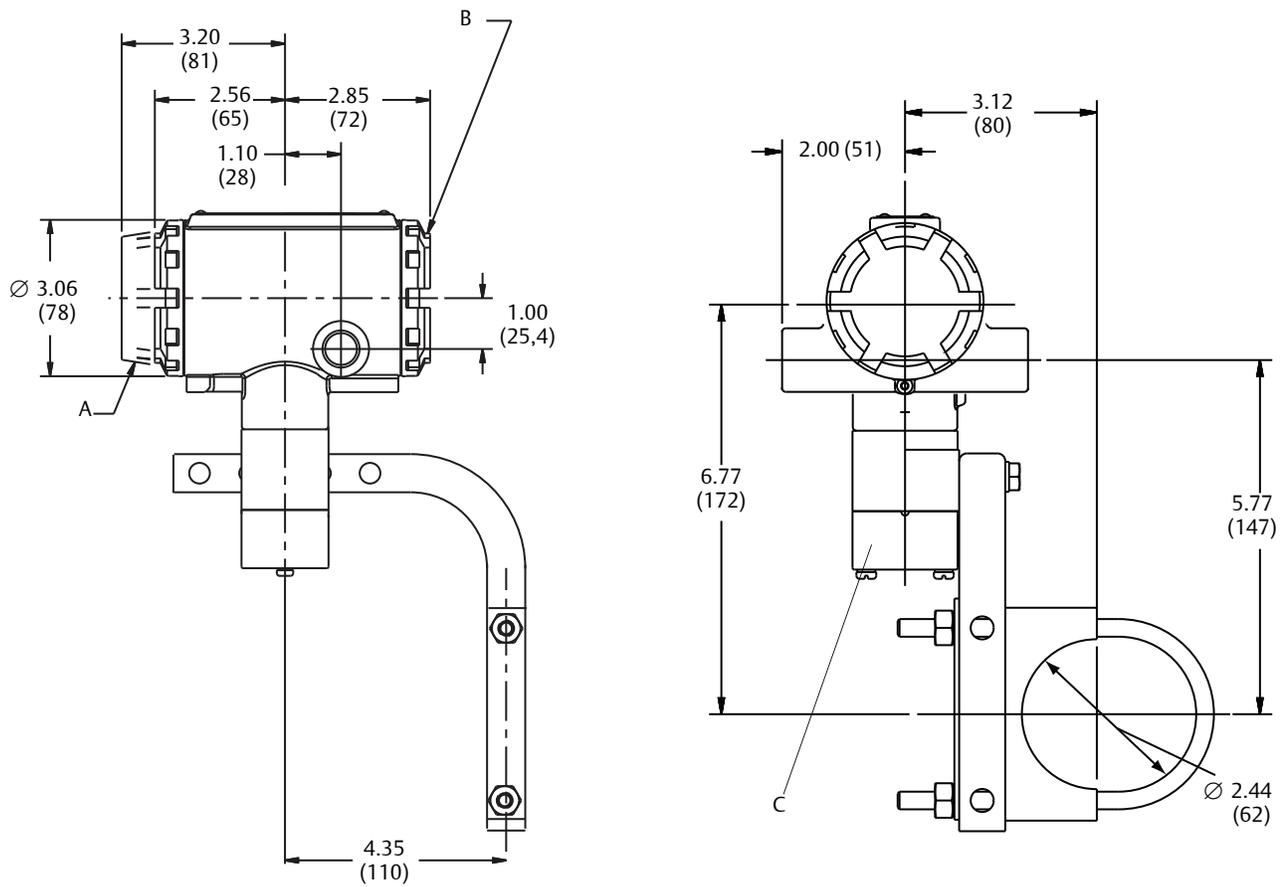
1. Add 0.2 lb (0,1 kg) for display option.

Table 16. Flanged-Style Flowmeter—Line Size 8-in. (200 mm) (Refer to Figure 3)

| Nominal size in. (mm) | Flange rating | Face-to-face A in. (mm) | Diameter B in. (mm) | C in. (mm) | Weight ⁽¹⁾ lb (kg) |
|-----------------------|---------------|-------------------------|---------------------|------------|-------------------------------|
| 8 (200) | ANSI 150 | 9.8 (250) | 7.55 (191,8) | 13.1 (332) | 104.9 (47.6) |
| | ANSI 300 | 11.4 (290) | 7.55 (191,8) | 13.1 (332) | 161.8 (73.4) |
| | PN 16 | 9.8 (250) | 7.55 (191,8) | 13.1 (332) | 104.9 (47.6) |
| | PN 40 | 12.2 (310) | 7.55 (191,8) | 13.1 (332) | 130.5 (59.2) |

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

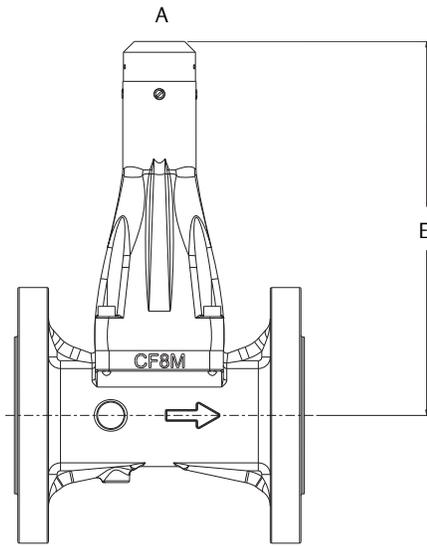
Figure 2. Remote Mount Transmitters



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

- A. Display option
- B. Terminal cover
- C. 1/2-14 NPT (for remote cable conduit)

Figure 3. Flanged Style Remote Mount Flowmeters—Line Sizes 1- to 8-in. (25 mm to 200 mm)



Note:
Dimensions are in inches (millimeters).

A. 1/2-14 NPT (for remote cable conduit)

Table 17. Remote Mount, Flanged Style Sensor Flowmeter Dimensions

| Nominal size in. (mm) | E flange style in. (mm) |
|-----------------------|--|
| 1 (25) | 8.3 (210) |
| 1 1/2 (40) | 8.5 (216) |
| 2 (50) | 8.7 (220) |
| 3 (80) | 9.3 (237) - ANSI150/PN16 9.1 (234) - ANSI300/PN40 |
| 4 (100) | 9.7 (247) |
| 6 (150) | 10.8 (273) |
| 8 (200) | 11.7 (298) |

Ordering information

Table 18. Rosemount 8600 Vortex Flowmeter Ordering Information

★ The Standard offering represents the most common models and options. These options should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

| Model | Product description | |
|---|--|---|
| 8600D | Vortex Flowmeter | |
| Meter style | | |
| F | Flanged style | |
| Line size | | |
| 010 | 1-in. (25 mm) | ★ |
| 015 | 1½-in. (40 mm) | ★ |
| 020 | 2-in. (50 mm) | ★ |
| 030 | 3-in. (80 mm) | ★ |
| 040 | 4-in. (100 mm) | ★ |
| 060 | 6-in. (150 mm) | |
| 080 | 8-in. (200 mm) | |
| Wetted materials | | |
| S | CF-8M cast stainless/CF-3M and Graphite Gasket Note: Material of construction is 316/316L | ★ |
| Flange or alignment ring size | | |
| A1 | ASME B16.5 (ANSI) RF Class 150 | ★ |
| A3 | ASME B16.5 (ANSI) RF Class 300 | ★ |
| K1 ⁽¹⁾ | EN 1092-1 PN 16 Type B1 | ★ |
| K3 | EN 1092-1 PN 40 Type B1 | ★ |
| Sensor process temperature range | | |
| N | Standard: -58 to 482 °F (-50 to 250 °C) | ★ |

Table 18. Rosemount 8600 Vortex Flowmeter Ordering Information

★ The Standard offering represents the most common models and options. These options should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

| Conduit entry and housing material | | |
|---|---|---|
| 1 | 1/2 -14 NPT – Aluminum Housing | ★ |
| 2 | M20 3 1.5 – Aluminum Housing | ★ |
| Transmitter output | | |
| D | 4-20 mA digital electronics (HART protocol) | ★ |
| P | 4-20 mA digital electronics (HART protocol) with scaled pulse | ★ |
| Calibration | | |
| 1 | 7 Point Flow Calibration | ★ |

Options

| MultiVariable options | | |
|---|---|---|
| MTA | MultiVariable output with Integral Temperature Sensor | |
| Hazardous locations certifications | | |
| E3 | NEPSI Flameproof | ★ |
| I3 | NEPSI Intrinsic Safety | ★ |
| N3 | NEPSI Type N | ★ |
| K3 | NEPSI Flameproof, Intrinsic Safety, Type N | ★ |
| E1 | ATEX Flameproof | ★ |
| I1 | ATEX Intrinsic Safety | ★ |
| N1 | ATEX Type-n | ★ |
| K1 | ATEX Flameproof, Intrinsic Safety | ★ |
| E7 | IECEX Flameproof | ★ |
| I7 | IECEX Intrinsic Safety | ★ |
| N7 | IECEX Type n | ★ |
| E6 | CSA (C/US) Explosion-proof, Dust Ignition-Proof, and Division 2 | ★ |
| I6 | CSA (C/US) Intrinsically Safe | ★ |
| K6 | CSA (C/US) Explosion-proof, Dust Ignition-Proof, Intrinsically Safe, and Division 2 | ★ |
| Display type | | |
| M5 | LCD display | ★ |
| Other options | | |
| PD | Pressure Equipment Directive (PED) | ★ |

Table 18. Rosemount 8600 Vortex Flowmeter Ordering Information

★ The Standard offering represents the most common models and options. These options should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

| Remote electronics | | |
|---------------------------------------|--|---|
| 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 | ★ |
| R33 | Remote electronics with 33 ft. (10 m) cable | ★ |
| R50 | Remote electronics with 50 ft (15,2 m) cable | ★ |
| RXX ⁽²⁾ | Remote electronics with customer-specified cable length (up to 75 ft (23 m) maximum) | |
| Transient protection | | |
| T1 | Transient protection terminal block | ★ |
| Alarm mode | | |
| C4 | NAMUR alarm and saturation values, high alarm | ★ |
| CN | NAMUR alarm and saturation values, low alarm | ★ |
| Ground screw assembly | | |
| V5 | External ground screw assembly | ★ |
| Advanced PlantWeb™ Diagnostics | | |
| DS1 | Internal Flow Simulation | |
| 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 | ★ |
| Q76 | Certification of Positive Material Identification | ★ |
| QBR | India Boiler Regulation (IBR) | ★ |
| MC certification | | |
| CM | China Metrology Cert | ★ |
| RM | Russian Metrology Cert | ★ |

Table 18. Rosemount 8600 Vortex Flowmeter Ordering Information

★ The Standard offering represents the most common models and options. These options should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

| Quick Start Guide (QSG) language options (default is English) | | |
|---|--------------------|---|
| YM | Chinese (Mandarin) | ★ |
| YR | Russian | ★ |
| YA | Danish | ★ |
| YC | Czech | ★ |
| YD | Dutch | ★ |
| YF | French | ★ |
| YG | German | ★ |
| YB | Hungarian | ★ |
| YI | Italian | ★ |
| YW | Swedish | ★ |
| YS | Spanish | ★ |
| YP | Portuguese | ★ |
| Typical Model Number: 8600 F 020 S A1 N 1 D 1 M5 | | |

1. On 1-in. (25 mm) to 3-in. (80 mm) line sizes the dimensions for PN16 and PN40 flanges are identical and therefore all flanges are marked PN40
2. XX is a customer specified length in feet.

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