

# Intelligent Vortex Flowmeters

## Model 84C with Flanged, Wafer, or Threaded (NPT) Body Styles

### Product Specification Sheet

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# Introduction

Vortex technology for flow measurement offers advantages such as easy installation without impulse lines; no moving parts to maintain or repair; decreased leak potential; and a wide flow turndown range. Ideal for remote locations, vortex meters also offer very low power consumption.

Vortex flow meters can measure liquids, gases, and steam, and can withstand high process pressures and temperatures. This makes vortex technology ideal for measuring natural gas, low conductivity boiler cooling water, and other applications in various power generating systems — both traditional and newer, cleaner alternatives.

Model 84C flanged, wafer, and threaded (NPT) vortex flowmeters are robust and reliable additions to the Schneider Electric family of intelligent, high performing vortex flowmeters. The flowmeters are available with 4 to 20 mA, HART 7, Modbus, and pulse outputs. The flowmeters can be ordered with an optional integrated platinum RTD temperature sensor, which allows the flowmeters to support multiple measurements as well as temperature-compensated mass flow measurements for steam and user-defined liquids.

The 84C sets the example for industry standards whether the application requires accuracy for totalizing and batching; utility metering of fluids in the process industries; fuel, air, steam, or gas metering for the measurement of energy in any high-use application; or stability and repeatability for process control.

The low-power (Electronics Version -L) version of the flowmeter is intended for use with battery power that is recharged with any technology, such as a solar array or alternator. The supply current is fixed at a constant 10 mA and remains in operation down to a minimum terminal voltage of 10 V dc.

These flowmeters are also offered with male NPT (threaded) end connections, which allows you to easily replace existing turbine, magnetic flow, and orifice meters.

Model 84C flowmeters can be configured locally or remotely. If you order the flowmeter with an optional LCD display, pushbuttons on the display allow you to easily configure the flowmeter locally. Alternatively, you can use a HART or Modbus communicator or a PC-based configurator.

## Key Features

- Reliable volumetric rate measurement of liquids, gas, and steam
- Time In Service Meter
  - Configuration “personalities” which streamline the menus, features, and engineering units for upstream oil and gas and steam applications
- Available with flanged, wafer, or threaded NPT body designs:
  - DN15 to DN300 (3/4 to 12 inch) flanged body
  - DN15 to DN200 (3/4 to 8 inch) wafer body
  - DN25 to DN50 (1 to 2 inch) NPT body
- High pressure up to Class 1500 and PN160
- *DirectSense*™ technology backed by a lifetime sensor warranty
- Wide rangeability
- ActiveTuning™ algorithms:
  - Real time Reynolds number ( $R_D$ ) low flow correction down to  $R_D$  of 5000
  - Compensation for piping effects
  - Adaptive filtering and signal conditioning
- Pulse output capability in raw, frequency, or pulse (total) modes

- CE marked; complies with EMC European Union and PED Directives, and NAMUR NE 21 interference immunity requirement
- CRN Registered

## DirectSense™ Technology for Improved Performance and Reliability

*DirectSense* technology measures pressure pulses directly from vortex shedding, without losses due to mechanical linkages. The benefits of *DirectSense* technology include:

- Increased measurement sensitivity for wider rangeability
- Greater immunity to pipe vibration
- High reliability backed by a lifetime sensor warranty
- Sensor is replaceable without the need for recalibration

## Optional Integral Process Temperature Measurement

The optional integrated Class A, 1000  $\Omega$ , platinum RTD temperature sensor allows temperature compensation for density of saturated and superheated steam and user-defined fluids.

The temperature measurement is provided as an output and provides:

- Mass flow rate accuracy of  $\pm 1.4\%$  for saturated and super-heated steam<sup>1</sup>
- Process temperature accuracy of  $\pm 0.56^\circ\text{C}$  ( $\pm 1^\circ\text{F}$ )

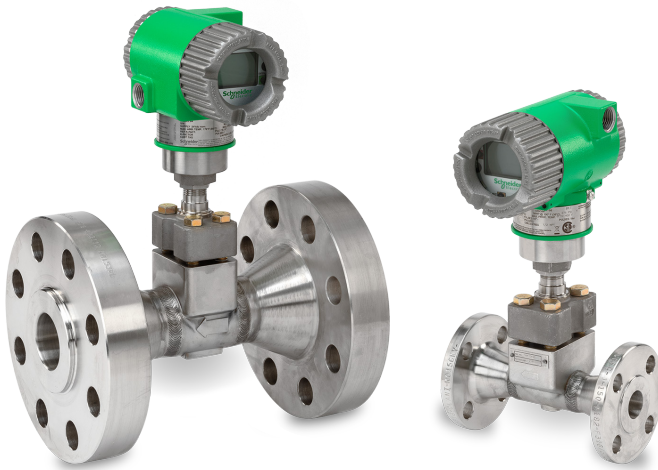


- High accuracy with an optional 1,000 ohm, 4-wire platinum RTD (flowmeters with Multivariable selection T only)
- Compensation for mass flow of saturated and superheated steam based on ASME steam tables<sup>2</sup>
- Robust and reliable mass and energy measurements for saturated steam
- Built-in steam calculations for superheated steam with use of external pressure
- Low-cost alternative to Coriolis flowmeters for liquids
- Only one process penetration for volumetric and temperature measurements, reducing the risk of potential leakage points
- *DirectSense* sensor with flexible tuning
- Available with 316 ss or high nickel alloy materials
- Multiple end connections and pressure ratings available

1. These specifications assume the flowmeter is insulated per MI 019-222 or MI 019-224.

2. Saturated and superheated steam based on *ASME International Steam Tables for Industrial Use* (Second Edition), 2009

## Temperature-Compensated Mass Flow of Steam



When configured with Multivariable selection T, the Model 84C Vortex flowmeter provides a process temperature measurement using the optional integral temperature sensor. With calculations based on ASME steam tables<sup>3</sup>, the Model 84C is an excellent solution for the mass flow metering of saturated steam.

Additionally, multivariable Model 84C Vortex flowmeters allow you to input live pressure readings remotely using HART or Modbus communication. These pressure readings, together with the measured process temperature, allow compensation for super-heated steam mass flow calculations based on the ASME steam tables.<sup>3</sup>

## Temperature-Compensated Mass Flow of User-Defined Liquids



The 84C flowmeter provides algorithms for temperature compensated mass flow of any user-defined liquids when configured with Multivariable selection T. It is a high-accuracy mass flowmeter for liquids at a fraction of the cost of other mass flow technologies.

3. Saturated and super-heated steam based on ASME *International Steam Tables for Industrial Use* (Second Edition), 2009.



## Oil and Gas Applications



- No moving parts = more reliable with lower maintenance costs than a mechanical meter
- *DirectSense* technology offers exceptional flowmeter reliability backed by a lifetime sensor warranty
- HART and Modbus communication protocols
- Threaded (NPT) body styles in 1- and 2-inch sizes for direct replacement of turbine, magnetic flow, and orifice meters
- High-pressure NPT flowmeter designs up to Class 1500 (1 inch) and Class 900 (2 inch)
- Oil and gas configuration “personality” with streamlined engineering units, features, and simpler, easier-to-use menus for upstream oil and gas applications
- Steam configuration “personality” with streamlined features and fluid selection for steam flow applications
- Low power option for use in solar power applications
- Produced water metering (PVM) option available upon request (contact Global Customer Support)

## Custom Produced Water Features



Available custom features are designed to improve the accuracy and reliability of liquid measurement on gas/liquid separators.

This customized set of features is available with ECEP CO190018. With it, the flowmeter can detect when gas passes the dump valve during a liquid dump cycle. This custom “heartbeat” feature is patented under U.S. Patent 8,576,084. Contact Global Customer Support for information about ECEP CO190018.



## Time In Service Meter

84C flowmeters have a Time in Service feature:

- **Primary Time** represents the number of days the transmitter has been powered up in the field over its lifetime.
- **User-Managed Time** represents the number of days the flowmeter has been powered up since the last **User-Managed Time** reset.

## Simplified Setup and Flowmeter “Personalities”

84C flowmeters can be shipped preconfigured with the flow data that you provide when ordering the flowmeter. Otherwise, you can easily configure the flowmeter for your process after it ships from the factory.

84C flowmeters offer configuration “personalities” that provide engineering units, features, and tailored menus for your specific application. When you purchase your flowmeter, the factory configures your flowmeter with the personality you select.

- The **General** personality provides all possible functions and settings. This personality can be used for any user liquids except saturated and super-heated steam.
- The **Steam** personality is similar to **General**, but it only applies to saturated steam and superheated steam.
- The **Oil & Gas** personality is used for the upstream oil and gas industry. This personality provides a reduced set of engineering units (EGUs) and a simplified, easy-to-use menu and configuration interface for a limited set of flow measurement features. This personality also limits the flowmeter to a single total output and a single pulse output.

If necessary, you can change the flowmeter’s personality using the local display, a HART or Modbus communicator, or the DTM.

## ActiveTuning™ Algorithms

### Reynold’s Number

The patented ActiveTuning algorithm improves accuracy down to an  $R_D$  of 5000.

### Compensation for Piping Effects

The 84C flowmeter can be configured to compensate for most of the common non-ideal upstream conditions, such as elbows and reducers. Straight runs as short as five pipe diameters can be configured to achieve full specified accuracy.

### Adaptive Filtering and Signal Conditioning

A patented, adaptive filtering algorithm provides real-time, dynamic frequency filters that follow the vortex shedding frequency. This results in exceptional low-flow measurement capability and vibration immunity. This is incorporated with a digital smoothing algorithm that conditions the raw vortex signal to further enhance low-flow performance.

### Tunable for Specific Operating Conditions

Configurable parameters for Low Flow Cut-In and damping allow tuning for specific flow conditions.

## Low Power Option

A low power option is available for use with battery power and any form of recharging technology, such as solar arrays or alternators.

## Compliance with European Union Directives

Model 84C flowmeters comply with:

- Electromagnetic Compatibility Requirements of EMC Directive 2014/30/EU by conforming to EN 61326-1:2013
- NAMUR NE 21 Interference Immunity Requirement (EMC)
- Pressure Equipment Directive (PED)
- Applicable European Union Directives (CE logo marked on product)

## Usable in Hazardous Area Locations

Model 84C flowmeters meet numerous agency requirements for hazardous locations.

## mA Output (HART and Low Power Versions)

In addition to the standard HART digital signal, these flowmeters produce a milliamp output signal.

- For 84C flowmeters with HART (Electronics Version -T), you can map a measurement to the HART primary variable (PV). This measurement drives the 4 to 20 mA analog output.
- For low power 84C flowmeters (Electronics Version -L), the mA output is fixed at 10 mA.

## Pulse Output

Vortex flowmeters can also produce a pulse signal in addition to the standard HART and 4 to 20 mA analog signal or the Modbus digital signal. Pulse output can be configured in one of the following modes

- **Raw mode** generates a pulse frequency according to the detected raw vortex frequency after filtering.
- **Frequency mode** generates a pulse frequency proportional to a mapped measurement.
- **Pulse mode** generates one pulse output per given quantity of material flowing through the sensor.

## Totalizers

The 84C Vortex flowmeter provides three separate totalizers that accumulate flow measurements. To allow you to track different types of flow measurements, each totalizer can be mapped, configured, and operated independently.<sup>4</sup>

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4. Only one totalizer is available for the 84C Oil & Gas personality.

## Diagnostics

### On-Line Diagnostics

The Model 84C Vortex Flowmeter uses many internal diagnostic functions, including hardware checks, internal code verification, and database validation. Error checking and diagnostic codes are also embedded in the HART and Modbus communication protocols. These diagnostics are performed at startup and continuously in the background.

For HART flowmeters, the 4 to 20 mA output follows the NAMUR 43 standard.

### Self-Test

The flowmeter initiates self tests to verify the health of the electronics. This test uses an internally generated frequency signal.

### Temperature Sensor Diagnostics

Software running in the flowmeter provides temperature sensor continuity checks.

## FlowExpertPro™ Sizing Application

The FlowExpertPro application helps with flowmeter type selection as well as flowmeter sizing. In addition, the FlowExpertPro application offers:

- A large library of the physical properties of typical process fluids.
- Tabular and graphic presentation of results.
- Options to save, print, and email results.
- Access to applicable flowmeter PSS documents and related documentation.

The program calculates minimum and maximum flow rates, rangeability, pressure loss, and Reynolds Number, using established flow equations. It also allows for material and flange selection, and provides ANSI and DIN flange recommendations for predicted flow pressure and temperature.

You can access this tool at the free website [www.FlowExpertPro.com](http://www.FlowExpertPro.com), or on a mobile device with the iOS or Android operating system.

Website <a href="http://www.FlowExpertPro.com">www.FlowExpertPro.com</a>	App Store (Apple®)	Google Play™ Store (Android®)
		

Contact Global Customer Support for further information and technical support.

# Design Specifications

## Compact, Efficient, and Durable Design

Model 84C flowmeters are designed to mount between ANSI or DIN EN 10921 flanges. Refer to *Model Code*, page 33 for end connections offered with each line size. Other flange face surfaces can be used as a custom design.

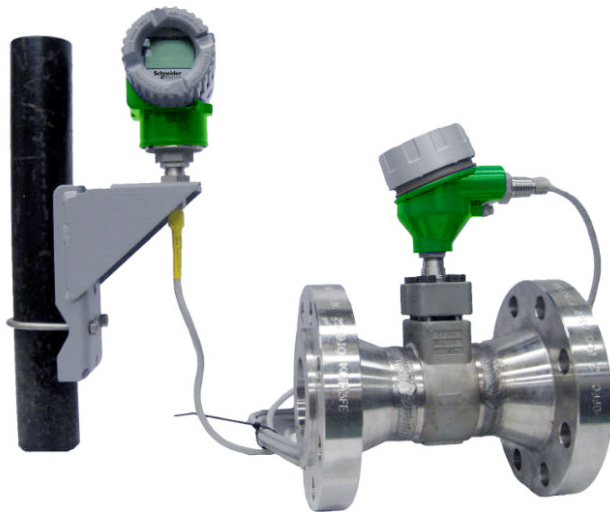
Electronics housing:

- Explosion-proof and flameproof
- Integrally or remotely mounted

Modular design:

- Reduced maintenance
- Sensor, amplifier, and some other parts are field replaceable

## Remote Mounted Electronics Housing



- Allows access to the amplifier and other housing electronics when the measurement is in a hard-to-reach location
- Supported by a bracket mounted to a surface or a nominal DN50 or 2-inch pipe
- Can be located up to a cable length of 15.2 m (50 ft) from the flowtube

## Local Digital Indicator/Configurator

- Optional multi-line local digital display serves as both a local configurator and a measurement indicator
- Easy configuration in Setup mode using four pushbuttons on the front of the transmitter
- Intuitive menu system
- Configurable indicator screen
- Real-time flowmeter measurement display
- Manually or automatically cycle through one or more flowmeter measurements
- Display of rollover counters for totalizer readings, errors, and alerts

## Patented Technology

This product is protected by the following patents: US 7853415 B2 and US 8576084 B2. Additional patents are pending.

## Write Protect Jumper

A write protect jumper helps to prevent local or remote configurators from writing to the electronics. This write-protection capability meets the security requirements of ISA-584.011986.

**NOTE:** Without the jumper installed, the flowmeter electronics module is write protected.

## Password Protection

Password protection is provided in the local display/configurator mode to help ensure operating integrity. A second level of protection is provided for configuration integrity.

# Communication

## HART Communication

The flowmeter provides efficient integration of measurements into HART process control schemes. It operates by using a bidirectional digital signal superimposed on the 4 to 20 mA current signal (standard power Electronics Version -T), or on the fixed 10 mA supply current (Low Power Electronics Version -L).

Remote digital communication, including reading and writing digital measurement values, status, and configuration information, is carried out via a HART communicator or PC-based configurator. Remote digital communication can also be carried out through a control system.

In addition to remote communications, the flowmeter offers an optional local digital indicator/configurator with pushbuttons for local interrogation and configuration.

**Table 1 - HART Communication Parameters**

Parameter	HART Analog or Digital Multidrop Mode
Communication Format	<ul style="list-style-type: none"> <li>Analog 4 to 20 mA with HART superimposed</li> <li>HART communications with fixed mA output</li> </ul>
Remote Configurator/Communicator	HART communicator or PC-based configurator
Communication Rate	1200 baud
Communication Distance (Rated)	1,800 m (6,000 ft)
Measurement Update	5 times/s
Raw Pulse Measurement Update	Vortex Shedding Frequency

With HART, digital multidropping — the connection of multiple transmitters to a single communications line — is permitted.

## Modbus Communication

The flowmeter uses the Modbus RTU (Remote Terminal Unit) mode over a 2-wire RS-485 multidrop serial connection for communication. The flowmeter functions as a Modbus server (slave) device.

**Table 2 - Modbus Communication Parameters**

Communication Rate	4800, 9600 (default), or 19200 baud
Measurement Update Rate	4800 baud: 19 times/s 9600 baud: 38 times/s 19200 baud: 76 times/s
Parity	none (default) even odd
Station Addressing	Stations use Device Address 1 through 247: <ul style="list-style-type: none"> <li>247 is the default</li> <li>0 is used for broadcast commands</li> </ul>



# Operating Conditions

In the table that follows:

- Factory calibration conditions assume: ANSI Schedule 160 process piping for 2-, 3-, and 4-inch line sizes using Class 1500 flanges; 6 inch (152.4 mm) and 8 inch (203.2 mm) line sizes using Class 900 and Class 1500 flanges; and DN150 and DN200 line sizes using PN160 flanges. Other line sizes and pressure options assume ANSI Schedule 40 process piping; flanges bored to interfacing pipe I.D.; piping and flowmeter body bores aligned to within 2% of meter bore; gaskets 3.18 mm (0.125 in) thick and not protruding into pipeline; a minimum of 30 pipe diameters of straight pipe upstream and five pipe diameters downstream of flowmeter; and clear water is free of air and particles.
- Operating limits are based on nonflashing, noncavitating conditions. A minimum positive back pressure is required for proper operation to avoid these effects.

Influence	Factory Calibration Conditions	Operating Limits
<b>Process Fluid</b>		
All Flowmeter versions	clear water	liquid, gas, and steam
<b>Process Temperature for Standard Temperature Flowmeters</b>		
With fluorolube fill (Sensor Fill, Temperature Range, and Material selection D or F)	20 to 30°C (70 to 85°F)	-18 and +93°C (0 and 200°F)
With silicone fill (Sensor Fill, Temperature Range, and Material selection R or S)	20 to 30°C (70 to 85°F)	-18 and +204°C (0 and 400°F)
<b>Process Temperature for Extended Temperature Flowmeters</b>		
Unfilled (Sensor Fill, Temperature Range, and Material selection A or B), without temperature compensation (Multivariable selection N)	20 to 30°C (70 to 85°F)	149 and 371°C (300 and 700°F)
Unfilled (Sensor Fill, Temperature Range, and Material selection A or B) with temperature compensation (Multivariable selection T)	20 to 30°C (70 to 85°F)	149 and 260°C (300 and 500°F)
Unfilled (Sensor Fill, Temperature Range, and Material selection E or G) without temperature compensation (Multivariable selection N)	20 to 30°C (70 to 85°F)	149 and 427°C (300 and 800°F)
Unfilled (Sensor Fill, Temperature Range, and Material selection E or G) with temperature compensation (Multivariable selection T)	20 to 30°C (70 to 85°F)	149 and 260°C (300 and 500°F)
<b>Ambient Temperature (Housing)<sup>5</sup></b>		
With local display	20 to 30°C (70 to 85°F)	-20 and +80°C (0 and 176°F)
Without local display	20 to 30°C (70 to 85°F)	-40 and +80°C (-40 and +176°F)
<b>Relative Humidity</b>		
All Flowmeter versions	50 to 90%	0 and 100%
<b>Supply Voltage</b>		
With Electronics Version -T (HART Communication)	24 ±0.5 V dc	15.75 and 42 V dc <sup>6</sup>
With Electronics Version -L (Low Power)	24 ±0.5 V dc	10 and 42 V dc <sup>7</sup>
With Electronics Version -M (Modbus Communication)	24 ±0.5 V dc	9 and 30 V dc

5. The 80°C (176°C) temperature is extended to 85°C (185°F) with certain electrical certifications. Refer to *Electrical Certifications*, page 31.

6. See *Supply Voltage vs Output Load for 4 to 20 mA Output*, page 18.

7. Supply current is fixed at a constant 10 mA for Electronics Version -L and remains in operation down to a minimum terminal voltage of 10 V dc.

# Functional Specifications

## Response Time (Without Damping)

**Table 3 - HART and Low Power Flowmeter Response Times**

Flowmeter Output	Response Time (Without Damping)
Analog Mode	0.5 second or the vortex shedding period for frequencies less than 2 Hz.
Digital Mode	0.5 second or the vortex shedding period for frequencies less than 2 Hz.
Pulse Output	<ul style="list-style-type: none"> <li>Raw mode: Vortex shedding frequency</li> <li>Frequency or Pulse mode: 0.25 second or the vortex shedding period for frequencies less than 2 Hz.</li> </ul>

**Table 4 - Modbus Flowmeter Response Times**

Flowmeter Output	Response Time (Without Damping)
Digital Mode	0.5 second or the vortex shedding period for frequencies less than 2 Hz.
Pulse Output	<ul style="list-style-type: none"> <li>Raw mode: Vortex shedding frequency</li> <li>Frequency or Pulse mode: 0.25 second or the vortex shedding period for frequencies less than 2 Hz.</li> </ul>

## Outputs

These flowmeters support the following outputs:

- HART Electronics Version -T: Digital and 4 to 20 mA output and pulse output
- Low Power Version -L: Fixed 10 mA output and pulse output
- Modbus Version -M: Digital output and pulse output

**Table 5 - HART and Low Power Flowmeter Outputs**

Output Type	Description
Analog (HART flowmeters only)	Flow rate available as a 4 to 20 mA signal, with the 20 mA value being set by the configured full range flow rate. See <i>Supply Voltage vs Output Load for 4 to 20 mA Output</i> , page 18.
Digital	Digital information is superimposed on a 4 to 20 mA output signal (standard power HART flowmeters) or the power supply loop (low power flowmeters) at 1200 baud. See <i>HART Communication Parameters</i> , page 14. For low power versions, output is fixed at 10 mA.
Pulse Output	<p>The pulse output can be configured with the electronics module in one of the following modes:</p> <ul style="list-style-type: none"> <li>• <b>Raw Mode:</b> The vortex shedding frequency is directly passed through, providing an instantaneous, nondampened frequency output.</li> <li>• <b>Frequency mode:</b> The frequency of this output is a 50% duty cycle pulse output with a frequency range of 0 to 10,000 Hz, proportional to zero flow to the full range flow rate/upper range value (URV).</li> <li>• <b>Pulse mode:</b> The frequency of this output is also a 50% duty cycle pulse output that is configured to provide a pulse when a determined volumetric/totalized unit has flowed through the meter.</li> </ul>

**Table 6 - Modbus Flowmeter Outputs**

Flowmeter Output	Response Time (Without Damping)
Digital	Digital information is conveyed using the Modbus RTU protocol over an RS-485 interface communicating at a baud rate of up to 19200. See <i>Modbus Communication Parameters, page 14</i> .
Pulse Output	The pulse output can be configured with the electronics module in one of the following modes: <ul style="list-style-type: none"> <li>• <b>Raw Mode:</b> The vortex shedding frequency is directly passed through, providing an instantaneous, nondampened frequency output.</li> <li>• <b>Frequency mode:</b> The frequency of this output is a 50% duty cycle pulse output with a frequency range of 0 to 10,000 Hz, proportional to zero flow to the full range flow rate/upper range value (URV).</li> <li>• <b>Pulse mode:</b> The frequency of this output is also a 50% duty cycle pulse output that is configured to provide a pulse when a determined volumetric/totalized unit has flowed through the meter.</li> </ul>

## Output Combinations

The HART or Low Power flowmeter uses two combined power and digital communications lines. Pulse output requires wiring an additional two lines.

The Modbus flowmeter requires two power and three digital communications lines. Pulse output requires wiring an additional two lines.

## Pulse Output Specifications

The pulse output is an externally powered 2-wire transistor switch type output. This output can be configured using any applicable configuration device to select one of three pulse output modes: raw, frequency, and pulse. The following specifications apply to the three types of pulse output modes:

- Isolated 2-wire transistor switch
- Applied voltage: 5 to 30 V dc
- Maximum "ON" state voltage drop: 1.0 V dc
- Maximum "ON" state current: 20 mA dc
- Reverse polarity protected
- Short circuit protected
- Connectable to pull-up and pull-down counters

## Power Supply Requirements

### Standard Power Versions (HART)

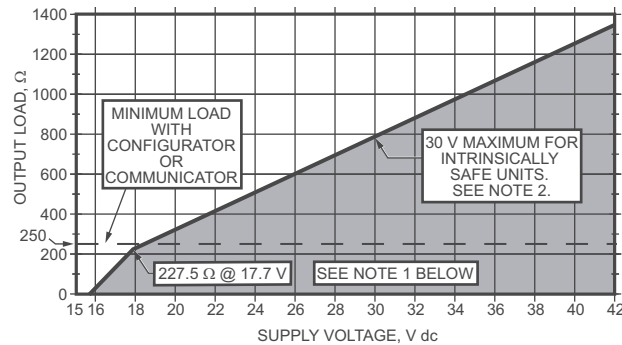
#### Supply Current:

- Digital Mode: 10 mA dc nominal
- Analog Mode: 22 mA dc maximum
- Pulse Output: 20 mA dc maximum

**Supply Voltage:**

- 15.75 to 42 V dc, depending on electrical safety approvals and certifications<sup>8</sup>. Refer to the following figure.

**NOTE:** When operating at ambient temperatures less than -29°C (-20°F), you must maintain a minimum terminal voltage of 15.75 V dc in order to maintain remote configurator communication capability. See MI 019-222 for typical installation topologies.

**Figure 1 - Supply Voltage vs Output Load for 4 to 20 mA Output****NOTES:**

1. The flowmeter will function with an output load less than 250 Ω, provided that a PC-based configurator or HART Communicator is not connected to it. Connecting a PC-based configurator or HART Communicator while operating in this area can cause output and/or communication disturbances.
2. With intrinsically safe certifications with a 24 V dc power supply, an active barrier is required.

**Low Power Versions****Supply Current:**

- 10 mA dc nominal

**Supply Voltage:**

- 10 and 42 V dc<sup>9</sup>

**NOTE:** For proper operation, 10 V dc must be maintained at the flowmeter terminals. For HART communication, a 250 Ω load resistor must be included in the power supply loop, and a voltage of 12.5 V dc must be maintained in the loop. See MI 019-222 for typical installation topologies.

**Modbus****Supply Current:**

- 10 mA dc nominal
- Pulse Output: 20 mA dc maximum

**Supply Voltage:**

- 9 and 30 V dc depending on electrical safety approvals and certifications.

8. See *Electrical Certifications*, page 31

9. Supply current is fixed at a constant 10 mA for Electronics Version -L and remains in operation down to a minimum terminal voltage of 10 V dc.

## Output Damping

Damping smooths the flow rate output and optimizes the flowmeter's response time to the control system. Damping is an exponential filter, 85% recovery time to an input step that is 80% of span, with a selectable time constant; it can be set between 0 and 32 seconds. An eight second damping factor will pass 85% of the step change in this time period. Damping applies to all outputs except the Raw Pulse Output where no damping is applied to the direct vortex shedding frequency.

## Flowmeter Ranges

The flowmeter is shipped with the flow range specified in the sales order or with a default flow range equal to the meter capacity. You can rerange the flowmeter and keep the same flow rate units, choose new flow rate units from a built-in menu-selectable list, or enter custom flow rate units.

To determine flow velocity limits and use other sizing tools, refer to the FlowExpertPro sizing program.

## Nominal Flow Velocity Limits

Although the calculations in the following table apply for many applications, they only provide *nominal* flow velocity limits. Use the FlowExpertPro™ sizing program for your specific application.

Range Limit	Standard Temperature Range		High Temperature Range	
	m/s	ft/s	m/s	ft/s
Lower	$3.0/\sqrt{\rho_f}$	$2.5/\sqrt{\rho_f}$	$6.0/\sqrt{\rho_f}$	$5.0/\sqrt{\rho_f}$
Upper	$300/\sqrt{\rho_f}$	$250/\sqrt{\rho_f}$	$300/\sqrt{\rho_f}$	$250/\sqrt{\rho_f}$

## Reference K-Factor

The reference K-factor is a coefficient that specifies the flowmeter calibration and is expressed as pulses per unit volume; where pulses/unit volume = pulses per second divided by volume flow per second.

The reference K-factor is the arithmetic mean value of K over the factory-calibrated flow range. It is determined at the factory by actual flow calibration with water by comparison to a master flowmeter calibration, or by actual static weight. Both calibrations are traceable to NIST. The reference K-factor is entered in the flowmeter database and stamped on the data plate. Once established, this K-factor is available to gas, liquid, or steam.

## Flowing K-Factor

The flowing K-factor is computed from the K-reference expressed in specified flowing units, and can be corrected for the following:

- Process Temperature
- Mating Pipe
- Upstream Disturbances

## Process Temperature Effect on K-Factor

There is an effect on the reference K-factor due to a diameter change of the flowtube bore with temperature. The effect is -0.3% of flow rate per 55°C (100°F) increase in temperature. These flowmeters automatically recompute a flowing K-factor based on detected changes in process temperature.

## K-Factor Bias

Provisions are made in the configuration menu to bias the flowmeter K-factor by a percent (%) value. The flowing K-factor value is automatically recalculated when the % bias is entered.

## Static Pressure Limits

To determine the pressure drop for Model 84C Vortex Flowmeters and use other sizing tools, refer to the FlowExpertPro sizing program (*FlowExpertPro™ Sizing Application, page 11*).

### Minimum Static Pressure

The minimum static pressure is that pressure which is sufficient to help prevent flashing and meet the pressure drop requirements to attain maximum flow rate. Refer to the FlowExpertPro sizing program.

### Maximum Static Pressure

Where reference temperature is 37.8°C (100°F):

- Flanged Body: 3750 psig (258.6 bar, 25855 kPa) or that imposed by flange rating
- Wafer Body: 1500 psig (103.4 bar, 10340 kPa) or that imposed by flange rating
- NPT Body as imposed by equivalent flange ratings:
  - Line size 010 equivalent to Class 1500 flanges
  - Line size 020 equivalent to Class 900 flanges



## Minimum Back Pressure (Volatile Liquids or Low Pressure Conditions)

Proper system design, and operation of the flowmeter within the rated flow rate range, helps prevent conditions that tend to contribute to the release of vapor from the liquid (flashing), which can also induce cavitation.

When locating the flowmeter, consider the need for a back pressure valve, or for increasing inlet pressure. To help minimize flashing and support stable vortex generation, the minimum back pressure should be:

- $P_G = (3)(\Delta P) + (1.25)(p_v) - (p_{atm})$

Where:

- $P_G$ : Gauge pressure in kPa or psi five pipe diameters downstream of the flowmeter
- $\Delta P$ : Pressure loss in psi or kPa
- $p_v$ : Vapor pressure at line conditions in psi or kPa absolute
- $p_{atm}$ : Atmospheric pressure in psi or kPa absolute

## Flange Pressure-Temperature Ratings

See MI 019-222 or MI 019-224 for ANSI and DIN flange pressure-temperature ratings. These ratings are also embedded in the FlowExpertPro sizing tool. Also observe the sensor temperature limit.

Flowmeters are designed to withstand pressure within ANSI/ASME B16.5 Class 150, 300, 600, 900, or 1500 flange ratings, and DIN EN 10921 PN16, PN25, PN40, PN63, PN100, or PN160 flange ratings. See MI 019-222 or MI 019-224 for flange pressure-temperature ratings.

For 84C wafer body flowmeters, the flowtube face outside diameter is designed to center between ANSI Class 150 flanges. For other flange ratings, specify centering spacers from the Mounting and Centering System selection in the Model Code.

## Electrical Fire Precautions

The Model 84C flowmeter is designed to minimize fire hazards by using low energy power, adequate insulation, and a separation of electrical circuits. These flowmeters conform to the required standards of worldwide testing agencies such as ATEX, CSA, EAC, FM, IECEx, INMETRO, and OSHA.

# Performance Specifications

## Factory Calibrated Flow Ranges

This table provides the K-factor, factory-calibrated flow range for water, and the Reynolds Number range for each Vortex flowmeter line size.

The flowmeter's K-factor is the relationship between the input (volumetric flow rate) and the output (pulse rate). Reference K-factor is the arithmetic mean value of the K-factor over a designated flow rate range (reference conditions). The mean K-factor is derived as:

$$\text{Mean K-factor} = (K_{\text{MAX}} + K_{\text{MIN}}) / 2$$

where  $K_{\text{MAX}}$  is the maximum K-factor and  $K_{\text{MIN}}$  is the minimum K-factor over the calibrated flow range.

The factory-calibrated Reynolds Number range for water applies to standard temperature sensors. Other sensor selections may alter the calibration range. For sizing tools and specific calibration ranges, visit [www.FlowExpertPro.com](http://www.FlowExpertPro.com).

**Table 7 - Factory-Calibrated Flow Ranges for Flanged (84CF) and Wafer (84CW) Flowmeters**

Nominal Line Size		Nominal Mean K-Factor	Factory-Calibrated Flow Range for Water		
Model Code	Size	Pulses/ft <sup>3</sup> (Pulses/L)	Range in US gpm	Range in L/s	Reynolds Number (R <sub>D</sub> ) Range
008	DN15 (¾ in)	5,580 (197)	6.9 to 34	0.43 to 2.1	30,000 to 150,000
010	DN25 (1 in)	2,250 (79.5)	8.9 to 56	0.56 to 3.5	30,000 to 190,000
015	DN40 (1½ in)	570 (20.1)	14 to 140	0.88 to 8.7	30,000 to 300,000
020 <sup>10</sup>	DN50 (2 in): 84CF flowmeters with Class 1500 flange pressure ratings <sup>11</sup>	389 (13.74)	16 to 203	1 to 12.8	30,000 to 380,000
020	DN50 (2 in): 84CW and 84CF flowmeters with all other flange pressure ratings	258 (9.11)	18 to 230	1.1 to 15	30,000 to 380,000
030	DN80 (3 in): 84CF flowmeters with Class 1500 flange ratings <sup>11</sup>	103 (3.64)	32 to 475	2 to 30	38,000 to 570,000
030	DN80 (3 in): 84CW and 84CF flowmeters with all other flange pressure ratings	78.7 (2.78)	34 to 500	2.1 to 32	38,000 to 570,000
040 <sup>10</sup>	DN100 (4 in): 84CF flowmeters with Class 1500 flange ratings <sup>11</sup>	47.29 (1.67)	55 to 818	3.4 to 51.6	50,000 to 750,000
040	DN100 (4 in): 84CW and 84CF flowmeters with all other flange pressure ratings	34.8 (1.23)	59 to 890	3.7 to 56	50,000 to 750,000
060 <sup>10</sup>	DN150 (6 in): 84CF flowmeters with Class 900, Class 1500, or PN160 flange ratings <sup>12</sup>	13.68 (0.483)	125 to 1,812	7.9 to 114.3	76,000 to 1,100,000
060	DN150 (6 in): 84CW and 84CF flowmeters with all other flange pressure ratings	10.00 (0.353)	140 to 2,000	8.5 to 130	76,000 to 1,100,000

10. Flanged body style (84CF) only.

11. End Connection and Flange Pressure Rating model code selections F5 or T5 (Class 1500).

12. End Connection and Flange Pressure Rating model code selections F4 or T4 (Class 900), F5 or T5 (Class 1500), D5 or B5 (PN160).

**Table 7 - Factory-Calibrated Flow Ranges for Flanged (84CF) and Wafer (84CW) Flowmeters (Continued)**

Nominal Line Size		Nominal Mean K-Factor	Factory-Calibrated Flow Range for Water		
Model Code	Size		Pulses/ft <sup>3</sup> (Pulses/L)	Range in US gpm	Range in L/s
080 <sup>13</sup>	DN200 (8 in): 84CF flowmeters with Class 900, Class 1500, or PN160 flange pressure ratings <sup>14</sup>	5.98 (0.211)	216 to 3,244	13.6 to 204.6	100,000 to 1,500,000
080	DN200 (8 in): 84CW and 84CF flowmeters with all other flange pressure ratings	4.26 (0.150)	240 to 3,600	15 to 220	100,000 to 1,500,000
100 <sup>13</sup>	DN250 (10 in)	2.19 (0.0773)	395 to 5,768	24.9 to 363.9	130,000 to 1,900,000
120 <sup>13</sup>	DN300 (12 in)	1.32 (0.0466)	578 to 8,305	36.4 to 524.0	160,000 to 2,300,000

**Table 8 - Factory-Calibrated Flow Ranges for NPT Flowmeters (84CN)**

Nominal Line Size		Nominal Mean K-Factor	Factory-Calibrated Flow Range for Water		
Model Code	Size		Pulses/ft <sup>3</sup> (Pulses/L)	Range in US gpm	Range in L/s
010	DN25 (1 in)	2,250 (79.5)	8.9 to 56	0.56 to 3.5	30,000 to 190,000
020	DN50 (2 in)	258 (9.11)	18 to 230	1.1 to 15	30,000 to 380,000

## Reference Accuracy

All accuracies are for operation within the calibrated range. To achieve these accuracies, you must insulate the flowmeter as described in MI 019-222 (HART/Low Power) or MI 019-224 (Modbus). You must also configure the flowing density and viscosity for the fluid. To determine accuracy for specific applications and use other sizing tools, visit [www.FlowExpertPro.com](http://www.FlowExpertPro.com). See *FlowExpertPro™ Sizing Application*, page 11.

## Volumetric Flow for Liquids

Accuracy within the calibrated range is as follows:

- For flanged and wafer flowmeters with R<sub>D</sub> greater than 30,000: ±0.5%
- For flanged and wafer flowmeters with R<sub>D</sub> between 20,000 and 30,000: ±1.0%
- For NPT flowmeters with R<sub>D</sub> greater than 20,000: ±1.0%
- For all flowmeters with R<sub>D</sub> between 5,000 and 20,000: ±2.0%

## Volumetric Flow for Gases and Steam

Accuracy within the calibrated range is as follows:

- For flanged and wafer flowmeters with R<sub>D</sub> greater than 20,000: ±1.0%
- For NPT flowmeters with R<sub>D</sub> greater than 20,000: ±1.5%
- For all flowmeters with R<sub>D</sub> between 5,000 and 20,000: ±2.0%

13. Flanged body style (84CF) only.

14. End Connection and Flange Pressure Rating model code selections F4 or T4 (Class 900), F5 or T5 (Class 1500), D5 or B5 (PN160).

## Mass Flow for Saturated and Superheated Steam

This applies to flowmeters with the optional RTD (Multivariable selection T).

- For Reynolds number greater than 20,000:
  - Mass flow accuracy for velocities greater than 10 m/s (33 ft/s) and temperature greater than 143°C (290°F): ±1.4% of rate
  - Mass flow accuracy for velocities 5 to 10 m/s (16.4 to 33 ft/s) and temperature greater than 143°C (290°F): ±1.9% of rate
- For Reynolds number between 5,000 and 20,000:
  - Mass flow accuracy for velocities greater than 10 m/s (33 ft/s) and temperature greater than 143°C (290°F): ±2.2% of rate
  - Mass flow accuracy for velocities 5 to 10 m/s (16.4 to 33 ft/s) and temperature greater than 143°C (290°F): ±2.57% of rate
- For temperatures less than 143°C (290°F):
  - Add an uncertainty of ±0.1% for every 5.6°C (10°F) less than 143°C (290°F)

## Process Temperature for Saturated and Superheated Steam

This applies to flowmeters with the optional RTD (Multivariable selection T).

- Process temperature accuracy for velocities greater than 10 m/s (33 ft/s) and for temperatures greater than 149°C (300°F):
  - ±0.56°C (±1°F)

## External Influences on Accuracy

**Table 9 - External Influences on Accuracy**

Effect	Description
<b>Supply Voltage Effect (Within Stated Limits)</b>	With Pulse Output                      No effect on accuracy
	With Analog Output                      Less than 0.005% per volt
	With Digital Output                      No effect on accuracy
<b>Ambient Temperature Effect</b>	With Pulse Output                      ±0.01% of reading from -40 to +80°C (-40 to +176°F)
	With Analog Output                      For a 28°C (50°F) change in ambient temperature within operative limits: Zero (4 mA):                              ±0.02% of span maximum Span (16 mA):                              ±0.1% of span maximum
	With Digital Output                      ±0.01% of reading from -40 to +80°C (-40 to +176°F) <sup>15</sup>
<b>Relative Humidity Effect</b>	No effect on accuracy if covers and conduit seals are properly installed.
<b>Vibration Effect</b>	The flowmeter complies with IEC 60068-2-6 for 10 to 500 Hz up to 2 "g". The flowmeter's built-in tuning functions and Low Flow Cut-in adjustments help minimize vibration effects.

15. The 80°C (176°F) temperature may be extended to 85°C (185°F). Refer to *Electrical Certifications*, page 31.

**Table 9 - External Influences on Accuracy (Continued)**

Effect	Description
<b>Electromagnetic and Radio-Frequency Interference (EMI and RFI) Effects</b>	The flowmeter meets the EMI and RFI requirements of EN 61326-1.
<b>Switching and Indirect Lightning Transients</b>	The flowmeter can withstand a transient shock wave up to 2000 V common mode or 1000 V normal mode without damage. The flowmeter complies with ANSI/IEEE C62.41-1980 and IEC 61000-4-5, and also complies with Electromagnetic Compatibility requirements of the European EMC Directive 2014/30/EU by conforming to EN 61326-1:2013.

# Physical Specifications

## Process Wetted Materials

Parts	84CF	84CW	84CN
<b>Body and Shedder Bar</b>	Cast 316 ss (CF8M) or 304 ss	Cast 316 ss (CF8M) or nickel alloy <sup>16</sup> (CW2M)	Cast 316 ss (CF8M)
<b>Flange or NPT Connection</b>	316 ss or 304 ss	N/A	cast 316 ss (CF8M)
<b>Sensor Seals</b>	316 ss, 316 ss/grafoil, nickel alloy <sup>16</sup> (CW2M), or nickel alloy <sup>16</sup> (CW2M)/grafoil		

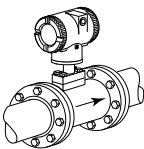
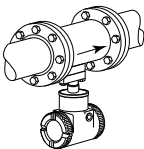
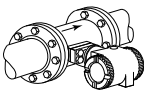
## Flowmeter Mounting

The flowmeter can be located in a pipeline which can run in any direction from the vertical (upward flow) to the horizontal. The electronics housing can also be rotated 270 degrees (in 90 degree increments) with respect to the body. A vertical pipeline is preferred for batch operations.

## Recommended Mounting Arrangements

The diagrams in the following table show flanged connections; however, these mounting arrangements apply to other connection types as well.

**Table 10 - Mounting Arrangements**

Flowmeter Orientation for:		Liquid	Gas	Saturated Steam	Superheated Steam
	Housing above pipe	Yes <sup>17</sup>	Yes	No	Yes <sup>18</sup>
	Housing below pipe	Yes <sup>19 20</sup>	Yes <sup>20</sup>	Yes <sup>18</sup>	Yes <sup>18</sup>
	Housing to side of pipe	Yes	Yes	No	Yes <sup>18</sup>

16. Equivalent to Hastelloy® C-4C. Hastelloy is a registered trademark of Haynes International, Inc.

17. Possibility of temporary startup error due to trapped air.

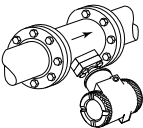
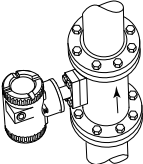
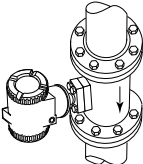
18. Requires adequate insulation.

19. Best choice when errors due to startup cannot be tolerated.

20. Recommended only for clean fluids.



**Table 10 - Mounting Arrangements (Continued)**

Flowmeter Orientation for:		Liquid	Gas	Saturated Steam	Superheated Steam
	Housing to side and below pipe	Yes	Yes	No	Yes <sup>21</sup>
	Vertical pipe, upward flow	Yes	Yes	No	Yes <sup>21</sup>
	Vertical pipe, downward flow	Yes <sup>22</sup>	Yes	No	Yes <sup>21</sup>

## Electrical Connections

Field wires enter through ½ NPT or M20 conduit threaded entrances on either side of the electronics housing. Wires terminate under screw terminals and washers on terminal block in the field terminal compartment. The unused entrance is plugged to help protect from moisture and Electromagnetic and Radio-Frequency Interference (EMI and RFI) effects.

## Housing Covers

A two compartment housing separates the electronics from the field connections. Housing and covers are low copper (0.6% maximum) die-cast aluminum alloy with an epoxy finish. Buna-N O-ring seals are used to seal the housing covers, housing neck, and terminal block.

## Electronics Module

Printed wiring assemblies (PWAs) are conformally coated for moisture and dust protection.

## Environmental Protection

The electronics housing has the dust tight and weatherproof rating of IP66 as defined by IEC 60529, and provides the environmental and corrosion resistant protection rating of NEMA 4X.

21. Requires adequate insulation.

22. Not preferred; must maintain full pipe with no voids in fluid.

## Data Plate

A stainless steel data plate encircles and is fastened to the lower part of the electronics housing. It includes conventional model code and operating data, such as the factory calibration factor (K-factor). For additional tag data space, you can request an optional stainless steel tag (see *Auxiliary Specification (AS) Code MTS: Stainless Steel Customer Tag Accessory*, page 43).

## NACE Certification

The Model 84C flowmeters have been designed to meet the requirements of NACE Standard MR-0175-2003 for use in H<sub>2</sub>S Sour Oilfield environments. The design and process wetted materials also comply with NACE Standard MR-0103-2007 for use in corrosive petroleum refining environments. A NACE compliance certificate is available by selecting model code option -Q option. See *Options -L, -M, and -Q: Schneider Electric Certificates of Conformance and Compliance*, page 43 and *Model Code*, page 33 for more information.

## Approximate Mass

The following tables list masses of different configurations of 84C flowmeters. The mass values shown are approximate and are meant as a guide.

Standard temperature flowmeter masses are listed for integrally mounted electronics housings. There is a slight difference in mass for high temperature flowmeters, which adds about 0.5 kg (1 lb), and for remote mounted housings (where the housing is replaced by a connector head assembly and junction box). The electronics housing itself weighs about 2 kg (4 lb) and varies slightly depending on whether the flowmeter is equipped with the indicator/configurator or the extended housing covers.

**Table 11 - Approximate Mass of Model 84C Flanged Flowmeters**

Nominal Line Size		Flange Specifications		Mass	
Model Code	Size	Type	Material	kg	lb
008	0.75 in	Class 150	316 ss	4.71	10.4
008	0.75 in	Class 1500	316 ss	8.75	19.3
010	1 in	Class 150	316 ss	5.53	12.2
010	1 in	Class 1500	316 ss	11.02	24.3
015	1.5 in	Class 150	316 ss	7.57	16.7
015	1.5 in	Class 1500	316 ss	15.65	34.5
020	2 in	Class 150	316 ss	9.48	20.9
020	2 in	Class 1500	316 ss	24.58	54.2
030	3 in	Class 150	316 ss	19.5	43
030	3 in	Class 1500	316 ss	49.76	109.7
040	4 in	Class 150	316 ss	21.05	46.4
040	4 in	Class 1500	316 ss	70.72	155.9
060	6 in	Class 150	316 ss	35.2	77.6
060	6 in	Class 600	316 ss	77.92	178.1
060	6 in	Class 1500	316 ss	161.93	357
080	8 in	Class 150	316 ss	57.74	127.3
080	8 in	Class 600	316 ss	131.26	289.4

**Table 11 - Approximate Mass of Model 84C Flanged Flowmeters (Continued)**

Nominal Line Size		Flange Specifications		Mass	
Model Code	Size	Type	Material	kg	lb
080	8 in	Class 1500	316 ss	298.1	657.2
100	10 in	Class 150	304 ss	72.57	160
100	10 in	Class 600	304 ss	216	476.2
120	12 in	Class 150	304 ss	114.48	252.4
120	12 in	Class 600	304 ss	245.12	540.4
008	DN15	PN40	316 ss	5.58	12.3
008	DN15	PN100	316 ss	7.35	16.2
010	DN25	PN40	316 ss	6.08	13.4
010	DN25	PN160	316 ss	8.66	19.1
015	DN40	PN40	316 ss	8.12	17.9
015	DN40	PN160	316 ss	12.79	28.2
020	DN50	PN40	316 ss	9.84	21.7
020	DN50	PN160	316 ss	17.42	38.4
030	DN80	PN40	316 ss	15.1	33.3
030	DN80	PN160	316 ss	26.58	58.6
040	DN100	PN40	316 ss	20.14	44.4
040	DN100	PN160	316 ss	36.83	81.2
060	DN150	PN16	316 ss	27.89	61.5
060	DN150	PN160	316 ss	88.81	195.8
080	DN200	PN16	316 ss	43	94.8
080	DN200	PN160	316 ss	161.79	356.7
100	DN250	PN16	304 ss	65.13	143.6
100	DN250	PN100	304 ss	191.23	421.6
120	DN300	PN16	304 ss	92.71	204.4
120	DN300	PN100	304 ss	280.32	618

**Table 12 - Approximate Mass for Model 84C Wafer Flowmeters with 316 ss Body Material**

Model Code	Nominal Line Size		Mass	
	mm	in	kg	lb
008	DN15	0.75	2.3	5
010	DN25	1	2.7	6
015	DN40	1.5	3.2	7
020	DN50	2	4.5	10
030	DN80	3	8	18
040	DN100	4	11.5	25
060	DN150	6	16	35
080	DN2000	8	27	60

**Table 13 - Approximate Mass for Model 84C NPT Flowmeters**

Nominal Line Size			Weight	
Model Code	mm	in	kg	lb
010	DN25	1	2.7	6
020	DN50	2	4.5	10

# Electrical Certifications

These flowmeters have been designed to meet the electrical safety descriptions listed in the following table. For detailed information or status of testing laboratory approvals/certifications, contact Global Customer Support.

- Refer to MI 019-177 for FM and CSA connection diagrams.
- Refer to MI 019-179 for ATEX and IECEx information.

**NOTE:** For Electronics Version -T with and intrinsically safe approvals and certifications with a 24 V dc supply, an active barrier is required.

**Table 14 - Electrical Certifications**

Agency Certification, Types of Protection, and Area Classification	Application Conditions	Model Code Option
<b>ATEX Intrinsically Safe:</b> II 1G; II 2D; Ex ia IIC T4 Ga <b>ATEX Dust Ignition Protection:</b> Ex tb IIIC T103°C Db	Sira 06ATEX2067X Temperature Class T4; Ta = -40° to +80°C	AA <sup>23</sup>
<b>ATEX Flameproof</b> Integral Electronics: II 2/1 (1) G; II 2D; Ex db [ia Ga] ia IIC T4 Gb Remote Electronics: II 2 (1) G; II 2D; Ex db [ia Ga] IIC T4 Gb <b>ATEX Dust Ignition Protection:</b> Ex tb IIIC T85°C Db	Sira 06ATEX2067X Temperature Class T4; Ta = -20° to +80°C	AD
<b>INMETRO Intrinsically Safe:</b> Ex ia IIC T4 Ga <b>INMETRO Dust Ignition Protection:</b> Ex tb IIIC T103°C Db	Temperature Class: -40°C ≤ Ta ≤ +80°C	BA <sup>23</sup>
<b>INMETRO Flameproof</b> Integral Electronics: Ex d [ia Ga] IIC T4 Gb Remote Electronics: Ex d [ia Ga] IIC T4 Gb <b>INMETRO Dust Ignition Protection:</b> Ex tb IIIC T85°C Db	Temperature Class: -20°C ≤ Ta ≤ +80°C	BD <sup>23</sup>
<b>CSA Intrinsically Safe</b> for Class I, II, III, Div. 1, Groups A, B, C, D, E, F, and G; Also Zone certified intrinsically safe Ex ia IIC T4; IP66, Type 4X; Dual Seal	Temperature Class T4; Ta = -40° to +80°C	CA <sup>23</sup>
<b>CSA Explosionproof</b> with IS sensor connection for Class I, Div. 1, Groups B, C, and D; <b>CSA Dust-Ignitionproof</b> for Class II, Div. 1, Groups E, F, and G; Class III Div. 1; Also Zone certified Ex d [ia] IIC T5; Dual Seal	Temperature Class T5; Ta = 60°C (divisions) Temperature Class T5; Ta = -40° to +80°C (zones)	CD
<b>CSA Division 2:</b> Class I, Div. 2, Groups A, B, C, and D; Class II, Div. 2, Groups F and G; Class III, Div. 2; Type 4X; Dual Seal	Temperature Class T4; Ta = 80°C	CN <sup>23</sup>
<b>IECEx Intrinsically Safe:</b> Ex ia IIC T4 Ga <b>IECEx Dust Ignition Protection:</b> Ex tb IIIC T103°C Db	Temperature Class T4; Ta = -40° to +80°C	EA <sup>23</sup>
<b>IECEx Flameproof</b> Integral Electronics: Ex db [ia Ga] ia IIC T4 Gb Remote Electronics: Ex db [ia Ga] IIC T4 Gb <b>IECEx Dust Ignition Protection:</b> Ex tb IIIC T85°C Db	Temperature Class T4; Ta = -20° to +80°C	ED
<b>FM Intrinsically Safe:</b> Class I, II, III, Div. 1, Groups A, B, C, D, E, F, G; Also Zone approved AEx ia IIC T4	Temperature Class T4; Ta = 80°C	FA <sup>23</sup>
<b>FM Explosionproof</b> with IS sensor connection for Class I, Div.1, Groups B, C, and D; <b>FM Dust-Ignitionproof</b> for Class II, Div. 1, Groups E, F, and G; Class III, Div. 1; T5	Temperature Class T5; Ta = 85°C	FD
<b>FM Nonincendive:</b> Class I, Div. 2, Groups A, B, C, and D; Class II, Div. 2, Groups F and G; Class III, Div. 2; T4	Temperature Class T4; Ta = 80°C	FN <sup>23</sup>
<b>KOSHA Flameproof</b> Integral Electronics: Ex d [ia] ia IIC T4 Gb Remote Electronics: Ex d [ia] IIC T4 Gb	Temperature Class T4; Ta = -20° to +80°C	KD <sup>23</sup>

23. Not available with Modbus (Electronics Version -M).

**Table 14 - Electrical Certifications (Continued)**

Agency Certification, Types of Protection, and Area Classification	Application Conditions	Model Code Option
<b>NEPSI Intrinsically Safe:</b> Ex ia IIC T4 Ga <b>NEPSI Dust Ignition Protection:</b> Ex tD A21 IP66 T103°C	Temperature Class T4; Ta = -40° to +80°C	NA <sup>24</sup>
<b>NEPSI Flameproof</b> Integral Electronics: Ex d ia IIC T4 Gb Remote Electronics: Ex d [ia Ga] IIC T4 Gb <b>NEPSI Dust Ignition Protection:</b> Ex tD A21 IP66 T85°C	Temperature Class T4; Ta = -20° to +80°C	ND <sup>24</sup>
<b>EAC Intrinsically Safe:</b> 0Ex ia IIC T4 Ga X <b>EAC Dust Ignition Protection:</b> Ex tb IIIC T103°C Db X	Temperature Class: -40°C ≤ Ta ≤ +80°C	RA <sup>24</sup>
<b>EAC Flameproof</b> Integral Electronics – 1Ex d [ia Ga] ia IIC T4 Gb X Remote Electronics – 1Ex d [ia Ga] IIC T4 Gb X <b>EAC Dust Ignition Protection:</b> Ex tb IIIC T85°C Db X	Temperature Class: -20°C ≤ Ta ≤ +80°C	RD <sup>24</sup>
CE mark only; PED controls and records	n/a	YY
No CE mark; do not install in European Union countries	n/a	ZZ

24. Not available with Modbus (Electronics Version -M).

# Model Code

These tables list all of the options for the Model 84C Vortex Flowmeters.

## Flanged Body Style

**Table 15 - Model Code for 84CF Flowmeters**

Code	Description
<b>Model</b>	
84C	Vortex Flowmeter
<b>Body Style</b>	
F	Flanged
<b>Nominal Line Size</b>	
008	DN15; 15 mm (3/4 in)
010	DN25; 25 mm (1 in)
015	DN40; 40 mm (1 1/2 in)
020	DN50; 50 mm (2 in)
030	DN80; 80 mm (3 in)
040	DN100; 100 mm (4 in)
060	DN150; 150 mm (6 in)
080	DN200; 200 mm (8 in) <sup>25</sup>
100	DN250; 250 mm (10 in)
120	DN300; 300 mm (12 in)
<b>Electronics Version</b>	
-T	HART Communication and 4 to 20 mA Output
-L	Low Power with HART Communication; Output Fixed at 10 mA
-M	Modbus Communication
<b>Pulse Output</b>	
P	Pulse Output Capability
<b>Body, Shedder Bar, and Flange Material</b>	
R	ASTM A351-CF8M (Cast 316 ss) Body and Shedder Bar <ul style="list-style-type: none"> <li>• 316 ss Flanges for Line Sizes 008 to 040</li> <li>• 304 ss Flanges for Line Sizes 060 to 080</li> </ul>
E	Fabricated 304 ss Body and Shedder Bar, with 304 ss Flanges (Line Sizes 100 to 120)
Y	316 ss with face-to-face lengths that are backwards compatible with Style A Model 84 Vortex Flowmeters <sup>26</sup> <ul style="list-style-type: none"> <li>• For Line Sizes 008 to 040, Cast 316 ss (CF8M) Body and Shedder Bar with 316 ss Flanges</li> <li>• Line Sizes 060 to 120 already have backward-compatible face-to-face lengths</li> </ul>

25. For Line Size 080 with End Connection F4, F5, T4, T5, D5, or B5, Optional Welding Certificate -X is included.

26. Selection Y is recommended *only* for replacement of Style A flowmeters that have lay-length differences greater than  $\pm 6.35$  mm (1/4 inch).

**Table 15 - Model Code for 84CF Flowmeters (Continued)**

Code	Description
<b>End Connections and Flange Pressure Rating</b>	
F1	ANSI Class 150 Raised Face
F2	ANSI Class 300 Raised Face
F3	ANSI Class 600 Raised Face
F4	ANSI Class 900 Raised Face (not available with Line Sizes 100 and 120)
F5	ANSI Class 1500 Raised Face (not available with Line Sizes 100 and 120)
T1	ANSI Class 150 Ring-Type Joint (not available with Line Size 008)
T2	ANSI Class 300 Ring-Type Joint
T3	ANSI Class 600 Ring-Type Joint
T4	ANSI Class 900 Ring-Type Joint (not available with Line Sizes 100 and 120)
T5	ANSI Class 1500 Ring-Type Joint (not available with Line Sizes 100 and 120)
D1	PN16 EN1092-1 Raised Face Type "D" Nut Groove (not available with Line Sizes 008 to 040)
D2	PN25 EN1092-1 Raised Face Type "D" Nut Groove (not available with Line Sizes 008 to 060)
D3	PN40 EN1092-1 Raised Face Type "D" Nut Groove
D6	PN63 EN1092-1 Raised Face Type "D" Nut Groove (not available with Line Sizes 008 to 015) <sup>27</sup>
D7	PN100 EN1092-1 Raised Face Type "D" Nut Groove
D5	PN160 EN1092-1 Raised Face Type "D" Nut Groove (not available with Line Sizes 008, 100, and 120)
B1	PN16 EN1092-1 Raised Face Finish Type B1 (not available with Line Sizes 008 to 040)
B2	PN25 EN1092-1 Raised Face Finish Type B1 (not available with Line Sizes 008 to 060)
B3	PN40 EN1092-1 Raised Face Finish Type B1
B6	PN63 EN1092-1 Raised Face Finish Type B2 (not available with Line Sizes 008 to 015) <sup>28</sup>
B7	PN100 EN1092-1 Raised Face Finish Type B2
B5	PN160 EN1092-1 Raised Face Finish Type B2 (not available with Line Sizes 008, 100, and 120)
C3	PN40 EN1092-1 Raised Face Finish Type F
C7	PN100 EN1092-1 Raised Face Finish Type F
<b>Single or Dual Measurement; Isolation Manifold</b>	
S	Single Measurement; No Isolation Manifold
<b>Multivariable Selection</b>	
N	None
T	Temperature Compensation up to 260°C (500°F) <sup>29</sup>

27. For Line Sizes 008, 010, and 015, select End Connection D7.

28. For Line Sizes 008, 010, and 015, select End Connection B7.

29. For Multivariable Selection T, pulse output is always enabled.



**Table 15 - Model Code for 84CF Flowmeters (Continued)**

Code	Description
<b>Sensor Fill, Temperature Range, and Material</b>	
<b>Standard Temperature Range (with Fill Fluid)</b>	
D	Fluorolube Fill, -18 to +93°C (0 to 200°F), Cast Nickel Alloy CW2M <sup>30</sup>
F	Fluorolube Fill, -18 to +93°C (0 to 200°F), Cast Stainless Steel CF3M
R	Silicone Fill, -18 to +204°C (0 to 400°F), Cast Nickel Alloy CW2M <sup>30</sup>
S	Silicone Fill, -18 to +204°C (0 to 400°F), Cast Stainless Steel CF3M
<b>Extended Temperature Range (No Fill Fluid)</b>	
A	Unfilled, 149 to 371°C (300 to 700°F), Cast Nickel Alloy CW2M <sup>30 31</sup>
B	Unfilled, 149 to 371°C (300 to 700°F), Cast Stainless Steel CF3M <sup>31</sup>
E	Unfilled, 149 to 427°C (300 to 800°F), Cast Nickel Alloy CW2M <sup>30 32 33</sup>
G	Unfilled, 149 to 427°C (300 to 800°F), Cast Stainless Steel CF3M <sup>32 33</sup>
<b>Mounting and Conduit Openings for Electronics Housing</b>	
T	Aluminum, Integral, Top-Mounted, with 1/2 NPT Conduit Connections
V	Aluminum, Integral, Top-Mounted, with M20 Conduit Connections
R	Aluminum, Remote-Mounted, with 1/2 NPT Conduit Connections <sup>34</sup>
W	Aluminum, Remote-Mounted, with M20 Conduit Connections <sup>34</sup>
<b>Local Digital Indicator/Configurator</b>	
N	No Digital Indicator/Configurator
J	Digital Indicator/Configurator
<b>Electrical Certifications (refer to <i>Electrical Certifications</i>, page 31)<sup>35</sup></b>	
AA	ATEX Intrinsically Safe <sup>36</sup>
AD	ATEX Flameproof
BA	INMETRO Intrinsically Safe <sup>36</sup>
BD	INMETRO Flameproof <sup>36</sup>
CA	CSA Intrinsically Safe <sup>36</sup>
CD	CSA Explosionproof
CN	CSA Division 2 <sup>36</sup>
EA	IECEx Intrinsically Safe <sup>36</sup>
ED	IECEx Flameproof
FA	FM Intrinsically Safe <sup>36</sup>
FD	FM Explosionproof
FN	FM Nonincendive <sup>36</sup>
KD	KOSHA Flameproof <sup>36</sup>

30. Equivalent to Hastelloy® C-4C. Hastelloy is a registered trademark of Haynes International, Inc.

31. With Multivariable Selection T, the temperature element of the RTD is rated to 260°C (500°F). Use care with a Vortex high temperature sensor, which is rated to a higher temperature.

32. Not available with temperature compensation (Multivariable Selection T).

33. Includes Optional Welding Certificate -X.

34. For remote mounting, select a cable length with the Cable for Connecting to Remote-Mounted Electronics option.

35. Contact Global Customer Support for availability.

36. Not available with Modbus (Electronics Version -M).

**Table 15 - Model Code for 84CF Flowmeters (Continued)**

Code	Description
NA	NEPSI Intrinsically Safe <sup>37</sup>
ND	NEPSI Flameproof <sup>37</sup>
RA	EAC Intrinsically Safe <sup>37</sup>
RD	EAC Flameproof <sup>37</sup>
YY	CE mark only; PED controls and records
ZZ	No CE mark; do not install in European Union countries
<b>Cable for Connecting to Remote-Mounted Electronics (Optional)</b>	
-B	6 m (20 ft) Cable
-D	9 m (30 ft) Cable
-E	12 m (40 ft) Cable
-G	15 m (50 ft) Cable
<b>Certificates of Compliance/Conformance (Optional)</b>	
-L	Standard Certificate of Compliance
-M	Material Certification of Process Wetted Metal (Conforms to EN 10204 Type 3.1 Certificate)
-Q	Process Wetted Parts Comply with NACE Standards MR-0175-2003 and MR-0103-2007
<b>Cable Connectors — with Mounting and Conduit Openings for Electronics Housing codes T and R only (1/2 NPT)</b>	
-P	Hawke Cable Gland (available only with Electrical Certifications YY and ZZ)
-R	PG11 Cable Gland, Trumpet-Shaped (available only with Electrical Certifications YY and ZZ)
<b>Welding Certificate (Optional) (select only one)</b>	
-F	Welding Certified to Conform to ASME Boiler and Pressure Vessel Code, Section IX
-X	Welding Certified to Conform to ASME Boiler and Pressure Vessel Code, Section IX, and Radiographic (X-Ray) Examination of Welds <sup>38</sup>
<b>Tamper-Resistant Options</b>	
-A	Tamper-Resistant Sealing for Housing and Covers
-S	Tamper-Resistant Cover over Bonnet Bolts
<b>Miscellaneous Optional Selections</b>	
-H	Cleaning of Process Wetted Parts for Oxygen/Chlorine Service per Compressed Gas Association's CGA G-4.1 and ASTM G93 <sup>39</sup>
-J	Gold-Plated Sensor
-N	Calibration and Pressure Test Certified Copy
-T	Adapter for 1/2–14 NPT Conduit (available only with Mounting and Conduit Openings for Electronics Housing code R, and with Electrical Certifications YY and ZZ)

37. Not available with Modbus (Electronics Version -M).

38. This option is already included with: Line Size 080 with End Connection F4, F5, T4, T5, D5, or B5; and with Sensor Fill, Temperature Range, and Material codes E and G.

39. Available only with sensors that have Fluorolube fill. Not available with unfilled sensors or sensors that have silicone fill.

## Wafer Body Style

**Table 16 - Model Code for 84CW Flowmeters**

Code	Description
<b>Model</b>	
84C	Vortex Flowmeter
<b>Body Style</b>	
W	Wafer
<b>Nominal Line Size</b>	
008	DN15; 15 mm (3/4 in)
010	DN25; 25 mm (1 in)
015	DN40; 40 mm (1 1/2 in)
020	DN50; 50 mm (2 in)
030	DN80; 80 mm (3 in)
040	DN100; 100 mm (4 in)
060	DN150; 150 mm (6 in)
080	DN200; 200 mm (8 in)
<b>Electronics Version</b>	
-T	HART Communication and 4 to 20 mA Output
-L	Low Power with HART Communication; Output Fixed at 10 mA
-M	Modbus Communication
<b>Pulse Output</b>	
P	Pulse Output Capability
<b>Body and Shedder Bar Material</b>	
R	ASTM A351-CF8M (Cast 316 ss) Body and Shedder Bar
H	ASTM A494-CW2M (Nickel Alloy) Body and Shedder Bar <sup>40</sup> (Line Sizes 008 to 040)
<b>Mounting and Centering System</b>	
W1	Centering for: <ul style="list-style-type: none"> <li>• ANSI Class 150, 300, and 600 Flanges (Line Sizes 008 to 040)</li> <li>• PN16 Flanges (Line Sizes 010 to 030)</li> <li>• PN40 Flanges (Line Sizes 010 to 030, 060, and 080)</li> <li>• PN63 and PN100 Flanges (All Line Sizes)</li> </ul>
W3	Centering for ANSI Class 600 Flanges (Line Sizes 060 to 080)
W4	Centering for PN16 Flanges (Line Sizes 040 to 080)
W5	Centering for PN40 Flanges (Line Size 040)
W9	Centering for PN16 and PN40 Flanges (Line Size 008)
<b>Single or Dual Measurement; Isolation Manifold</b>	
S	Single Measurement; No Isolation Manifold

40. Equivalent to Hastelloy® C-4C. Hastelloy is a registered trademark of Haynes International, Inc.

**Table 16 - Model Code for 84CW Flowmeters (Continued)**

Code	Description
<b>Multivariable Selection</b>	
N	None
T	Temperature Compensation up to 260°C (500°F) <sup>41</sup>
<b>Sensor Fill, Temperature Range, and Material</b>	
<b>Standard Temperature Range (with Fill Fluid)</b>	
D	Fluorolube Fill, -18 to +93°C (0 to 200°F), Cast Nickel Alloy CW2M <sup>42</sup>
F	Fluorolube Fill, -18 to +93°C (0 to 200°F), Cast Stainless Steel CF3M
R	Silicone Fill, -18 to +204°C (0 to 400°F), Cast Nickel Alloy CW2M <sup>42</sup>
S	Silicone Fill, -18 to +204°C (0 to 400°F), Cast Stainless Steel CF3M
<b>Extended Temperature Range (No Fill Fluid)<sup>43</sup></b>	
E	Unfilled, 149 to 427°C (300 to 800°F), Cast Nickel Alloy CW2M <sup>42</sup>
G	Unfilled, 149 to 427°C (300 to 800°F), Cast Stainless Steel CF3M
<b>Mounting and Conduit Openings for Electronics Housing</b>	
T	Aluminum, Integral, Top-Mounted, with 1/2 NPT Conduit Connections
V	Aluminum, Integral, Top-Mounted, with M20 Conduit Connections
R	Aluminum, Remote-Mounted, with 1/2 NPT Conduit Connections <sup>44</sup>
W	Aluminum, Remote-Mounted, with M20 Conduit Connections <sup>44</sup>
<b>Local Digital Indicator/Configurator</b>	
N	No Digital Indicator/Configurator
J	Digital Indicator/Configurator
<b>Electrical Certifications (refer to <i>Electrical Certifications, page 31</i>)<sup>45</sup></b>	
AA	ATEX Intrinsically Safe <sup>46</sup>
AD	ATEX Flameproof
BA	INMETRO Intrinsically Safe <sup>46</sup>
BD	INMETRO Flameproof <sup>46</sup>
CA	CSA Intrinsically Safe <sup>46</sup>
CD	CSA Explosionproof
CN	CSA Division 2 <sup>46</sup>
EA	IECEX Intrinsically Safe <sup>46</sup>
ED	IECEX Flameproof
FA	FM Intrinsically Safe <sup>46</sup>
FD	FM Explosionproof
FN	FM Nonincendive <sup>46</sup>
KD	KOSHA Flameproof <sup>46</sup>

41. For Multivariable Selection T, pulse output is always enabled.

42. Equivalent to Hastelloy® C-4C. Hastelloy is a registered trademark of Haynes International, Inc.

43. With Multivariable Selection T, the temperature element of the RTD is rated to 260°C (500°F). Use care with a Vortex high temperature sensor, which is rated to a higher temperature.

44. For remote mounting, select a cable length with the Cable for Connecting to Remote-Mounted Electronics option.

45. Contact Global Customer Support for availability.

46. Not available with Modbus (Electronics Version -M).

**Table 16 - Model Code for 84CW Flowmeters (Continued)**

Code	Description
NA	NEPSI Intrinsically Safe <sup>47</sup>
ND	NEPSI Flameproof <sup>47</sup>
RA	EAC Intrinsically Safe <sup>47</sup>
RD	EAC Flameproof <sup>47</sup>
YY	CE mark only; PED controls and records
ZZ	No CE mark; do not install in European Union countries
<b>Cable for Connecting to Remote-Mounted Electronics (Optional)</b>	
-B	6 m (20 ft) Cable
-D	9 m (30 ft) Cable
-E	12 m (40 ft) Cable
-G	15 m (50 ft) Cable
<b>Certificates of Compliance/Conformance (Optional)</b>	
-L	Standard Certificate of Compliance
-M	Material Certification of Process Wetted Metal (Conforms to EN 10204 Type 3.1 Certificate)
-Q	Process Wetted Parts Comply with NACE Standards MR-0175-2003 and MR-0103-2007
<b>Cable Connectors — with Mounting and Conduit Openings for Electronics Housing codes T and R only (1/2 NPT) (Optional)</b>	
-P	Hawke Cable Gland (available only with Electrical Certifications YY and ZZ)
-R	PG11 Cable Gland, Trumpet-Shaped (available only with Electrical Certifications YY and ZZ)
<b>Tamper-Resistant Options</b>	
-A	Tamper-Resistant Sealing for Housing and Covers
-S	Tamper-Resistant Cover over Bonnet Bolts
<b>Miscellaneous Optional Selections</b>	
-H	Cleaning of Process Wetted Parts for Oxygen/Chlorine Service per Compressed Gas Association's CGA G-4.1 and ASTM G93 <sup>48</sup>
-J	Gold-Plated Sensor
-N	Calibration and Pressure Test Certified Copy
-T	Adapter for 1/2–14 NPT Conduit (available only with Mounting and Conduit Openings for Electronics Housing code R, and with Electrical Certifications YY and ZZ)

47. Not available with Modbus (Electronics Version -M).

48. Available only with sensors that have Fluorolube fill. Not available with unfilled sensors or sensors that have silicone fill.

## NPT (Threaded) Body Style

**Table 17 - Model Code for 84CN Flowmeters**

Code	Description
<b>Model</b>	
84C	Vortex Flowmeter
<b>Body Style</b>	
N	NPT (Male) Threaded Connection
<b>Nominal Line Size</b>	
010	DN25; 25 mm (1 in)
020	DN50; 50 mm (2 in)
<b>Electronics Version</b>	
-T	HART Communication and 4 to 20 mA Output
-L	Low Power with HART Communication; Output Fixed at 10 mA
-M	Modbus Communication
<b>Pulse Output</b>	
P	Pulse Output Capability
<b>Body and Shedder Bar Material</b>	
R	ASTM A351-CF8M (Cast 316 ss) Body and Shedder Bar
<b>End Connections and Pressure Rating</b>	
V4	NPT Male Connection and: <ul style="list-style-type: none"> <li>ANSI Class 1500 Pressure Rating (Line Size 010)</li> <li>ANSI Class 900 Pressure Rating (Line Size 020)</li> </ul>
<b>Single or Dual Measurement; Isolation Manifold</b>	
S	Single Measurement; No Isolation Manifold
<b>Multivariable Selection</b>	
N	None
T	Temperature Compensation up to 260°C (500°F) <sup>49</sup>
<b>Sensor Fill, Temperature Range, and Material</b>	
<b>Standard Temperature Range (with Fill Fluid)</b>	
D	Fluorolube Fill, -18 to +93°C (0 to 200°F), Cast Nickel Alloy CW2M <sup>50</sup>
F	Fluorolube Fill, -18 to +93°C (0 to 200°F), Cast Stainless Steel CF3M
R	Silicone Fill, -18 to +204°C (0 to 400°F), Cast Nickel Alloy CW2M <sup>50</sup>
S	Silicone Fill, -18 to +204°C (0 to 400°F), Cast Stainless Steel CF3M

49. For Multivariable Selection T, pulse output is always enabled.

50. Equivalent to Hastelloy® C-4C. Hastelloy is a registered trademark of Haynes International, Inc.

**Table 17 - Model Code for 84CN Flowmeters (Continued)**

Code	Description
<b>Extended Temperature Range (No Fill Fluid)</b>	
A	Unfilled, 149 to 371°C (300 to 700°F), Cast Nickel Alloy CW2M <sup>51</sup> 52
B	Unfilled, 149 to 371°C (300 to 700°F), Cast Stainless Steel CF3M <sup>52</sup>
E	Unfilled, 149 to 427°C (300 to 800°F), Cast Nickel Alloy CW2M <sup>51</sup> 53
G	Unfilled, 149 to 427°C (300 to 800°F), Cast Stainless Steel CF3M <sup>53</sup>
<b>Mounting and Conduit Openings for Electronics Housing</b>	
T	Aluminum, Integral, Top-Mounted, with 1/2 NPT Conduit Connections
V	Aluminum, Integral, Top-Mounted, with M20 Conduit Connections
R	Aluminum, Remote-Mounted, with 1/2 NPT Conduit Connections <sup>54</sup>
W	Aluminum, Remote-Mounted, with M20 Conduit Connections <sup>54</sup>
<b>Local Digital Indicator/Configurator</b>	
N	No Digital Indicator/Configurator
J	Digital Indicator/Configurator
<b>Electrical Certifications (refer to <i>Electrical Certifications, page 31</i>)<sup>55</sup></b>	
AA	ATEX Intrinsically Safe <sup>56</sup>
AD	ATEX Flameproof
BA	INMETRO Intrinsically Safe <sup>56</sup>
BD	INMETRO Flameproof <sup>56</sup>
CA	CSA Intrinsically Safe <sup>56</sup>
CD	CSA Explosionproof
CN	CSA Division 2 <sup>56</sup>
EA	IECEX Intrinsically Safe <sup>56</sup>
ED	IECEX Flameproof
FA	FM Intrinsically Safe <sup>56</sup>
FD	FM Explosionproof
FN	FM Nonincendive <sup>56</sup>
KD	KOSHA Flameproof <sup>56</sup>
NA	NEPSI Intrinsically Safe <sup>56</sup>
ND	NEPSI Flameproof <sup>56</sup>
RA	EAC Intrinsically Safe <sup>56</sup>
RD	EAC Flameproof <sup>56</sup>
YY	CE mark only; PED controls and records
ZZ	No CE mark; do not install in European Union countries

51. Equivalent to Hastelloy® C-4C. Hastelloy is a registered trademark of Haynes International, Inc.

52. With Multivariable Selection T, the temperature element of the RTD is rated to 260°C (500°F). Use care with a Vortex high temperature sensor, which is rated to a higher temperature.

53. Not available with temperature compensation (Multivariable Selection T).

54. For remote mounting, select a cable length with the Cable for Connecting to Remote-Mounted Electronics option.

55. Contact Global Customer Support for availability.

56. Not available with Modbus (Electronics Version -M).

**Table 17 - Model Code for 84CN Flowmeters (Continued)**

Code	Description
<b>Cable for Connecting to Remote-Mounted Electronics (Optional)</b>	
-B	6 m (20 ft) Cable
-D	9 m (30 ft) Cable
-E	12 m (40 ft) Cable
-G	15 m (50 ft) Cable
<b>Certificates of Compliance/Conformance (Optional)</b>	
-L	Standard Certificate of Compliance
-M	Material Certification of Process Wetted Metal (Conforms to EN 10204 Type 3.1 Certificate)
-Q	Process Wetted Parts Comply with NACE Standards MR-0175-2003 and MR-0103-2007
<b>Cable Connectors — with Mounting and Conduit Openings for Electronics Housing codes T and R only (1/2 NPT) (Optional)</b>	
-P	Hawke Cable Gland (available only with Electrical Certifications YY and ZZ)
-R	PG11 Cable Gland, Trumpet-Shaped (available only with Electrical Certifications YY and ZZ)
<b>Tamper-Resistant Options</b>	
-A	Tamper-Resistant Sealing for Housing and Covers
-S	Tamper-Resistant Cover over Bonnet Bolts
<b>Miscellaneous Optional Selections</b>	
-H	Cleaning of Process Wetted Parts for Oxygen/Chlorine Service per Compressed Gas Association's CGA G-4.1 and ASTM G93 <sup>57</sup>
-J	Gold-Plated Sensor
-N	Calibration and Pressure Test Certified Copy
-T	Adapter for 1/2–14 NPT Conduit (available only with Mounting and Conduit Openings for Electronics Housing code R, and with Electrical Certifications YY and ZZ)

57. Available only with sensors that have Fluorolube fill. Not available with unfilled sensors or sensors that have silicone fill.



## Optional Selections and Accessories

### Options -A: Tamper-Resistant Sealing for Housing and Covers

This option is recommended if you need tamper-resistant sealing for the housing and covers.

### Options -B, -D, -E, and -G: Cable Assembly to Remote Electronics Housing

When selecting Code R or W for a Remote Mounted Housing, you must also select a cable length. Four cable lengths are offered:

Option	Cable Length	
	m	ft
-B	6	20
-D	9	30
-E	12	40
-G	15	50

### Option -H: Cleaning for Oxygen or Chlorine Gas Service

Process wetted parts are cleaned for oxygen or chlorine service in compliance with Compressed Gas Association's CGA-4.1 and ASTM G93.

### Option -J: Gold Plated Sensor

This option is recommended for H<sub>2</sub> (hydrogen) processes.

### Options -L, -M, and -Q: Schneider Electric Certificates of Conformance and Compliance

Three material certificates are offered.

- Option -L provides a certificate of compliance to the specifications of the Schneider Electric Quality System, which conforms to ISO 9001.
- Option- M is a certification of material for process wetted metal (conforms to EN 10204 Type 3.1 certificate).
- Option -Q certifies that process-wetted materials meet NACE Standards MR-0175-2003 and MR-0103-2007.

### Option -N: Certified Calibration Certificate

A calibration and pressure test sheet are supplied with each flowmeter by default. Option -N provides a *certified* flow calibrated K-factor and pressure test certificate.

## Options -F, and-X: Welding Certificates

Two optional certificates are available with flanged 84C flowmeters:

- Option -F certifies that the fabrication of flowtubes by welders is to ASME Boiler Code, Section IX.
- Option -X certifies that welding is per ASME Boiler Code, Section IX and Radiographic Examination.

## Option -P: Cable Connector – Hawke-Type Cable Gland

A brass cable gland with ½ NPT external thread provides support for field cable. This cable connector must be qualified to meet the electrical safety specification selected. This option is only available with Mounting and Conduit Openings for Electronics Housing selections T and R (½ NPT) and Electrical Certifications selections YY and ZZ.

## Option -R: Cable Connector – PG11 Cable Gland

A PG11 cable gland with ½ NPT external thread provides strain-relieved support for the field cable. The PG11 is for cable diameters from 0.31 to 0.47 inches (8 to 12 mm). This cable connector must be qualified to meet the electrical safety specification selected. This option is only available with Mounting and Conduit Openings for Electronics Housing selections T and R (½ NPT) and Electrical Certifications selections YY and ZZ.

## Options -S: Tamper-Resistant Cover for Bonnet Bolts

This option is recommended if you need a tamper-resistant cover over the bonnet bolts.

## Option -T: Conduit Fitting

A conduit fitting is available with Mounting and Conduit Openings for Electronics Housing selection R (½ NPT). It is provided when conduit is used to enclose the cable between the flowtube body and the remote transmitter. Both ends of the fitting are ½ NPT and interconnect the conduit and transmitter at the housing and flowtube ends. This option is only available with Mounting and Conduit Openings for Electronics Housing selection R (½ NPT) and Electrical Certifications selections YY and ZZ.

## Auxiliary Specification (AS) Code MTS: Stainless Steel Customer Tag Accessory

A 40 x 90 mm (1.5 x 3.5 in) stainless steel tag is offered as an option for customer data that does not fit on the standard plate. The stainless steel tag accessory is fastened to the housing with wire, and accommodates 10 lines of data with 40 characters/spaces per line. This tag will also show the K-factor (information with flowing conditions being submitted with sales order).

## Bolting Kits for 84CW

You can separately order bolting kits for wafer body flowmeters using the part numbers in the following tables. Bolting kits contain carbon steel studs and nuts that conform to line size and ANSI or DIN size and rating. Kits are offered for ¾- to 4-inch line sizes for ANSI flanges, and DN50 to DN100 line sizes for DIN flanges

**Table 18 - ANSI Flange Bolting Kit Part Numbers**

Size	Class 150	Class 300	Class 600
¾ inch	D0148ZF	D0148ZJ	D0148ZJ
1 inch	D0148ZF	D0148ZJ	D0148ZJ
1½ inch	D0148ZF	D0148ZK	D0148ZS
2 inch	A2044HB	A2044HB <sup>58</sup>	A2044HC <sup>58</sup>
3 inch	A2044HC	A2044HD	A2044HD
4 inch	A2044HC <sup>58</sup>	A2044HD	A2044HE

**Table 19 - Metric Flange Bolting Kit Part Numbers**

Size	PN16	PN40	PN64	PN100
DN50	N/A	D0148ZU	N/A	N/A
DN80	NA	D0148ZZ <sup>58</sup>	N/A	N/A
DN100	L0114NT	L0114NT	N/A	N/A

58. Two kits are required.

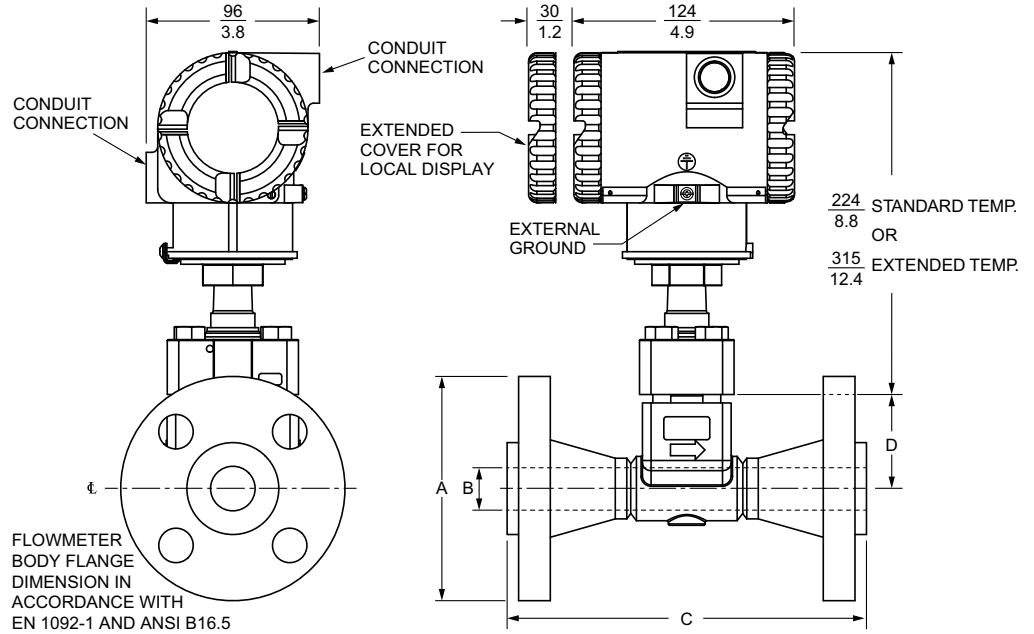
# Nominal Dimensions

For dimensional information specific to your sales order, contact your sales representative to order a Certified Dimensional Print (CDP).

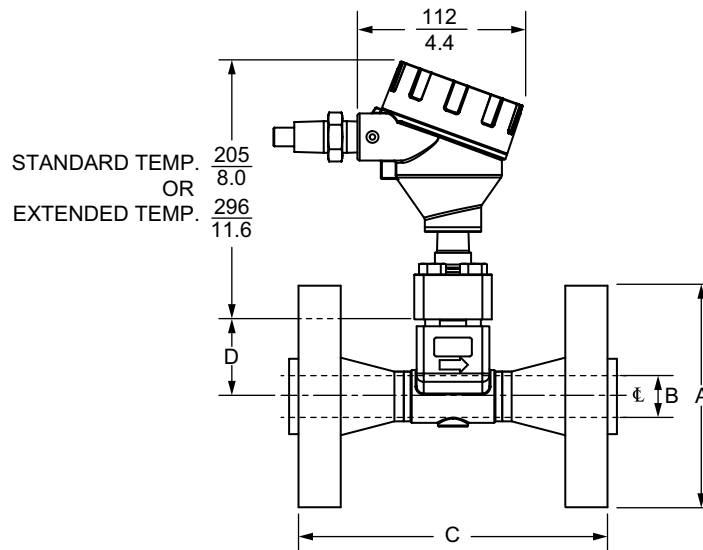
All dimensions in diagrams are shown in millimeters over inches ( $\frac{\text{mm}}{\text{in}}$ ).

## Dimensions for 84C Flanged Body Flowmeters

**Figure 2 - Flanged Body Flowmeter with Integrally Mounted Electronics Housing**



**Figure 3 - Flanged Body Flowmeter with Junction Box**



**Table 20 - Flanged Body, with ANSI Flanges and Material Code R or E**

Nominal Line Size	Flange Type	Dimension A (OD)	Dimension B (ID)	Dimension C <sup>59</sup>		Dimension D
				RF Flange	RTJ Flange	
008	Class 150	3.88 in	0.74 in	6.56 in	—	1.82 in
	Class 300	4.62 in		6.94 in	7.32 in	
	Class 600			7.44 in	7.44 in	
	Class 900	5.12 in		8.44 in	8.44 in	
	Class 1500					
010	Class 150	4.25 in	0.96 in	6.80 in	7.18 in	1.93 in
	Class 300	4.88 in		7.32 in	7.70 in	
	Class 600			7.82 in	7.82 in	
	Class 900	5.88 in		8.70 in	8.70 in	
	Class 1500					
015	Class 150	4.62 in	1.50 in	7.32 in	7.70 in	2.20 in
	Class 300	6.12 in		7.82 in	8.20 in	
	Class 600			8.44 in	8.44 in	
	Class 900	7.00 in		9.44 in	9.44 in	
	Class 1500					
020	Class 150	6.00 in	1.94 in	7.75 in	8.13 in	2.32 in
	Class 300	6.50 in		8.25 in	8.75 in	
	Class 600			9.01 in	9.13 in	
	Class 900	8.50 in	11.25 in	11.37 in		
	Class 1500		1.69 in		2.20 in	
030	Class 150	7.50 in	2.87 in	8.88 in	9.26 in	2.75 in
	Class 300	8.25 in		9.62 in	10.12 in	
	Class 600			10.38 in	10.50 in	
	Class 900	9.50 in		11.88 in	12.00 in	
	Class 1500	10.50 in	2.63 in	13.12 in	13.25 in	2.62 in
040	Class 150	9.00 in	3.83 in	9.62 in	10.00 in	3.35 in
	Class 300	10.00 in		10.38 in	10.88 in	
	Class 600	10.75 in		12.12 in	12.24 in	
	Class 900	11.50 in	13.12 in	13.24 in		
	Class 1500	12.25 in	3.44 in	13.88 in	14.00 in	
060	Class 150	11.00 in	5.76 in	12.00 in	12.38 in	4.42 in
	Class 300	12.50 in		12.76 in	13.26 in	
	Class 600	14.00 in		14.74 in	14.86 in	
	Class 900	15.00 in	5.19 in	16.50 in	16.62 in	
	Class 1500	15.50 in		19.00 in	19.25 in	

59. For line sizes 008 through 010, the overall length (dimension C) is  $\pm 6.4$  mm ( $\pm 0.250$  in). For line size 120, the overall length is  $\pm 8.9$  mm ( $\pm 0.350$  in).

**Table 20 - Flanged Body, with ANSI Flanges and Material Code R or E (Continued)**

Nominal Line Size	Flange Type	Dimension A (OD)	Dimension B (ID)	Dimension C <sup>60</sup>		Dimension D
				RF Flange	RTJ Flange	
080	Class 150	13.50 in	7.63 in	15.00 in	15.38 in	5.47 in
	Class 300	15.00 in		15.75 in	16.26 in	
	Class 600	16.50 in		18.00 in	18.12 in	
	Class 900	18.50 in	6.81 in	20.26 in	20.38 in	
	Class 1500	19.00 in		24.26 in	24.64 in	
100	Class 150	16.00 in	9.56 in	15.00 in	15.38 in	6.55 in
	Class 300	17.50 in		16.24 in	16.74 in	
	Class 600	20.00 in		19.5 in	19.62 in	
120	Class 150	19.00 in	11.37 in	17.00 in	17.38 in	7.55 in
	Class 300	20.50 in		18.24 in	18.24 in	
	Class 600	22.00 in		20.74 in	20.76 in	

**Table 21 - Flanged Body, with DIN Flanges and Material Code R or E**

Nominal Line Size	Flange Type	Dimension A (OD)	Dimension B (ID)	Dimension C <sup>60</sup>	Dimension D
008	PN 40 <sup>61</sup>	95 mm	19 mm	138 mm	46 mm
	PN 100	105 mm		152 mm	
010	PN 40 <sup>61</sup>	115 mm	24.31 mm	142 mm	49 mm
	PN 100	140 mm		178 mm	
	PN 160				
015	PN 40 <sup>61</sup>	150 mm	38.10 mm	152 mm	56 mm
	PN 100	170 mm		186 mm	
	PN 160			190 mm	
020	PN 40 <sup>61</sup>	165 mm	49 mm	166 mm	59 mm
	PN 63	180 mm		194 mm	
	PN 100	195 mm		206 mm	
	PN 160			220 mm	
030	PN 40 <sup>61</sup>	200 mm	73 mm	202 mm	70 mm
	PN 63	215 mm		230 mm	
	PN 100	230 mm		242 mm	
	PN 160			258 mm	
040	PN 40 <sup>61</sup>	235 mm	97 mm	222 mm	85 mm
	PN 63	250 mm		248 mm	
	PN 100	265 mm		272 mm	
	PN 160			292 mm	

60. For line sizes 008 through 010, the overall length (dimension C) is ±6.4 mm (±0.250 in). For line size 120, the overall length is ±8.9 mm (±0.350 in).

61. May be used with a PN 25 mating flange.

**Table 21 - Flanged Body, with DIN Flanges and Material Code R or E (Continued)**

Nominal Line Size	Flange Type	Dimension A (OD)	Dimension B (ID)	Dimension C <sup>62</sup>	Dimension D
060	PN 16	285 mm	146 mm	237 mm	112 mm
	PN 40 <sup>63</sup>	300 mm		277 mm	
	PN 63	345 mm		317 mm	
	PN 100	355 mm		357 mm	
	PN 160		132 mm	383 mm	
080	PN 16	340 mm	194 mm	302 mm	139 mm
	PN 25	360 mm		338 mm	
	PN 40	375 mm		354 mm	
	PN 63	415 mm		398 mm	
	PN 100	430 mm		438 mm	
	PN 160		173 mm	458 mm	
100	PN 16	405 mm	243 mm	318 mm	166 mm
	PN 25	425 mm		354 mm	
	PN 40	450 mm		388 mm	
	PN 63	470 mm		428 mm	
	PN 100	505 mm		492 mm	
120	PN 16	460 mm	289 mm	359 mm	192 mm
	PN 25	485 mm		387 mm	
	PN 40	515 mm		433 mm	
	PN 63	530 mm		483 mm	
	PN 100	585 mm		543 mm	

**Table 22 - Flanged Body, with ANSI Flanges and Material Code Y (Backward Compatible with Style A)**

Nominal Line Size	Flange Rating <sup>64</sup>	Dimension A (OD)	Dimension B (ID)	Dimension C <sup>65</sup>	Dimension D
008	Class 150	3.88 in	0.74 in	6.00 in	1.82 in
	Class 300	4.62 in		6.50 in	
	Class 600				
010	Class 150	4.25 in	0.96 in	6.50 in	1.93 in
	Class 300	4.88 in		7.00 in	
	Class 600				
015	Class 150	4.62 in	1.50 in	7.25 in	2.20 in
	Class 300	6.12 in		7.88 in	
	Class 600				
020	Class 300	6.50 in	1.94 in	7.75 in	2.32 in
	Class 600			8.50 in	

62. For line sizes 008 through 010, the overall length (dimension C) is  $\pm 6.4$  mm ( $\pm 0.250$  in). For line size 120, the overall length is  $\pm 8.9$  mm ( $\pm 0.350$  in).

63. May be used with a PN 25 mating flange.

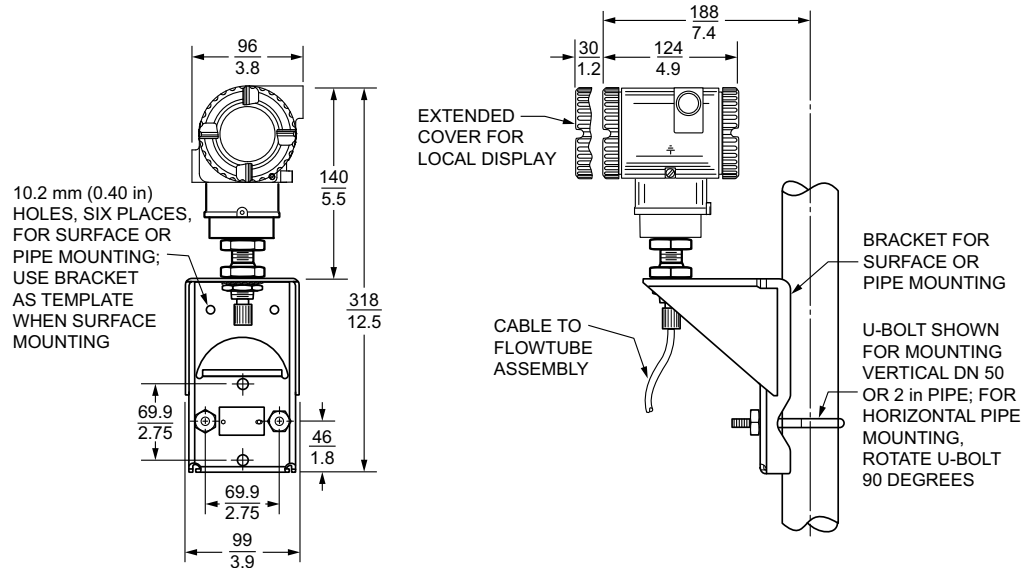
64. For ANSI flanges, material code Y offers face-to-face lengths that are backward compatible with the Style A vortex flowmeters model code selection S. Use material code Y when replacing a Model 84F Style A meter.

65. Overall length (C) is  $\pm 0.250$  in ( $\pm 6.4$  mm).

**Table 22 - Flanged Body, with ANSI Flanges and Material Code Y (Backward Compatible with Style A) (Continued)**

Nominal Line Size	Flange Rating <sup>66</sup>	Dimension A (OD)	Dimension B (ID)	Dimension C <sup>67</sup>	Dimension D
030	Class 300	8.25 in	2.87 in	8.75 in	2.75 in
	Class 600			9.50 in	
040	Class 300	10.00 in	3.83 in	9.50 in	3.35 in
	Class 600	10.75 in		10.50 in	

**Figure 4 - Remotely Mounted Electronics Housing for 84CF**



**NOTE:** WHEN THE BRACKET IS USED FOR WALL MOUNTING, REPLACE THE U-BOLT WITH TWO OR FOUR 0.375 in BOLTS LONG ENOUGH TO PASS THROUGH THE BRACKET AND SURFACE.

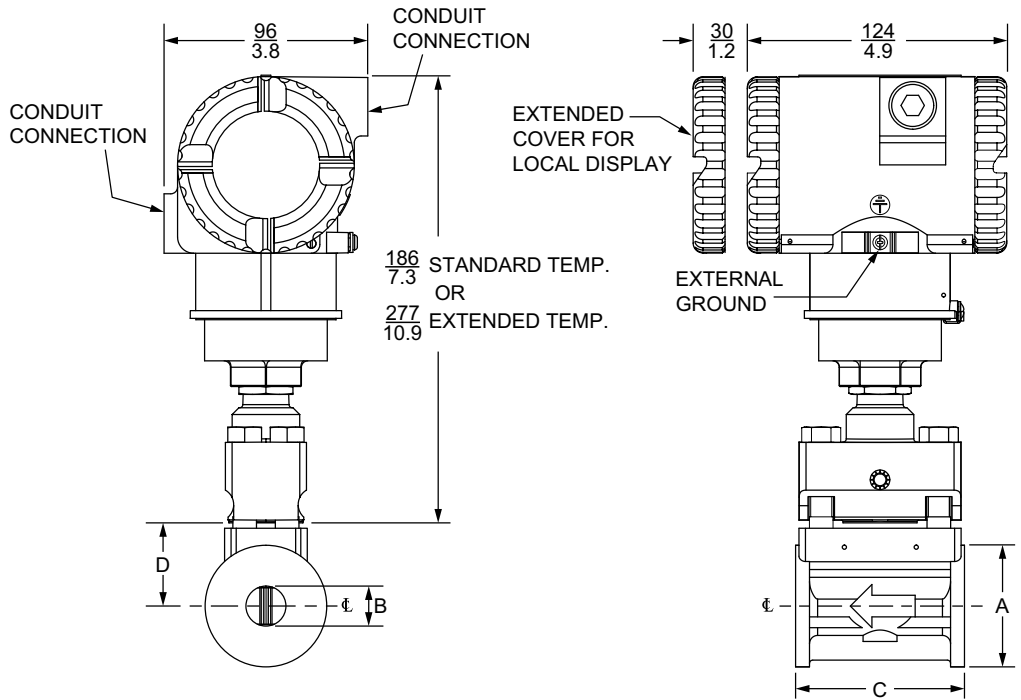
66. For ANSI flanges, material code Y offers face-to-face lengths that are backward compatible with the Style A vortex flowmeters model code selection S. Use material code Y when replacing a Model 84F Style A meter.

67. Overall length (C) is  $\pm 0.250$  in ( $\pm 6.4$  mm).

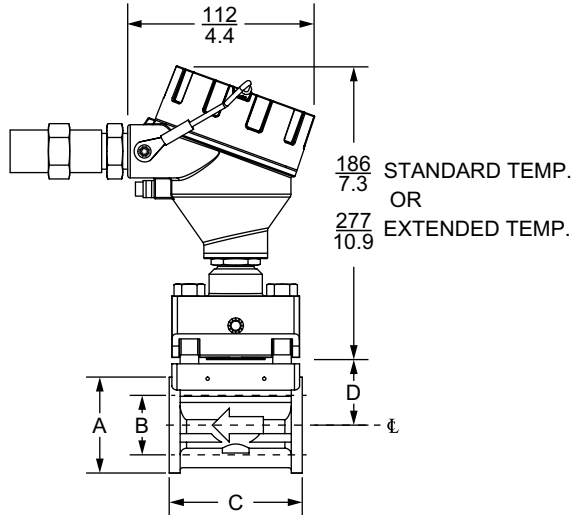


## Dimensions for 84C Wafer Body Flowmeters

**Figure 5 - Wafer Body Flowmeter with Integrally Mounted Electronics Housing**



**Figure 6 - Wafer Body Flowmeter with Junction Box**



**Table 23 - Wafer Body Dimensions**

Nominal Line Size <sup>68</sup>	Dimension A (OD)	Dimension B (ID) <sup>69</sup>	Dimension C	Dimension D
008	57.2 mm (2.25 in)	18.8 mm (0.74 in)	79.5 mm (3.13 in)	36.6 mm (1.44 in)
010	66.8 mm (2.63 in)	24.3 mm (0.96 in)	79.5 mm (3.13 in)	39.4 mm (1.55 in)
015	85.9 mm (3.38 in)	38.1 mm (1.50 in)	79.5 mm (3.13 in)	46.2 mm (1.82 in)

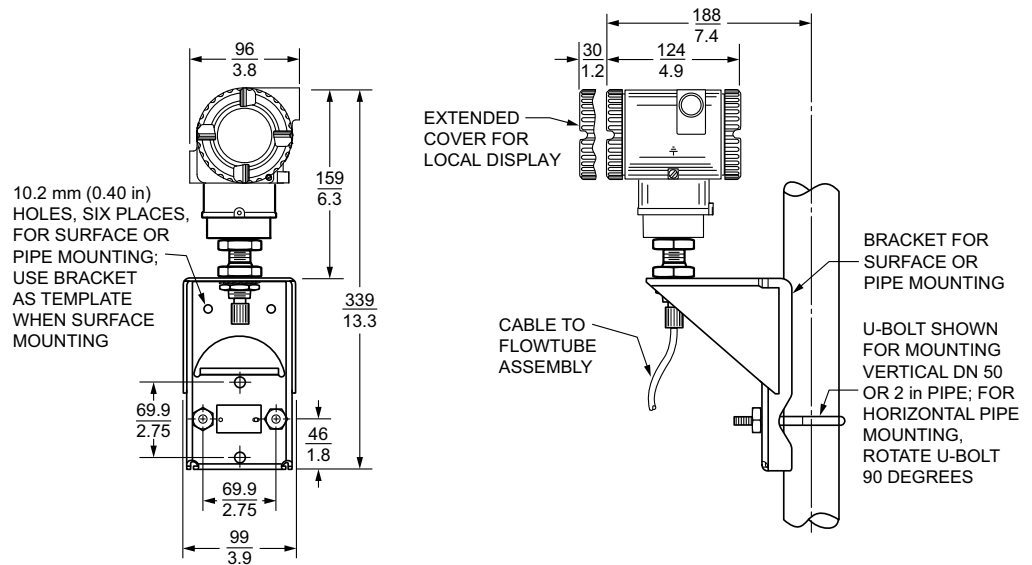
68. Flowmeter body fits between ANSI Class 150, 300, or 600 raised face flanges, or between PN 16, 40, 63, or 100 flanges.

69. Bore equivalent to Schedule 80 pipe.

**Table 23 - Wafer Body Dimensions (Continued)**

Nominal Line Size <sup>70</sup>	Dimension A (OD)	Dimension B (ID) <sup>71</sup>	Dimension C	Dimension D
020	104.6 mm (4.12 in)	49.2 mm (1.94 in)	79.5 mm (3.13 in)	49.3 mm (1.94 in)
030	136.7 mm (5.38 in)	72.9 mm (2.87 in)	95.3 mm (3.75 in)	60.2 mm (2.37 in)
040	174.5 mm (6.87 in)	96.7 mm (3.81 in)	120.7 mm (4.75 in)	73.9 mm (2.91 in)
060	222.3 mm (8.75 in)	147.3 mm (5.80 in)	177.8 mm (7.00 in)	98.0 mm (3.86 in)
080	279.4 mm (11.00 in)	193.0 mm (7.60 in)	228.6 mm (9.00 in)	122.9 mm (4.84 in)

**Figure 7 - Remotely Mounted Electronics Housing for 84CW**



**NOTE:** WHEN THE BRACKET IS USED FOR WALL MOUNTING, REPLACE THE U-BOLT WITH TWO OR FOUR 0.375 in BOLTS LONG ENOUGH TO PASS THROUGH THE BRACKET AND SURFACE.

70. Flowmeter body fits between ANSI Class 150, 300, or 600 raised face flanges, or between PN 16, 40, 63, or 100 flanges.

71. Bore equivalent to Schedule 80 pipe.

# Dimensions for 84C NPT Body Flowmeters

Figure 8 - NPT Body Flowmeter with Integrally Mounted Electronics Housing

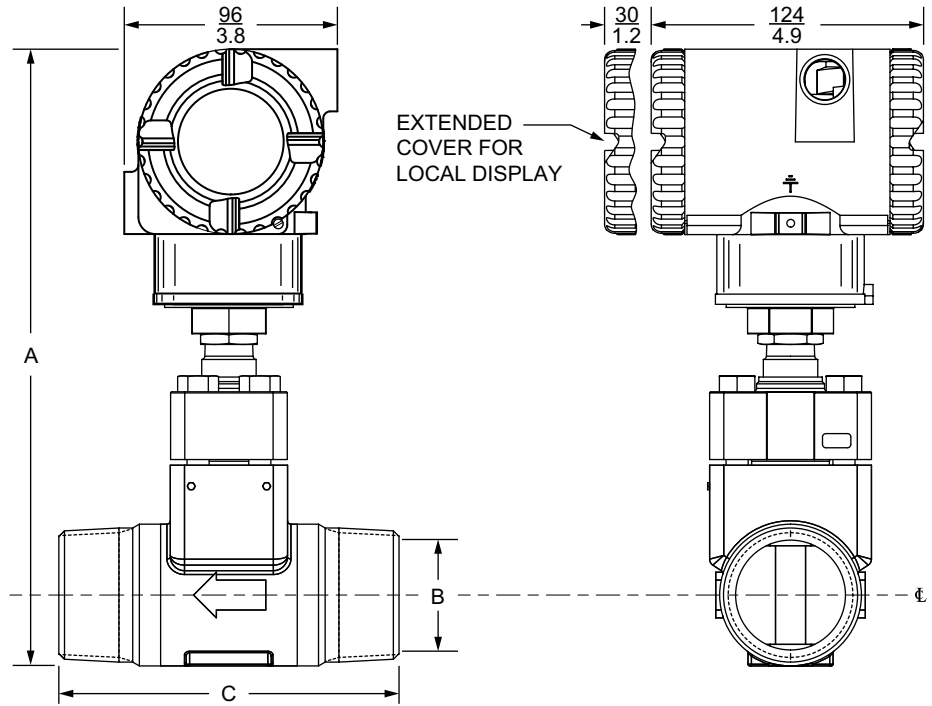
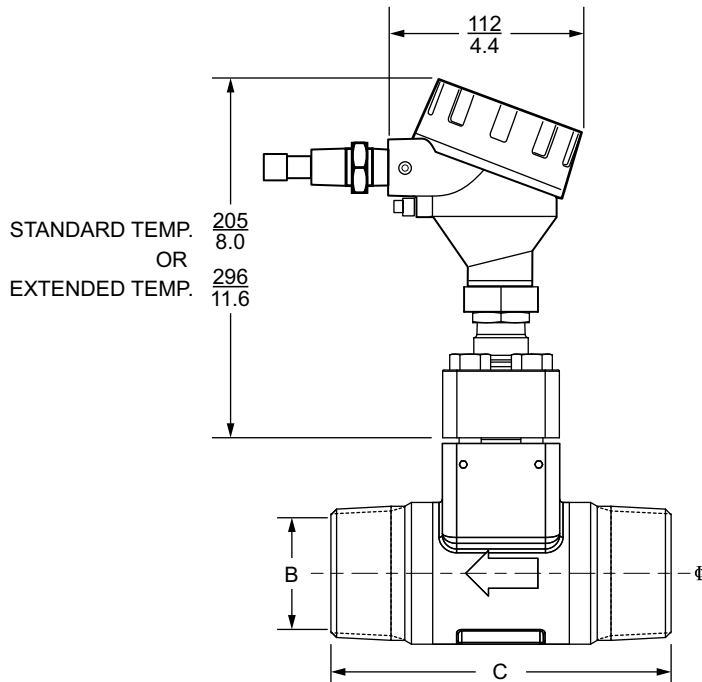


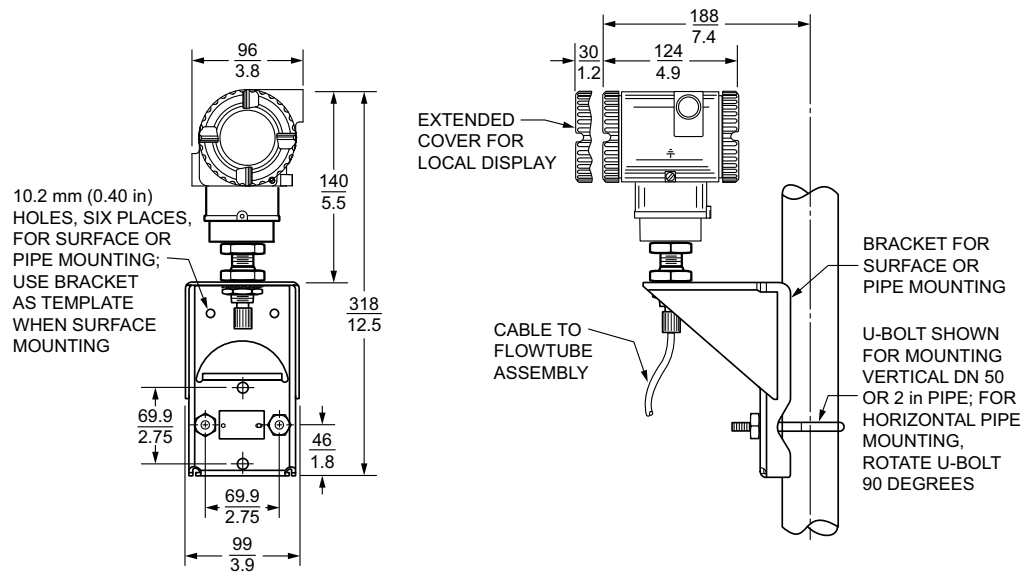
Figure 9 - NPT Body Flowmeter with Junction Box



**Table 24 - NPT Body Dimensions**

Nominal Line Size	Dimension A		Dimension B (ID)	Dimension C
	Standard Temperature	Extended Temperature		
010	251 mm (9.9 in)	342 mm (13.5 in)	24.3 mm (0.96 in)	101.6 mm (4.0 in)
020	277 mm (10.9 in)	368 mm (14.5 in)	49.2 mm (1.94 in)	152.4 mm (6.0 in)

**Figure 10 - Remotely Mounted Electronics Housing for 84CN**



**NOTE:** WHEN THE BRACKET IS USED FOR WALL MOUNTING, REPLACE THE U-BOLT WITH TWO OR FOUR 0.375 in BOLTS LONG ENOUGH TO PASS THROUGH THE BRACKET AND SURFACE.

# Ordering Instructions

1. Model Code
2. Flow data:
  - a. Maximum, minimum, and normal flow rate
  - b. Fluid composition and viscosity at operating temperatures
  - c. Fluid density or relative density (specific gravity)
  - d. Maximum, minimum, and normal operating temperatures
  - e. Maximum, minimum, and normal operating pressures
  - f. Mating pipe schedule
  - g. Type and location (distance) of upstream disturbances
3. Personality:
  - a. General
  - b. Steam
  - c. Oil & Gas
4. Calibration Information (analog output only); maximum flow rate at 20 mA output
5. Customer Tag Data

Schneider Electric Systems USA, Inc.  
38 Neponset Avenue  
Foxboro, MA 02035  
United States of America

1-866-746-6477 inside the U.S.  
1-508-549-2424 outside the U.S.

[pasupport.schneider-electric.com](http://pasupport.schneider-electric.com)

As standards, specifications, and design change from time to time,  
please ask for confirmation of the information given in this publication.

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