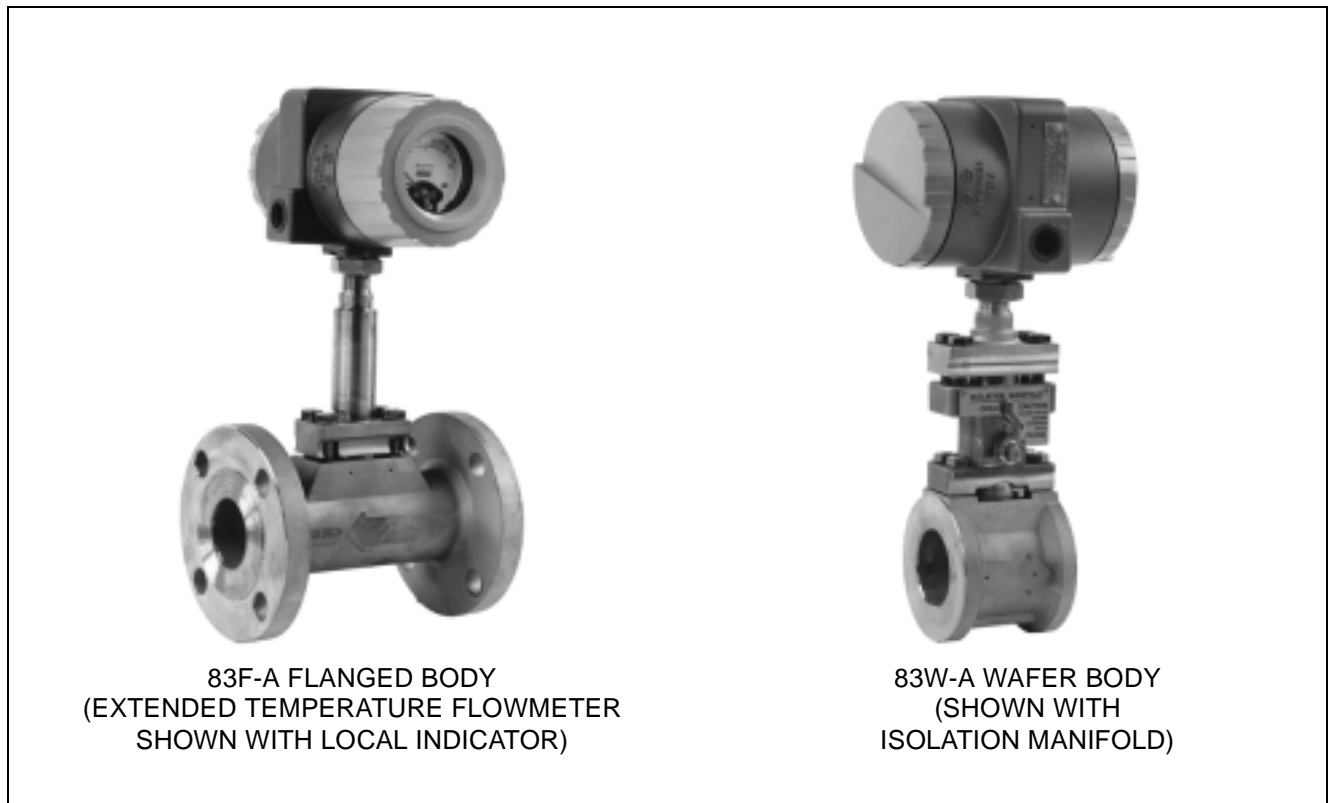


83F–A Flanged Body Vortex Flowmeter

83W–A Wafer Body Vortex Flowmeter

4 to 20 mA Analog and Pulse Output



The 83F–A and the 83W–A comprise a family of high performance vortex flowmeters.

FEATURES

- Used on Liquids, Gases, and Steam
- 4 to 20 mA and Pulse Flowmeter Outputs; User-Selectable
- Outputs Compatible with all Types of Totalizing and Control Loops
- Rangeability up to 100:1
- Wide Temperature Range up to 430°C (800°F)
- Hastelloy C or Stainless Steel Bodies and Flanges
- A Very Wide Selection of Sizes
 - Flanged Body: 15 to 300 mm (3/4 to 12 in)
 - Wafer Body: 15 to 200 mm (3/4 to 8 in)
- Field Adjustable Low Flow Cut-In Selections
- Isolation Valve Offered to allow Sensor Replacement without Interrupting Flow in Pipe
- Pulse Train Smoothing Enhances Low Flow Measurement
- Rapid Response Time
- Flow Rate Indicator with a Selection of Scales for both 4 to 20 mA and Pulse output
- FlowExpert Sizing Program greatly Simplifies Flowmeter Selection
- Can be used in Hazardous Area Locations
- Dual Measurement Capability (83F only)
- Conforms to Applicable European Union Directives (Product marked with “CE” logo)

LIFETIME WARRANTY

Sensor Warranty against workmanship and material defects for lifetime of flowmeter – contact Foxboro.

DESIGNED FOR HIGH PROCESS TEMPERATURE APPLICATIONS

The 83F and 83W are part of a large line of Foxboro Vortex Flowmeters. These flowmeters for liquid, gas, and steam are offered for general purpose applications at process temperatures up to 200°C (400°F) and for high temperature applications at process temperatures up to 430°C (800°F).

In addition to 83F and 83W Analog Output Flowmeters, Foxboro also offers . . .

83F-D, -T and 83W-D, -T I/A Series® Intelligent Vortex Flowmeters that provide a Scaled Pulse Output, a 4 to 20 mA Analog Output, or a Digital Output with either FoxCom or HART Communication Protocol. See PSS 1-8A1 E.

83S-D, -T I/A Series Intelligent Sanitary Vortex Flowmeter that provides the same outputs as the I/A Series Flanged and Wafer Body Flowmeters described above. See PSS 1-8A2 D.

83S-A Sanitary Vortex Flowmeter that provides a 4 to 20 mA Analog Output or Pulse Output. See PSS 1-8A2 E.

HIGH PERFORMANCE AT LOWER COST

Foxboro's patented family of vortex flowmeters has the high accuracy and rangeability of positive displacement and turbine flowmeters without the mechanical complexity and high cost. Calibrated flow rangeability is 15:1 (with a useful range as high as 40:1 in liquids and 100:1 in gases and steam) compared to 3:1 for a differential pressure producer (orifice plate). Because the 83F-A and 83W-A Vortex Flowmeters have no moving parts, they are very durable and reliable. This simplicity of design ensures low initial cost, low operating and maintenance costs, and therefore contributing to an overall low cost of ownership.

SIMPLIFIED START-UP

Foxboro will pre-configure the flowmeter using flow data supplied by the customer. No primary device calculations or mechanical calibrations are required if the flow data is supplied when placing the order. This allows the user to simply install the flow-calibrated flowmeter and connect wiring to the proper power source and readout or control instrumentation, and the 83F-A or 83W-A is ready to measure flow.

When flow data is not provided, the flowmeter is shipped partially configured. On-site configuration can be completed using easily accessible DIP-switches.

WIDE VARIETY OF APPLICATIONS

The 83F-A Vortex Flowmeter is available in nominal 15 to 300 mm (3/4 to 12 in) line sizes and the 83W-A Vortex Flowmeter is available in nominal 15 to 200 mm (3/4 to 8 in) line sizes. Water velocities (at standard conditions) of up to 7.7 m/s (25.3 ft/s), and gas or steam velocities of up to 185 m/s (600 ft/s) can be accommodated. These flowmeters set 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.

COMPACT, EFFICIENT AND DURABLE DESIGN

Offered in common line sizes, the 83F and 83W bodies are designed for mounting between ANSI or DIN raised face flanges. See Model Code section of this document for end connections offered with each line size.

The electronics housing is of explosionproof construction and provides environmental protection to the enclosed amplifier, terminal block, and integral flow rate indicator. The housing is offered integrally mounted to the flowtube assembly, or can be mounted in a location remote from the flowmeter body.

This uncomplicated design means minimum flowmeter maintenance. Parts are common to all sizes and are field replaceable – including the sensor assembly and the plug-in amplifier. The amplifier can be replaced without interrupting the flow in the pipe; the sensor can be replaced without process shutdown when an isolation valve is installed. Since a single device can be used for multiprocess-fluid applications, user operation is simplified and spare parts are minimized.

OUTPUT IS COMPATIBLE WITH ALL TYPES OF TOTALIZING AND CONTROL LOOPS

These flowmeters transmit two different types of output signals that are linearly proportional to volumetric flow rate. The flowmeters produce a pulse rate signal for totalizing and batching, or an electronic analog 4 to 20 mA dc signal for recording and control of flow rate.

FLOW RATE INDICATOR

A Flow Rate Indicator is available for both the analog (4 to 20 mA) and pulse output flowmeters. Linear indicator scales, either 0 to 100% or with ten equally spaced divisions, are offered for both output versions. The Flow Rate Indicator is a Model Code Selection.

DUAL MEASUREMENT FLOWMETER

Dual Measurement Vortex Flowmeters provide the user with redundant sensors and electronics. Essentially two electronics housings and sensors are mounted to the flowmeter body assembly as depicted in the “DIMENSIONS-NOMINAL” section. In the event that one transmitter fails, the redundant measurement avoids the necessity of shutting down the process. The failed transmitter can then be replaced at some later noncritical time. Applications include Safety Shutdown Systems (independent of Process Measurement Network), Safety Backup for critical flow loops, Comparative Verification of Measurement for high accuracy precision loops, or just for dual communications paths with the same primary element. Dual Measurement configurations are only offered with flanged body flowmeters, and are a Model Code selection.

REMOTE MOUNTED ELECTRONICS HOUSING

This flowmeter configuration allows access to amplifier and other housing parts when the measurement is not in an easily accessible location. The remote mounted electronics housing can be located up to 15.2 m (50 ft) from the measurement without loss of low level signal. The housing meets the requirements of IEC IP66 and provides the environmental protection of NEMA Type 4X. It is a Model Code selection.

ISOLATION VALVE(S)

Isolation valves can be selected that allow sensor(s) to be removed or replaced without interrupting the flow in the pipe. They are available for both standard and high temperature flowmeters. In single measurement configuration the isolation valve is a stand-alone device. It attaches to the flowmeter body in the location normally occupied by the sensor and bonnet. The sensor is then mounted in the isolation valve. For dual measurement configurations, two independent isolation valves are built into the manifold. See “DIMENSIONS-NOMINAL” section. Isolation valving is a Model Code selection.

“CE” COMPLIANCE

The 83F-A and 83W-A Vortex Flowmeters display on the product the “CE” designation (logo) indicating conformance to the applicable new European Community Standards for immunity to sources of electromagnetic interference. This compliance with European Community Standards also includes conformance to a maximum level of self-generated electromagnetic energy.

DESIGNED FOR USE IN HAZARDOUS LOCATIONS

These flowmeters have been designed to meet the approval requirements of many certifying agencies for use in hazardous area locations. Refer to “Product Safety Specifications” section.

OPERATING CONDITIONS(a)

Influence	Calibration Operating Conditions(b)	Normal Operating Condition Limits	Operative Limits
Process Fluid	Clear Water	Liquid	Liquid
Process Temperature	20 to 30°C (70 to 85°F)	-18 and +200°C (0 and 400°F)	-18 and +200°C (0 and 400°F)
Ambient Temperature (Electronics Housing)	20 to 30°C (70 to 85°F)	-40 and +85°C (-40 and +185°F)	-40 and +85°C (-40 and +185°F)
Relative Humidity	50 to 90% RH	0 and 100%	0 and 100%
Supply Voltage: • Pulse • Analog(c)	24 V dc 24 V dc	10.5 and 50 V dc 10.5 and 50 V dc	10.5 and 50 V dc 10.5 and 50 V dc
Loop Load: • Pulse • Analog(c)	R = 100 kΩ, C = 0 μF 300 Ω(c)	R = 100 kΩ, C = 0.05 μF 0 and 1925Ω(c)	R = 10 kΩ min, C = 0.05 μF 0 and 1925Ω(c)

(a) Limited to nonflashing, noncavitating conditions. Flow rate and temperature of process may induce flashing and cavitation which is dependent on pressure drop and process vapor pressure. A minimum positive back-pressure is required for proper operation.

(b) Assumes compatible process piping and fittings; gaskets not protruding into process line; a minimum of thirty pipe diameters of straight pipe upstream of flowmeter and eight pipe diameters downstream; clear water free of air or particles.

(c) The loop load can vary as listed, depending on the supply voltage used. See Figure 2 for a plot of supply voltage vs. loop load.

PERFORMANCE SPECIFICATIONS

(Under Reference Operating Conditions unless Otherwise Specified)

Factory Calibration Conditions

Nominal Meter Size	Nominal Mean K-Factor in Pulses/ft ³ (Pulses/L)	Factory-Calibrated Flow Range for Water		
		Range in US gpm (L/s)	Range in L/s	Reynolds Number Range
3/4 in (15 mm)	5580 (197)	6.9 to 34	0.43 to 2.1	30 000 to 150 000
1 in (25 mm)	2250 (79.5)	8.9 to 56	0.56 to 3.5	30 000 to 190 000
1 1/2 in (40 mm)	570 (20.1)	14 to 140	0.88 to 8.7	30 000 to 300 000
2 in (50 mm)	258 (9.11)	18 to 230	1.1 to 15	30 000 to 380 000
3 in (80 mm)	78.7 (2.78)	34 to 500	2.1 to 32	38 000 to 570 000
4 in (100 mm)	34.8 (1.23)	59 to 890	3.7 to 56	50 000 to 750 000
6 in (150 mm)	10.00 (0.353)	140 to 2000	8.5 to 130	76 000 to 1 100 000
8 in (200 mm)	4.26 (0.150)	240 to 3600	15 to 220	100 000 to 1 500 000
10 in (250 mm)	1.99 (0.0703)	390 to 5800	24 to 370	130 000 to 1 900 000
12 in (300 mm)	1.16 (0.0410)	560 to 8400	36 to 530	160 000 to 2 300 000

NOTES: 1) The K-factor is the relationship between input (volumetric flow rate) and the output (pulse rate).

2) Mean K-factor: The arithmetic mean value of K-factor over a designated flow rate range (reference conditions).

The mean K-factor is derived as:

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

Where KMAX is the Maximum K-factor and KMIN is the Minimum K-factor over the calibrated flow range.

Accuracy - General

The accuracy of the meters, stated in next paragraphs, is under calibration operating conditions (see Operating Conditions table). Installation parameters such as location of valves, proximity to elbows, etc., will affect the accuracy of the flow measurement. Data is presented in MI 019-189 to correct the measurement for these effects.

The accuracy below 20 000 R_D is not specified because the K-factor deviates from its reference value at low flows. For applications below 20 000 R_D, the I/A Series Intelligent Vortex Flowmeter is recommended. See PSS 1-8A1 E.

Accuracy for Liquids (Figure 1)

Accuracy within factory-calibrated Reynolds Number range is ±0.5%. Outside the calibrated range, the accuracy is ±1% of reading for flow rates with Reynolds Number of 20 000 or greater.

Accuracy for Gases and Steam

Accuracy is ±1% of reading for flow rates with Reynolds Number of 20 000 or greater.

Relative Humidity Effect

There is no effect due to relative humidity as long as the covers and seals are properly installed.

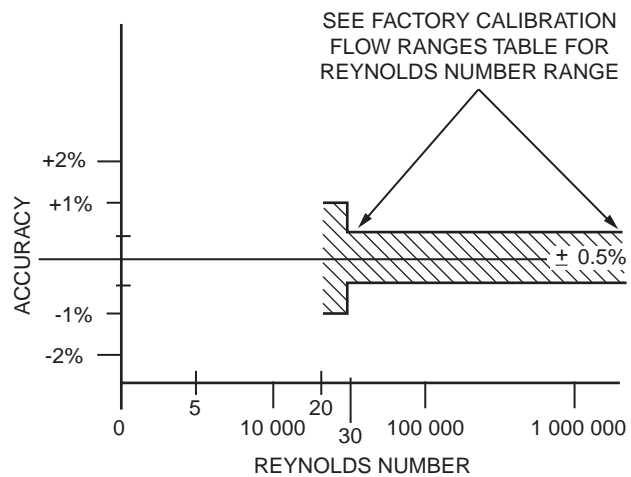


Figure 1. Flowmeter Accuracy for Liquids

Process Liquid Viscosity Effect

The viscosity of liquids must be known when choosing a vortex flowmeter for low flow applications. High viscosity will reduce the ability of the flowmeter to measure low flow. Below 30 000, the accuracy is affected by an increasing positive linearity error reaching about +2% at 10 000 Reynolds Number. Below an R_D of 10 000, accuracy is not easily predictable - however, calibration of a given flowmeter is repeatable. An indication of flow may be possible to as low as 5 000 Reynolds Number. Use the Foxboro's FlowExpert Sizing Program for process viscosity limits.

PERFORMANCE SPECIFICATIONS (Cont.)

Flow Overrange Effect

Overranges beyond 20% of maximum velocity could result in sensor damage with subsequent loss of signal.

WITH PULSE OUTPUT

No significant effect on accuracy or loss of signal.

WITH ANALOG OUTPUT

Analog signal is limited to 20 mA dc maximum, and, therefore, may not reproduce true flow rate measurement above 20 mA.

Process Temperature Effect on K-Factor

The K-factor reference is factory-determined at reference conditions. When the actual process temperature is provided, Foxboro calculates the flowing K-factor to correct for temperature effects. Calculation procedures to manually change the flowing K-factor are contained in Foxboro Instruction Manual MI 019-189.

Ambient Temperature Effect (Amplifier only)

WITH PULSE OUTPUT

No pulse rate change above low flow cut-in.

WITH ANALOG OUTPUT

For 55°C (100°F) change in ambient temperature within operative limits.

Zero (4 mA): $\pm 0.25\%$ of span maximum

Span (16 mA): $\pm 0.25\%$ of span maximum

Supply Voltage Effect (Within Stated Limits)

WITH PULSE OUTPUT

No effect on accuracy

WITH ANALOG OUTPUT

Less than 0.01% per 1.0% voltage change.

Position Effect (Filled Pipe Conditions)

For most applications, the flowmeter can be mounted in a pipeline which may run in any direction from the vertical (flow in upward direction) to the horizontal. Measurement of liquid and gas streams is not affected by the pipeline orientation or the flowmeter orientation in the pipeline. See Recommended Mounting Arrangements section.

For saturated steam measurement, the recommended flowmeter position is in a horizontal pipe with the electronics housing located below the pipeline.

For superheated steam, the flowmeter is usually best mounted in a horizontal or inclined pipe with the electronics housing located above the pipeline. Measuring superheated steam in vertical pipelines requires that the electronics housing and sensor compartment be free of intermittent condensate. It is recommended that the sensor be insulated to insure at least 6°C (10°F) of superheat.

Emission Effect

Radiated and conducted electromagnetic emissions meet the requirements of North America, NAMUR, and CENELEC.

Electromagnetic Compatibility (RFI)

The output error from RFI at radio frequencies ranging from 27 to 1 000 MHz is less than $\pm 1\%$ of span at a field intensity of 10 V/m; and less than $\pm 2\%$ of span at a field intensity of 30 V/m. This applies only when the electronics housing is properly earthed (grounded).

FUNCTIONAL SPECIFICATIONS

Output Signal

PULSE OUTPUT

Square wave voltage equals supply voltage minus two volts. Maximum current is 10 mA (sink or source). Shielded and twisted cable is recommended.

ANALOG OUTPUT

4 to 20 mA dc into a maximum of 1925 Ω depending on power supply. See Figure 2.

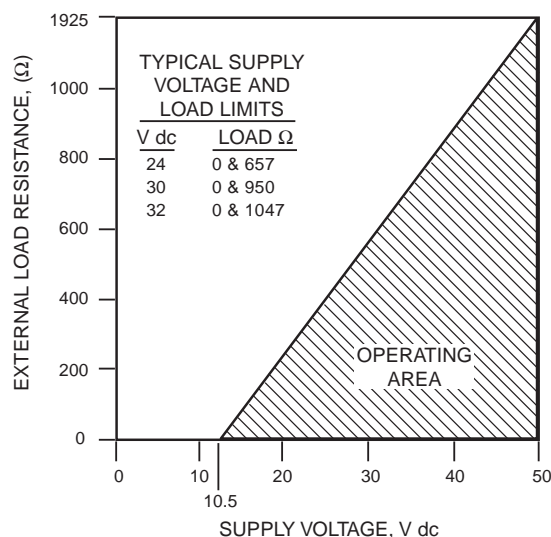


Figure 2. Supply Voltage vs. Load Resistance

FUNCTIONAL SPECIFICATIONS (Cont.)

Power Supply Requirements

PULSE MODE

Supply Voltage Limits: See Figure 2.

Supply Current: 15 mA dc.

ANALOG MODE

Supply Voltage Limits: See Figure 2.

Supply Current: 22 mA dc.

High Voltage Protection

A power zener diode (transient voltage suppressor) is included in the terminal compartment of the electronics housing to protect against a voltage surge of up to 2500 V.

Input Frequency Range

The amplifier can accept a wide range of vortex pulse rates. The vortex frequency limits are between 0.5 and 3000 Hz for both pulse and analog output modes.

Response Time

PULSE OUTPUT

Equal to the vortex shedding period.

ANALOG OUTPUT

0.25 s (rise time) plus the vortex shedding period, where rise time is 90% recovery time to an 80% input step with zero output damping.

Low Flow Cut-in Adjustment

Pulse and analog versions have low flow cut-ins to optimize amplifier performance as a function of fluid density and minimum fluid velocity. Field-adjustable by low flow cut-in switches. Flow rate settings will change by a nominal factor of 2 for each sequence of cut-in switch position.

Span Adjustment

Not required for pulse version. For analog version, the output is factory set and is field-adjustable with coarse and fine span potentiometer.

Zero Adjustment

No suppression or elevation. The analog output version is factory set to 4.00±0.01 mA and has a potentiometer to adjust the zero to 4.00 mA.

Reference K-Factor

The reference K-factor is a coefficient that specifies the flowmeter calibration and is expressed as the ratio of pulses per unit volume, where pulses/unit volume = pulses per second divided by volume flow per second. Refer to Table 1 for the reference K-factor for each flowmeter size. The reference K-factor is the arithmetic mean value of K over the factory-calibrated flow range.

Reference K-Factor Determination

The reference K-factor is determined at the factory flow facility by actual flow calibration with water by comparison to a master flowmeter calibration or by actual static weight. Both calibrations are traceable to NIST (National Institute of Standards and Technology). The reference K-factor is stamped on the data plate.

Flowing K-Factor

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

- Process Temperature
- Mating Pipe
- Upstream Disturbances

Minimum Measurable Velocity

The minimum measurable velocity for both standard and extended temperature range flowmeters is shown in the table below. In the table, ρ_f is the process fluid density at flowing conditions in lb/ft³ or kg/m³, as applicable.

Nominal Minimum Flow Velocity (V_{min})

Standard Temperature Range		Extended Temperature Range	
U.S. Customary Units ft/s	SI Units m/s	U.S. Customary Units ft/s	SI Units m/s
$2.5/\sqrt{\rho_f}$	$3.0/\sqrt{\rho_f}$	$5.0/\sqrt{\rho_f}$	$6.0/\sqrt{\rho_f}$

This specification holds for the majority of applications but does change slightly for some combinations of process fluid density and line size. Refer to Foxboro FlowExpert for actual viscosity limits.

FUNCTIONAL SPECIFICATIONS (Cont.)

Maximum Flow Velocity

The maximum measurable velocity for both standard and extended temperature range flowmeters is shown in the table below. In the table, ρ_f is the process fluid density of flowing conditions in lb/ft^3 or kg/m^3 , as applicable.

Nominal Maximum Flow Velocity (V_{\max})

Nominal Line Size		-Maximum Flow Velocity- Use Lowest of the 2 Values Listed	
mm	in	U.S. Customary Units ft/s	SI Units m/s
15	3/4	$200/\sqrt{\rho_f}$ or 175	$240/\sqrt{\rho_f}$ or 55
25	1	$200/\sqrt{\rho_f}$ or 275	$240/\sqrt{\rho_f}$ or 80
40	1 1/2	$200/\sqrt{\rho_f}$ or 425	$240/\sqrt{\rho_f}$ or 130
50	2	$200/\sqrt{\rho_f}$ or 575	$240/\sqrt{\rho_f}$ or 175
80	3	$200/\sqrt{\rho_f}$ or 600	$240/\sqrt{\rho_f}$ or 185
100	4	$200/\sqrt{\rho_f}$ or 600	$240/\sqrt{\rho_f}$ or 185
150	6	$200/\sqrt{\rho_f}$ or 600	$240/\sqrt{\rho_f}$ or 185
200	8	$200/\sqrt{\rho_f}$ or 600	$240/\sqrt{\rho_f}$ or 185
250	10	$200/\sqrt{\rho_f}$ or 600	$240/\sqrt{\rho_f}$ or 185
300	12	$200/\sqrt{\rho_f}$ or 600	$240/\sqrt{\rho_f}$ or 185

Nominal Flow Velocity Limits

These limits can be calculated using the minimum and maximum flow velocity tables. In these tables, ρ_f is the process fluid density at flowing conditions in

kg/m^3 or lb/ft^3 , as applicable. The specifications apply for most applications, but can deviate slightly for some combinations of density and line size.

Flow Rate Limits

Refer to Tables 1, 2, and 3 for operating flow rate limits for water, air, and steam, respectively. Refer to the notes under each table for the conditions that apply to the flow rate limits listed. The maximum flow rates shown apply to continuous operation. Overranges much beyond 20% of the maximum flow rate could result in sensor damage with subsequent loss of signal.

The minimum and maximum flow rates are dependent upon the flow velocity limits defined earlier in Functional Specifications.

Flowmeter Sizing – FlowExpert Sizing Program

Foxboro's FlowExpert provides the best means of selecting the correct flowmeter size for any application. Also, the sizing program will calculate minimum and maximum flow rates, rangeability, pressure loss, Reynolds Number, and calibration frequency. For example, you can use FlowExpert to determine the nominal shedding frequency for any flow rate for a given line size.

For many applications, Tables 1, 2, and 3 can be used (in lieu of FlowExpert) as a quick guide to flowmeter sizing. These tables list operating flow rate limits for water, air, and steam for each line size. Note that flowmeter must operate within flow velocity limits previously defined.

Table 1. Reference K-Factor. And Water Flow Rates and Upper Range Value Limits at 20°C and 101.3 kPa absolute (68°F and 14.7 psia)

Nominal Line Size		Nominal Reference K-Factor (a)			Minimum and Maximum Operating Flow Rates (b)		Recommended Min. URV(c)	
mm	in	p/L	p/ft ³	p/U.S. gal	L/s	U.S. gpm	L/s	U.S. gpm
15	3/4	197	5580	746	0.07 and 2.1	1.2 and 34	0.2	3.6
25	1	79.5	2250	301	0.10 and 3.6	1.5 and 57	0.30	4.7
40	1 1/2	20.1	570	76.2	0.15 and 8.8	2.4 and 140	0.6	9.8
50	2	9.11	258	34.5	0.19 and 14.7	3.1 and 233	1.3	21.4
80	3	2.78	78.7	10.5	0.47 and 32.2	7.4 and 511	4.4	69
100	4	1.23	34.8	4.65	0.89 and 56.7	14.0 and 899	10.2	162
150	6	0.353	10.00	1.34	2.4 and 130	37.3 and 2060	35.6	564
200	8	0.150	4.26	0.569	4.6 and 228	72.1 and 3610	82.1	1300
250	10	0.070	1.99	0.266	8.1 and 372	129 and 5900	169	2680
300	12	0.041	1.16	0.155	12.5 and 540	198 and 8560	296	4690

(a) The reference K-factor is based on testing with Schedule 40 mating pipe. K-factor connection, when using pipe other than Schedule 40 mating pipe, or when using less than the recommended upstream piping can be configured into the flowmeter.

(b) The approximate values listed are with the low flow cut-in set at its minimum value. For flow rate values at other conditions, refer to the Foxboro FlowExpert Sizing Program or TI 027-067.

(c) The recommended minimum upper range value is shown; the maximum URV is the maximum operating flow rate.

Table 2. Air Flow Rate Limits in Normal m³/h and standard ft³/h— Approximate Values Listed(a)

Process Pressure in kPa Gauge	Minimum and Maximum Flow Rates for the Following Sizes(b)									
	In NCMH for 15 mm	In NCMH for 25 mm	In NCMH for 40 mm	In NCMH for 50 mm	In NCMH for 80 mm	In NCMH for 100 mm	In NCMH for 150 mm	In NCMH for 200 mm	In NCMH for 250 mm	In NCMH for 300 mm
0	3.6 & 54.8	4.6 & 136	11 & 537	18.4 & 1190	40.3 & 2750	71 & 4840	162 & 11 100	285 & 19 400	465 & 31 700	676 & 46 100
250	5.0 & 190	8.4 & 472	20.5 & 1640	34.2 & 2740	75.1 & 6000	132 & 10 600	302 & 24 200	531 & 42 500	867 & 69 300	1260 & 101 000
500	6.5 & 326	10.9 & 809	26.9 & 2150	44.8 & 3580	98.3 & 7870	173 & 13 800	396 & 31 700	695 & 55 600	1130 & 90 800	1650 & 132 000
1000	8.9 & 599	14.8 & 1190	36.4 & 2910	60.7 & 4850	133 & 10 700	235 & 18 800	537 & 42 900	942 & 75 300	1540 & 123 000	2230 & 179 000
2000	12.3 & 981	20.5 & 1640	50.4 & 4030	84 & 6720	184 & 14 800	325 & 26 000	743 & 59 400	1300 & 104 000	2130 & 170 000	3130 & 247 000
Process Pressure in psig	In SCFH for 3/4 in	In SCFH for 1 in	In SCFH for 1 1/2 in	In SCFH for 2 in	In SCFH for 3 in	In SCFH for 4 in	In SCFH for 6 in	In SCFH for 8 in	In SCFH for 10 in	In SCFH for 12 in
0	140 & 1940	181 & 4800	400 & 18 900	667 & 41 900	1460 & 97 000	2580 & 171 000	5890 & 391 000	10 300 & 686 000	16 900 & 1 120 000	24 500 & 1 630 000
50	204 & 8530	342 & 21 200	839 & 67 100	1400 & 112 000	3070 & 246 000	5410 & 433 000	12 400 & 990 000	21 700 & 1 740 000	35 500 & 2 840 000	51 500 & 4 120 000
100	272 & 15 100	455 & 36 400	1120 & 89 500	1860 & 149 000	4090 & 327 000	7210 & 577 000	16 500 & 1 320 000	28 900 & 2 310 000	47 200 & 3 780 000	68 600 & 5 490 000
200	373 & 28 400	623 & 49 900	1530 & 123 000	2550 & 204 000	5610 & 449 000	9870 & 790 000	22 600 & 1 810 000	39 600 & 3 170 000	64 700 & 5 180 000	94 000 & 7 520 000
300	452 & 36 100	756 & 60 400	1860 & 149 000	3100 & 248 000	6800 & 544 000	12 000 & 957 000	27 400 & 2 190 000	48 000 & 3 840 000	78 400 & 6 270 000	115 000 & 9 110 000

(a) Normal m³/h (NCMH) values are given at selected base conditions of 0°C and 101.325 kPa, absolute, with the low flow cut-in set at its minimum value. Standard ft³/h (SCFH) values are given at selected base conditions of 60°F and 14.7 psia, with the low flow cut-in set at its minimum value. For values for other gases, at other than base conditions, refer to the Foxboro FlowExpert Sizing Program or TI 027-067.

(b) A minimum upper range value (URV) of three times the minimum flow rate is recommended. The maximum URV equals the maximum flow rate. For example, for a 25 mm analog output flowmeter at 0 kPa gauge, the recommended minimum URV would be 3 X 4.6 or 13.8 NCMH and the maximum URV would be 136 NCMH.

Table 3. Dry Saturated Steam Flow Rate Limits—Approximate Values Listed (a)

Process Pressure in kPa Gauge	Process Temperature in °C	Minimum and Maximum Flow Rates for the Following Sizes(b)									
		In kg/h for 15 mm	In kg/h for 25 mm	In kg/h for 40 mm	In kg/h for 50 mm	In kg/h for 80 mm	In kg/h for 100 mm	In kg/h for 150 mm	In kg/h for 200 mm	In kg/h for 250 mm	In kg/h for 300 mm
0	100.0	3.3 & 32.8	4.2 & 81.2	9.7 & 321	16.1 & 708	35.4 & 1640	62.4 & 2890	143 & 6620	250 & 11 600	409 & 19 000	594 & 27 500
250	139.0	4.2 & 105	7.1 & 260	17.3 & 1030	28.9 & 2270	63.4 & 5070	112 & 8930	255 & 20 400	448 & 35 900	732 & 58 600	1060 & 85 000
500	158.9	5.4 & 174	9.1 & 432	22.3 & 1700	37.2 & 2980	81.7 & 6530	114 & 11 500	329 & 26 300	577 & 46 200	943 & 75 400	1370 & 110 000
1000	184.1	7.2 & 309	12.1 & 767	29.7 & 2380	49.6 & 3970	109 & 8710	192 & 15 300	438 & 35 100	769 & 61 600	1260 & 101 000	1820 & 146 000
5000	265.1(c)	31 & 1240	51.9 & 2070	127 & 5100	213 & 8500	536 & 18 700	1030 & 32 800	2700 & 75 200	5220 & 132 000	9320 & 215 000	14 300 & 313 000
10 000	311.7(c)	45.6 & 1830	76.3 & 3050	195 & 7500	357 & 12 500	897 & 27 500	1720 & 48 300	4520 & 111 000	8730 & 194 000	15 600 & 317 000	24 000 & 460 000
Process Pressure in psig	Process Temperature in °F	In lb/h for 3/4 in	In lb/h for 1 in	In lb/h for 1 1/2 in	In lb/h for 2 in	In lb/h for 3 in	In lb/h for 4 in	In lb/h for 6 in	In lb/h for 8 in	In lb/h for 10 in	In lb/h for 12 in
0	212.0	7.2 & 72.2	9.3 & 179	21.3 & 707	35.6 & 1560	78.1 & 3620	137 & 6370	315 & 14 600	552 & 25 600	901 & 41 800	1310 & 60 700
50	297.6	10.4 & 290	17.4 & 718	42.7 & 2830	71.2 & 5700	156 & 12 500	275 & 22 000	630 & 50 400	1110 & 88 400	1800 & 144 000	2620 & 210 000
100	337.8	13.6 & 497	22.8 & 1230	56 & 4480	93.4 & 7470	205 & 16 400	361 & 28 900	826 & 66 000	1450 & 116 000	2370 & 189 000	3440 & 275 000
500	470.0(c)	56.6 & 2150	94.7 & 3790	233 & 9310	388 & 15 500	919 & 34 100	1760 & 60 000	4630 & 137 000	8950 & 241 000	16 000 & 393 000	24 500 & 571 000
1000	546.3(c)	81.2 & 3250	136 & 5430	333 & 13 300	592 & 22 200	1480 & 48 800	2840 & 86 000	7470 & 197 000	14 500 & 345 000	25 800 & 564 000	39 700 & 819 000
1500	597.5(c)	103 & 4110	172 & 6870	442 & 16 900	810 & 28 000	2030 & 61 800	3890 & 109 000	10 200 & 249 000	19 800 & 437 000	35 400 & 713 000	54 300 & 1 040 000

(a) Values listed are for dry saturated steam (steam quality = 100%) with the low flow cut-in set at its minimum value. For steam quality other than 100%, refer to the Foxboro FlowExpert Sizing Program or TI 027-067.

(b) A minimum upper range value (URV) of three times the minimum flow rate is recommended. The maximum URV equals the maximum flow rate. For example, for a 25 mm analog output flowmeter at 0 kPa, gauge, the recommended minimum URV would be 3 X 4.2 or 12.6 kg/h and the maximum URV would be 81.2 kg/h.

(c) The Extended Temperature Range sensors, "C" or "T", are required for these applications. See Model Code section.

FUNCTIONAL SPECIFICATIONS (Cont.)

Pressure-Temperature Limits

See Figure 3 for pressure-temperature limits of flowtube with ANSI Class 150, 300, and 600 flanges, and with isolation valve on standard and high temperature flowmeters.

Static Pressure Limits

MINIMUM

The minimum static pressure is that pressure which is sufficient to prevent flashing (see Minimum Back Pressure paragraph).

MAXIMUM

1500 psi (10 340 kPa) or that imposed by process piping. See Figure 3 for ANSI flange pressure-temperature limits.

Minimum Back Pressure (Volatile Liquids or Low Pressure Conditions)

Any condition that tends to contribute to the release of vapor from the liquid (flashing, which may also induce cavitation) shall be avoided by proper system design and operation of the flow-meter within the rated flow rate range. Location of flowmeter should determine the need for incorporating or considering a back-pressure valve, or for increasing inlet

pressure. To avoid flashing and to ensure 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
- ΔP = Calculated pressure loss in kPa or psi (see "Approximate Pressure Loss" section)
- p_v = Vapor pressure at line conditions in kPa or psi absolute
- p_{atm} = Atmospheric pressure in kPa or psi absolute

Approximate Pressure Loss

The maximum pressure loss at maximum flow for every flowmeter with any fluid is 55 kPa (8 psi). Sample plots for water and air are shown in Figures 4 and 5. Note that for many flow conditions, the actual pressure loss is much less than 55 kPa (8 psi). Use the Foxboro FlowExpert Sizing Program to determine actual pressure loss for a given set of conditions.

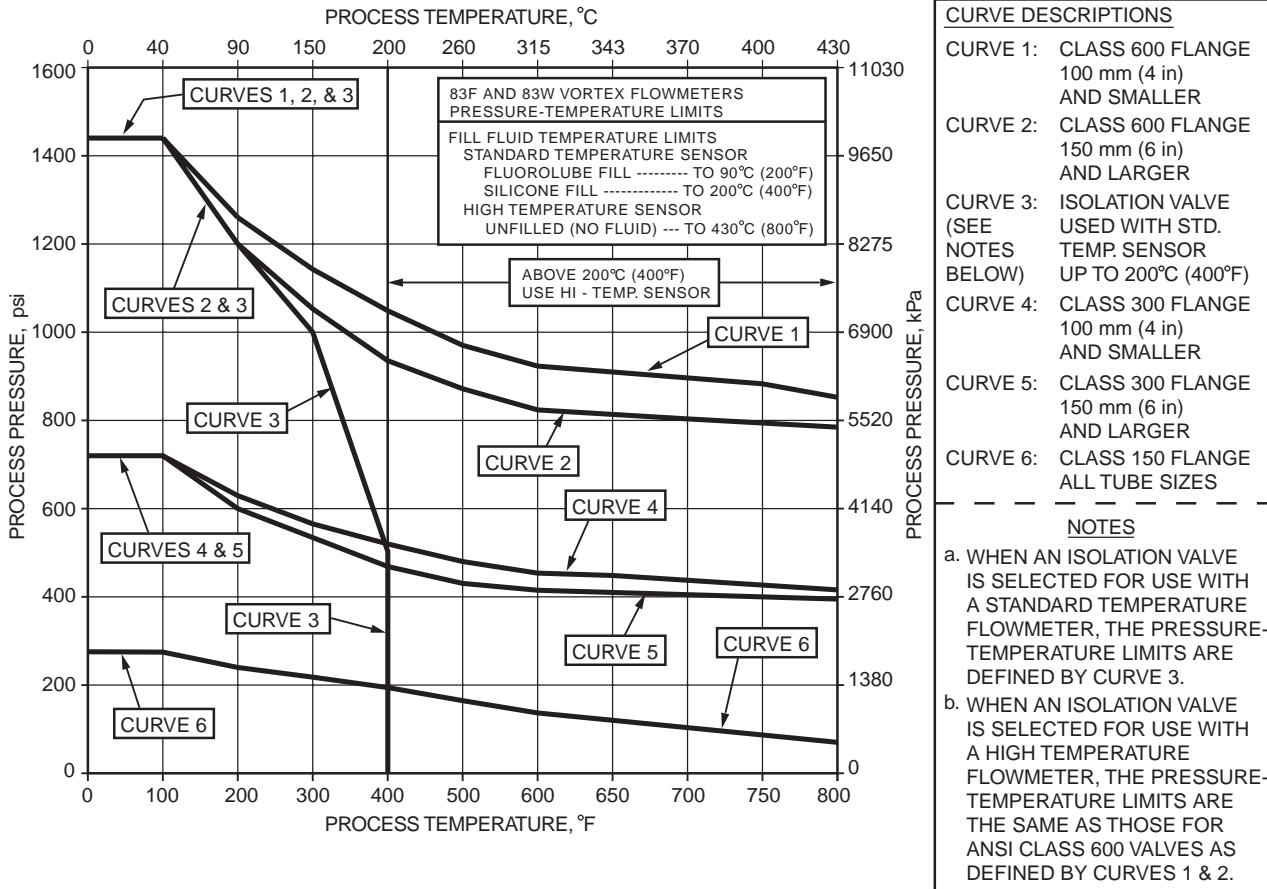


Figure 3. Pressure-Temperature Limits with ANSI Flanges

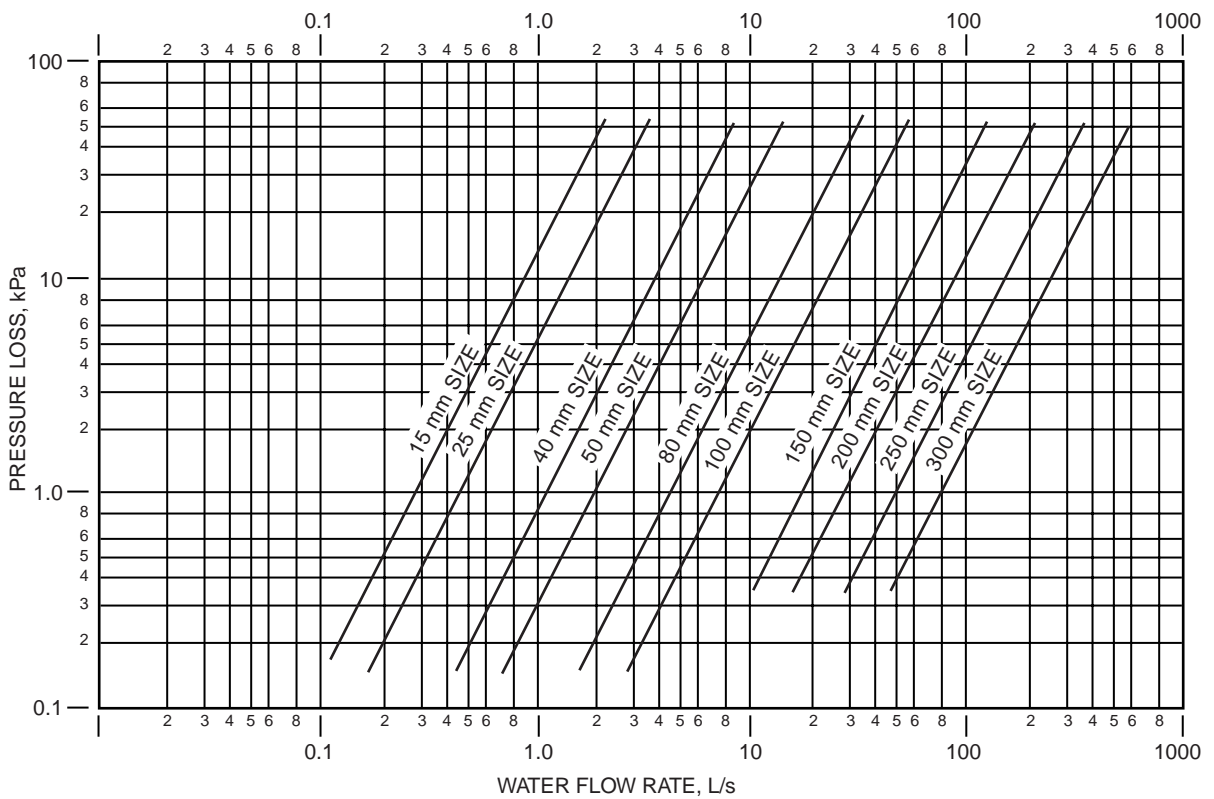
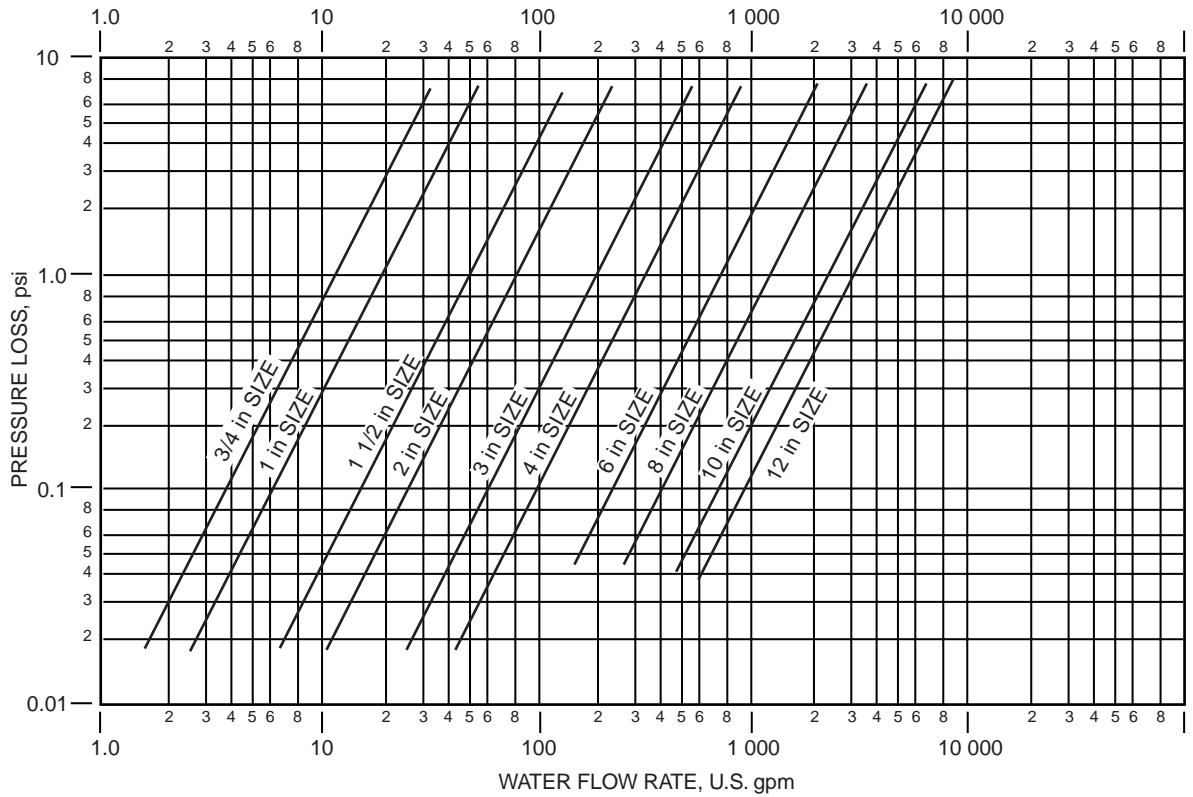


Figure 4. Water Flow Rate vs. Pressure Loss at Base Conditions of 15.6°C (60°F)

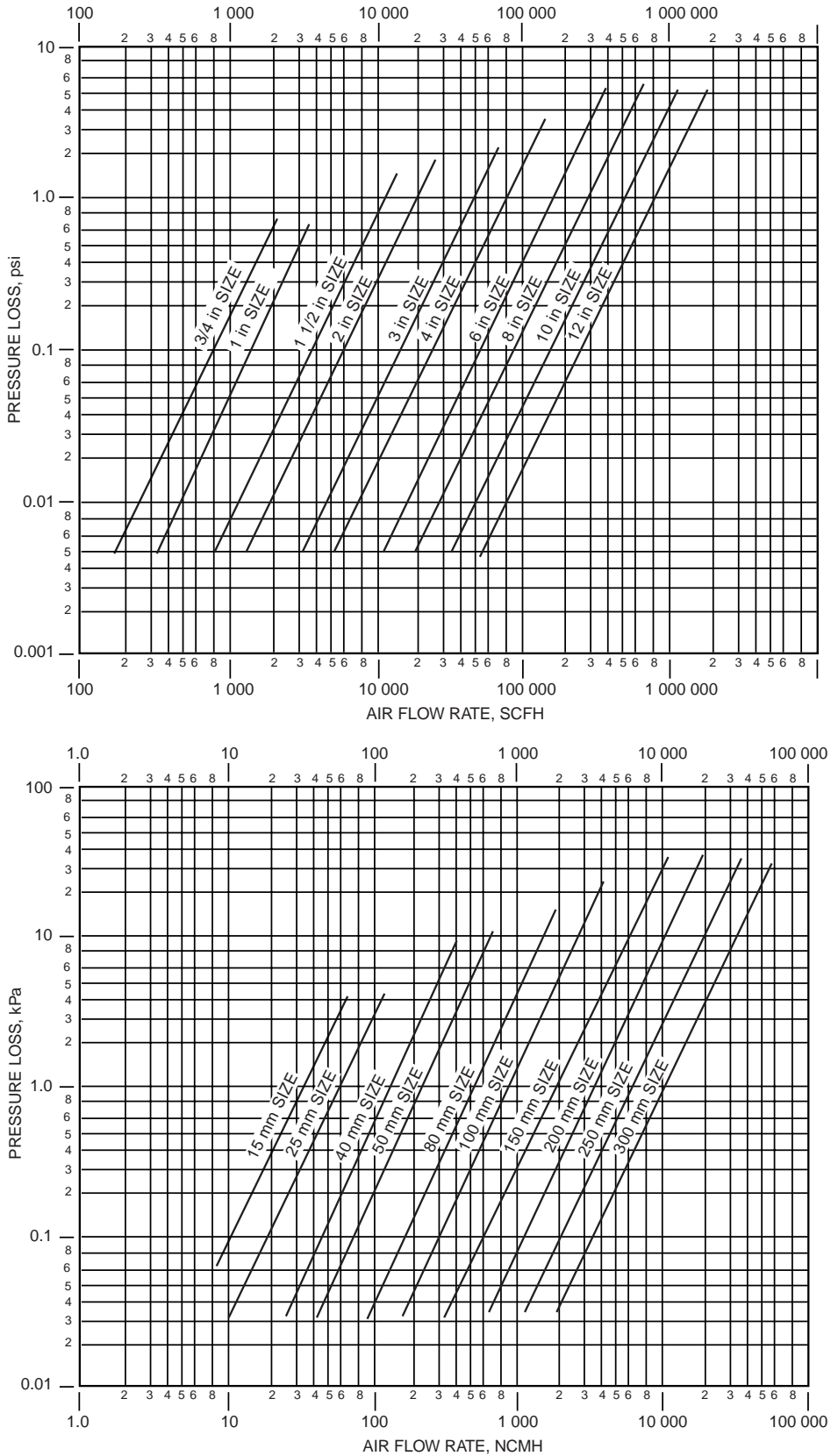


Figure 5. Air Flow Rate vs. Pressure Loss at Base Conditions of 15°C and 101 kPa (59°F and 14.7 psi)

PHYSICAL SPECIFICATIONS

Materials of Construction

PROCESS-WETTED PARTS

Flowmeter Body, Flanges, Shedding Element, and Sensor

See Model Code for materials.

Gaskets and Flow Dams

ptfe, stainless steel, Hastelloy C

NONWETTED PARTS

Electronics Housing and Covers

Low copper aluminum alloy.

Finish

Gray epoxy powder-coated finish electronics housing and covers.

Cover Gaskets

Buna-N O-ring

DUAL MEASUREMENT MANIFOLD

CF8M stainless steel; pressure and temperature rating of dual manifold same as flowmeter body.

Mounting

The flowmeter can be located in pipelines which may run in any direction from the vertical (flow in upward direction) to the horizontal. The electronics housing can also be rotated 270° with respect to the body. A vertical pipeline is preferred for "Batch" operations to provide improved full line assurance (flow direction must be up for liquids).

For mounting arrangements for various applications see Recommended Mounting Arrangements section.

Enclosure Classification

The electronics housing meets the requirements of IEC IP66 and provides the environmental protection of NEMA Type 4X.

Data Plate

Stainless steel data plate fastened to electronics housing with self-tapping drive screws. Includes space for customer tag data up to a maximum of 32 characters and spaces. This tag also shows the factory calibration factor (K-factor). If additional space is required for tag data, an optional Customer Stainless Steel Tag is offered. See Optional Selections section.

Isolation Valves

MANIFOLD BODY

Grade CF8M stainless steel

VALVE BALL

316 ss

VALVE SEATS

Standard Temperature: Glass-Filled ptfe

Extended Temperature: Graphite

STEM SEAL

The valve stem seal meets the external leakage requirements for fire safety per API Standard 607.

VALVE HANDLE

Use adjustable wrench.

SEAT LEAKAGE

Standard Temperature

Class IV – Less than 5 mL/h per MSS-SPG1.

High Temperature

Class IV per ANSI/FCI-70.2

FLOW VELOCITY LIMITS

See "Flow Velocity Limits" section.

APPLICATIONS

Recommended for use with clean liquids, saturated steam, and all gases.

LIMITATIONS

Not recommended for use with superheated steam without insulation, or liquids with suspended solids.

MOUNTING

See MI 019-194 (FoxCom) or MI 019-199 (HART) for installation guidelines.

PRESSURE/TEMPERATURE RATING

Both standard and high temperature isolation valves have a maximum pressure rating of 1440 psig at 100°F. The standard temperature valve with ptfe seats is further limited to a maximum pressure of 500 psi at 400°F. The high temperature valve has ANSI Class 600 temperature and pressure rating. See Figure 3.

Physical Dimensions

See DP 019-150 (Flanged Body, Single Measurement Configuration), DP 019-151 (Flanged Body, Dual Measurement Configuration), or DP 019-152 (Wafer Body) for dimensions.

PHYSICAL SPECIFICATIONS (Cont.)

Process Connections

83F FLANGED BODY FLOWMETERS - TABLE 4

Table 4. Line Size vs. 83F Flange Rating

Nominal Line Size		Metric or ANSI Flange Ratings	
mm	in	Flange Cast on Body	Flange Welded to Body
15	3/4	PN 40, 100 Class 150, 300, 600	–
25	1	PN 40, 100 Class 150, 300, 600	–
40	1 1/2	PN 40, 100 Class 150, 300, 600	–
50	2	PN 40, 64, 100 Class 150, 300, 600	–
80	3	PN 40, 64, 100 Class 150, 300, 600	–
100	4	PN 40, 64, 100 Class 150, 300, 600	–
150 (a)	6	–	PN 16/40/64/100 Cl. 150/300/600
200 (a)	8	–	PN 16/40/64/100 Cl. 150, 300, 600
250	10	–	PN 40/64/100 Cl. 150, 300
300	12	–	PN 40, 64 Class 150, 300

(a) PN 16 and ANSI Class 150 use slip on type flanges. All other welded flanges are weld neck.

Process Connections (Cont.)

83W WAFER BODY FLOWMETERS - TABLE 5

Wafer type flowmeters are available with bore sizes 15 to 200 mm (3/4 to 8 in). Flowmeters must be properly aligned in the pipeline to provide optimum accuracy. Alignment spacers are provided to achieve this alignment. Flowmeters may be used with the flanges listed in Table 5.

Table 5. Line Size vs 83W Flange Ratings

Nominal Line Size	Flange Rating
3/4 to 8 in	ANSI Class 150, 300, and 600
15 to 200 mm	PN 16, PN 40, PN 64, PN 100

NACE Certification

The stainless steel material option has been designed, and materials selected, to meet the requirements of NACE (National Association of Corrosion Engineers) Standard MR-01.

Electrical Connections

Tapped for 1/2 NPT conduit.

Approximate Weight

See Tables 6 to 10.

Table 6. 83F Vortex Flowmeters - Flanged Body: Approximate Weight (Class 150 Flanges)

Nominal Line Size		With Integral Mounted Electronics Housing				With Remote Mounted Electronics Housing					
		Flowmeter Weight(a)				Flowmeter Weight(b)				Electronics Housing Weight(c)	
		Sensor Types D, F, R, & S		Sensor Types C & T		Sensor Types D, F, R, & S		Sensor Types C & T			
in	mm	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
3/4	15	11.0	5.0	11.7	5.3	9.0	4.1	9.9	4.5	5.0	2.3
1	25	13.2	6.0	13.9	6.3	11.0	5.0	11.9	5.4	5.0	2.3
1 1/2	40	16.0	7.3	16.7	7.6	14.0	6.4	15.0	6.8	5.0	2.3
2	50	20.2	9.2	21.0	9.5	18.0	8.2	19.0	8.6	5.0	2.3
3	80	33.2	15.1	33.9	15.4	29.0	13.2	30.0	13.6	5.0	2.3
4	100	45.0	20.5	45.8	20.8	43.0	19.5	44.0	20.0	5.0	2.3
6	150	72.2	32.8	72.8	33.1	70.0	31.8	71.3	32.3	5.0	2.3
8	200	125.0	56.6	125.4	57.0	121.0	54.9	122.0	55.3	5.0	2.3
10	250	190	86.2	190.0	86.2	185.0	83.9	187.0	84.8	5.0	2.3
12	300	265.0	120.0	265.0	120.0	260.0	118.0	262.0	119.0	5.0	2.3

(a) Weight of complete flowmeter, including integral electronics housing.

(b) Flowmeter Weight is weight of flowtube with sensor plus bonnet plus junction box.

(c) Housing Assembly Weight (for all Sensor Type selections) is weight of electronics housing assembly plus mounting bracket.

PHYSICAL SPECIFICATIONS (Cont.)

Table 7. 83W Vortex Flowmeters - Wafer Body: Approximate Weight (Class 150 Flanges)

Nominal Line Size		With Integral Mounted Electronics Housing				With Remote Mounted Electronics Housing					
		Flowmeter Weight(a)				Flowmeter Weight(b)				Electronics Housing Weight(c)	
		Sensor Types D, F, R, & S		Sensor Types C & T		Sensor Types D, F, R, & S		Sensor Types C & T			
in	mm	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
3/4	15	7.0	3.2	7.3	3.3	5.0	2.3	5.5	2.5	5.0	2.3
1	25	8.1	3.7	8.4	3.8	6.0	2.7	6.4	2.9	5.0	2.3
1 1/2	40	9.0	4.1	9.2	4.2	7.0	3.2	7.5	3.4	5.0	2.3
2	50	12.0	5.4	12.3	5.6	10.0	4.5	10.3	4.7	5.0	2.3
3	80	17.2	7.8	17.4	7.9	15.0	6.8	15.4	7.0	5.0	2.3
4	100	25.0	11.3	25.3	11.5	23.0	10.4	23.5	10.7	5.0	2.3
6	150	37.0	16.8	37.2	16.9	35.0	16.0	35.6	16.2	5.0	2.3
8	200	61.1	27.7	61.3	27.8	59.0	26.8	59.4	27.0	5.0	2.3

(a) Weight of complete flowmeter, including electronics housing.

(b) Flowmeter Weight is weight of flowtube with sensor plus bonnet plus junction box.

(c) Housing Assembly Weight (for all Sensor Type selections) is weight of electronics housing assembly plus mounting bracket.

Table 8. Additional Weight for Single Measurement Flowmeter with Isolation Valve
(Add Weight in this table to Table 5 Weight as Applicable)

Nominal Line Size(a)		With Integral Mounted Electronics Housing				With Remote Mounted Electronics Housing			
		Added Weight with Sensor Types				Added Weight with Sensor Types			
		D, F, R, & S		C & T		D, F, R, & S		C & T	
in	mm	lb	kg	lb	kg	lb	kg	lb	kg
All	All	2.1	1.0	2.1	1.0	2.1	1.0	2.1	1.0

(a) Sizes 10 and 12 in (250 and 300 mm) not available with wafer body flowmeter.

Table 9. Additional Weight for Dual Measurement Flowmeter without Isolation Valves
(Add Weight in this table to Table 5 Weight as Applicable)

Nominal Line Size(a)		With Integral Mounted Electronics Housing				With Remote Mounted Electronics Housing			
		Added Weight with Sensor Types(b)				Added Weight with Sensor Types(c)			
		D, F, R, & S		C & T		D, F, R, & S		C & T	
in	mm	lb	kg	lb	kg	lb	kg	lb	kg
All	All	11.9	5.4	12.6	5.7	7.2	3.3	8.8	4.0

(a) Dual Measurement Flowmeters are only available with Flanged Body Flowtubes.

(b) Added weight includes dual manifold without valves, one sensor, a bonnet, an electronics housing, and a support bracket.

(c) Added weight includes dual manifold without valves, one sensor, a bonnet, a junction box assembly, and a support bracket.

Table 10. Additional Weight for Dual Measurement Flowmeter with Isolation Valves
(Add Weight in this table to Table 5 Weight as Applicable)

Nominal Line Size(a)		With Integral Mounted Electronics Housing				With Remote Mounted Electronics Housing			
		Added Weight with Sensor Types(b)				Added Weight with Sensor Types(c)			
		D, F, R, & S		C & T		D, F, R, & S		C & T	
in	mm	lb	kg	lb	kg	lb	kg	lb	kg
All	All	15.0	6.8	15.7	7.1	10.3	4.7	11.8	5.4

(a) Dual Measurement Flowmeters are only available with Flanged Body Flowtubes.

(b) Added weight includes dual manifold with valves, one sensor, a bonnet, an electronics housing, and a support bracket.

(c) Added weight includes dual manifold with valves, one sensor, a bonnet, a junction box assembly, and a support bracket.

PRODUCT SAFETY SPECIFICATIONS

Pressure Safety: 83W Series

Wafer body flowmeters designed to withstand pressure within ANSI Class 150, 300, or 600 flange ratings, and DIN PN 16, PN 40, PN 64, and PN 100 flange ratings. The flowtube face outside diameter is designed to center between ANSI Class 150 flanges. For other flange ratings, centering spacers are provided. See Figure 3 for pressure-temperature ratings of ANSI flanges.

Pressure Safety: 83F Series

Designed to withstand pressure within ANSI Class 150, 300, or 600 flange ratings, and DIN PN 40, PN 64, or PN 100 flange ratings. The ANSI Class 600 flange is used only on flowmeter sizes up through 200 mm (8 in). See Table 4 for other line size and flange rating limitations. See Figure 3 for pressure-temperature ratings of ANSI flanges.

Electrical Safety Classification

Refer to Electrical Safety Specification table below for Testing Laboratory, Types of Protection and Area Classification, Application Conditions, and Electrical Classification Code.

Personnel and Electrical Fire Safety

This device is designed to be a minimum fire hazard by using low energy power and adequate insulation and separation of electrical circuits. The requirements of worldwide standards such as FM, CSA, CENELEC, and the consensus standards adopted by OSHA, have been fulfilled.

Electrical Safety Specifications

Testing Laboratory, Types of Protection and Area Classification	Application Conditions	Electrical Safety Design Code
CSA intrinsically safe for Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; and Class III, Division 1.	Temperature Class T3C at 85°C and T4A at 40°C maximum ambient. Limited to Gas Groups C and D when connected to 33 V, 185 Ω Zener barrier. Connect per TI 005-105.	A
CSA explosionproof for Class I, Division 1, Groups C and D; dust-ignitionproof for Class II and III, Division 1, Groups E, F, and G; and Class III, Division 1. Suitable for Class I, Division 2, Groups A, B, C, D; Class II, Division 2, Groups F, G; and Class III, Division 2.	Temperature Class T5.	
Europe (KEMA) nonsparking, Ex n IIC, Zone 2.	Temperature Class T4 - T6.	
FM intrinsically safe for Class I, II, and III, Division 1, Group A, B, C, D, E, F, and G; nonincendive Class I, II, and III, Division 2, Groups A, B, C, D, F, and G.	Temperature Class T3C at 85°C and T4A at 40°C maximum ambient. Connect per TI 005-101.	
FM explosionproof for Class I, Division 1, Groups C and D; dust-ignitionproof for Class II and III, Division 1, Groups E, F, and G; nonincendive Class I, II, and III, Division 2, Groups A, B, C, D, F, and G.	Temperature Class T5.	
SAA intrinsically safe for Ex ib Gas Group IIC, Zone 1.	Temperature Class T4.	
SAA flameproof for Ex d Gas Group IIB, Zone 1.	Temperature Class T6.	
CENELEC intrinsically safe for EEx ib, Gas Group IIC, Zone 1.	Temperature Class T4 at 0.8 W. Temperature Class T5 at 0.5 W. Temperature Class T6 at 0.3 W.	E
CENELEC flameproof for EEx d [ib] Gas Group IIC, Zone 1.	Temperature Class T6.	H

NOTE

The 83F and 83W Flowmeters have been designed to meet the electrical classifications listed in the table above. For detailed information or status of testing laboratory approvals or certifications, contact Foxboro.

MODEL CODES

83F Vortex Flowmeters - Flanged Body

Description	Model
Vortex Flowmeter - Flanged Body	83F
Electronics Type	
4 to 20 mA Analog and Pulse Electronics	-A
Nominal Line Size	
3/4 in (15 mm) Line Size	3Q
1 in (25 mm) Line Size	01
1 1/2 in (40 mm) Line Size	1H
2 in (50 mm) Line Size	02
3 in (80 mm) Line Size	03
4 in (100 mm) Line Size	04
6 in (150 mm) Line Size	06
8 in (200 mm) Line Size	08
10 in (250 mm) Line Size	10
12 in (300 mm) Line Size	12
Body and Flange Material	
CF8M (316 ss) Cast Body/Flange and Shedder (Size Codes 3Q through 04 only). Body fabricated from Type 304 ss Tubing with Type 304 ss Flanges.	S
Type 304 ss Tubing with A105 Carbon Steel Flanges (Size Codes 06 through 12 only)	K
End Connections and Flange Rating	
ANSI Class 150 Flange	1
ANSI Class 300 Flange	2
ANSI Class 600 Flange (Size Codes 3Q through 08 only)	3
Metric PN 16 Flange (Size Codes 06 and 08 only)	4
Metric PN 40 Raised Face Flange Finish Form "D" per DIN 2501	5
Metric PN 64 Raised Face Flange Finish Form "E" per DIN 2501	6
Metric PN 100 Raised Face Flange Finish Form "E" per DIN 2501 (Size Codes 02 to 10 only)	7
Metric PN 40 Raised Face Flange Finish Form "C" per DIN 2501 (Size Codes 02 to 12 only)	8
Metric PN 40 Raised Face Flange Finish Form "N" per DIN 2501 (Size Codes 3Q to 04 only)	A
Metric PN 64 Raised Face Flange Finish Form "N" per DIN 2501 (Size Codes 3Q to 04 only)	B
Metric PN 100 Raised Face Flange Finish Form "N" per DIN 2501 (Size Codes 02 to 12 only)	C
Single or Dual Measurement and Isolation Valve	
Single Measurement; No Isolation Valve	S
Dual Measurement; No Isolation Valve; CF8M Stainless Steel Manifold	D
Single Measurement with Isolation Valve; CF8M Stainless Steel	K
Dual Measurement with Isolation Valve; CF8M Stainless Steel Manifold & Valve	L
Sensor Fill, Temperature Range, and Material	
Standard Temperature Range (with Fill Fluid)	
Fluorolube Fill, 0 to 200°F (-20 to +90°C) Hastelloy Type CW2M	D
Fluorolube Fill, 0 to 200°F (-20 to +90°C) Stainless Steel Type CF3M	F
Silicone Fill, 0 to 400°F (-20 to +200°C) Hastelloy Type CW2M	R
Silicone Fill, 0 to 400°F (-20 to +200°C) Stainless Steel Type CF3M	S
High Temperature Range (No Fill Fluid)	
Unfilled, 400 to 800°F (200 to 430°C) Hastelloy Type CW2M	C
Unfilled, 400 to 800°F (200 to 430°C) Stainless Steel Type CF3M	T

(Continued on Next Page)

MODEL CODES (Cont.)

83F Vortex Flowmeters - Flanged Body (Cont.)

Mounting for Electronics Housing	
Integrally Mounted; Housing Mounted to Flowtube	T
Remote Mounted; Housing Mounted in a Remote Location. You must also Select Optional Cable Length (-B, -D, -E, or -G) further in this Code.	R
Output Indicator	
No Output Indicator (Blind Unit)	N
Analog Output Indicator, 4 to 20 mA, 0 to 100% Scale	A
Analog Output Indicator, Ten Equally Spaced Divisions	B
Pulse Output Indicator, 0 to 100% Scale	E
Pulse Output Indicator, Ten Equally Spaced Divisions	D
Electrical Safety (See Electrical Safety Specifications Section for Description and Status)	
CSA, Europe, FM, and SAA Testing Laboratories as Described below:	A
CSA, ia, ia Connection; and CSA, d	
Europe, KEMA, Ex n IIC, Zone 2	
FM, ia, ia Connection; and FM, d	
SAA, ib, ib Connection; and SAA, d	
CENELEC, ib, ib Connection	E
CENELEC, d	H
No Approval/Certification Required	Z
Optional Selections	
Cable Length Selection for Remote Electronics Housing	
20 ft (6 m) Cable to Connect to Remote Electronics Housing	-B
30 ft (9 m) Cable to Connect to Remote Electronics Housing	-D
40 ft (12 m) Cable to Connect to Remote Electronics Housing	-E
50 ft (15 m) Cable to Connect to Remote Electronics Housing	-G
Calibration Cable	
Cable used to Check Amplifier Calibration	-C
Cleaning for Oxygen or Chlorine Service	
Cleaning of Process Wetted Parts for Oxygen/Chlorine Service per Compressed Gas Association's CGA G-4.1 and ASTM G93 (Not Available with Measurement/Isolation Valve Codes "D", "K", & "L" or Size Codes "10" & "12")	-H
Sensor Plating	
Gold Plated Sensor (for H ₂ or Corrosive Service)	-J
Foxboro Certificates of Compliance/Conformance	
Standard Certificate of Compliance	-L
Foxboro Material Certification of Process Wetted Metal (Conforms to DIN 50049-3.1b)	-M
Process Wetted Parts Conform to NACE MR-01	-Q
Foxboro Calibration Certificate	
Foxboro Calibration and Pressure Test Certification	-N
Cable Connections	
Hawke Cable Gland (Not for use on Models with Explosionproof Certification)	-P
PG11 Trumpet Gland (Not for use on Models with Explosionproof or Flameproof Certifications)	-R
PG13.5 Trumpet Gland (Not for use on Models with Explosionproof or Flameproof Certifications)	-S
Welding Certificate (Size Codes 06 through 12 only)(a,b)	
Welding Certified to the ASME Boiler Code	-F
Radiographic Examination (X-Ray) of Flange Welds (except ANSI Class 150 and Metric PN 16)	-V
Welding Certified to the ASME Boiler Code and Radiographic Examination (Code "-V" above)	-X
Examples: 83F-A02S1SDTNA-X; 83F-A06K7DCRJE-GQNX	

(a) Select one certificate only. Note that Certificate "-X" includes both "-F" and "-V" certifications.

(b) Not available when Size Code 06 or 08 is combined with End Connection Code 1 or 4.

MODEL CODE

83W Vortex Flowmeter - Wafer Body

Description	Model
Vortex Flowmeter - Wafer Body	83W
Electronics Type 4 to 20 mA Analog and Pulse Electronics	-A
Nominal Meter Size 3/4 in (15 mm) Line Size	3Q
1 in (25 mm) Line Size	01
1 1/2 in (40 mm) Line Size	1H
2 in (50 mm) Line Size	02
3 in (80 mm) Line Size	03
4 in (100 mm) Line Size	04
6 in (150 mm) Line Size	06
8 in (200 mm) Line Size	08
Body Material ASTM A351-CF8M (316 ss) Cast Body and Shedder	S
ASTM A494-CW2M (Hastelloy C) Cast Body and Shedder, Not Available with Size Codes 06 or 08	H
Mounting and Centering System Centering for ANSI Class 150, ANSI Class 300, and ANSI Class 600, Metric PN16 (Sizes 3Q to 03 only), Metric PN40 (Not for Size 04), Metric PN64, and Metric PN100.	1
Centering for Metric PN16 (Sizes 04, 06, and 08 only)	4
Centering for Metric PN40 (Size 04 only)	5
Isolation Valve No Isolation Valve	S
Isolation Valve, Type CF3M Stainless Steel	K
Sensor Fill, Temperature Range, and Material Standard Temperature Range (with Fill Fluid) Fluorolube Fill, 0 to 200°F (-20 to +90°C) Hastelloy Type CW2M	D
Fluorolube Fill, 0 to 200°F (-20 to +90°C) Stainless Steel Type CF3M	F
Silicone Fill, 0 to 400°F (-20 to +200°C) Hastelloy Type CW2M	R
Silicone Fill, 0 to 400°F (-20 to +200°C) Stainless Steel Type CF3M	S
High Temperature Range (No Fill Fluid) Unfilled, 400 to 800°F (200 to 430°C) Hastelloy Type CW2M	C
Unfilled, 400 to 800°F (200 to 430°C) Stainless Steel Type CF3M	T
Mounting for Electronics Housing Integrally Mounted; Housing Mounted to Flowtube	T
Remote Mounted; Housing Mounted in a Remote Location. You must also Select Optional Cable Length (-B, -D, -E, or -G) further in this code.	R
Output Indicator No Output Indicator (Blind Unit)	N
Analog Output Indicator, 4 to 20 mA, 0 to 100% Scale	A
Analog Output Indicator, Ten Equally Spaced Divisions	B
Pulse Output Indicator, 0 to 100% Scale	E
Pulse Output Indicator, Ten Equally Spaced Divisions	D

(Continued on Next Page)

83 SERIES VORTEX SINGLE MEASUREMENT FLOWMETERS - MOUNTING ARRANGEMENTS WITH AND WITHOUT ISOLATION VALVE

Housing Above Pipe

GAS

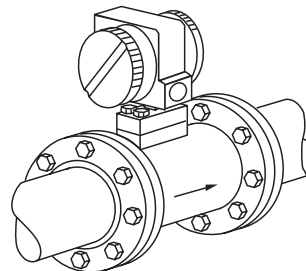
Recommended mounting.

STEAM

Recommended for super-heated steam with adequate insulation. Not recommended for saturated steam.

LIQUID

Adequate self-purging. Recommended mounting. Isolation Valve may cause temporary start-up error due to entrapped air.



Vertical Pipe

GAS

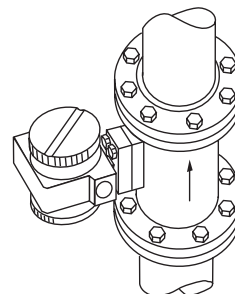
Recommended mounting.

STEAM

Recommended for super-heated steam with adequate insulation. Not recommended for saturated steam.

LIQUID

Adequate self-purging. Recommended mounting.



Housing Below Pipe

GAS

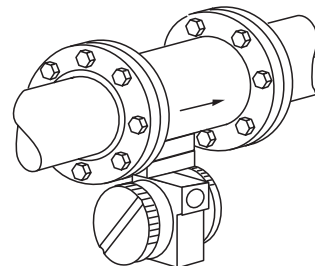
Recommended for clean applications only.

STEAM

Not recommended for super-heated steam. Recommended for saturated steam.

LIQUID

Recommended when self-purging is important.



Housing Beside Horizontal Pipe

GAS

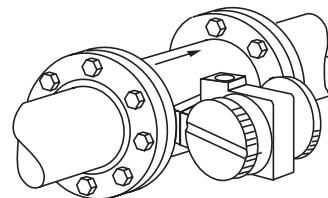
Recommended mounting.

STEAM

Not recommended for saturated steam. Recommended for superheated steam provided the pipe is adequately insulated.

LIQUID

Adequate self-purging, recommended mounting.



Housing to the Side and Below Horizontal Pipe

GAS

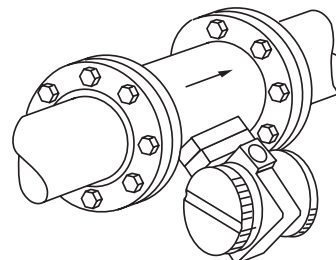
Not recommended.

STEAM

Not recommended.

LIQUID

Recommended.



**83 SERIES DUAL MEASUREMENT VORTEX FLOWMETER - MOUNTING ARRANGEMENTS
WITH OR WITHOUT ISOLATION VALVES**

Housings Above Pipe

GAS

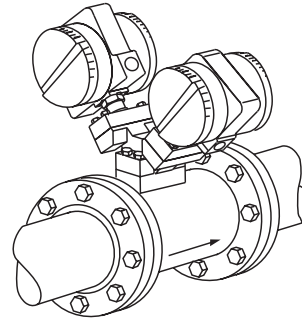
Recommended mounting.

STEAM

Recommended for super-heated steam with adequate insulation. Not recommended for saturated steam.

LIQUID

Not self-purging. May cause errors at startup. Not recommended for batch operations.



Vertical Pipe

GAS

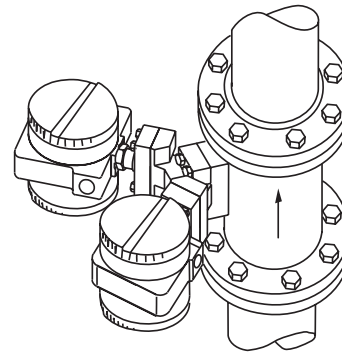
Recommended mounting.

STEAM

Recommended for super-heated steam with adequate insulation. Not recommended for saturated steam.

LIQUID

Adequate self-purging. Recommended mounting.



Housings Below Pipe

GAS

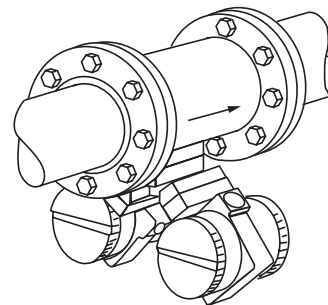
Not recommended.

STEAM

Not recommended for super-heated steam.
Recommended for saturated steam.

LIQUID

Self-purging. Recommended for batch operations.



OPTIONAL SELECTIONS AND ACCESSORIES

Cables to Connect Remote Electronics Housing Assembly to Flowtube Assembly

When selecting Code "R" for a Remote Mounted Electronics Housing, an optional cable length selection must also be made. Foxboro offers four cable lengths as follows:

Optional

Suffix Cable Length

-B	20 ft (6 m)
-D	30 ft (9 m)
-E	40 ft (12 m)
-G	50 ft (15 m)

Calibration Cable

A calibration cable that can be plugged into the amplifier is available to connect to a frequency generator to check the frequency-to-analog calibration of amplifier. Available by selecting Optional Suffix "-C".

Welding Certificates - Flanged Body Flowtubes

Three different welding certificates are available. Optional Suffix "-F" certifies that the fabrication of 150 to 300 mm (6 to 12 in) flowtubes by welders is to ASME Boiler Code, Section IX. Suffix "-V" provides radiographic examination (X-ray) certification of circumferential welds (not available with ANSI Class 150 or Metric PN16 flanges). And Suffix "-X" certifies that welding is per ASME Boiler Code and Radiographic Examination (except as noted for Suffix "-F").

Cleaning for Oxygen or Chlorine Service

Process wetted parts are cleaned for oxygen or chlorine service in compliance with Compressed Gas Association's CGA-4.1 and ASTM G93. Cleaning is not offered when an Isolation Valve is used with the flowtube assembly. Select Optional Suffix "-H".

Gold Plated Sensor

Ideally suited for H₂ or extremely corrosive processes. Specify Optional Suffix "-J".

Foxboro Certificates of Conformance and Compliance

Three material certificates are offered. Optional Suffix "-L" provides a certificate of compliance to Foxboro specifications. The Foxboro quality system conforms to ISO 9001. Suffix "-M" is a certification of material for process wetted metal (conforms to DIN 50049-3.1b). And, Suffix "-Q" certifies that stainless steel materials meet NACE Standard MR-01.

Calibration Certificate

Flow calibrated K-factor and pressure test certificate is available by selecting Optional Suffix "-N".

Hawke-Type 1/2 NPT Cable Gland

Brass cable gland with 1/2 NPT external thread. Has BASEEFA EEx, d, IIC flameproof electrical safety classification. Not certified for explosionproof installations. Select Optional Suffix "-P".

PG-11 and PG-13.5 Cable Connections

A PG-11 or PG-13.5 electrical cable connection is attached to the electronics housing. Connection provides a smooth trumpet-shaped entrance and strain relieved support for open cable wiring. The PG-11 is recommended for cable diameters from 8 to 12 mm and the PG-13.5 for cable diameters from 9 to 14 mm. Not offered with flameproof or explosionproof approved/certified transmitters. Select Optional Suffix "-R" or "-S".

Bolting Kits for 83W Flowmeters Only

Sets of studs and nuts which conform to size and material requirements necessary to meet pressure rating of specified flange class. Offered in 3/4 to 1 1/2 in sizes for ANSI Class 150, 300, and 600 flanges; and 2 and 3 in (50 and 80 mm) sizes for ANSI Class 150, 300, and 600 flanges, and Metric PN 40 flanges. Select Model Code Optional Suffix "-T".

Stainless Steel Customer Tag

This optional accessory adds a 40 x 90 mm (1.5 x 3.5 in) stainless steel tag for customer data that does not fit on the standard stainless steel data plate. It is fastened to housing with stainless steel wire. There can be a maximum of 10 lines of data with 40 characters and spaces per line. This tag will also show the K-factor specific to customer application (information with flowing conditions being submitted to Foxboro with the purchase order). Specify AS Code MTS.

ORDERING INSTRUCTIONS

- 1. Model Number
- 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 up-stream disturbances.
- 3. Calibration information (analog output only); maximum flow rate for 20 mA output.
- 4. Electrical Classification
- 5. Optional Features
- 6. Customer Tag Data

PATENT NOTICE

This product and its components are protected by one or more of the following U.S. Patents.

3,948,098; 4,085,614; 4,520,678; 5,003,827 and 5,209,125. Corresponding patents have been issued or are pending in other countries.

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MB 010

Printed in U.S.A.

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