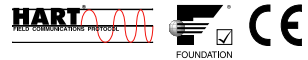
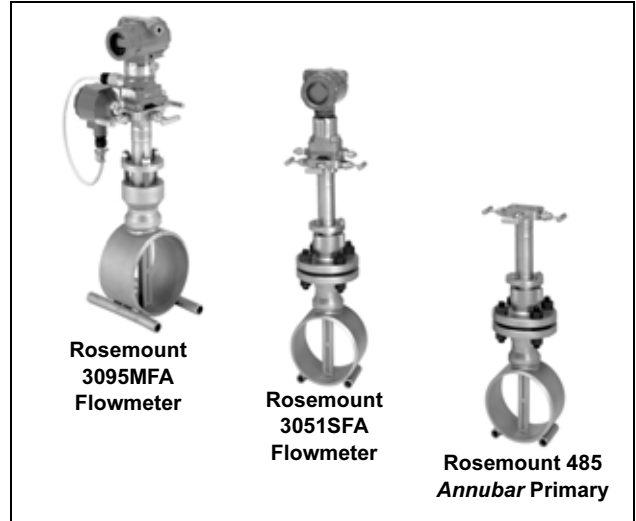


# Rosemount Annubar® Flowmeter Series

- Industry leading integrated DP flowmeters are created when Annubar primary elements are packaged with Rosemount pressure transmitters
- Improved performance with innovative measuring techniques
- Real-time mass flow measurements available with integral temperature sensor design
- Increased plant uptime with the maintenance-free design
- Energy savings gained through minimal permanent pressure loss



## Contents

The Annubar Flowmeter Series . . . . .	page Flow-2
Annubar Flowmeter Series Selection Guide . . . . .	page Flow-3
Rosemount 3051SFA ProBar® Flowmeter . . . . .	page Flow-4
Specifications . . . . .	page Flow-4
Product Certifications . . . . .	page Flow-11
Dimensional Drawings . . . . .	page Flow-15
Ordering Information . . . . .	page Flow-21
Rosemount 3095MFA Mass ProBar Flowmeter . . . . .	page Flow-28
Specifications . . . . .	page Flow-28
Installation Considerations . . . . .	page Flow-32
Dimensional Drawings . . . . .	page Flow-35
Ordering Information . . . . .	page Flow-41
Rosemount 485 Annubar Primary . . . . .	page Flow-46
Specifications . . . . .	page Flow-46
Dimensional Drawings . . . . .	page Flow-50
Ordering Information . . . . .	page Flow-57

## The Annubar Flowmeter Series

### Industry leading integrated DP flowmeters

By integrating pressure transmitter electronics with the *Annubar* Averaging Pitot Tube (APT), Rosemount provides the highest performing insertion DP flowmeter. This fully integrated flowmeter eliminates the need for fittings, tubing, valves, adapters, manifolds, and mounting brackets, thereby reducing welding and installation time.

### Improved performance with innovative measuring techniques

The *Annubar's* frontal slot design and revolutionary shape improve the accuracy and repeatability of every flow measurement point. Tight process control is gained by increased signal strength and reduced signal noise.

### Real-time mass flow measurements are available with the integral temperature sensor design

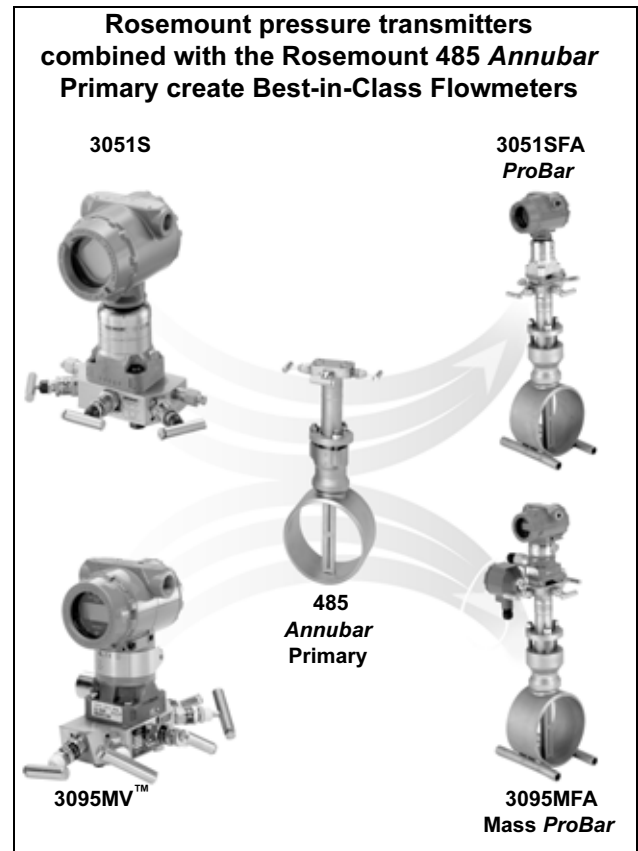
The patented T-shaped sensor includes a sealed, pressure-retaining thermowell that permits mass flow in all line sizes with a single pipe penetration. Multivariable technology in gas and steam applications compensates for pressure and temperature variations, which can cause significant flow errors.

### Plant uptime is increased with the maintenance-free design

The *Annubar* sensor is designed to prevent wear and blockage in the pipe. The electronics are the most stable in the industry and allows up to 10 year calibration cycles, providing significant maintenance savings.

### Energy savings gained through minimal permanent pressure loss

The non-constricting design of the *Annubar* sensor creates minimal blockage in the pipe, which reduces permanent pressure loss. Permanent pressure loss can be converted directly into energy savings in the form of compressor cost for gas, electrical cost for pumping liquids, and fuel costs for generating steam.



### Advanced *PlantWeb*® Functionality



Rosemount *Annubar* flowmeters power *PlantWeb* through a scalable architecture, advanced diagnostics, and MultiVariable capabilities. This reduces operational and maintenance expenditures while improving throughput and utilities management.

## Rosemount DP-Flow Solutions

### ***Annubar* Flowmeter Series: Rosemount 3051SFA ProBar®, 3095MFA Mass ProBar®, 485, and 285**

The state-of-the-art, fifth generation Rosemount 485 *Annubar* combined with the 3051S or 3095 MultiVariable transmitter creates an accurate, repeatable and dependable insertion-type flowmeter. The Rosemount 285 provides a commercial product offering for your general purpose applications.

### **Compact Orifice Flowmeter Series: Rosemount 3051SFC, 3095MFC, and 405**

Compact Orifice Flowmeters can be installed between existing flanges, up to a Class 600 (PN100) rating. In tight fit applications, a conditioning orifice plate version is available, requiring only two diameters of straight run upstream.

### **Integral Orifice Flowmeter Series: Rosemount 3051SFP ProPlate®, 3095MFP Mass ProPlate, and 1195**

These integral orifice flowmeters eliminate the inaccuracies that become more pronounced in small orifice line installations. The completely assembled, ready to install flowmeters reduce cost and simplify installation.

### **Orifice Plate Primary Element Systems: Rosemount 1495 and 1595 Orifice Plates, 1496 Flange Unions and 1497 Meter Sections**

A comprehensive offering of orifice plates, flange unions and meter sections that is easy to specify and order. The 1595 Conditioning Orifice provides superior performance in tight fit applications.

## Annubar Flowmeter Series Selection Guide

### Rosemount 3051SFA *ProBar* Flowmeter

See ordering information on page Flow-21.

- Combines the Rosemount 3051S scalable pressure transmitter with the Rosemount 485 *Annubar* Primary Element
- $\pm 0.80\%$  of volumetric flow rate accuracy
- LCD and communication ports can be mounted remotely for easy “at grade” access.
- *FOUNDATION*<sup>®</sup> fieldbus protocol available
- Ideal fluid type: liquid



Rosemount 3051SFA  
*ProBar* Flowmeter



Rosemount 3095MFA  
Mass *ProBar* Flowmeter

### Rosemount 3095MFA Mass *ProBar* Flowmeter

See ordering information on page Flow-41.

- Combines the Rosemount 3095 MultiVariable mass flow transmitter with the Rosemount 485 *Annubar* Primary
- 0.90% of mass flow rate accuracy
- Measures differential pressure, static pressure, and process temperature with a single pipe penetration
- Dynamically calculates compensated mass flow
- Ideal fluid types: gas and steam

### Rosemount 485 *Annubar* Primary

See ordering information on page Flow-57.

- Innovative slot and T-shape design increases accuracy to  $\pm 0.75\%$
- Wide variety of mounting configurations
- Integral manifold head allows direct mounting of DP transmitters
- Flo-Tap design allows installation without system shutdown
- Ideal fluid types: liquid, gas, and steam



Rosemount 485  
*Annubar* Primary

# The Annubar Flowmeter Series

## Rosemount 3051SFA ProBar<sup>®</sup> Flowmeter

### SPECIFICATIONS

#### Performance

##### System Reference Accuracy

Percentage (%) of volumetric flow rate

Classic (8:1 flow turndown)	Ultra (8:1 flow turndown)	Ultra for Flow (14:1 flow turndown)
±1.10%	±0.90%	±0.80%

##### Repeatability

±0.1%

##### Line Sizes

- Sensor Size 1: 2-in. to 8-in. (50 to 200 mm)
- Sensor Size 2: 6-in. to 96-in. (150 to 2400 mm)
- Sensor Size 3: 12-in. to 96-in. (300 to 2400 mm)

#### NOTE

Some mounting types are not available in larger line sizes.

TABLE 1. Reynolds Number and Probe Width

Sensor Size	Minimum Rod Reynolds Number ( $R_d$ )	Probe Width ( $d$ )
1	6500	0.590-in. (14.99 mm)
2	12500	1.060-in. (26.92 mm)
3	25000	1.935-in. (49.15 mm)

Where

$d$  = Probe width (feet)

$V$  = Velocity of fluid (ft/sec)

$\rho$  = Density of fluid ( $\text{lb}_m/\text{ft}^3$ )

$\mu$  = Viscosity of the fluid ( $\text{lb}_m/\text{ft-sec}$ )

$$R_d = \frac{d \times V \times \rho}{\mu}$$

#### Performance Statement Assumptions

- Measured pipe I.D
- Transmitter is trimmed for optimum flow accuracy

#### Sizing

Contact an Emerson Process Management representative for assistance. A Configuration Data Sheet is required prior to order for application verification.

#### Annubar Sensor Surface Finish

The front surface of the *Annubar* primary is textured for high Reynolds number applications (typically gas and steam). The surface texture creates a more turbulent boundary layer on the front surface of the sensor. The increased turbulence produces a more predictable and repeatable separation of flow at the edge of the sensor. The appropriate surface finish will be determined for each application by the Emerson Process Management sizing program, Instrument Toolkit software.

#### Functional

##### Service

- Liquid
- Gas
- Steam

#### 4–20 mA/HART

##### Zero and Span Adjustment

Zero and span values can be set anywhere within the range. Span must be greater than or equal to the minimum span.

##### Output

Two-wire 4–20 mA is user-selectable for linear or square root output. Digital process variable superimposed on 4–20 mA signal, available to any host that conforms to the HART protocol.

##### Power Supply

External power supply required.

Standard transmitter (4–20 mA): 10.5 to 42.4 V dc with no load  
3051S HART Diagnostics transmitter: 12 to 42 Vdc with no load

# Product Data Sheet

00813-0100-4809, Rev FA  
Catalog 2008 - 2009

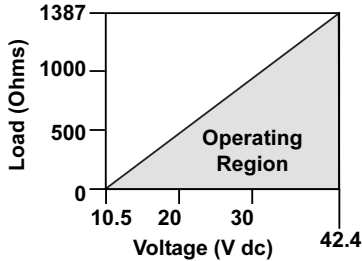
# The Annubar Flowmeter Series

### Load Limitations

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

#### Standard Transmitter

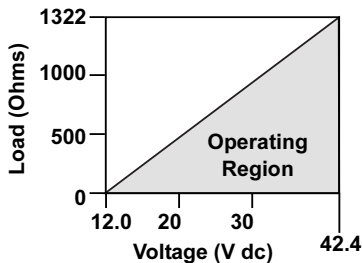
Maximum Loop Resistance =  $43.5 * (\text{Power Supply Voltage} - 10.5)$



The HART communicator requires a minimum loop resistance of  $250\Omega$  for communication.

#### 3051S HART Diagnostics Transmitter (option code DA1)

Maximum Loop Resistance =  $43.5 * (\text{Power Supply Voltage} - 12.0)$



The HART communicator requires a minimum loop resistance of  $250\Omega$  for communication.

### ASP™ Diagnostics Suite for HART (Option Code DA1)

The 3051S provides Abnormal Situation Prevention indication for a breakthrough in diagnostic capability. The New 3051S ASP™ Diagnostics Suite for HART includes Statistical Process Monitoring (SPM), variable logging with time stamp and advanced process alerts. The enhanced EDDL graphic display provides an intuitive and user-friendly interface to better visualize these diagnostics.

The integral SPM technology calculates the mean and standard deviation of the process variable 22 times per second and makes them available to the user. The 3051S uses these values and highly flexible configuration options for customization to detect many user-defined or application specific abnormal situations (e.g. detecting plugged impulse lines and fluid composition change). Variable logging with time stamp and advanced process alerts capture valuable process and sensor data to enable quick troubleshooting of application and installation issues.

### FOUNDATION fieldbus

#### Power Supply

External power supply required; transmitters operate on 9.0 to 32.0 V dc transmitter terminal voltage.

#### Current Draw

17.5 mA for all configurations (including LCD display option)

### FOUNDATION fieldbus Parameters

Schedule Entries	14 (max.)
Links	30 (max.)
Virtual Communications Relationships (VCR)	20 (max.)

### Standard Function Blocks

#### Resource Block

- Contains hardware, electronics, and diagnostic information.

#### Transducer Block

- Contains actual sensor measurement data including the sensor diagnostics and the ability to trim the pressure sensor or recall factory defaults.

#### LCD Block

- Configures the local display.

#### 2 Analog Input Blocks

- Processes the measurements for input into other function blocks. The output value is in engineering or custom units and contains a status indicating measurement quality.

#### PID Block with Auto-tune

- Contains all logic to perform PID control in the field including cascade and feedforward. Auto-tune capability allows for superior tuning for optimized control performance.

### Backup Link Active Scheduler (LAS)

The transmitter can function as a Link Active Scheduler if the current link master device fails or is removed from the segment.

### Software Upgrade in the Field

Software for the 3051S with FOUNDATION fieldbus is easy to upgrade in the field using the FOUNDATION fieldbus Common Device Software Download procedure.

### PlantWeb Alerts

Enable the full power of the PlantWeb digital architecture by diagnosing instrumentation issues, communicating advisory, maintenance, and failure details, and recommending a solution.

### Advanced Control Function Block Suite (Option Code A01)

#### Input Selector Block

- Selects between inputs and generates an output using specific selection strategies such as minimum, maximum, midpoint, average, or first "good."

#### Arithmetic Block

- Provides pre-defined application-based equations including flow with partial density compensation, electronic remote seals, hydrostatic tank gauging, ratio control and others.

#### Signal Characterizer Block

- Characterizes or approximates any function that defines an input/output relationship by configuring up to twenty X, Y coordinates. The block interpolates an output value for a given input value using the curve defined by the configured coordinates.

#### Integrator Block

- Compares the integrated or accumulated value from one or two variables to pre-trip and trip limits and generates discrete output signals when the limits are reached. This block is useful for calculating total flow, total mass, or volume over time.

# The Annubar Flowmeter Series

## Output Splitter Block

- Splits the output of one PID or other control block so that the PID will control two valves or other actuators.

## Control Selector Block

- Selects one of up to three inputs (highest, middle, or lowest) that are normally connected to the outputs of PID or other control function blocks.

Block	Execution Time
Resource	-
Transducer	-
LCD Block	-
Analog Input 1, 2	20 milliseconds
PID with Auto-tune	35 milliseconds
Input Selector	20 milliseconds
Arithmetic	20 milliseconds
Signal Characterizer	20 milliseconds
Integrator	20 milliseconds
Output Splitter	20 milliseconds
Control Selector	20 milliseconds

## Fully Compensated Mass Flow Block (Option Code H01)

Calculates fully compensated mass flow based on differential pressure with external process pressure and temperature measurements over the fieldbus segment. Configuration for the mass flow calculation is easily accomplished using the Rosemount Engineering Assistant.

## ASP™ Diagnostics Suite for FOUNDATION fieldbus (Option Code D01)

3051S FOUNDATION fieldbus Diagnostics provide Abnormal Situation Prevention (ASP) indication and enhanced EDDL graphic displays for easy visual analysis.

The integral statistical process monitoring (SPM) technology calculates the mean and standard deviation of the process variable 22 times per second and makes them available to the user. The 3051S ASP algorithm uses these values and highly flexible configuration options for customization to detect many user-defined or application specific abnormal situations (e.g. detecting plugged impulse lines and fluid composition change).

## Wireless Self-Organizing Networks

### Output

Wireless enabled HART.

### Transmit Rate

User selectable, 15 sec. to 60 min.

### Power Module

Replaceable, Intrinsically Safe Lithium-thionyl chloride Power Module with polybutadine terephthalate (PBT) enclosure. Five-year life at one minute transmit rate: ten-year life at ten minute transmit rate.<sup>(1)</sup>

(1) Reference conditions are 70 °F (21 °C), and routing data for three additional network devices.

#### NOTE

Continuous exposure to ambient temperature limits, -40 °F (-40 °C) or 185 °F (85 °C), may reduce specified life by less than 20 percent.

## Process Temperature Limits

### Direct Mount Transmitter

- 500 °F (260 °C)
- 750 °F (398 °C) when used with a direct mount, high temperature 5-valve manifold (Transmitter Connection Platform code 6)

### Remote Mount Transmitter

- 1250 °F (677 °C) – *Hastelloy*® Sensor Material
- 850 °F (454 °C) – Stainless Steel Sensor Material

## Transmitter Temperature Limits

### Ambient

- -40 to 185 °F (-40 to 85 °C)
- With Integral Display<sup>(1)</sup>: -40 to 175 °F (-40 to 80 °C)

### Storage

- -50 to 230 °F (-46 to 110 °C)
- With Integral Display: -40 to 185 °F (-40 to 85 °C)
- With wireless output (code X): -40 to 185 °F (-40 to 85 °C)

## Pressure Limits<sup>(2)</sup>

### Direct Mount Transmitter

- Pressure retention per ANSI B16.5 600# or DIN PN

## Static Pressure Limits

- Range 1A: Operates within specification between static line pressures of 0.5 psia to 2000 psig (0.03 to 138 bar)
- Ranges 2A– 3A: Operates within specifications between static line pressures of 0.5 psia and 3626 psig (0.03 bar-A to 250 bar-G)

## Burst Pressure Limits

### Coplanar or traditional process flange

- 10000 psig (689,5 bar).

## Overpressure Limits

Transmitters withstand the following limits without damage:

- Range 1A: 2000 psig (138 bar)
- Ranges 2A–3A: 3626 psig (250 bar)

TABLE 2. Overpressure Limits<sup>(1)</sup>

Standard	Type	Carbon Steel Rating	Stainless Steel Rating
ANSI/ASME	Class 150	285 (20)	275 (19)
ANSI/ASME	Class 300	740 (51)	720 (50)
ANSI/ASME	Class 600	1480 (102)	1440 (99)
<i>At 100 °F (38 °C), the rating decreases with increasing temperature.</i>			
DIN	PN 10/40	580 (40)	580 (40)
DIN	PN 10/16	232 (16)	232 (16)
DIN	PN 25/40	580 (40)	580 (40)
<i>At 248 °F (120 °C), the rating decreases with increasing temperature.</i>			

(1) Carbon Steel and Stainless Steel Ratings are measured in psig (bar).

## Humidity Limits

- 0–100% relative humidity

(1) LCD display may not be readable and LCD updates will be slower at temperatures below -4 °F (-20 °C).

(2) Static pressure selection may effect pressure limitations.

# Product Data Sheet

00813-0100-4809, Rev FA  
 Catalog 2008 - 2009

# The Annubar Flowmeter Series

## Turn-On Time

Performance within specifications less than 2 seconds (typical) after power is applied to the transmitter

## Damping

Analog output response to a step input change is user-selectable from 0 to 60 seconds for one time constant. This software damping is in addition to sensor module response time

## Failure Mode Alarm

### HART 4-20mA (output option codes A and B)

If self-diagnostics detect a gross transmitter failure, the analog signal will be driven offscale to alert the user. Rosemount standard (default), NAMUR, and custom alarm levels are available (see Table 3).

High or low alarm signal is software-selectable or hardware-selectable via the optional switch (option D1).

TABLE 3. Alarm Configuration

	High Alarm	Low Alarm
Default	$\geq 21.75$ mA	$\leq 3.75$ mA
NAMUR compliant <sup>(1)</sup>	$\geq 22.5$ mA	$\leq 3.6$ mA
Custom levels <sup>(2)</sup>	20.2 - 23.0 mA	3.6 - 3.8 mA

(1) Analog output levels are compliant with NAMUR recommendation NE 43, see option codes C4 or C5.

(2) Low alarm must be 0.1 mA less than low saturation and high alarm must be 0.1 mA greater than high saturation.

## 3051S Safety-Certified Transmitter Failure Values

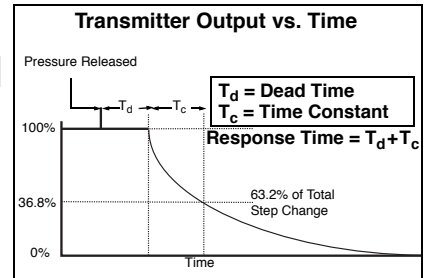
Safety accuracy: 2.0%<sup>(1)</sup>

Safety response time: 1.5 seconds

(1) A 2% variation of the transmitter mA output is allowed before a safety trip. Trip values in the DCS or safety logic solver should be derated by 2%.

## Dynamic Performance<sup>(1)</sup>

	4 - 20 mA (HART <sup>®</sup> ) <sup>(2)</sup>	Fieldbus protocol <sup>(3)</sup>	Typical Transmitter Response Time
<b>Total Response Time (Td + Tc)<sup>(4)</sup>:</b>			
3051S_C, Ranges 2A - 3A:	100 milliseconds	152 milliseconds	
Range 1A:	255 milliseconds	307 milliseconds	
<b>Dead Time (Td)<sup>(5)</sup></b>	45 milliseconds (nominal)	97 milliseconds	
<b>Update Rate</b>	3051S 22 times per second	22 times per second	



(1) Does not apply to wireless output code X. See "Wireless Self-Organizing Networks" on page 6 for wireless transmit rate.

(2) Dead time and update rate apply to all models and ranges; analog output only

(3) Transmitter fieldbus output only, segment macro-cycle not included.

(4) Nominal total response time at 75 °F (24 °C) reference conditions. For option code DA1, add 45 milliseconds (nominal) to 4-20 mA (HART<sup>®</sup>) total response time values.

(5) For option code DA1, dead time (Td) is 90 milliseconds (nominal).

## Physical

### Temperature Measurement

#### Integral RTD

- 100 Ohm platinum RTD
- 4-wire RTD ( $\alpha = 0.00385$ )

#### Remote RTD

- 100 Ohm platinum RTD, spring loaded with 1/2-in. NPT nipple and union (078 series with Rosemount 644 housing)

#### Thermowell with Remote RTD

- 1/2-in. x 1/2-in NPT, 316 Stainless Steel with 1/2-in. weld couplet to match pipe material

### Housing Connections

1/2–14 NPT, G1/2, and M20 x 1.5 (CM20) conduit. HART interface connections fixed to terminal block for output code A

### Annubar Sensor Material

- 316 Stainless Steel
- Hastelloy 276

### Annubar Type

See “Dimensional Drawings” on page 15

#### Pak-Lok Model (option P)

- Provided with a compression sealing mechanism rated up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C))
- Graphite Packing (–300 to 850 °F (–184 to 454 °C))

#### Flanged with Opposite Side Support Model (option F)

- Provided with opposite side support, which is the same material as the pipe and requires a second pipe penetration
- Sensor flange is the same material as the Annubar sensor and the mounting flange is the same material as the pipe material
- Flanged mounting hardware: nuts, studs and gaskets (DIN units supplied without nuts, studs and gaskets)
- SST: (–300 to 850 °F (–184 to 454 °C))
- Hastelloy: (–300 to 1250 °F (–184 to 677 °C))

#### Flange-Lok Model (option L)

- Flange-Lok assembly is supplied in 316 SST material.
- Flange-Lok mounting hardware: nuts, studs and gaskets (DIN units supplied without nuts, studs and gaskets)
- –300 to 850 °F (–184 to 454 °C)

#### Flo-Tap Models (options G and M)

- Opposite side support is not available
- Threaded connection is not available with Sensor Size 3
- Gear Drive is not available with Sensor Size 1
- Packing gland required
- Packing Gland Material Temperature Limits
  - PTFE: –40 to 400 °F (–40 to 204 °C)
  - Graphite: –300 to 850 °F (–184 to 454 °C)
- Isolation valve included
  - The isolation valve will carry the same pressure rating as the sensor flange and mounting flange specified in the mounting type
  - Ball valves have a 300# limitation
  - For threaded flo-tap models, the isolation valve NPT size is 1 1/4-in. (Sensor Size one) and 2-in. (Sensor Size 2).

### Annubar Type Specification Chart

Option Code	Description	Pak-Lok <sup>(1)</sup>	Flange-Lok	Flange	Manual and Gear Drive Flo-Tap
T1 <sup>(1)</sup>	Pak-Lok Body Threaded connection	X			X
A1	150# RF ANSI		X	X	X
A3	300# RF ANSI		X	X	X
A6	600# RF ANSI		X	X	X
A9 <sup>(2)</sup>	900# RF ANSI			X	
AF <sup>(2)</sup>	1500# RF ANSI			X	
AT <sup>(2)</sup>	2500# RF ANSI			X	
D1	DN PN 16		X	X	X
D3	DN PN 40		X	X	X
D6	DN PN 100		X	X	X
R9 <sup>(2)</sup>	900# RTJ Flange			X	
RF <sup>(2)</sup>	1500# RTJ Flange			X	
RT <sup>(2)</sup>	2500# RTJ Flange			X	

(1) Available up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C)) rating.

(2) Remote mount only.

### Instrument Connections Temperature Ranges

TABLE 4. Minimum / Maximum Temperature Range

Code	Description	Temperature
G1	Needle Valves, Carbon Steel	–20 to 500 °F (–29 to 260 °C)
G2	Needle Valves, Stainless Steel	–40 to 600 °F (–40 to 316 °C)
G3	Needle Valves, Hastelloy	–40 to 600 °F (–40 to 316 °C)
G5	OS&Y Gate Valve, Carbon Steel	–20 to 775 °F (–29 to 413 °C)
G6	OS&Y Gate Valve, Stainless Steel	–40 to 850 °F (–40 to 454 °C)
G7	OS&Y Gate Valve, Hastelloy	–40 to 1250 °F (–40 to 677 °C)



## Product Data Sheet

00813-0100-4809, Rev FA

Catalog 2008 - 2009

# The Annubar Flowmeter Series

### Flowmeter Installed in Flanged Pipe Spool Section (option codes H3, H4, and H5)

- All pipe spool sections are flanged pipe sections
- The flanged pipe spool section is constructed from the same material as the pipe
- Consult the factory for remote temperature measurement and ANSI ratings above 600# and DIN flanges

TABLE 5. Flanged Pipe Spool Section Schedule

ANSI	Schedule
150# ANSI	40
300# ANSI	40
600# ANSI	80

TABLE 6. Flange Pipe Spool Section Length

Nominal Pipe Size	Length
2-in. (50 mm)	10.52-in. (267.2 mm)
3-in. (80 mm)	11.37-in. (288.8 mm)
4-in. (100 mm)	12.74-in. (323.6 mm)
6-in. (150 mm)	14.33-in. (364.0 mm)
8-in. (200 mm)	16.58-in. (421.1 mm)

### Process-Wetted Parts

#### Integral Manifolds

- 316 SST
- *Hastelloy C-276*

#### Remote Manifolds

- 316 SST
- *Hastelloy C-276*

#### Transmitter Vent Valves and Process Flanges

- 316 SST
- *Hastelloy C-276*
- Glass-filled PTFE o-rings

#### Process Isolating Diaphragms

- 316L SST
- *Hastelloy C-276*

#### Integral Manifold O-Rings

- PTFE / Graphite

### Non-Wetted Parts

#### Sensor Module Fill Fluid

- Silicone oil
- Inert Fill optional

#### Cover O-rings

- Buna-N

#### Remote Mounting Brackets

- SST

#### Sensor mounting (including nuts, bolts, and gasket)

- Match Process Pipe material

#### Transmitter Housing

- Low copper aluminum, NEMA 4x, IP65
- SST (optional)

#### Paint

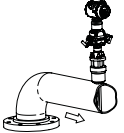
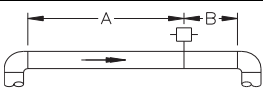
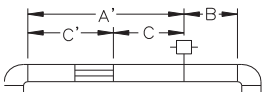
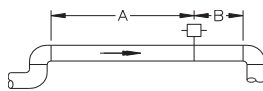
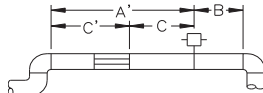
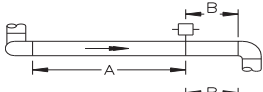
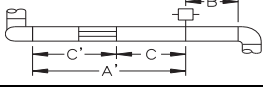

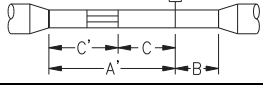
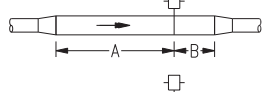
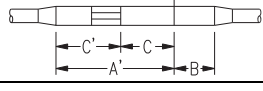
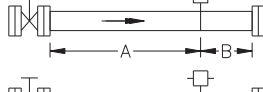
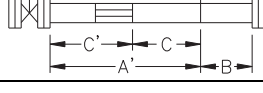
- Polyurethane

#### Bolts

- CS

# The Annubar Flowmeter Series

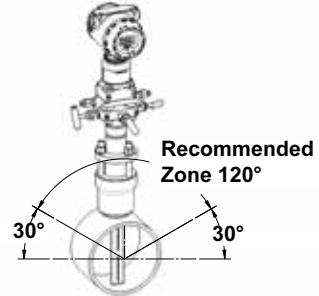
## Straight Run Requirements<sup>(1)</sup>

In Plane 	Upstream Dimensions (Pipe Diameters)					Downstream
	Without Vanes <sup>(2)</sup>		With Vanes <sup>(3)</sup>			
	In Plane A	Out of Plane A	A'	C	C'	
1 	8	10	—	—	—	4
1 	—	—	8	4	4	4
2 	11	16	—	—	—	4
2 	—	—	8	4	4	4
3 	23	28	—	—	—	4
3 	—	—	8	4	4	4
4 	12	12	—	—	—	4
4 	—	—	8	4	4	4
5 	18	18	—	—	—	4
5 	—	—	8	4	4	4
6 	30	30	—	—	—	4
6 	—	—	8	4	4	4

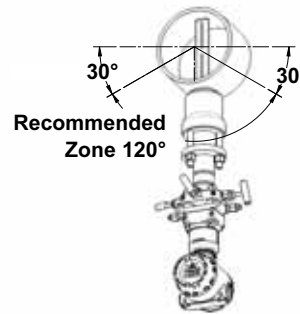
- (1) Consult the factory for instructions regarding use in square or rectangular ducts.
- (2) "In Plane A" means the bar is in the same plane as the elbow. "Out of Plane A" means the bar is perpendicular to the plane of the upstream elbow.
- (3) Use straightening vane to reduce the required straight run length.

## Flowmeter Orientation (Recommended)

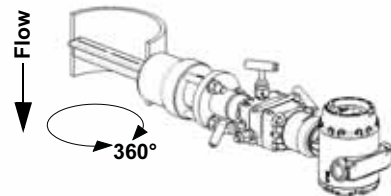
### Gas (Horizontal)



### Liquid and Steam (Horizontal)

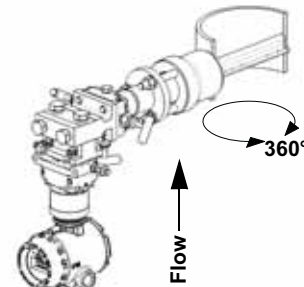


### Gas (Vertical)



Note: Can also be mounted for Gas Vertical up applications.

### Steam (Vertical)



## Drill Hole Size According to Sensor Size

Sensor Size	Diameter
1	3/4-in. (19 mm)
2	1 <sup>5</sup> / <sub>16</sub> -in. (34 mm)
3	2 <sup>1</sup> / <sub>2</sub> -in. (64 mm)

## PRODUCT CERTIFICATIONS

### Approved Manufacturing Locations

Rosemount Inc. — Chanhassen, Minnesota USA  
Emerson Process Management GmbH & Co. — Wessling, Germany  
Emerson Process Management Asia Pacific Private Limited — Singapore  
Beijing Rosemount Far East Instrument Co., LTD — Beijing, China

### European Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found at [www.rosemount.com](http://www.rosemount.com). A hard copy may be obtained by contacting an Emerson Process Management representative.

#### ATEX Directive (94/9/EC)

Emerson Process Management complies with the ATEX Directive.

#### European Pressure Equipment Directive (PED) (97/23/EC)

Models 3051S\_CA4; 3051S\_CD2, 3, 4, 5; (also with P9 option)  
Pressure Transmitters — QS Certificate of Assessment - EC No. PED-H-20, Module H Conformity Assessment  
All other Model 3051S Pressure Transmitters — Sound Engineering Practice  
Transmitter Attachments: Diaphragm Seal - Process Flange - Manifold — Sound Engineering Practice  
Primary Elements, Flowmeter  
— See appropriate Primary Element QIG

#### Electro Magnetic Compatibility (EMC) (89/336/EEC)

All Models: EN 50081-1: 1992; EN 50082-2:1995;  
EN 61326-1:1997 – Industrial

### Ordinary Location Certification for FM

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

## Hazardous Locations Certifications

### North American Certifications

#### FM Approvals

**E5** Explosion-proof for Class I, Division 1, Groups B, C, and D; dust-ignition proof for Class II and Class III, Division 1, Groups E, F, and G; hazardous locations; enclosure Type 4X, conduit seal not required when installed according to Rosemount drawing 03151-1003.

**15/IE** Intrinsically Safe for use in Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1; Class I, Zone 0 AEx ia IIC when connected in accordance with Rosemount drawing 03151-1006; Non-incendive for Class I, Division 2, Groups A, B, C, and D Enclosure Type 4X  
For entity parameters see control drawing 03151-1006.

#### Canadian Standards Association (CSA)

**E6** Explosion-proof for Class I, Division 1, Groups B, C, and D; Dust-Ignition-Proof for Class II and Class III, Division 1, Groups E, F, and G; suitable for Class I, Division 2, Groups A, B, C, and D, when installed per Rosemount drawing 03151-1013, CSA Enclosure Type 4X; conduit seal not required.

**16/IF** Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D when connected in accordance with Rosemount drawings 03151-1016;  
For entity parameters see control drawing 03151-1016.

## European Certifications


**11/IA** ATEX Intrinsic Safety  
Certificate No.: BAS01ATEX1303X  II 1G  
EEx ia IIC T4 (T<sub>a</sub> = -60 °C to 70 °C) -HART/Remote Display/Quick Connect/HART Diagnostics  
EEx ia IIC T4 (T<sub>a</sub> = -60 °C to 70 °C) -FOUNDATION fieldbus  
EEx ia IIC T4 (T<sub>a</sub> = -60 °C to 40 °C) -FISCO  
IP66  
CE 1180


TABLE 7. Input Parameters

Loop / Power	Groups
U <sub>i</sub> = 30 V	HART / FOUNDATION fieldbus / Remote Display / Quick Connect / HART Diagnostics
U <sub>i</sub> = 17.5 V	FISCO
I <sub>i</sub> = 300 mA	HART / FOUNDATION fieldbus / Remote Display / Quick Connect / HART Diagnostics
I <sub>i</sub> = 380 mA	FISCO
P <sub>i</sub> = 1.0 W	HART / Remote Display / Quick Connect / HART Diagnostics
P <sub>i</sub> = 1.3 W	FOUNDATION fieldbus
P <sub>i</sub> = 5.32 W	FISCO
C <sub>i</sub> = 30 nF	SuperModule Platform / Quick Connect
C <sub>i</sub> = 11.4 nF	HART / HART Diagnostics
C <sub>i</sub> = 0	FOUNDATION fieldbus / Remote Display / FISCO
L <sub>i</sub> = 0	HART / FOUNDATION fieldbus / FISCO / Quick Connect / HART Diagnostics
L <sub>i</sub> = 60 µH	Remote Display

#### Special conditions for safe use (x)


- The apparatus, excluding the Types 3051 S-T and 3051 S-C (In-line and *Coplanar SuperModules* respectively), is not capable of withstanding the 500V test as defined in Clause 6.4.12 of EN 50020. This must be considered during installation.
- The terminal pins of the Types 3051 S-T and 3051 S-C must be protected to IP20 minimum.

# The Annubar Flowmeter Series

**N1** ATEX Type n  
 Certificate No.: BAS01ATEX3304X  II 3 G  
 EEx nL IIC T5 ( $T_a = -40\text{ °C TO } 70\text{ °C}$ )  
 $U_i = 45\text{ Vdc max}$   
 IP66  
**CE**


### Special conditions for safe use (x)

The apparatus is not capable of withstanding the 500V insulation test required by Clause 9.1 of EN 50021: 1999. This must be taken into account when installing the apparatus.

**ND** ATEX Dust  
 Certificate No.: BAS01ATEX1374X  II 1 D  
 $T_{105\text{ °C}} (-20\text{ °C} \leq T_{\text{amb}} \leq 85\text{ °C})$   
 $V_{\text{max}} = 42.4\text{ volts max}$   
 $A = 22\text{ mA}$   
 IP66  
**CE 1180**

### Special conditions for safe use (x)

1. The user must ensure that the maximum rated voltage and current (42.4 volts, 22 milliampere, DC) are not exceeded. All connections to other apparatus or associated apparatus shall have control over this voltage and current equivalent to a category "ib" circuit according to EN 50020.
2. Cable entries must be used which maintain the ingress protection of the enclosure to at least IP66.
3. Unused cable entries must be filled with suitable blanking plugs which maintain the ingress protection of the enclosure to at least IP66.
4. Cable entries and blanking plugs must be suitable for the ambient range of the apparatus and capable of withstanding a 7J impact test.
5. The 3051S must be securely screwed in place to maintain the ingress protection of the enclosure.

**E1** ATEX Flameproof  
 Certificate No.: KEMA00ATEX2143X  II 1/2 G  
 EEx d IIC T6 ( $-50\text{ °C} \leq T_{\text{amb}} \leq 65\text{ °C}$ )  
 EEx d IIC T5 ( $-50\text{ °C} \leq T_{\text{amb}} \leq 80\text{ °C}$ )  
 $V_{\text{max}} = 42.4\text{V}$   
**CE 1180**

### Special conditions for safe use (x)

This device contains a thin wall diaphragm. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime. The Model 3051S pressure transmitter must include a Series 300S housing integrally mounted to a Series Model 3051S Sensor module as per Rosemount drawing 03151-1023.

## Japanese Certifications

**E4** TIIS Flameproof  
 Ex d IIC T6

Certificate	Description
TC15682	Coplanar with Junction Box Housing
TC15683	Coplanar with PlantWeb Housing
TC15684	Coplanar with PlantWeb Housing and LCD Display
TC15685	In-Line SST with Junction Box Housing
TC15686	In-Line Hastelloy with Junction Box Housing
TC15687	In-Line SST with PlantWeb Housing
TC15688	In-Line Hastelloy with Plantweb Housing
TC15689	In-Line SST with Plantweb Housing and LCD Display
TC15690	In-Line Hastelloy with PlantWeb Housing and LCD Display

## Australian Certifications

**E7** SAA Flameproof and Dust Ignition-proof  
 Certification No.: AUS Ex 3798X  
 Ex d IIC T6 ( $T_a = 60\text{ °C}$ ) IP66  
 DIP A21 TA T6 ( $T_a = 60\text{ °C}$ ) IP66

### Special conditions for safe use (x)

1. It is a condition of safe use that each housing shall be connected to external circuits via suitable conduit or Standards Australia certified cable glands. Where only one entry is used for connection to external circuits, the unused entry shall be closed by means of the blanking plug supplied by the equipment manufacturer or by a suitable Standards Australia certified blanking plug.
2. It is a condition of safe use that a dielectric strength test shall be applied whenever the terminal block is changed or replaced in either the dual compartment or single compartment housings. The breakdown current shall be less than 5 mA, when 500 V, 47 to 62 Hz, is applied for one minute. Note: if tested with an optional T1 transient protector terminal block fitted, the protection will operate and hence there will be no current indicated.
3. It is a condition of safe use that each transmitter module shall be used with a Model 300S housing, in order to comply with flameproof requirements.
4. It is a condition of safe use that each model 300S housing fitted with a transmitter module shall be marked with the same certification marking code information. Should the housing be replaced after initial supply to another model 300S housing, the replacement housing shall have the same certification marking code information as the housing it replaces.

## Product Data Sheet

00813-0100-4809, Rev FA  
Catalog 2008 - 2009

# The Annubar Flowmeter Series

### IECEX Certifications

#### I7/IG IECEX Intrinsic Safety

Certificate No.: IECEXBAS04.0017X  
Ex ia IIC T4 ( $T_a = -60\text{ °C}$  to  $70\text{ °C}$ ) -HART/Remote Display/Quick Connect/HART Diagnostics  
Ex ia IIC T4 ( $T_a = -60\text{ °C}$  to  $70\text{ °C}$ ) -FOUNDATION fieldbus  
Ex ia IIC T4 ( $T_a = -60\text{ °C}$  to  $40\text{ °C}$ ) -FISCO  
IP66

TABLE 8. Input Parameters

Loop / Power	Groups
$U_i = 30\text{ V}$	HART / FOUNDATION fieldbus/ Remote Display / Quick Connect / HART Diagnostics
$U_i = 17.5\text{ V}$	FISCO
$I_i = 300\text{ mA}$	HART / FOUNDATION fieldbus/ Remote Display / Quick Connect / HART Diagnostics
$I_i = 380\text{ mA}$	FISCO
$P_i = 1.0\text{ W}$	HART / Remote Display / Quick Connect / HART Diagnostics
$P_i = 1.3\text{ W}$	FOUNDATION fieldbus
$P_i = 5.32\text{ W}$	FISCO
$C_i = 30\text{ nF}$	SuperModule Platform / Quick Connect
$C_i = 11.4\text{ nF}$	HART / HART Diagnostics
$C_i = 0$	FOUNDATION fieldbus / Remote Display / FISCO / Quick Connect / HART Diagnostics
$L_i = 0$	HART / FOUNDATION fieldbus / FISCO / Quick Connect / HART Diagnostics
$L_i = 60\mu\text{ H}$	Remote Display

#### Special conditions for safe use (x)

- The Models 3051S HART 4-20mA, 3051S fieldbus, 3051S Profibus and 3051S FISCO are not capable of withstanding the 500V test as defined in clause 6.4.12 of IEC 60079-11. This must be taken into account during installation.
- The terminal pins of the Types 3051S-T and 3051S-C must be protected to IP20 minimum.

#### N7 IECEX Type n

Certificate No.: IECEXBAS04.0018X  
Ex nC IIC T5 ( $T_a = -40\text{ °C}$  to  $70\text{ °C}$ )  
 $U_i = 45\text{ Vdc MAX}$   
IP66

#### Special conditions for safe use (x)

The apparatus is not capable of withstanding the 500 V insulation test required by Clause 8 of IEC 79-15: 1987.

### Combinations of Certifications

Stainless steel certification tag is provided when optional approval is specified. Once a device labeled with multiple approval types is installed, it should not be reinstalled using any other approval types. Permanently mark the approval label to distinguish it from unused approval types.

- K1** Combination of E1, I1, N1, and ND
- K5** Combination of E5 and I5
- K6** Combination of E6 and I6
- K7** Combination of E7, I7, and N7
- KA** Combination of E1, I1, E6, and I6
- KB** Combination of E5, I5, I6 and E6
- KC** Combination of E5, E1, I5 and I1
- KD** Combination of E5, I5, E6, I6, E1, and I1

## WIRELESS CERTIFICATIONS

### Telecommunication Compliance

All wireless devices require certification to ensure that they adhere to regulations regarding the use of the RF spectrum. Nearly every country requires this type of product certification. Emerson is working with governmental agencies around the world to supply fully compliant products and remove the risk of violating country directives or laws governing wireless device usage.

### FCC and IC Approvals

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference this device must accept any interference received, including interference that may cause undesired operation.

This device must be installed to ensure a minimum antenna separation distance of 20cm from all persons.

### Ordinary Location Certification for FM

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

### European Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found at [www.rosemount.com](http://www.rosemount.com). A hard copy may be obtained by contacting an Emerson Process Management representative.

#### ATEX Directive (94/9/EC)

Emerson Process Management complies with the ATEX Directive.

#### European Pressure Equipment Directive (PED) (97/23/EC)

Models 3051S\_CA4; 3051S\_CD2, 3, 4, 5; (also with P9 option)  
Pressure Transmitters — QS Certificate of Assessment -  
EC No. PED-H-100, Module H Conformity Assessment

All other Model 3051S Pressure Transmitters  
— Sound Engineering Practice

Transmitter Attachments: Diaphragm Seal - Process Flange -  
Manifold — Sound Engineering Practice

Primary Elements, Flowmeter

— See appropriate Primary Element QIG

#### Electro Magnetic Compatibility (EMC) (2004/108/EC)

All Models: EN 50081-1: 1992; EN 50082-2:1995;  
EN 61326-1:1997 + A1, A2, and A3 – Industrial

#### Radio and Telecommunications Terminal Equipment Directive (R&TTE)(1999/5/EC)

Emerson Process Management complies with the R&TTE Directive.

## Hazardous Locations Certifications

### North American Certifications


#### Factory Mutual (FM) Approvals

- I5** FM Intrinsically Safe, Non-Incendive, and Dust Ignition-proof.  
Intrinsically Safe for Class I/II/III, Division 1,  
Groups A, B, C, D, E, F, and G.  
Zone Marking: Class I, Zone 0, AEx ia IIC  
Temperature Codes T4 ( $T_{amb} = -50$  to  $70^{\circ}C$ )  
Non-Incendive for Class I, Division 2, Groups A, B, C, and D.  
Dust Ignition-proof for Class II/III, Division 1,  
Groups E, F, and G.  
Ambient temperature limits:  $-50$  to  $85^{\circ}C$   
For use with Rosemount SmartPower options  
00753-9220-XXXX only.  
Enclosure Type 4X / IP66

### CSA - Canadian Standards Association

- I6** CSA Intrinsically Safe  
Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D.  
Temp Code T3C  
Enclosure Type 4X / IP66  
For use with Rosemount SmartPower options  
00753-9220-XXXX only.

### European Certifications

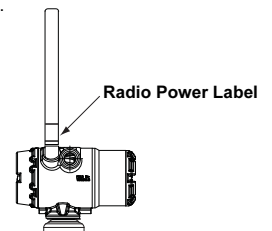
- I1** ATEX Intrinsic Safety  
Certificate No.: BAS01ATEX1303X  II 1G  
Ex ia IIC T4 ( $T_a = -60^{\circ}C$  to  $70^{\circ}C$ )  
IP66  
For use with Rosemount SmartPower options  
00753-9220-XXXX only.  
CE 1180



Country	Restriction
Bulgaria	General authorization required for outdoor use and public service
France	Outdoor use limited to 10mW e.i.r.p.
Italy	If used outside of own premises, general authorization is required.
Norway	May be restricted in the geographical area within a radius of 20 km from the center of Ny-Alesund.
Romania	Use on a secondary basis. Individual license required.

Radio Power Label (See Figure 1) indicates output power configuration of the radio. Devices with this label are configured for output power less than 10 mW e.i.r.p. At time of purchase the customer must specify ultimate country of installation and operation.

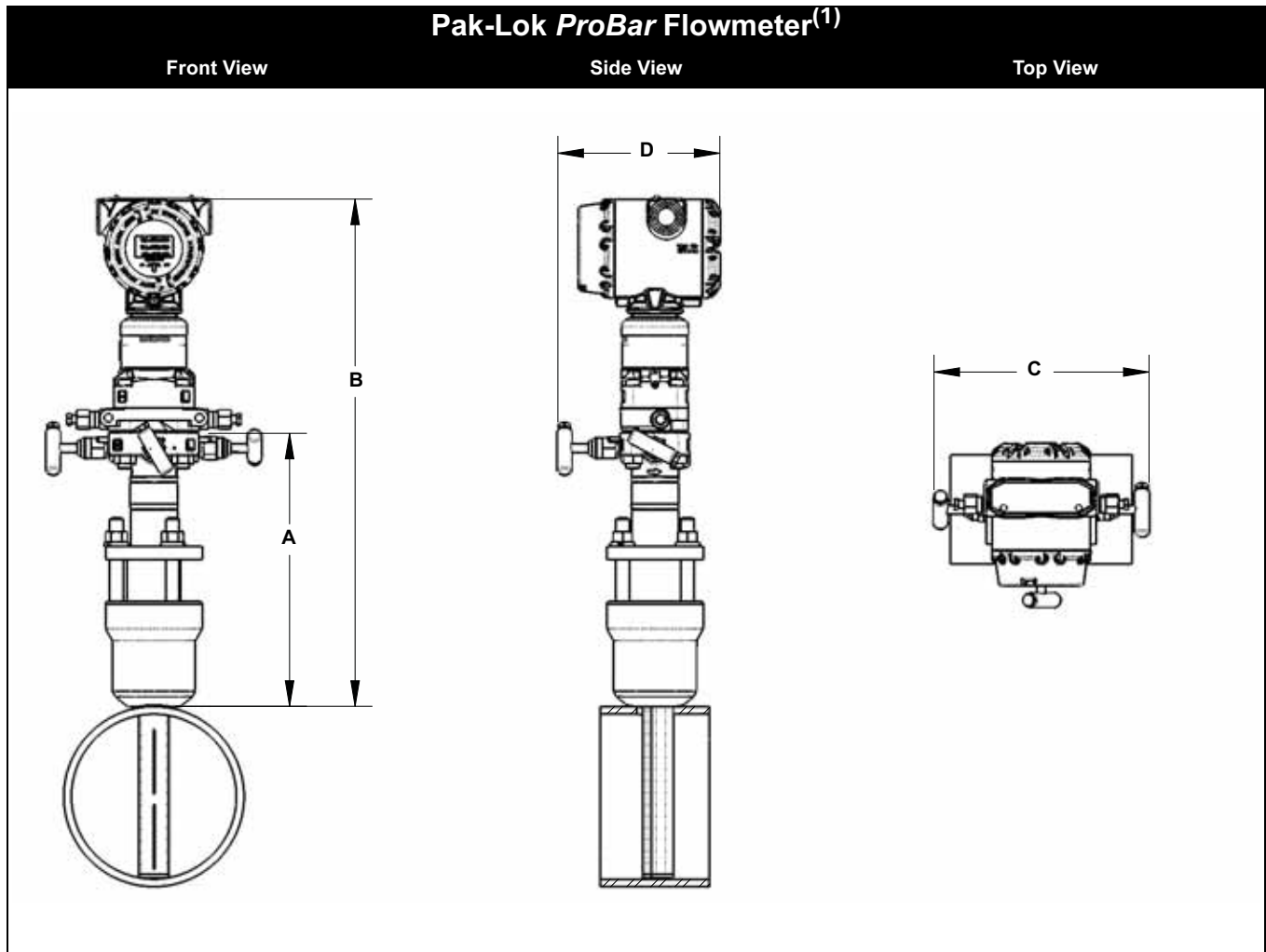
Figure 1.



### IECEx Certifications

- I7** IECEx Intrinsic Safety  
Certificate No.: IECEx BAS 04.0017X  
Ex ia IIC T4 ( $T_a = -60^{\circ}C$  to  $70^{\circ}C$ )  
For use with Rosemount SmartPower options  
00753-9220-XXXX only.  
IP66

**DIMENSIONAL DRAWINGS**



(1) The Pak-Lok Annubar model is available up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C)).

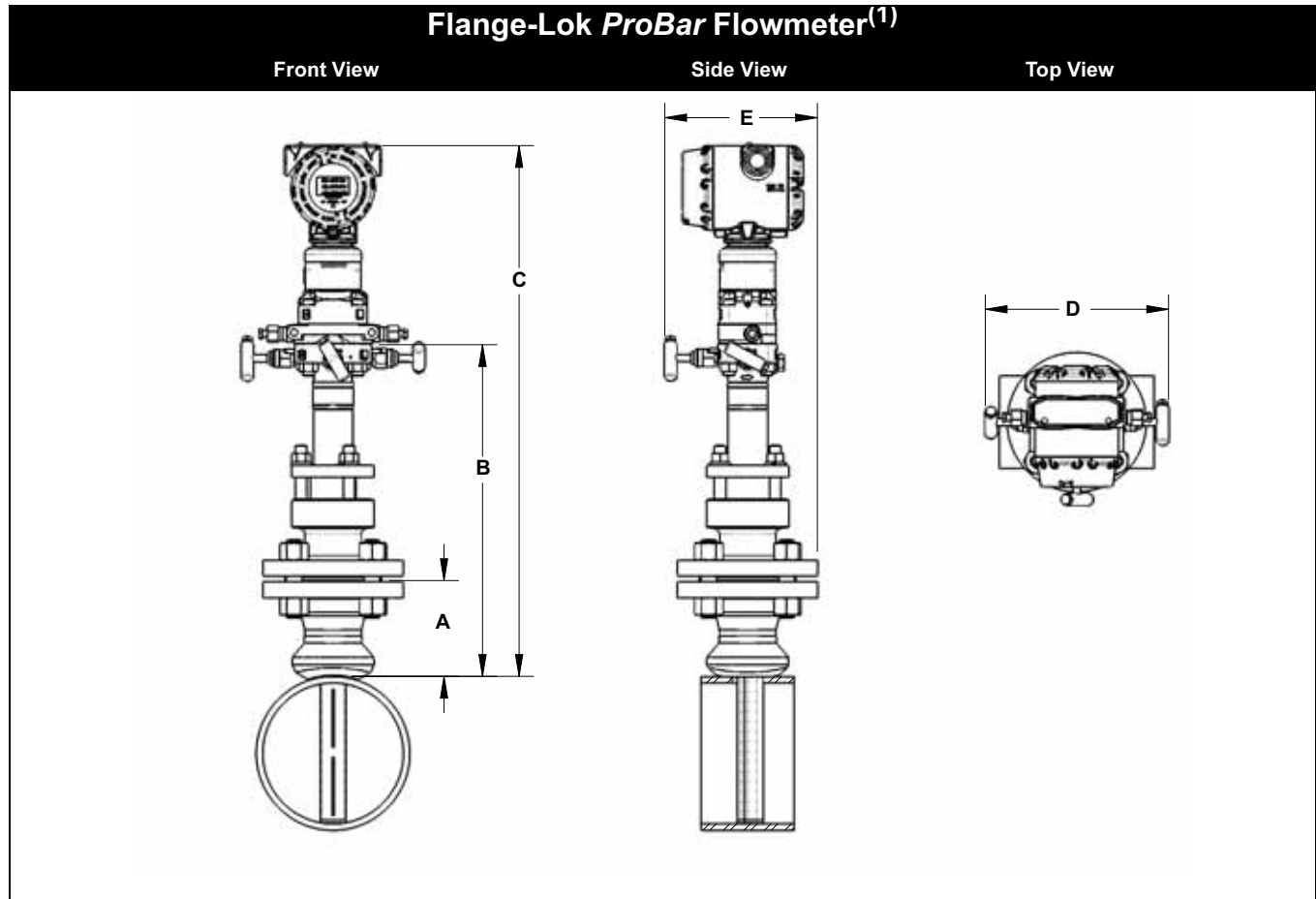
TABLE 9. Pak-Lok ProBar Flowmeter Dimensional Data

Sensor Size	A (Max)	B (Max)	C (Max)	D (Max)
1	7.50 (190.5)	16.03 (407.2)	9.00 (228.6)	6.90 (175.3)
2	9.25 (235.0)	17.78 (451.6)	9.00 (228.6)	6.90 (175.3)
3	12.00 (304.8)	20.53 (521.5)	9.00 (228.6)	6.90 (175.3)

Dimensions are in inches (millimeters)

# The Annubar Flowmeter Series

**Product Data Sheet**  
00813-0100-4809, Rev FA  
Catalog 2008 - 2009



(1) The Flange-Lok Annubar model can be direct mounted up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C)).

TABLE 10. Flange-Lok ProBar Flowmeter Dimensional Data

Sensor Size	Flange Size and Rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	C (Max)	D (Max)	E (Max)
1	1½ – 150#	3.88 (98.6)	12.25 (311.2)	20.78 (527.8)	9.00 (228.6)	6.30 (160.0)
1	1½ – 300#	4.13 (104.9)	12.25 (311.2)	20.78 (527.8)	9.00 (228.6)	6.86 (174.2)
1	1½ – 600#	4.44 (112.8)	12.25 (311.2)	20.78 (527.8)	9.00 (228.6)	6.86 (174.2)
1	DN40/PN16	3.09 (78.5)	12.25 (311.2)	20.78 (527.8)	9.00 (228.6)	6.86 (174.2)
1	DN40/PN40	3.21 (81.5)	12.25 (311.2)	20.78 (527.8)	9.00 (228.6)	6.86 (174.2)
1	DN40/ PN100	3.88 (98.6)	12.25 (311.2)	20.78 (527.8)	9.00 (228.6)	6.86 (174.2)
2	2 – 150#	4.13 (104.9)	14.25 (362.0)	22.78 (578.6)	9.00 (228.6)	6.80 (172.7)
2	2 – 300#	4.38 (111.3)	14.25 (362.0)	22.78 (578.6)	9.00 (228.6)	7.05 (179.1)
2	2 – 600#	4.76 (120.9)	14.25 (362.0)	22.78 (578.6)	9.00 (228.6)	7.05 (179.1)
2	DN50/PN16	3.40 (86.4)	14.25 (362.0)	22.78 (578.6)	9.00 (228.6)	7.05 (179.1)
2	DN50/PN40	3.51 (89.2)	14.25 (362.0)	22.78 (578.6)	9.00 (228.6)	7.05 (179.1)
2	DN50/ PN100	4.30 (109.2)	14.25 (362.0)	22.78 (578.6)	9.00 (228.6)	7.05 (179.1)
3	3 – 150#	4.63 (117.6)	17.50 (444.5)	26.03 (661.2)	9.00 (228.6)	7.55 (191.8)
3	3 – 300#	5.00 (127.0)	17.50 (444.5)	26.03 (661.2)	9.00 (228.6)	7.93 (201.3)
3	3 – 600#	5.38 (136.7)	17.50 (444.5)	26.03 (661.2)	9.00 (228.6)	7.93 (201.3)
3	DN80/PN16	3.84 (97.5)	17.50 (444.5)	26.03 (661.2)	9.00 (228.6)	7.93 (201.3)
3	DN80/PN40	4.16 (105.7)	17.50 (444.5)	26.03 (661.2)	9.00 (228.6)	7.93 (201.3)
3	DN80/ PN100	4.95 (125.7)	17.50 (444.5)	26.03 (661.2)	9.00 (228.6)	7.93 (201.3)

Dimensions are in inches (millimeters)



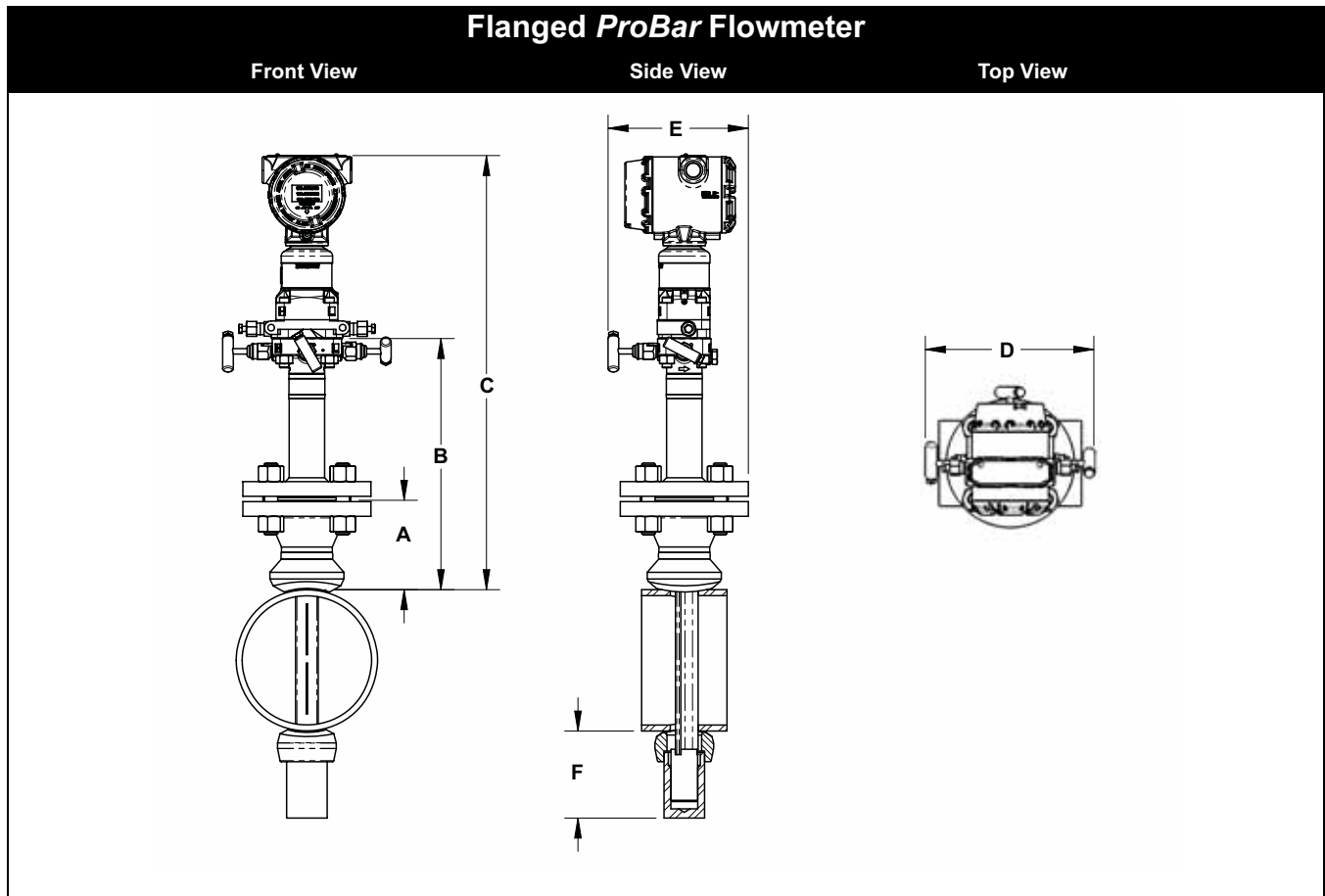


TABLE 11. Flanged *ProBar* Flowmeter Dimensional Data

Sensor Size	Flange Size and Rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	C ± 0.25 (6.4)	D (Max)	E (Max)	F (Max)
1	1½ – 150#	3.88 (98.6)	11.00 (279.4)	19.53 (496.1)	9.00 (228.6)	6.30 (160.0)	3.50 (88.9)
1	1½ – 300#	4.13 (104.9)	11.00 (279.4)	19.53 (496.1)	9.00 (228.6)	6.86 (174.2)	3.50 (88.9)
1	1½ – 600#	4.44 (112.8)	11.00 (279.4)	19.53 (496.1)	9.00(228.6)	6.86 (174.2)	3.50 (88.9)
1	DN40/PN16	3.09 (78.5)	11.00 (279.4)	19.53 (496.1)	9.00 (228.6)	6.86 (174.2)	3.50 (88.9)
1	DN40/PN40	3.21 (81.5)	11.00 (279.4)	19.53 (496.1)	9.00 (228.6)	6.86 (174.2)	3.50 (88.9)
1	DN40/ PN100	3.88 (98.6)	11.00 (279.4)	19.53 (496.1)	9.00(228.6)	6.86 (174.2)	3.50 (88.9)
1	1½ – 900#	4.94 (125.5)	9.32 (236.6)	—	—	—	3.50 (88.9)
1	1½ – 1500#	4.94 (125.5)	9.32 (236.6)	—	—	—	3.50 (88.9)
1	1½ – 2500#	6.76 (171.7)	11.64 (295.5)	—	—	—	4.00 (101.6)
2	2 – 150#	4.13 (104.9)	12.00 (304.8)	20.53 (521.5)	9.00 (228.6)	6.80 (172.7)	5.00 (127.0)
2	2 – 300#	4.38 (111.3)	12.00 (304.8)	20.53 (521.5)	9.00 (228.6)	7.05 (179.1)	5.00 (127.0)
2	2 – 600#	4.76 (120.9)	12.00 (304.8)	20.53 (521.5)	9.00 (228.6)	7.05 (179.1)	5.00 (127.0)
2	DN50/PN16	3.40 (86.4)	12.00 (304.8)	20.53 (521.5)	9.00 (228.6)	7.05 (179.1)	5.00 (127.0)
2	DN50/PN40	3.51 (89.2)	12.00 (304.8)	20.53 (521.5)	9.00 (228.6)	7.05 (179.1)	5.00 (127.0)
2	DN50/ PN100	4.30 (109.2)	12.00 (304.8)	20.53 (521.5)	9.00 (228.6)	7.05 (179.1)	5.00 (127.0)
2	2 – 900#	5.88 (149.4)	10.51 (266.8)	—	—	—	5.00 (127.0)
2	2 – 1500#	5.88 (149.4)	10.51 (266.8)	—	—	—	5.00 (127.0)
2	3 – 2500#	9.87 (250.7)	15.62 (396.7)	—	—	—	4.50 (114.3)
3	3 – 150#	4.63 (117.6)	13.50 (342.9)	22.03 (559.6)	9.00 (228.6)	7.55 (191.8)	4.00 (101.6)
3	3 – 300#	5.00 (127.0)	13.50 (342.9)	22.03 (559.6)	9.00 (228.6)	7.93 (201.3)	4.00 (101.6)

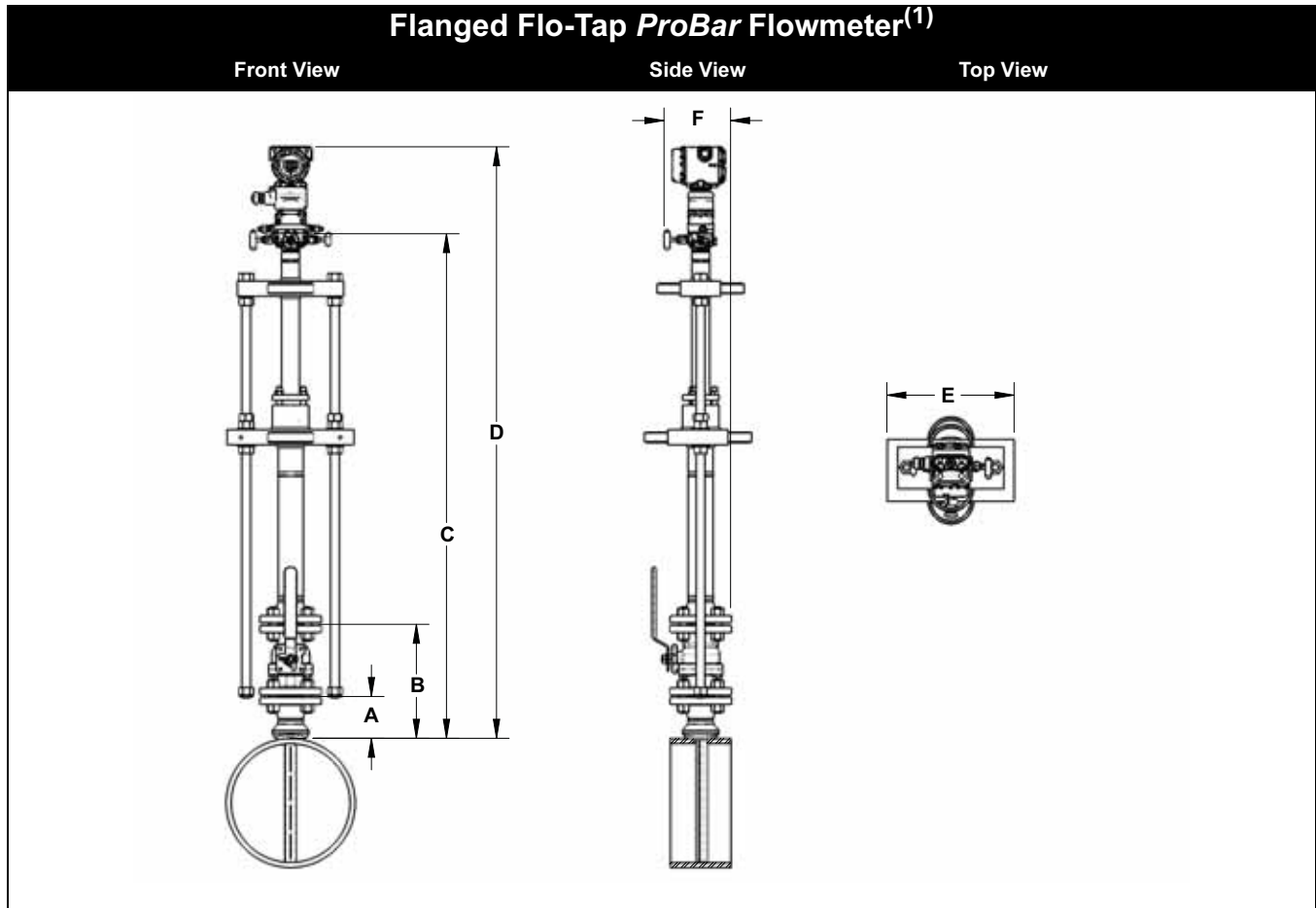
Table 11 Continued on Next Page

# The Annubar Flowmeter Series

TABLE 11. Flanged *ProBar* Flowmeter Dimensional Data

Sensor Size	Flange Size and Rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	C ± 0.25 (6.4)	D (Max)	E (Max)	F (Max)
3	3 – 600#	5.38 (136.7)	13.50 (342.9)	22.03 (559.6)	9.00 (228.6)	7.93 (201.3)	4.00 (101.6)
3	DN80/PN16	3.84 (97.5)	13.50 (342.9)	22.03 (559.6)	9.00 (228.6)	7.93 (201.3)	4.00 (101.6)
3	DN80/PN40	4.16 (105.7)	13.50 (342.9)	22.03 (559.6)	9.00 (228.6)	7.93 (201.3)	4.00 (101.6)
3	DN80/ PN100	4.95 (125.7)	13.50 (342.9)	22.03 (559.6)	9.00 (228.6)	7.93 (201.3)	4.00 (101.6)
3	4 – 900#	8.19 (208.0)	13.44 (341.3)	—	—	—	7.00 (177.8)
3	4 – 1500#	8.56 (217.4)	13.81 (350.8)	—	—	—	7.00 (177.8)
3	4 – 2500#	11.19 (284.2)	17.32 (439.8)	—	—	—	7.00 (177.8)

*Dimensions are in inches (millimeters)*



(1) The Flanged Flo-Tap ProBar Flowmeter is available with both the manual and gear drive options.

TABLE 12. Flanged Flo-Tap ProBar Flowmeter Dimensional Data

Sensor Size	Flange Size and Rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	C <sup>1</sup> (Max) (Gear Drive)	C <sup>1</sup> (Max) (Manual)	D (Max)	E (Max)	F (Max)
1	1½ – 150#	3.88 (98.5)	10.50 (266.7)	—	17.9 (454.7)	C + 8.53 (216.7)	10.50 (266.7)	6.30 (160.0)
1	1½ – 300#	4.13 (104.9)	11.75 (298.5)	—	17.9 (454.7)	C + 8.53 (216.7)	10.50 (266.7)	6.86 (174.2)
1	1½ – 600#	4.44 (112.8)	14.06 (357.2)	—	17.9 (454.7)	C + 8.53 (216.7)	10.50 (266.7)	6.86 (174.2)
1	DN40/PN16	3.09 (78.5)	See Note.	—	17.9 (454.7)	C + 8.53 (216.7)	10.50 (266.7)	6.86 (174.2)
1	DN40/PN40	3.21 (81.5)	See Note.	—	17.9 (454.7)	C + 8.53 (216.7)	10.50 (266.7)	6.86 (174.2)
1	DN40/PN100	3.88 (98.6)	See Note.	—	17.9 (454.7)	C + 8.53 (216.7)	10.50 (266.7)	6.86 (174.2)
2	2 – 150#	4.13 (104.9)	11.25 (285.8)	24.6 (624.8)	21.4 (543.6)	C + 8.53 (216.7)	12.56 (319.0)	6.80 (172.7)
2	2 – 300#	4.38 (111.3)	13.00 (330.2)	24.6 (624.8)	21.4 (543.6)	C + 8.53 (216.7)	12.56 (319.0)	7.05 (179.1)
2	2 – 600#	4.76 (120.9)	16.38 (416.0)	24.6 (624.8)	21.4 (543.6)	C + 8.53 (216.7)	12.56 (319.0)	7.05 (179.1)
2	DN50/PN16	3.40 (86.4)	See Note.	24.6 (624.8)	21.4 (543.6)	C + 8.53 (216.7)	12.56 (319.0)	7.05 (179.1)
2	DN50/PN40	3.51 (89.2)	See Note.	24.6 (624.8)	21.4 (543.6)	C + 8.53 (216.7)	12.56 (319.0)	7.05 (179.1)
2	DN50/PN100	4.30 (109.2)	See Note.	24.6 (624.8)	21.4 (543.6)	C + 8.53 (216.7)	12.56 (319.0)	7.05 (179.1)
3	3 – 150#	4.63 (117.6)	12.75 (323.9)	26.5 (673.1)	23.3 (591.8)	C + 8.53 (216.7)	14.13 (358.9)	7.55 (191.8)
3	3 – 300#	5.00 (127.0)	16.25 (412.8)	26.5 (673.1)	23.3 (591.8)	C + 8.53 (216.7)	14.13 (358.9)	7.93 (201.3)
3	3 – 600#	5.38 (136.7)	19.50 (495.4)	26.5 (673.1)	23.3 (591.8)	C + 8.53 (216.7)	14.13 (358.9)	7.93 (201.3)
3	DN80/PN16	3.84 (97.5)	See Note.	26.5 (673.1)	23.3 (591.8)	C + 8.53 (216.7)	14.13 (358.9)	7.93 (201.3)
3	DN80/PN40	4.16 (105.7)	See Note.	26.5 (673.1)	23.3 (591.8)	C + 8.53 (216.7)	14.13 (358.9)	7.93 (201.3)
3	DN80/PN100	4.95 (125.7)	See Note.	26.5 (673.1)	23.3 (591.8)	C + 8.53 (216.7)	14.13 (358.9)	7.93 (201.3)

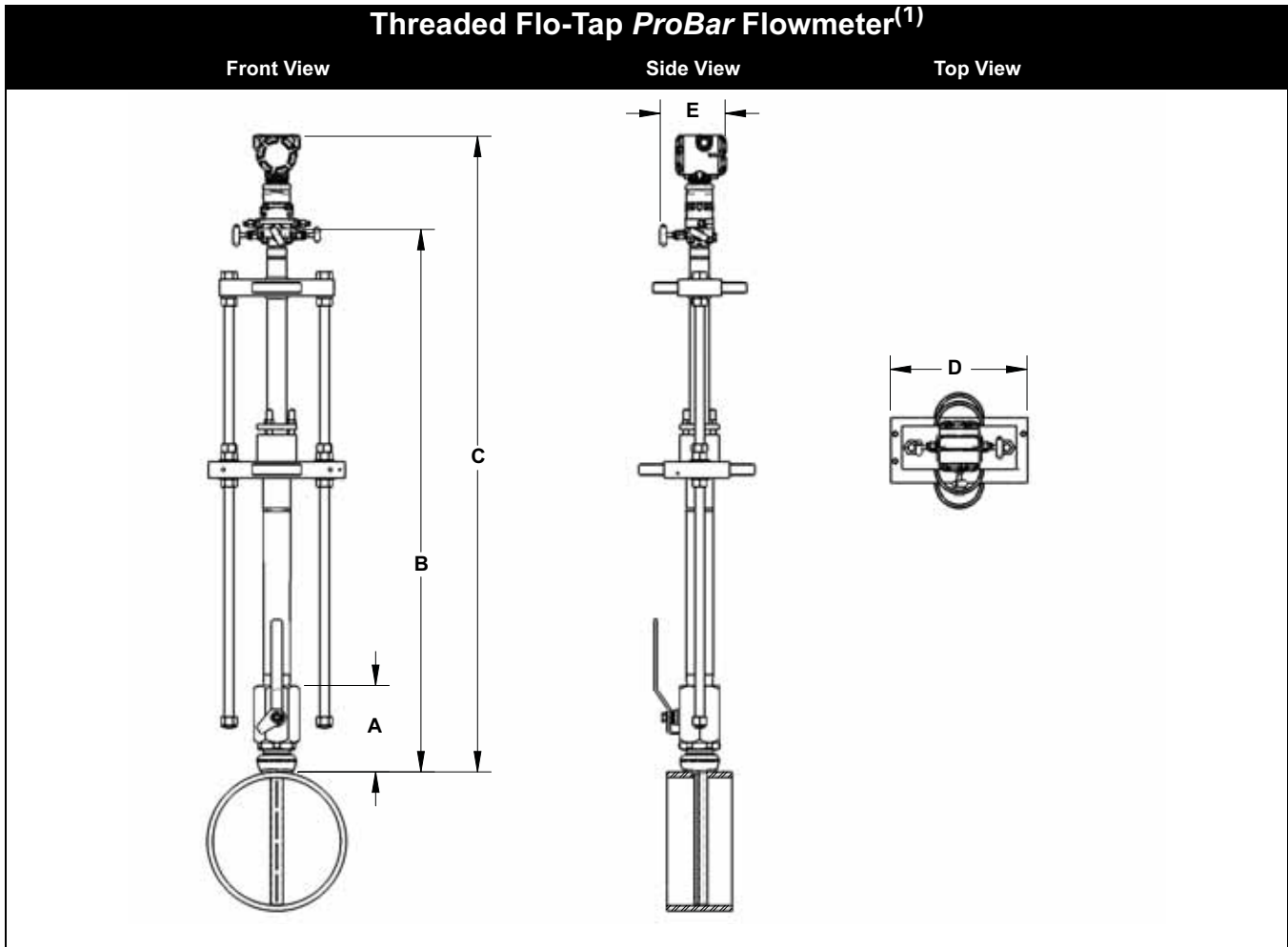
Dimensions are in inches (millimeters)

**Note: Customer Supplied.**

Inserted, C Dimension = Pipe I.D. + Wall Thickness + B + C<sup>1</sup>

Retracted, C Dimension = 2 x (Pipe I.D. + Wall Thickness + B) + C<sup>1</sup>

# The Annubar Flowmeter Series



(1) The Threaded Flo-Tap ProBar Flowmeter is available with both the manual and gear drive options.

TABLE 13. Threaded Flo-Tap ProBar Flowmeter Dimensional Data

Sensor Size	A ± 0.50 (12.7)	B <sup>1</sup> (Max) (Gear Drive)	B <sup>1</sup> (Max) (Manual)	C (Max)	D (Max)	E (Max)
1	6.76 (171.8)	—	17.40 (442.0)	B + 8.53 (216.7)	10.50 (266.7)	6.90 (175.3)
2	8.17 (207.5)	23.70 (602.0)	20.80 (528.3)	B + 8.53 (216.7)	12.56 (319.0)	6.90 (175.3)

Sensor Size 3 is not available in a Threaded Flo-Tap.

Dimensions are in inches (millimeters)

Inserted, B Dimension = Pipe I.D. + Wall Thickness + A + B<sup>1</sup>  
Retracted, B Dimension = 2 x (Pipe I.D. + Wall Thickness + A) + B<sup>1</sup>

# Product Data Sheet

00813-0100-4809, Rev FA  
Catalog 2008 - 2009

# The Annubar Flowmeter Series

## ORDERING INFORMATION

### Rosemount 3051SFA ProBar Flowmeter Ordering Information

Model	Product Description		
3051SFA	ProBar Flowmeter		
Code	Measurement Type		
D	Differential Pressure		
Code	Fluid Type		
L	Liquid		
G	Gas		
S	Steam		
Code	Line Size	Code	Line Size
020	2-in. (50 mm)	180	18-in. (450 mm)
025	2 <sup>1</sup> / <sub>2</sub> -in. (63.5 mm)	200	20-in. (500 mm)
030	3-in. (80 mm)	240	24-in. (600 mm)
035	3 <sup>1</sup> / <sub>2</sub> -in. (89 mm)	300	30-in. (750 mm)
040	4-in. (100 mm)	360	36-in. (900 mm)
050	5-in. (125 mm)	420	42-in. (1066 mm)
060	6-in. (150 mm)	480	48-in. (1210 mm)
070	7-in. (175 mm)	600	60-in. (1520 mm)
080	8-in. (200 mm)	720	72-in. (1820 mm)
100	10-in. (250 mm)	780	78-in. (1950 mm)
120	12-in. (300 mm)	840	84-in. (2100 mm)
140	14-in. (350 mm)	900	90-in. (2250 mm)
160	16-in. (400 mm)	960	96-in. (2400 mm)
Code	Pipe I.D. Range (Refer to the "Pipe I.D. Range Code—measured in inches (millimeters)" on page 27)		
A	Range A from the Pipe I.D. table		
B	Range B from the Pipe I.D. table		
C	Range C from the Pipe I.D. table		
D	Range D from the Pipe I.D. table		
E	Range E from the Pipe I.D. table		
Z	Non-standard Pipe I.D. Range or Line Sizes greater than 12 inches		
Code	Pipe Material / Mounting Assembly Material		
C	Carbon steel		
S	316 Stainless Steel		
G	Chrome-Moly Grade F-11		
N	Chrome-Moly Grade F-22		
J	Chrome-Moly Grade F-91		
0 <sup>(1)</sup>	No Mounting (Customer Supplied)		
Code	Piping Orientation		
H	Horizontal Piping		
D	Vertical Piping with Downwards Flow		
U	Vertical Piping with Upwards Flow		
Code	Annubar Type		
P	Pak-Lok		
F	Flanged with opposite side support		
L	Flange-Lok		
G	Gear-Drive Flo-Tap		
M	Manual Flo-Tap		
Code	Sensor Material		
S	316 Stainless Steel		
H	Hastelloy C-276		

# The Annubar Flowmeter Series

## Rosemount 3051SFA ProBar Flowmeter Ordering Information

Code	Sensor Size		
1	Sensor size 1 — Line sizes 2-in. (50 mm) to 8-in. (200 mm)		
2	Sensor size 2 — Line sizes 6-in. (150 mm) to 96-in. (2400 mm)		
3	Sensor size 3 — Line sizes greater than 12-in. (300 mm)		
Code	Mounting Type		
T1	Compression or Threaded Connection		
A1	150# RF ANSI		
A3	300# RF ANSI		
A6	600# RF ANSI		
A9 <sup>(2)</sup>	900# RF ANSI		
AF <sup>(2)</sup>	1500# RF ANSI		
AT <sup>(2)</sup>	2500 # RF ANSI		
D1	DN PN16 Flange		
D3	DN PN40 Flange		
D6	DN PN100 Flange		
R1	150# RTJ Flange		
R3	300# RTJ Flange		
R6	600# RTJ Flange		
R9 <sup>(2)</sup>	900# RTJ Flange		
RF <sup>(2)</sup>	1500# RTJ Flange		
RT <sup>(2)</sup>	2500# RTJ Flange		
Code	Opposite Side Support and Packing Gland		
0	No opposite side support or packing gland (Required for Pak-Lok and Flange-Lok models)		
Opposite Side Support – Required for Flanged Models			
C	NPT Threaded Opposite Support Assembly – Extended Tip		
D	Welded Opposite Support Assembly – Extended Tip		
Packing Gland – Required for Flo-Tap Models			
	<i>Packing Gland Material</i>	<i>Rod Material</i>	<i>Packing Material</i>
J	Stainless Steel Packing Gland / Cage Nipple	Carbon Steel	PTFE
K	Stainless Steel Packing Gland / Cage Nipple	Stainless Steel	PTFE
L	Stainless Steel Packing Gland / Cage Nipple	Carbon Steel	Graphite
N	Stainless Steel Packing Gland / Cage Nipple	Stainless Steel	Graphite
R	Hastelloy Packing Gland / Cage Nipple	Stainless Steel	Graphite
Code	Isolation Valve for Flo-Tap Models		
1	Gate Valve, Carbon Steel		
2	Gate Valve, Stainless Steel		
5	Ball Valve, Carbon Steel		
6	Ball Valve, Stainless Steel		
0 <sup>(1)</sup>	Not Applicable or Customer Supplied		
Code	Temperature Measurement		
T	Integral RTD – not available with Flanged model greater than class 600		
R	Remote Thermowell and RTD		
0	No Temperature Sensor		
Code	Transmitter Connection Platform		
3	Direct-mount, Integral 3-valve manifold– not available with Flanged model greater than class 600		
5	Direct -mount, 5-valve manifold – not available with Flanged model greater than class 600		
6	Direct-mount, high temperature 5-valve manifold – not available with Flanged model greater than class 600		
7	Remote-mount NPT Connections ( <sup>1</sup> / <sub>2</sub> -in. FNPT)		
8	Remote-mount SW Connections ( <sup>1</sup> / <sub>2</sub> -in.)		
Code	Differential Pressure Ranges		
1	0 to 25 in H <sub>2</sub> O (0 to 62.2 mbar)		
2	0 to 250 in H <sub>2</sub> O (0 to 623 mbar)		
3	0 to 1000 in H <sub>2</sub> O (0 to 2.5 bar)		

## Product Data Sheet

00813-0100-4809, Rev FA

Catalog 2008 - 2009

# The Annubar Flowmeter Series

### Rosemount 3051SFA *ProBar* Flowmeter Ordering Information

Code	Static Pressure Ranges
A	None

Code	Output Protocol
A	4–20 mA with digital signal based on <i>HART</i> protocol
F <sup>(3)</sup>	FOUNDATION fieldbus protocol
X <sup>(4)</sup>	Wireless (Requires wireless options and wireless housing 5A)

Code	Transmitter Housing Style	Material	Conduit Entry Size
00	None (Customer-supplied electrical connection)		
01	Assemble to Rosemount 753R Web-based Monitoring Indicator		
1A	<i>PlantWeb</i> Housing	Aluminum	1/2-14 NPT
1B	<i>PlantWeb</i> Housing	Aluminum	M20 x 1.5 (CM20)
1C	<i>PlantWeb</i> Housing	Aluminum	G <sup>1/2</sup>
1J	<i>PlantWeb</i> Housing	316L SST	1/2-14 NPT
1K	<i>PlantWeb</i> Housing	316L SST	M20 x 1.5 (CM20)
1L	<i>PlantWeb</i> Housing	316L SST	G <sup>1/2</sup>
2A	Junction Box Housing	Aluminum	1/2-14 NPT
2B	Junction Box Housing	Aluminum	M20 x 1.5 (CM20)
2C	Junction Box Housing	Aluminum	G <sup>1/2</sup>
2E	Junction Box housing with output for remote display and interface	Aluminum	1/2-14 NPT
2F	Junction Box housing with output for remote display and interface	Aluminum	M20 x 1.5 (CM20)
2G	Junction Box housing with output for remote display and interface	Aluminum	G <sup>1/2</sup>
2J	Junction Box Housing	316L SST	1/2-14 NPT
2M	Junction Box housing with output for remote display and interface	316L SST	1/2-14 NPT
5A	Wireless <i>PlantWeb</i> housing	Aluminum	M20 x 1.5 (CM20)
7J <sup>(5)</sup>	Quick Connect (A size Mini, 4-pin male termination)		

Code	Transmitter Performance Class
1 <sup>(6)</sup>	Ultra: up to 0.9% flow rate accuracy, 8:1 flow turndown, 10-year stability, limited 12-year warranty
2	Classic: up to 1.1% flow rate accuracy, 8:1 flow turndown, 5-year stability
3 <sup>(6)</sup>	Ultra for Flow: up to 0.8% flow rate accuracy, 14:1 flow turndown, 10-year stability, limited 12-year warranty

Code	Options
<b>Pressure Testing</b>	
P1 <sup>(7)</sup>	Hydrostatic Testing with Certificate
PX <sup>(7)</sup>	Extended Hydrostatic Testing
<b>Special Cleaning</b>	
P2	Cleaning for Special Processes
PA	Cleaning per ASTM G93 level D (section 11.4)
<b>Material Testing</b>	
V1	Dye Penetrant Exam
<b>Material Examination</b>	
V2	Radiographic Examination
<b>Flow Calibration</b>	
W1	Flow Calibration (Average K)
WZ	Special Calibration
<b>Special Inspection</b>	
QC1	Visual and Dimensional Inspection with Certificate
QC7	Inspection and Performance Certificate
<b>Surface Finish</b>	
RL	Surface finish for Low Pipe Reynolds Number in Gas and Steam
RH	Surface finish for High Pipe Reynolds Number in Liquid
<b>Material Traceability Certification</b>	
Q8 <sup>(8)</sup>	Material Certificate per ISO 10474 3.1.B and EN 10204 3.1.B

# The Annubar Flowmeter Series

## Rosemount 3051SFA ProBar Flowmeter Ordering Information

### Code Conformance

J1	Canadian Registration
J2 <sup>(9)</sup>	ANSI B31.1
J3 <sup>(9)</sup>	ANSI B31.3
J4 <sup>(9)</sup>	ANSI B31.8
J5 <sup>(10)</sup>	NACE MR-0175 / ISO 15156
J6	European Pressure Directive (PED)

### Installed in Flanged Pipe Spool Section

H3	150# Flanged Connection with Rosemount Standard Length and Schedule
H4	300# Flanged Connection with Rosemount Standard Length and Schedule
H5	600# Flanged Connection with Rosemount Standard Length and Schedule

### Instrument Connections for Remote Mount Option

G1	Needle Valves, Carbon Steel
G2	Needle Valves, Stainless Steel
G3	Needle Valves, <i>Hastelloy</i>
G5	OS&Y Gate Valve, Carbon Steel
G6	OS&Y Gate Valve, Stainless Steel
G7	OS&Y Gate Valve, <i>Hastelloy</i>

### Special Shipment

Y1	Mounting Hardware Shipped Separately
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### Special Dimensions

VM	Variable Mounting
VT	Variable Tip
VS	Variable length Spool Section
V9	Special Dimension

### Transmitter Calibration Certification

Q4	Calibration Data Certificate for Transmitter
QP	Calibration Data Certificate and Tamper Evident Seal

### Safety Certification

QS	Certificate of FMEDA data
QT <sup>(11)</sup>	Safety certified to IEC 61508 with certificate of FMEDA data

### Product Certifications

E1	ATEX Flameproof
I1	ATEX Intrinsic Safety
IE	FM FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only
IF	CSA FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only
IA <sup>(12)</sup>	ATEX FISCO Intrinsic Safety; for FOUNDATION fieldbus protocol only
N1	ATEX Type n
ND	ATEX Dust
K1	ATEX Flameproof, Intrinsic Safety, Type n, Dust (combination of E1, I1, N1, and ND)
E4	TIIS Flameproof
E5	FM Explosion-proof, Dust Ignition-proof
I5	FM Intrinsically Safe, Division 2
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5 and I5)
E6	CSA Explosion-proof, Dust Ignition-proof, Division 2
I6	CSA Intrinsically Safe
K6	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E6 and I6)
E7 <sup>(12)</sup>	SAA Flameproof, Dust Ignition-proof
I7	IECEX Intrinsic Safety
IG	IECEX FISCO Intrinsic Safety; for FOUNDATION fieldbus protocol only
N7	IECEX Type n
K7	SAA Flameproof, Dust Ignition-proof, IECEX Intrinsic Safety, Type n (combination of E7, I7, and N7)



# Product Data Sheet

00813-0100-4809, Rev FA  
Catalog 2008 - 2009

# The Annubar Flowmeter Series

## Rosemount 3051SFA ProBar Flowmeter Ordering Information

KA	ATEX and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E1, I1, E6, and I6) <i>Note: Only available on Housing Style codes 00, 1A, 1J, 2A, 2J, 2E, or 2M.</i>
KB	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5, E6, I5, and I6) <i>Note: Only available on Housing Style codes 00, 1A, 1J, 2A, 2J, 2E, or 2M.</i>
KC	FM and ATEX Explosion-proof, Intrinsically Safe, Division 2 (combination of E5, E1, I5, and I1) <i>Note: Only available on Housing Style codes 00, 1A, 1J, 2A, 2J, 2E, or 2M.</i>
KD	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe (combination of E5, I5, E6, I6, E1, and I1) <i>Note: Only available on Housing Style codes 00, 1A, 1J, 2A, 2J, 2E, or 2M.</i>

### Alternate Transmitter Materials of Construction

L1	Inert Sensor Fill Fluid
L2	Graphite-Filled PTFE o-ring
LA	Inert Sensor Fill Fluid and Graphite-Filled PTFE o-ring

### Display<sup>(13)</sup>

M5	PlantWeb LCD display
M7 <sup>(6)(14)</sup>	Remote mount LCD display and interface, no cable; PlantWeb housing, SST bracket, requires 4-20 mA / HART output
M8 <sup>(6)(14)</sup>	Remote mount LDC display and interface, 50 ft. (15 m) cable; PlantWeb housing, SST bracket, requires 4-20 mA / HART output
M9 <sup>(6)(14)</sup>	Remote mount LCD display and interface, 100 ft. (31 m) cable; PlantWeb housing, SST bracket, requires 4-20 mA / HART output

### Terminal Blocks

T1 <sup>(15)</sup>	Transient terminal block
T2 <sup>(16)</sup>	Terminal block with WAGO® spring clamp terminals
T3 <sup>(16)</sup>	Transient terminal block with WAGO spring clamp terminals

### Manifold for Remote Mount Option

F1	3-Valve Manifold, Carbon Steel
F2	3-Valve Manifold, Stainless Steel
F3	3-Valve Manifold, Hastelloy C
F5	5-Valve Manifold, Carbon Steel
F6	5-Valve Manifold, Stainless Steel
F7	5-Valve Manifold, Hastelloy C

### PlantWeb Control Functionality

A01 <sup>(17)</sup>	FOUNDATION fieldbus Advanced Control Function Block Suite
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### PlantWeb Diagnostic Functionality

D01 <sup>(17)</sup>	FOUNDATION fieldbus Diagnostics Suite
DA1 <sup>(18)</sup>	HART Diagnostic Suite

### PlantWeb Enhanced Measurement Functionality

H01 <sup>(17)(19)</sup>	Fully Compensated Mass Flow Block
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### Code Wireless Options - Select code from each wireless category (example: WA2WK1)

#### Wireless Transmit Rate

WA	User Configurable Transmit Rate
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#### Operating Frequency and Protocol

1	2.4 GHz DSSS, HART
2	900 MHz FHSS, HART

#### Antenna

WK	Omnidirectional, Integral Antenna
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#### SmartPower™

1	Long-life Power Module Adapter, Intrinsically Safe NOTE: Long-life Power Module must be shipped separately, order Part No. 00753-9220-0001.
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### Code Options

#### Special Configuration (Software)

C4 <sup>(6)(20)</sup>	NAMUR alarm and saturation signal levels, high alarm
C5 <sup>(6)(20)</sup>	NAMUR alarm and saturation signal levels, low alarm
C6 <sup>(6)(20)</sup>	Custom alarm and saturation signal levels, high alarm <i>Note: A Configuration Data Sheet (00806-0100-4809) must be completed.</i>
C7 <sup>(6)(20)</sup>	Custom alarm and saturation signal levels, low alarm <i>Note: A Configuration Data Sheet (00806-0100-4809) must be completed.</i>
C8 <sup>(6)(20)</sup>	Low alarm (standard Rosemount alarm and saturation signal levels)

# The Annubar Flowmeter Series

## Rosemount 3051SFA ProBar Flowmeter Ordering Information

### Special Configuration (Hardware)

D1 <sup>(6)(20)</sup>	Hardware Adjustment (zero, span, alarm, security)
D4	External Ground Screw
DA <sup>(6)(20)</sup>	Hardware Adjustment (zero, span, alarm, security) and External Ground Screw

### Conduit Electrical Connector

GE <sup>(21)</sup>	M12, 4-pin, Male Connector ( <i>euromast</i> <sup>®</sup> )
GM <sup>(21)</sup>	A size Mini, 4-pin, Male Connector ( <i>minifast</i> <sup>®</sup> )

**Typical Model Number: 3051SFA D L 060 D C H P S 2 T1 0 0 0 3 2A A 1A 3**

- (1) Provide the "A" dimension for Flanged, Flange-Lok, and Threaded Flo-Tap models. Provide the "B" dimension for Flange Flo-Tap models.
- (2) Available in remote mount applications only.
- (3) Requires PlantWeb housing.
- (4) Available approvals are FM Intrinsically Safe, Division 2 (option code I5), CSA Intrinsically Safe (option code I6), ATEX Intrinsic Safety (option code I1; only available with 2.4 GHz), and IECEx Intrinsic Safety (option code I7; only available with 2.4 GHz).
- (5) Available with output code A only. Available approvals are FM Intrinsically Safe, Division 2 (option code I5) or ATEX Intrinsic Safety (option code I1). Contact an Emerson Process Management representative for additional information.
- (6) Not available with output protocol code X.
- (7) Applies to assembled flowmeter only, mounting not tested.
- (8) Isolation and Instrument valves not included in Traceability Certification.
- (9) Not available with Transmitter Connection Platform 6.
- (10) Materials of Construction comply with metallurgical requirements within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.
- (11) Not available with output code F or X. Not available with housing code 01 or 7J.
- (12) Consult factory for availability.
- (13) Not available with Housing code 01 or 7J.
- (14) Not available with output code F, Housing code 01, option code DA1, or option code QT.
- (15) Not available with Housing code 00, 01, 5A, or 7J.
- (16) Available with Output Protocol code A and Plantweb housing only.
- (17) Requires PlantWeb housing and output code F.
- (18) Requires PlantWeb housing and output code A. Includes Hardware Adjustments as standard. Not available with option code QT.
- (19) Requires Rosemount Engineering Assistant to configure.
- (20) Not available with Output Protocol code F or Housing code 01.
- (21) Not available with Housing code 00, 01, 5A, or 7J. Available with Intrinsically Safe approvals only. For FM Intrinsically Safe, Division 2 (option code I5) or FM FISCO Intrinsically Safe (option code IE), install in accordance with Rosemount drawing 03151-1009 to maintain outdoor rating (NEMA 4X and IP66).

**Pipe I.D. Range Code—measured in inches (millimeters)**

See "Rosemount 3051SFA ProBar Flowmeter Ordering Information" on page 21

For pipes with an Inner Diameter (I.D.) Range / Pipe Wall Thickness not found in this table or with a line size greater than 12-in. (300 mm), choose option code Z and specify the exact pipe dimensions (I.D. and Pipe Wall Thickness) on the HART Configuration Data Sheet (See document 00806-0100-4809). The Emerson process Management Sizing program will determine this code, based on the application piping.

	Line Size		Option Code	Pipe Wall Thickness			I.D. Range Code
	Nominal	Max. O.D.		Inner Diameter (I.D.) Range	ANSI Pipes	Non-ANSI Pipes	
	2-in. (50 mm)	2.625-in. (66.68 mm)	020	1.784 to 1.841-in. (45.31 to 46.76 mm)	0.065 to 0.545-in. (1.7 to 13.8 mm)	0.065 to 0.488-in. (1.7 to 12.4 mm)	A
				1.842 to 1.938-in. (46.79 to 49.23 mm)		0.065 to 0.449-in. (1.7 to 11.4 mm)	B
				1.939 to 2.067-in. (49.25 to 52.50 mm)		0.065 to 0.417-in. (1.7 to 10.6 mm)	C
				2.068 to 2.206-in. (52.53 to 56.03 mm)		0.065 to 0.407-in. (1.7 to 10.3 mm)	D
	2½-in. (63.5 mm)	3.188-in. (80.98 mm)	025	2.207 to 2.322-in. (56.06 to 58.98 mm)	0.083 to 0.563-in. (2.1 to 14.3 mm)	0.083 to 0.448-in. (2.1 to 11.4 mm)	B
				2.323 to 2.469-in. (59.00 to 62.71 mm)		0.083 to 0.417-in. (2.1 to 10.6 mm)	C
				2.470 to 2.598-in. (62.74 to 65.99 mm)		0.083 to 0.435-in. (2.1 to 11.0 mm)	D
				2.599 to 2.647-in. (66.01 to 67.23 mm)		0.083 to 0.515-in. (2.1 to 13.1 mm)	E
	3-in. (80 mm)	3.75-in. (95.25 mm)	030	2.648 to 2.751-in. (67.26 to 69.88 mm)	0.083 to 0.563-in. (2.1 to 14.3 mm)	0.083 to 0.460-in. (2.1 to 11.7 mm)	A
				2.752 to 2.899-in. (69.90 to 73.63 mm)		0.083 to 0.416-in. (2.1 to 10.6 mm)	B
				2.900 to 3.068-in. (73.66 to 77.93 mm)		0.083 to 0.395-in. (2.1 to 10.0 mm)	C
				3.069 to 3.228-in. (77.95 to 81.99 mm)		0.083 to 0.404-in. (2.1 to 10.3 mm)	D
	3½-in. (89 mm)	4.25-in. (107.95 mm)	035	3.229 to 3.333-in. (82.02 to 84.66 mm)	0.120 to 0.600-in. (3.0 to 15.2 mm)	0.120 to 0.496-in. (3.0 to 12.6 mm)	B
				3.334 to 3.548-in. (84.68 to 90.12 mm)		0.120 to 0.386-in. (3.0 to 9.8 mm)	C
				3.549 to 3.734-in. (90.14 to 94.84 mm)		0.120 to 0.415-in. (3.0 to 10.5 mm)	D
	4-in. (100 mm)	5.032-in. (127.81 mm)	040	3.735 to 3.825-in. (94.87 to 97.16 mm)	0.120 to 0.600-in. (3.0 to 15.2 mm)	0.120 to 0.510-in. (3.0 to 13.0 mm)	B
				3.826 to 4.026-in. (97.18 to 102.26 mm)		0.120 to 0.400-in. (3.0 to 10.2 mm)	C
				4.027 to 4.237-in. (102.29 to 107.62 mm)		0.120 to 0.390-in. (3.0 to 9.9 mm)	D
				4.238 to 4.437-in. (107.65 to 112.70 mm)		0.120 to 0.401-in. (3.0 to 10.2 mm)	E
	5-in. (125 mm)	6.094-in. (154.79 mm)	050	4.438 to 4.571-in. (112.73 to 116.10 mm)	0.134 to 0.614-in. (3.4 to 15.6 mm)	0.134 to 0.481-in. (3.4 to 12.2 mm)	A
				4.572 to 4.812-in. (116.13 to 122.22 mm)		0.134 to 0.374-in. (3.4 to 9.5 mm)	B
				4.813 to 5.047-in. (122.25 to 128.19 mm)		0.134 to 0.380-in. (3.4 to 9.7 mm)	C
				5.048 to 5.249-in. (128.22 to 133.32 mm)		0.134 to 0.413-in. (3.4 to 10.5 mm)	D
Sensor Size 1	6-in. (150 mm)	6.93-in. (176.02 mm)	060	5.250 to 5.472-in. (133.35 to 138.99 mm)	0.134 to 0.614-in. (3.4 to 15.6 mm)	0.134 to 0.3919-in. (3.4 to 9.9 mm)	A
				5.473 to 5.760-in. (139.01 to 146.30 mm)		0.134 to 0.327-in. (3.4 to 8.3 mm)	B
				5.761 to 6.065-in. (146.33 to 154.05 mm)		0.134 to 0.31-in. (3.4 to 7.9 mm)	C
				6.066 to 6.383-in. (154.08 to 162.13 mm)		0.134 to 0.297-in. (3.4 to 7.5 mm)	D
Sensor Size 2	6-in. (150 mm)	6.93-in. (176.02 mm)	060	5.250 to 5.472-in. (133.35 to 139.99 mm)	0.134 to 1.354-in. (3.4 to 34.4 mm)	0.134 to 1.132-in. (3.4 to 28.7 mm)	A
				5.473 to 5.760-in. (139.01 to 146.30 mm)		0.134 to 1.067-in. (3.4 to 27.1 mm)	B
				5.761 to 6.065-in. (146.33 to 154.05 mm)		0.134 to 1.05-in. (3.4 to 26.7 mm)	C
				6.066 to 6.383-in. (154.08 to 162.13 mm)		0.134 to 1.037-in. (3.4 to 26.3 mm)	D
Sensor Size 1	7-in. (180 mm)	7.93-in. (201.42 mm)	070	6.384 to 6.624-in. (162.15 to 168.25 mm)	0.134 to 0.614-in. (3.4 to 15.6 mm)	0.134 to 0.374-in. (3.4 to 9.5 mm)	B
				6.625 to 7.023-in. (168.28 to 178.38 mm)		0.134 to 0.216-in. (3.4 to 5.5 mm)	C
				7.024 to 7.392-in. (178.41 to 187.76 mm)		0.134 to 0.246-in. (3.4 to 6.2 mm)	D
Sensor Size 2	7-in. (180 mm)	7.93-in. (201.42 mm)	070	6.384 to 6.624-in. (162.15 to 168.25 mm)	0.134 to 1.354-in. (3.4 to 34.4 mm)	0.134 to 1.114-in. (3.4 to 28.3 mm)	B
				6.625 to 7.023-in. (168.28 to 178.38 mm)		0.134 to 0.956-in. (3.4 to 24.3 mm)	C
				7.024 to 7.392-in. (178.41 to 187.76 mm)		0.134 to 0.986-in. (3.4 to 25.0 mm)	D
Sensor Size 1	8-in. (200 mm)	9.688-in. (246.08 mm)	080	7.393 to 7.624-in. (187.78 to 193.65 mm)	0.250 to 0.73-in. (6.4 to 18.5 mm)	0.250 to 0.499-in. (6.4 to 12.6 mm)	B
				7.625 to 7.981-in. (193.68 to 202.72 mm)		0.250 to 0.374-in. (6.4 to 9.5 mm)	C
				7.982 to 8.400-in. (202.74 to 213.36 mm)		0.250 to 0.312-in. (6.4 to 7.9 mm)	D
				8.401 to 8.766-in. (213.39 to 222.66 mm)		0.250 to 0.364-in. (6.4 to 9.2 mm)	E
Sensor Size 2	8-in. (200 mm)	9.688-in. (246.08 mm)	080	7.393 to 7.624-in. (187.78 to 193.65 mm)	0.250 to 1.47-in. (6.4 to 37.3 mm)	0.250 to 1.239-in. (6.4 to 31.4 mm)	B
				7.625 to 7.981-in. (193.68 to 202.72 mm)		0.250 to 1.114-in. (6.4 to 28.3 mm)	C
				7.982 to 8.400-in. (202.74 to 213.36 mm)		0.250 to 1.052-in. (6.4 to 26.7 mm)	D
				8.401 to 8.766-in. (213.39 to 222.66 mm)		0.250 to 1.104-in. (6.4 to 28.0 mm)	E
	10-in. (250 mm)	11.75-in. (298.45 mm)	100	8.767 to 9.172-in. (222.68 to 232.97 mm)	0.250 to 1.470-in. (6.4 to 37.3 mm)	0.250 to 1.065-in. (6.4 to 27.1 mm)	A
				9.173 to 9.561-in. (232.99 to 242.85 mm)		0.250 to 1.082-in. (6.4 to 27.5 mm)	B
				9.562 to 10.020-in. (242.87 to 254.51 mm)		0.250 to 1.012-in. (6.4 to 25.7 mm)	C
				10.021 to 10.546-in. (254.53 to 267.87 mm)		0.250 to 0.945-in. (6.4 to 24.0 mm)	D
				10.547 to 10.999-in. (267.89 to 279.37 mm)		0.250 to 1.018-in. (6.4 to 25.9 mm)	E
	12-in. (300 mm)	13.0375-in. (331.15 mm)	120	11.000 to 11.373-in. (279.40 to 288.87 mm)	0.250 to 1.470-in. (6.4 to 37.3 mm)	0.250 to 1.097-in. (6.4 to 27.9 mm)	B
				11.374 to 11.938-in. (288.90 to 303.23 mm)		0.250 to 0.906-in. (6.4 to 23.0 mm)	C
				11.939 to 12.250-in. (303.25 to 311.15 mm)		0.250 to 1.159-in. (6.4 to 29.4 mm)	D

## Rosemount 3095MFA Mass *ProBar* Flowmeter

### SPECIFICATIONS

#### Performance

##### System Reference Accuracy

±0.90% (10:1 turndown) of mass flow rate accuracy

##### Repeatability

±0.1%

##### Line Sizes

- Sensor Size 1: 2-in. to 8-in. (50 to 200 mm)
- Sensor Size 2: 6-in. to 96-in. (150 to 2400 mm)
- Sensor Size 3: 12-in. to 96-in. (300 to 2400 mm)

#### NOTE

Some mounting types are not available in larger line sizes.

TABLE 14. Reynolds Number and Probe Width

Sensor Size	Minimum Rod Reynolds Number ( $R_d$ )	Probe Width ( $d$ ) (inches)
1	6500	0.590-in. (14.99 mm)
2	12500	1.060-in. (26.92 mm)
3	25000	1.935-in. (49.15 mm)

Where

$d$  = Probe width (feet)

$v$  = Velocity of fluid (ft/sec)

$\rho$  = Density of fluid (lbm/ft<sup>3</sup>)

$\mu$  = Viscosity of the fluid (lbm/ft-sec)

$$R_d = \frac{d \times v \times \rho}{\mu}$$

#### Output

Two-wire 4–20 mA, user-selectable for DP, AP, GP, PT, mass flow, or totalized flow. Digital *HART* protocol superimposed on 4–20 mA signal, available to any host that conforms to the *HART* protocol

#### Performance Statement Assumptions

- Measured pipe I.D.
- Electronics are trimmed for optimum flow accuracy.

#### Sizing

Contact a Emerson Process Management sales representative for assistance. A "Configuration Data Sheet" is required prior to order for application verification

#### Optional Performance Class Specification

Ultra for Flow (Code U3): up to 0.95% mass flow rate accuracy, 10:1 turndown, 10-year stability, limited 12-year warranty

#### Annubar Sensor Surface Finish

The front surface of the *Annubar* primary is textured for high Reynolds number applications (typically gas and steam). The surface texture creates a more turbulent boundary layer on the front surface of the sensor. The increased turbulence produces a more predictable and repeatable separation of flow at the edge of the sensor. The appropriate surface finish will be determined for each application by the Emerson Process Management sizing program, Instrument Toolkit software.

#### Functional

##### Service

- Liquid
- Gas
- Steam

##### Power Supply

4–20 mA option

- External power supply required. Standard transmitter (4–20 mA) operates on 11 to 55 v dc with no load

##### Process Temperature Limits

Direct Mount Transmitter

- 500 °F (260 °C)
- 750 °F (398 °C) when used with a direct mount, high temperature 5-valve manifold (Transmitter Connection Platform code 6)

Remote Mount Transmitter

- 1250 °F (677 °C) – *Hastelloy* Sensor Material
- 850 °F (454 °C) – Stainless Steel Sensor Material

##### Transmitter Temperature Limits

Ambient

- –40 to 185 °F (–40 to 85 °C)
- With Integral Display: –4 to 175 °F (–20 to 80 °C)

Storage

- –50 to 230 °F (–46 to 110 °C)
- With Integral Display: –40 to 185 °F (–40 to 85 °C)

##### Pressure Limits<sup>(1)</sup>

Direct Mount Transmitter

- Up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C))
- Integral temperature measurement is not available with Flanged mounting type greater than class 600

Remote Mount Transmitter

- Up to 2500# ANSI (6000 psig at 100 °F (416 bar at 38 °C))

##### Overpressure Limits

0 to 2 times the absolute pressure range with a maximum of 3626 psia (250 bar).

##### Static Pressure Limits

- Operates within specification between static pressures of 0.5 psia (0.03 bar-A) and the URL of the static pressure sensor.

(1) Static pressure selection may effect pressure limitations.

# Product Data Sheet

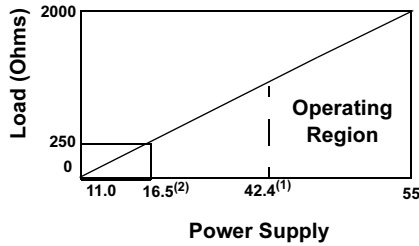
00813-0100-4809, Rev FA  
Catalog 2008 - 2009

# The Annubar Flowmeter Series

## Load Limitations

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

$$\text{Maximum Loop Resistance} = \frac{\text{Power Supply} - 11.0}{0.022}$$



(1) For CSA approval, power supply must not exceed 42.4 V dc.

(2) HART protocol communication requires a loop resistance value between 250-1100 ohms, inclusive.

## FOUNDATION fieldbus (output option code V)

### Power Supply

External power supply required; transmitters operate on 9.0 to 32.0 Vdc transmitter voltage.

### Current Draw

17.5 mA for all configurations (including LCD display option).

## Humidity Limits

- 0–100% relative humidity

## Turn-On Time

Digital and analog measured variables will be within specification 7 – 10 seconds after power is applied to the transmitter.

Digital and analog flow output will be within specifications 10 – 14 seconds after power is applied to the transmitter.

## Damping

Analog output response to a step input change is user-selectable from 0 to 29 seconds for one time constant. This software damping is in addition to sensor module response time

## Failure Mode Alarm

### Output Code A

If self-diagnostics detect a non-recoverable transmitter failure, the analog signal will be driven either below 3.75 mA or above 21.75 mA to alert the user. High or low alarm signal is user-selectable by internal jumper pins.

### Output Code V

If self-diagnostics detect a gross transmitter failure, that information gets passed as a status along with the process variable(s).

## Configuration

HART Hand-held Communicator (Model 275 or 375)

- Performs traditional transmitter maintenance functions

3095 Multivariable Engineering Assistant (EA) software package

- Contains built-in physical property database
- Enables mass flow configuration, maintenance, and diagnostic functions via HART modem (output option code A)
- Enables mass flow configuration via PCMCIA Interface for FOUNDATION fieldbus (output option code V)

## Physical Properties Database

- Maintained in Engineering Assistant Software Configurator
- Physical properties for over 110 fluids
- Natural gas per AGA
- Steam and water per ASME
- Other database fluids per American Institute of Chemical Engineers (AIChE)
- Optional custom entry

## FOUNDATION fieldbus Function Blocks

### Standard Function Blocks

#### Resource Block

- Contains hardware, electronics, and diagnostic information.

#### Transducer Block

- Contains actual sensor measurement data including the sensor diagnostics and the ability to trim the pressure sensor or recall factory defaults.

#### LCD Block

- Configures the local display.

#### 5 Analog Input Blocks

- Processes the measurements for input into other function blocks. The output value is in engineering or custom units and contains a status indicating measurement quality.

#### PID Block with Auto-tune

- Contains all logic to perform PID control in the field including cascade and feedforward. Auto-tune capability allows for superior tuning for optimized control performance.

### Advanced Control Function Block Suite (Option Code A01)

#### Input Selector Block

- Selects between inputs and generates an output using specific selection strategies such as minimum, maximum, midpoint, average, or first "good."

#### Arithmetic Block

- Provides pre-defined application-based equations including flow with partial density compensation, electronic remote seals, hydrostatic tank gauging, ratio control and others.

#### Signal Characterizer Block

- Characterizes or approximates any function that defines an input/output relationship by configuring up to twenty X, Y coordinates. The block interpolates an output value for a given input value using the curve defined by the configured coordinates.

#### Integrator Block

- Compares the integrated or accumulated value from one or two variables to pre-trip and trip limits and generates discrete output signals when the limits are reached. This block is useful for calculating total flow, total mass, or volume over time.

#### Output Splitter Block

- Splits the output of one PID or other control block so that the PID will control two valves or other actuators.

#### Control Selector Block

- Selects one of up to three inputs (highest, middle, or lowest) that are normally connected to the outputs of PID or other control function blocks.

# The Annubar Flowmeter Series

## Physical

### Temperature Measurement

#### Integral RTD

- 100 Ohm platinum RTD
- 4-wire RTD ( $\alpha = 0.00385$ )

#### Remote RTD

- 100 Ohm platinum RTD, spring loaded with 1/2-in. NPT nipple and union (078 series with Rosemount 644 housing)

#### Thermowell

- 1/2-in. x 1/2-in NPT, 316 Stainless Steel with 1/2-in. Weld coupling material to match process pipe.

### Housing Connections

1/2–14 NPT, G1/2, and M20 x 1.5 (CM20) conduit. HART interface connections fixed to terminal block for output code A

### Annubar Sensor Material

- 316 Stainless Steel
- Hastelloy 276

### Annubar Type

See “Dimensional Drawings” on page 35

#### Pak-Lok Model (option P)

- Provided with a compression sealing mechanism rated up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C))
- Graphite Packing (–300 to 850 °F (–184 to 454 °C))

#### Flanged with Opposite Side Support Model (option F)

- Provided with opposite side support, which is the same material as the pipe and requires a second pipe penetration
- Sensor flange is the same material as the Annubar sensor and the mounting flange is the same material as the pipe material
- Flanged mounting hardware: nuts, studs and gaskets (DIN units supplied without nuts, studs and gaskets)
- SST: (–300 to 850 °F (–184 to 454 °C))
- Hastelloy: (–300 to 1250 °F (–184 to 677 °C))

#### Flange-Lok Model (option L)

- Flange-Lok assembly is supplied in 316 SST material.
- Flange-Lok mounting hardware: nuts, studs and gaskets (DIN units supplied without nuts, studs and gaskets)
- –300 to 850 °F (–184 to 454 °C)

#### Flo-Tap Models (options G and M)

- Opposite side support is not available
- Threaded connection is not available with Sensor Size 3
- Gear Drive is not available with Sensor Size 1
- Packing gland required
- Packing Gland Material Temperature Limits
  - PTFE: –40 to 400 °F (–40 to 204 °C)
  - Graphite: –300 to 850 °F (–184 to 454 °C)
- Isolation valve included
  - The isolation valve will carry the same pressure rating as the sensor flange and mounting flange specified in the mounting type
  - Ball valves have a 300# limitation
  - For threaded flo-tap models, the isolation valve NPT size is 1 1/4-in. (Sensor Size one) and 2-in. (Sensor Size 2).

### Process-Wetted Parts

#### Integral Manifolds

- 316 SST
- Hastelloy C-276

#### Remote Manifolds

- 316 SST
- Hastelloy C-276

#### Transmitter Vent Valves and Process Flanges

- 316 SST
- Hastelloy C-276
- Glass-filled PTFE O-rings

#### Process Isolation Diaphragms

- 316 SST
- Hastelloy C-276

#### Integral Manifold O-Rings

- PTFE/Graphite

### Non-Wetted Parts

#### Sensor Module Fill Fluid

- Silicone oil
- Inert Fill optional

#### Cover O-rings

- Buna-N

#### Remote Mounting Brackets

- SST

#### Sensor Mounting (including nuts, bolts, and gasket)

- Match Process Pipe Material

#### Transmitter Housing

- Low copper aluminum, NEMA 4x, IP65
- SST (optional)

#### Paint

- Polyurethane

#### Bolts

- CS

# Product Data Sheet

00813-0100-4809, Rev FA  
Catalog 2008 - 2009

# The Annubar Flowmeter Series

## Annubar Type Specification Chart

Option Code	Description	Pak-Lok <sup>(1)</sup>	Flange-Lok	Flange	Manual and Gear Drive Flo-Tap
T1 <sup>(1)</sup>	Pak-Lok Body Threaded connection	X			X
A1	150# RF ANSI		X	X	X
A3	300# RF ANSI		X	X	X
A6	600# RF ANSI		X	X	X
A9 <sup>(2)</sup>	900# RF ANSI			X	
AF <sup>(2)</sup>	1500# RF ANSI			X	
AT <sup>(2)</sup>	2500# RF ANSI			X	
D1	DN PN 16		X	X	X
D3	DN PN 40		X	X	X
D6	DN PN 100		X	X	X
R9 <sup>(2)</sup>	900# RTJ Flange			X	
RF <sup>(2)</sup>	1500# RTJ Flange			X	
RT <sup>(2)</sup>	2500# RTJ Flange			X	

(1) Available up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C)) rating.

(2) Remote mount only.

## Instrument Connections Temperature Ranges

TABLE 15. Minimum / Maximum Temperature Range

Code	Description	Temperature
G1	Needle Valves, Carbon Steel	-20 to 500 °F (-29 to 260 °C)
G2	Needle Valves, Stainless Steel	-40 to 600 °F (-40 to 316 °C)
G3	Needle Valves, <i>Hastelloy</i>	-40 to 600 °F (-40 to 316 °C)
G5	OS&Y Gate Valve, Carbon Steel	-20 to 775 °F (-29 to 413 °C)
G6	OS&Y Gate Valve, Stainless Steel	-40 to 850 °F (-40 to 454 °C)
G7	OS&Y Gate Valve, <i>Hastelloy</i>	-40 to 1250 °F (-40 to 677 °C)

## Flowmeter Installed in Flanged Pipe Spool Section (option codes H3, H4, and H5)

- All pipe spool sections are flanged pipe sections
- The flanged pipe spool section is constructed from the same material as the pipe
- Consult the factory for remote temperature measurement and ANSI ratings above 600# and DIN flanges

TABLE 16. Flanged Pipe Spool Section Schedule

ANSI	Schedule
150# ANSI	40
300# ANSI	40
600# ANSI	80

TABLE 17. Flange Pipe Spool Section Length

Nominal Pipe Size	Length
2-in. (50 mm)	10.52-in. (267.2 mm)
3-in. (80 mm)	11.37-in. (288.8 mm)
4-in. (100 mm)	12.74-in. (323.6 mm)
6-in. (150 mm)	14.33-in. (364.0 mm)
8-in. (200 mm)	16.58-in. (421.1 mm)

# The Annubar Flowmeter Series

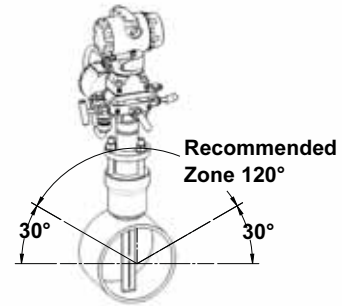
## Installation Considerations. Straight Run Requirements<sup>(1)</sup>

	In Plane		Upstream Dimensions (Pipe Diameters)					Downstream
	Out of Plane		Without Vanes <sup>(2)</sup>		With Vanes <sup>(3)</sup>			
	In Plane A	Out of Plane A	A'	C	C'	B		
1		8	10	—	—	—	4	
2		—	—	8	4	4	4	
3		11	16	—	—	—	4	
4		—	—	8	4	4	4	
5		23	28	—	—	—	4	
6		—	—	8	4	4	4	
7		12	12	—	—	—	4	
8		—	—	8	4	4	4	
9		18	18	—	—	—	4	
10		—	—	8	4	4	4	
11		30	30	—	—	—	4	
12		—	—	8	4	4	4	

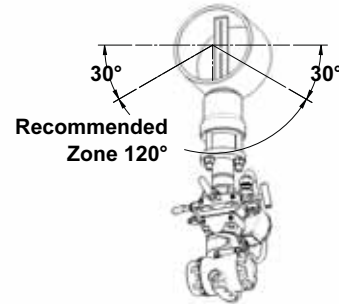
- Consult the factory for instructions regarding use in square or rectangular ducts.
- "In Plane A" means the bar is in the same plane as the elbow. "Out of Plane A" means the bar is perpendicular to the plane of the upstream elbow.
- Use straightening vane to reduce the required straight run length.

## Flowmeter Orientation (Recommended)

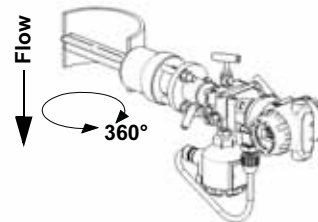
### Gas (Horizontal)



### Liquid and Steam (Horizontal)

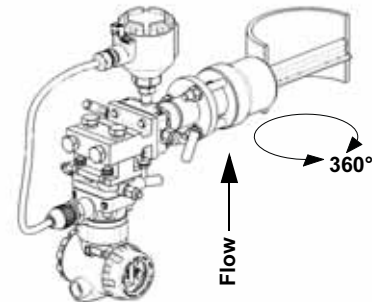


### Gas (Vertical)



Note: Can also be mounted for Gas Vertical up applications.

### Steam (Vertical)



## Drill Hole Size According to Sensor Size

Sensor Size	Diameter
1	3/4-in. (19 mm)
2	1 <sup>5</sup> / <sub>16</sub> -in. (34 mm)
3	2 <sup>1</sup> / <sub>2</sub> -in. (64 mm)



## Product Data Sheet

00813-0100-4809, Rev FA

Catalog 2008 - 2009

# The Annubar Flowmeter Series

## PRODUCT CERTIFICATIONS

### Rosemount 3095 with HART

#### European Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at [www.rosemount.com](http://www.rosemount.com). A hard copy may be obtained by contacting our local sales office.

#### ATEX Directive (94/9/EC)

Emerson Process Management complies with the ATEX Directive.

#### European Pressure Equipment Directive (PED) (97/23/EC)

3095M\_2/3,4/D Flow Transmitters — QS Certificate of Assessment - EC No. PED-H-20  
Module H Conformity Assessment

All other 3095\_ Transmitters/Level Controller —  
Sound Engineering Practice

Transmitter Attachments: Process Flange - Manifold —  
Sound Engineering Practice

#### Electro Magnetic Compatibility (EMC) (89/336/EEC)

3095MV Flow Transmitters  
— EN 50081-1: 1992; EN 50082-2:1995;  
EN 61326-1:1997 – Industrial

#### Ordinary Location Certification for Factory Mutual

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

## Hazardous Locations Certifications

### North American Certifications

#### FM Approvals

E5 Explosion Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition Proof for Class II/Class III, Division 1, Groups E, F, and G. Enclosure type NEMA 4X. Factory Sealed. Provides nonincendive RTD connections for Class I, Division 2, Groups A, B, C, and D.

I5 Intrinsically Safe for use in Class I, II and III, Division 1, Groups A, B, C, D, E, F, and G hazardous outdoor locations. Non-incendive for Class I, Division 2, Groups A, B, C, and D. Temperature Code T4. Factory Sealed.

For input parameters and installation see control drawing 03095-1020.

#### Canadian Standards Association (CSA)

E6 Explosion Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition Proof for Class II/Class III, Division 1, Groups E, F, and G. CSA enclosure Type 4X suitable for indoor and outdoor hazardous locations. Provides nonincendive RTD connection for Class I, Division 2, Groups A, B, C, and D. Factory Sealed. Install in accordance with Rosemount Drawing 03095-1024. Approved for Class I, Division 2, Groups A, B, C, and D.

I6 Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D. when installed in accordance with Rosemount drawing 03095-1021. Temperature Code T3C.

For input parameters and installation see control drawing 03095-1021.

### European Certifications


I1 ATEX Intrinsic Safety  
Certificate Number: BAS98ATEX1359X  II 1 G  
EEx ia IIC T5 ( $T_{amb} = -45\text{ °C to }40\text{ °C}$ )  
EEx ia IIC T4 ( $T_{amb} = -45\text{ °C to }70\text{ °C}$ )  
**CE** 1180

TABLE 18. Connection Parameters (Power/Signal Terminals)

$U_i = 30\text{ V}$   
 $I_i = 200\text{ mA}$   
 $P_i = 1.0\text{ W}$   
 $C_i = 0.012\text{ }\mu\text{F}$   
 $L_i = 0$

TABLE 19. Temperature Sensor Connection Parameters


$U_o = 30\text{ V}$   
 $I_o = 19\text{ mA}$   
 $P_o = 140\text{ mW}$   
 $C_i = 0.002\text{ }\mu\text{F}$   
 $L_i = 0$

TABLE 20. Temp Sensor Terminals Connection Parameters

$C_o = 0.066\text{ }\mu\text{F}$	Gas Group IIC
$C_o = 0.560\text{ }\mu\text{F}$	Gas Group IIB
$C_o = 1.82\text{ }\mu\text{F}$	Gas Group IIA
$L_o = 96\text{ mH}$	Gas Group IIC
$L_o = 365\text{ mH}$	Gas Group IIB
$L_o = 696\text{ mH}$	Gas Group IIA
$L_o/R_o = 247\text{ }\mu\text{H}/\text{ohm}$	Gas Group IIC
$L_o/R_o = 633\text{ }\mu\text{H}/\text{ohm}$	Gas Group IIB
$L_o/R_o = 633\text{ }\mu\text{H}/\text{ohm}$	Gas Group IIA

### Special Conditions for Safe Use

The 3095, when fitted with the transient terminal block (order code B), are not capable of withstanding the 500 volts insulation test required by EN50 020, Clause 6.4.12 (1994). This condition must be accounted for during installation.

N1 ATEX Type N  
Certificate Number: BAS98ATEX3360X  II 3 G  
EEx nL IIC T5 ( $T_{amb} = -45\text{ °C to }40\text{ °C}$ )  
EEx nL IIC T4 ( $T_{amb} = -45\text{ °C to }70\text{ °C}$ )


$U_i = 55\text{ V}$

**CE**

The apparatus is designed for connection to a remote temperature sensor such as a resistance temperature detection (RTD)

### Special Conditions for Safe Use

The 3095, when fitted with the transient terminal block (order code B), are not capable of withstanding the 500 volts insulation test required by EN50 021, Clause 9.1 (1995). This condition must be accounted for during installation.


E1 ATEX Flameproof  
Certificate Number: KEMA02ATEX2320X  II 1/2 G  
EEx d IIC T5 ( $-50\text{ °C} \leq T_{amb} \leq 80\text{ °C}$ )  
T6 ( $-50\text{ °C} \leq T_{amb} \leq 65\text{ °C}$ )

**CE** 1180

# The Annubar Flowmeter Series

## Special Conditions for Safe Use (x):

The device contains a thin wall diaphragm. Installation, maintenance, and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.

- ND ATEX Dust  
 Certificate Number: KEMA02ATEX2321  II 1 D  
 V = 55 Vdc MAX  
 I = 23 mA MAX  
 IP66  
 CE 1180

## Combinations of Certifications

Stainless steel certification tag is provided when optional approval is specified. Once a device labeled with multiple approval types is installed, it should not be reinstalled using any other approval types. Permanently mark the approval label to distinguish it from unused approval types.

- K5 E5 and I5 combination  
 K6 E6 and I6 combination  
 K1 I1, N1, E1, and ND combination

## Rosemount 3095 with *Fieldbus*

### European Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at [www.rosemount.com](http://www.rosemount.com). A hard copy may be obtained by contacting our local sales office.

### ATEX Directive (94/9/EC)

Emerson Process Management complies with the ATEX Directive.

### European Pressure Equipment Directive (PED) (97/23/EC)

3095F\_2/3,4/D and 3095M\_2/3,4/D Flow Transmitters  
 — QS Certificate of Assessment - EC No. PED-H-20  
 Module H Conformity Assessment  
 All other 3095\_ Transmitters/Level Controller  
 — Sound Engineering Practice  
 Transmitter Attachments: Process Flange - Manifold  
 — Sound Engineering Practice  
 Primary Elements, Flowmeter  
 — See appropriate Primary Element QIG

## Electro Magnetic Compatibility (EMC) (89/336/EEC)

3095 Flow Transmitters

— EN 50081-1: 1992; EN 50082-2:1995; EN 61326-1:1997 – Industrial

## Ordinary Location Certification for Factory Mutual

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

## Rosemount 3095 Fieldbus Hazardous Locations Certifications

### North American Certifications

#### FM Approvals

- E5** Explosion Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition Proof for Class II/Class III, Division 1, Groups E, F, and G. Enclosure type NEMA 4X. Factory Sealed. Provides nonincendive RTD connections for Class I, Division 2, Groups A, B, C, and D.
- I5** Intrinsically Safe for use in Class I, II and III, Division 1, Groups A, B, C, D, E, F, and G hazardous outdoor locations. Non-incendive for Class I, Division 2, Groups A, B, C, and D. Temperature Code T4. Factory Sealed.

For input parameters and installation see control drawing 03095-1020.

- IE** FISCO for use in Class I, II and III, Division 1, Groups A, B, C, D, E, F, and G hazardous outdoor locations. Temperature Code T4. Factory Sealed.

For input parameters and installation see control drawing 03095-1020.

#### Combinations of Certifications

Stainless steel certification tag is provided when optional approval is specified. Once a device labeled with multiple approval types is installed, it should not be reinstalled using any other approval types. Permanently mark the approval label to distinguish it from unused approval types.

- K5** E5 and I5 combination

### Canadian Standards Association (CSA)

- IF** CSA FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only

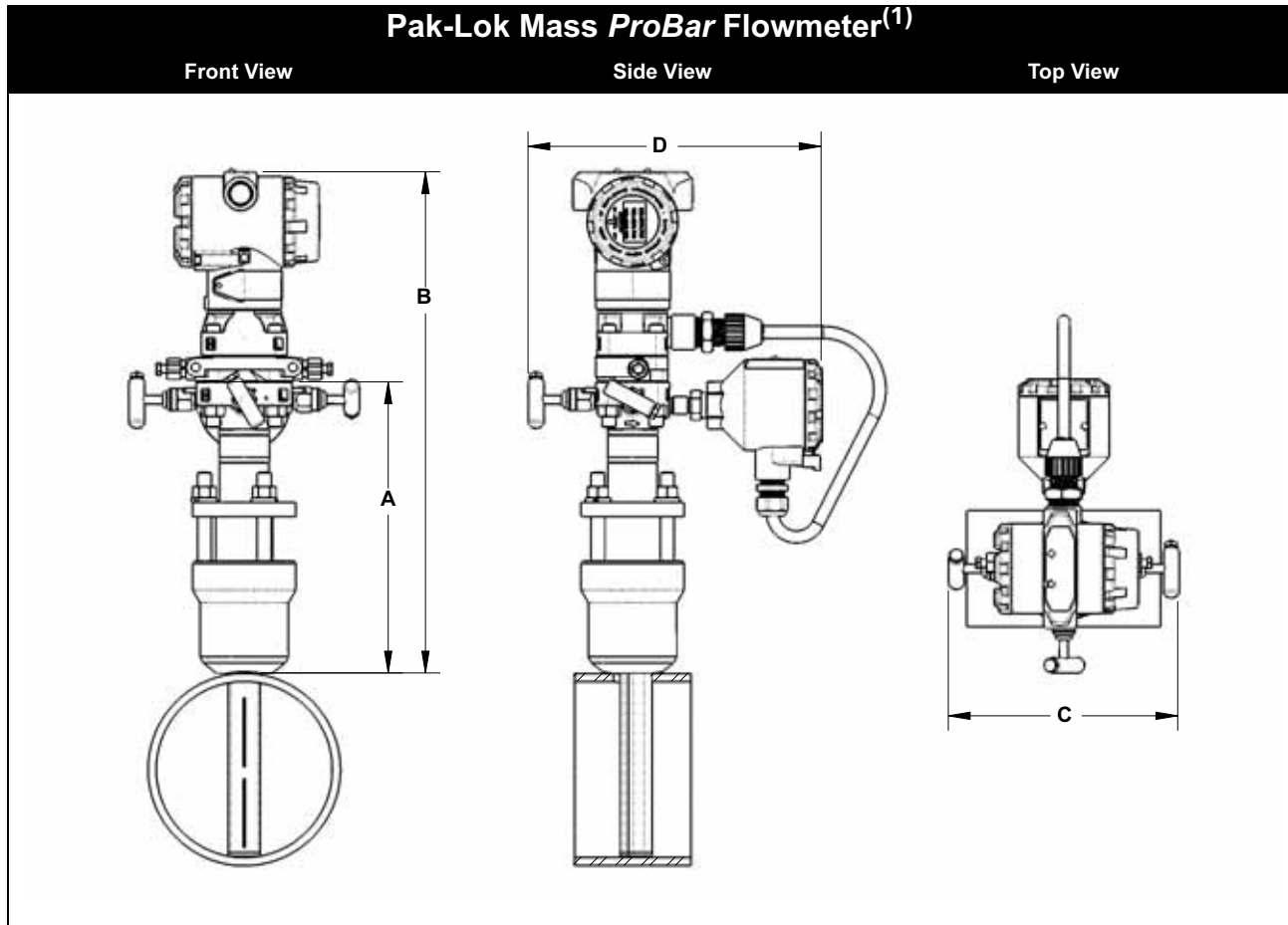
### European Certifications

- IA** ATEX FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only

### Australian Certifications

- IG** IECEx FISCO Intrinsic Safety

**DIMENSIONAL DRAWINGS**



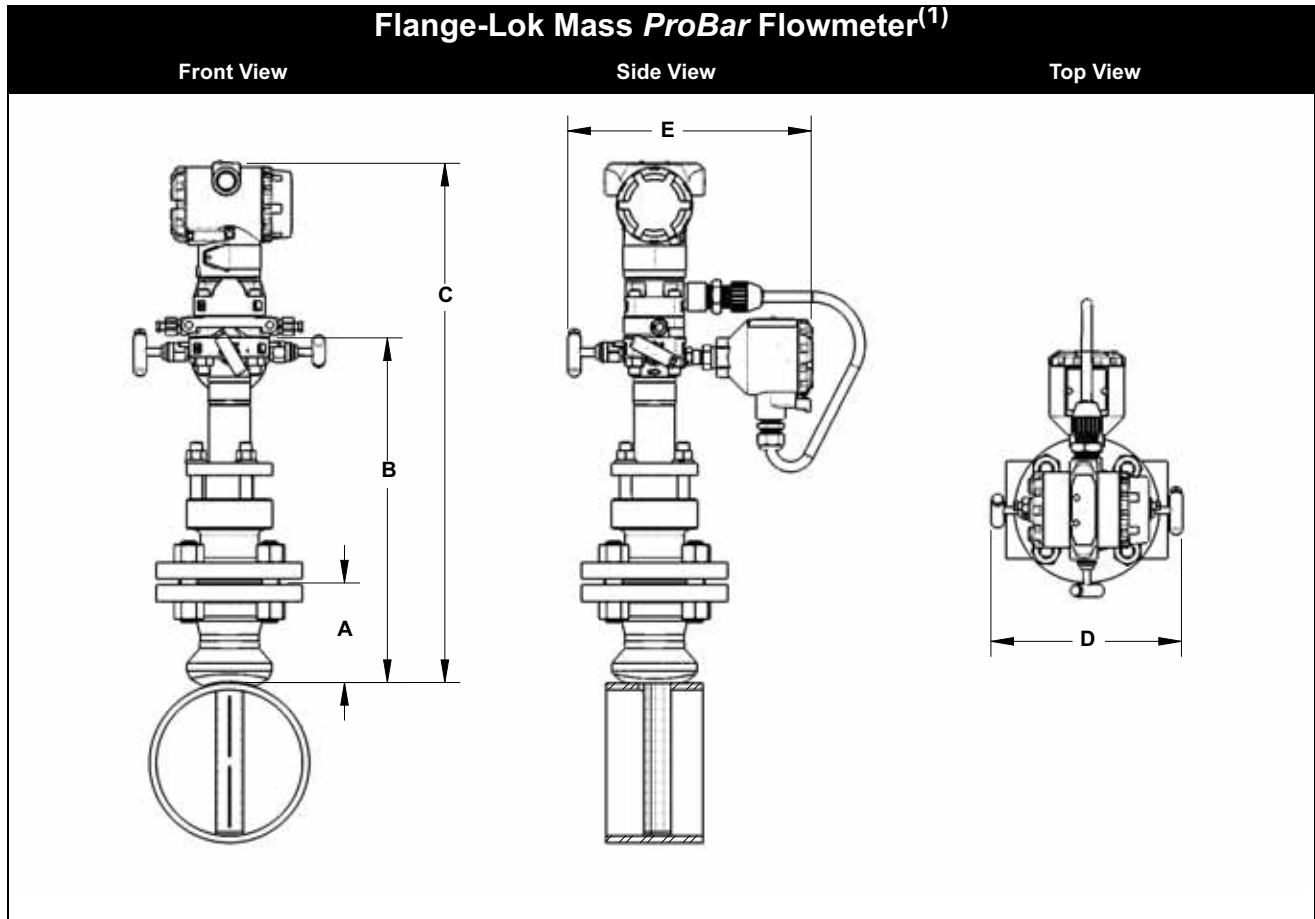
(1) The Pak-Lok Annubar model is available up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C)).

TABLE 21. Pak-Lok Mass *ProBar* Flowmeter Dimensional Data

Sensor Size	A (Max)	B (Max)	C (Max)	D (Max)
1	7.50 (190.5)	14.60 (370.8)	9.00 (228.6)	11.25 (285.8)
2	9.25 (235.0)	16.35 (415.3)	9.00 (228.6)	11.25 (285.8)
3	12.00 (304.8)	19.10 (485.1)	9.00 (228.6)	11.25 (285.8)

Dimensions are in inches (millimeters)

# The Annubar Flowmeter Series



(1) The Flange-Lok Annubar model can be direct mounted up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C)).

TABLE 22. Flange-Lok Mass ProBar Flowmeter Dimensional Data

Sensor Size	Flange Size and Rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	C (Max)	D (Max)	E (Max)
1	1½ – 150#	3.88 (98.6)	12.25 (311.2)	19.35 (491.5)	9.00 (228.6)	11.25 (285.8)
1	1½ – 300#	4.13 (104.9)	12.25 (311.2)	19.35 (491.5)	9.00 (228.6)	11.25 (285.8)
1	1½ – 600#	4.44 (112.8)	12.25 (311.2)	19.35 (491.5)	9.00 (228.6)	11.25 (285.8)
1	DN40/PN16	3.09 (78.5)	12.25 (311.2)	19.35 (491.5)	9.00 (228.6)	11.25 (285.8)
1	DN40/PN40	3.21 (81.5)	12.25 (311.2)	19.35 (491.5)	9.00 (228.6)	11.25 (285.8)
1	DN40/ PN100	3.88 (98.6)	12.25 (311.2)	19.35 (491.5)	9.00 (228.6)	11.25 (285.8)
2	2 – 150#	4.13 (104.9)	14.25 (362.0)	21.35 (542.3)	9.00 (228.6)	11.25 (285.8)
2	2 – 300#	4.38 (111.3)	14.25 (362.0)	21.35 (542.3)	9.00 (228.6)	11.25 (285.8)
2	2 – 600#	4.76 (120.9)	14.25 (362.0)	21.35 (542.3)	9.00 (228.6)	11.25 (285.8)
2	DN50/PN16	3.40 (86.4)	14.25 (362.0)	21.35 (542.3)	9.00 (228.6)	11.25 (285.8)
2	DN50/PN40	3.51 (89.2)	14.25 (362.0)	21.35 (542.3)	9.00 (228.6)	11.25 (285.8)
2	DN50/PN100	4.30 (109.2)	14.25 (362.0)	21.35 (542.3)	9.00 (228.6)	11.25 (285.8)
3	3 – 150#	4.63 (117.6)	17.50 (444.5)	24.60 (624.8)	9.00 (228.6)	11.25 (285.8)
3	3 – 300#	5.00 (127.0)	17.50 (444.5)	24.60 (624.8)	9.00 (228.6)	11.25 (285.8)
3	3 – 600#	5.38 (136.7)	17.50 (444.5)	24.60 (624.8)	9.00 (228.6)	11.25 (285.8)
3	DN80/PN16	3.84 (97.5)	17.50 (444.5)	24.60 (624.8)	9.00 (228.6)	11.25 (285.8)
3	DN80/PN40	4.16 (105.7)	17.50 (444.5)	24.60 (624.8)	9.00 (228.6)	11.25 (285.8)
3	DN80/PN100	4.95 (125.7)	17.50 (444.5)	24.60 (624.8)	9.00 (228.6)	11.25 (285.8)

Dimensions are in inches (millimeters)

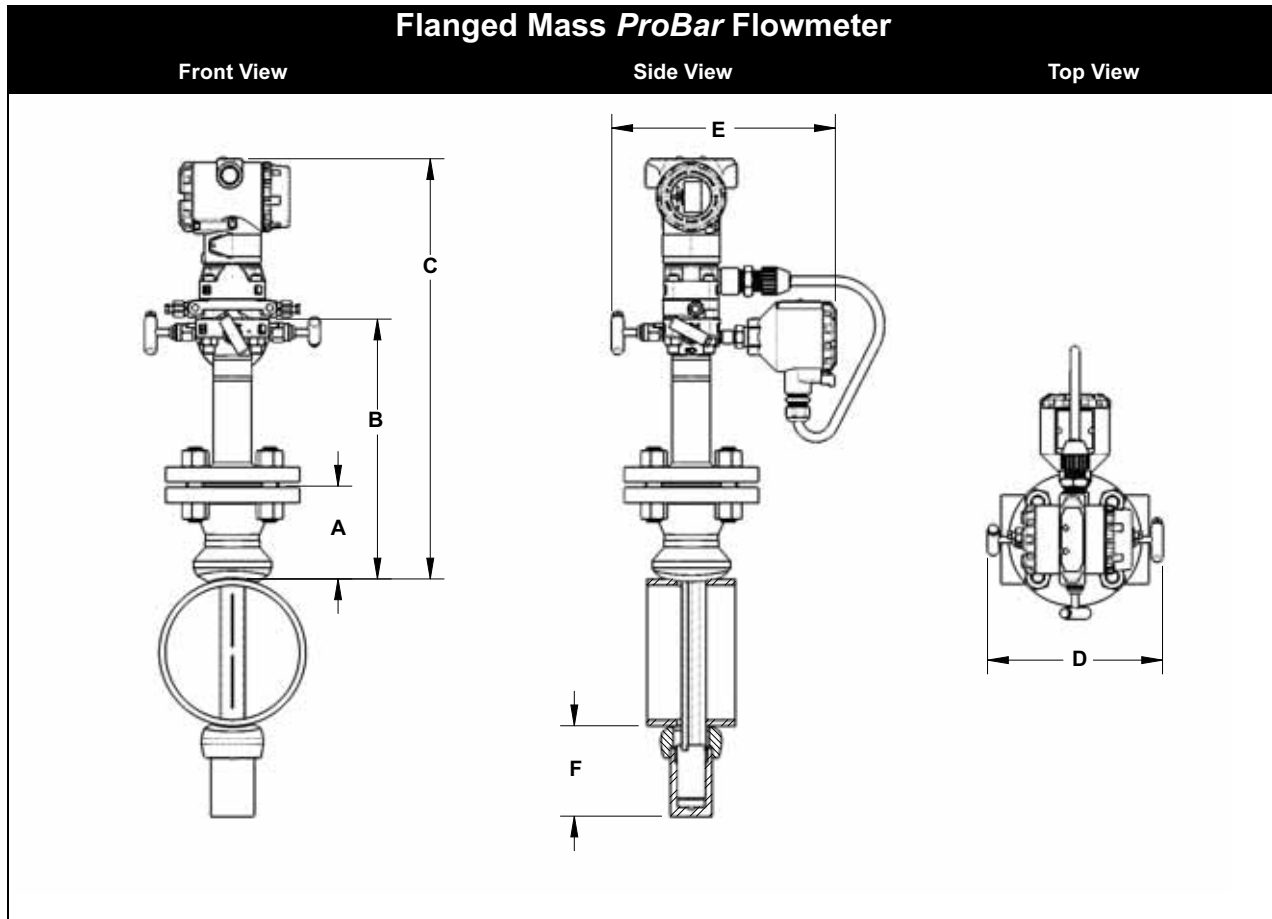


TABLE 23. Flanged Mass ProBar Flowmeter Dimensional Data

Sensor Size	Flange Size and Rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	C ± 0.25 (6.4)	D (Max)	E (Max)	F (Max)
1	1½ – 150#	3.88 (98.6)	11.00 (279.4)	18.10 (459.7)	9.00 (228.6)	11.25 (285.8)	3.50 (88.9)
1	1½ – 300#	4.13 (104.9)	11.00 (279.4)	18.10 (459.7)	9.00 (228.6)	11.25 (285.8)	3.50 (88.9)
1	1½ – 600#	4.44 (112.8)	11.00 (279.4)	18.10 (459.7)	9.00 (228.6)	11.25 (285.8)	3.50 (88.9)
1	DN40/PN16	3.09 (78.5)	11.00 (279.4)	18.10 (459.7)	9.00 (228.6)	11.25 (285.8)	3.50 (88.9)
1	DN40/PN40	3.21 (81.5)	11.00 (279.4)	18.10 (459.7)	9.00 (228.6)	11.25 (285.8)	3.50 (88.9)
1	DN40/ PN100	3.88 (98.6)	11.00 (279.4)	18.10 (459.7)	9.00 (228.6)	11.25 (285.8)	3.50 (88.9)
1	1½ – 900#	4.94 (125.5)	9.32 (236.6)	—	—	—	3.50 (88.9)
1	1½ – 1500#	4.94 (125.5)	9.32 (236.6)	—	—	—	3.50 (88.9)
1	1½ – 2500#	6.76 (171.7)	11.64 (295.5)	—	—	—	4.00 (101.6)
2	2 – 150#	4.13 (104.9)	12.00 (304.8)	19.10 (485.1)	9.00 (228.6)	11.25 (285.8)	5.00 (127.0)
2	2 – 300#	4.38 (111.3)	12.00 (304.8)	19.10 (485.1)	9.00 (228.6)	11.25 (285.8)	5.00 (127.0)
2	2 – 600#	4.76 (120.9)	12.00 (304.8)	19.10 (485.1)	9.00 (228.6)	11.25 (285.8)	5.00 (127.0)
2	DN50/PN16	3.40 (86.4)	12.00 (304.8)	19.10 (485.1)	9.00 (228.6)	11.25 (285.8)	5.00 (127.0)
2	DN50/PN40	3.51 (89.2)	12.00 (304.8)	19.10 (485.1)	9.00 (228.6)	11.25 (285.8)	5.00 (127.0)
2	DN50/ PN100	4.30 (109.2)	12.00 (304.8)	19.10 (485.1)	9.00 (228.6)	11.25 (285.8)	5.00 (127.0)
2	2 – 900#	5.88 (149.4)	10.51 (266.8)	—	—	—	5.00 (127.0)
2	2 – 1500#	5.88 (149.4)	10.51 (266.8)	—	—	—	5.00 (127.0)
2	3 – 2500#	9.87 (250.7)	15.62 (396.7)	—	—	—	4.50 (114.3)
3	3 – 150#	4.63 (117.6)	13.50 (342.9)	20.60 (523.2)	9.00 (228.6)	11.25 (285.8)	4.00 (101.6)
3	3 – 300#	5.00 (127.0)	13.50 (342.9)	20.60 (523.2)	9.00 (228.6)	11.25 (285.8)	4.00 (101.6)

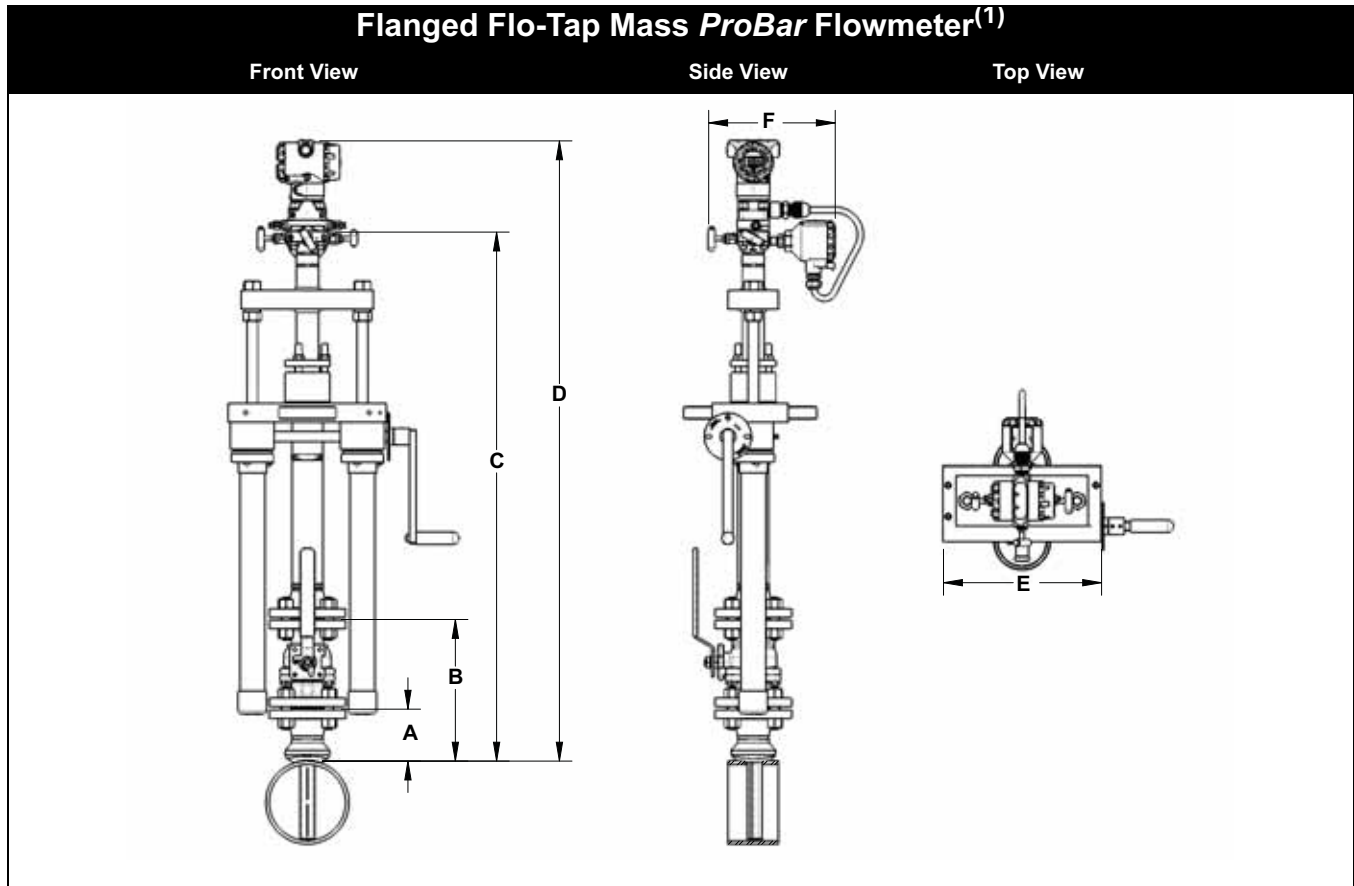
Table 23 Continued on Next Page

# The Annubar Flowmeter Series

TABLE 23. Flanged Mass *ProBar* Flowmeter Dimensional Data

Sensor Size	Flange Size and Rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	C ± 0.25 (6.4)	D (Max)	E (Max)	F (Max)
3	3 – 600#	5.38 (136.7)	13.50 (342.9)	20.60 (523.2)	9.00 (228.6)	11.25 (285.8)	4.00 (101.6)
3	DN80/PN16	3.84 (97.5)	13.50 (342.9)	20.60 (523.2)	9.00 (228.6)	11.25 (285.8)	4.00 (101.6)
3	DN80/PN40	4.16 (105.7)	13.50 (342.9)	20.60 (523.2)	9.00 (228.6)	11.25 (285.8)	4.00 (101.6)
3	DN80/ PN100	4.95 (125.7)	13.50 (342.9)	20.60 (523.2)	9.00 (228.6)	11.25 (285.8)	4.00 (101.6)
3	4 – 900#	8.19 (208.0)	13.44 (341.3)	—	—	—	7.00 (177.8)
3	4 – 1500#	8.56 (217.4)	13.81 (350.8)	—	—	—	7.00 (177.8)
3	4 – 2500#	11.19 (284.2)	17.32 (439.8)	—	—	—	7.00 (177.8)

*Dimensions are in inches (millimeters)*



(1) The Flanged Flo-Tap Mass ProBar Flowmeter is available with both the manual and gear drive options.

TABLE 24. Flanged Flo-Tap Mass ProBar Flowmeter Dimensional Data

Sensor Size	Flange Size and Rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	C <sup>1</sup> (Max) (Gear Drive)	C <sup>1</sup> (Max) (Manual)	D (Max)	E (Max)	F (Max)
1	1½ – 150#	3.88 (98.5)	10.50 (266.7)	—	17.9 (454.7)	C + 7.10 (180.3)	10.50 (266.7)	11.25 (285.8)
1	1½ – 300#	4.13 (104.9)	11.75 (298.5)	—	17.9 (454.7)	C + 7.10 (180.3)	10.50 (266.7)	11.25 (285.8)
1	1½ – 600#	4.44 (112.8)	14.06 (357.2)	—	17.9 (454.7)	C + 7.10 (180.3)	10.50 (266.7)	11.25 (285.8)
1	DN40/PN16	3.09 (78.5)	See Note.	—	17.9 (454.7)	C + 7.10 (180.3)	10.50 (266.7)	11.25 (285.8)
1	DN40/PN40	3.21 (81.5)	See Note.	—	17.9 (454.7)	C + 7.10 (180.3)	10.50 (266.7)	11.25 (285.8)
1	DN40/PN100	3.88 (98.6)	See Note.	—	17.9 (454.7)	C + 7.10 (180.3)	10.50 (266.7)	11.25 (285.8)
2	2 – 150#	4.13 (104.9)	11.25 (285.8)	24.6 (624.8)	21.4 (543.6)	C + 7.10 (180.3)	12.56 (319.0)	11.25 (285.8)
2	2 – 300#	4.38 (111.3)	13.00 (330.2)	24.6 (624.8)	21.4 (543.6)	C + 7.10 (180.3)	12.56 (319.0)	11.25 (285.8)
2	2 – 600#	4.76 (120.9)	16.38 (416.0)	24.6 (624.8)	21.4 (543.6)	C + 7.10 (180.3)	12.56 (319.0)	11.25 (285.8)
2	DN50/PN16	3.40 (86.4)	See Note.	24.6 (624.8)	21.4 (543.6)	C + 7.10 (180.3)	12.56 (319.0)	11.25 (285.8)
2	DN50/PN40	3.51 (89.2)	See Note.	24.6 (624.8)	21.4 (543.6)	C + 7.10 (180.3)	12.56 (319.0)	11.25 (285.8)
2	DN50/PN100	4.30 (109.2)	See Note.	24.6 (624.8)	21.4 (543.6)	C + 7.10 (180.3)	12.56 (319.0)	11.25 (285.8)
3	3 – 150#	4.63 (117.6)	12.75 (323.9)	26.5 (673.1)	23.3 (591.8)	C + 7.10 (180.3)	14.13 (358.9)	11.25 (285.8)
3	3 – 300#	5.00 (127.0)	16.25 (412.8)	26.5 (673.1)	23.3 (591.8)	C + 7.10 (180.3)	14.13 (358.9)	11.25 (285.8)
3	3 – 600#	5.38 (136.7)	19.50 (495.4)	26.5 (673.1)	23.3 (591.8)	C + 7.10 (180.3)	14.13 (358.9)	11.25 (285.8)
3	DN80/PN16	3.84 (97.5)	See Note.	26.5 (673.1)	23.3 (591.8)	C + 7.10 (180.3)	14.13 (358.9)	11.25 (285.8)
3	DN80/PN40	4.16 (105.7)	See Note.	26.5 (673.1)	23.3 (591.8)	C + 7.10 (180.3)	14.13 (358.9)	11.25 (285.8)
3	DN80/PN100	4.95 (125.7)	See Note.	26.5 (673.1)	23.3 (591.8)	C + 7.10 (180.3)	14.13 (358.9)	11.25 (285.8)

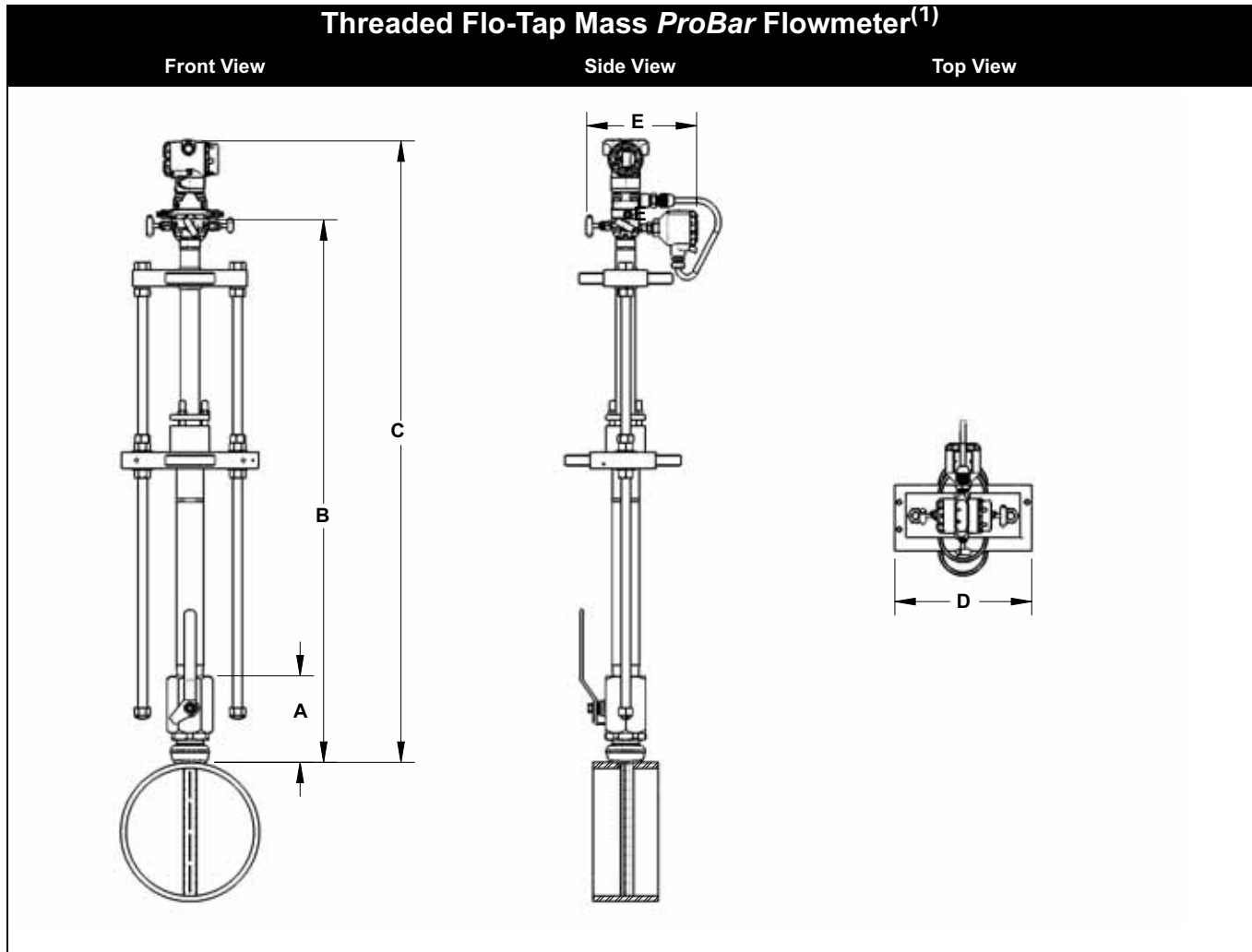
Dimensions are in inches (millimeters)

**Note: Customer Supplied.**

Inserted, C Dimension = Pipe I.D. + Wall Thickness + B + C<sup>1</sup>

Retracted, C Dimension = 2 x (Pipe I.D. + Wall Thickness + B) + C<sup>1</sup>

# The Annubar Flowmeter Series



(1) The Threaded Flo-Tap Mass ProBar Flowmeter is available with both the manual and gear drive options.

TABLE 25. Threaded Flo-Tap Mass ProBar Flowmeter Dimensional Data

Sensor Size	A ± 0.50 (12.7)	B <sup>1</sup> (Max) (Gear Drive)	B <sup>1</sup> (Max) (Manual)	C (Max)	D (Max)	E (Max)
1	6.76 (171.8)	—	17.40 (442.0)	B + 7.10 (180.3)	10.50 (266.7.0)	11.25 (285.8)
2	8.17 (207.5)	23.70 (602.0)	20.80 (528.3)	B + 7.10 (180.3)	12.56 (319.0)	11.25 (285.8)

Sensor Size 3 is not available in a Threaded Flo-Tap.

Dimensions are in inches (millimeters)

Inserted, B Dimension = Pipe I.D. + Wall Thickness + A + B<sup>1</sup>

Retracted, B Dimension = 2 x (Pipe I.D. + Wall Thickness + A) + B<sup>1</sup>



**ORDERING INFORMATION**

**Rosemount 3095MFA Mass *ProBar* Flowmeter Ordering Information**

Model	DP Flow Flowmeter Type		
3095MFA	Mass <i>ProBar</i> Flowmeter		
Code	Fluid Type		
L	Liquid		
G	Gas		
S	Steam		
Code	Line Size	Code	Line Size
020	2-in. (50 mm)	180	18-in. (450 mm)
025	2 <sup>1</sup> / <sub>2</sub> -in. (63.5 mm)	200	20-in. (500 mm)
030	3-in. (80 mm)	240	24-in. (600 mm)
035	3 <sup>1</sup> / <sub>2</sub> -in. (89 mm)	300	30-in. (750 mm)
040	4-in. (100 mm)	360	36-in. (900 mm)
050	5-in. (125 mm)	420	42-in. (1066 mm)
060	6-in. (150 mm)	480	48-in. (1210 mm)
070	7-in. (175 mm)	600	60-in. (1520 mm)
080	8-in. (200 mm)	720	72-in. (1820 mm)
100	10-in. (250 mm)	780	78-in. (1950 mm)
120	12-in. (300 mm)	840	84-in. (2100 mm)
140	14-in. (350 mm)	900	90-in. (2250 mm)
160	16-in. (400 mm)	960	96-in. (2400 mm)
Code	Pipe I.D. Range (Refer to the "Pipe I.D. Range Code—measured in inches (millimeters)" on page 45)		
A	Range A from the Pipe I.D. table		
B	Range B from the Pipe I.D. table		
C	Range C from the Pipe I.D. table		
D	Range D from the Pipe I.D. table		
E	Range E from the Pipe I.D. table		
Z	Non-standard Pipe I.D. Range or Line Sizes greater than 12 inches		
Code	Pipe Material / Assembly Material		
C	Carbon steel		
S	316 Stainless Steel		
G	Chrome-Moly Grade F-11		
N	Chrome-Moly Grade F-22		
J	Chrome-Moly Grade F-91		
0 <sup>(1)</sup>	No Mounting (Customer Supplied)		
Code	Piping Orientation		
H	Horizontal Piping		
D	Vertical Piping with Downwards Flow		
U	Vertical Piping with Upwards Flow		
Code	<i>Annubar</i> Type		
P	Pak-Lok		
F	Flanged with opposite side support		
L	Flange-Lok		
G	Gear-Drive Flo-Tap		
M	Manual Flo-Tap		
Code	Sensor Material		
S	316 Stainless Steel		
H	<i>Hastelloy</i> C-276		
Code	Sensor Size		
1	Sensor size 1 — Line sizes 2-in. (50 mm) to 8-in. (200 mm)		
2	Sensor size 2 — Line sizes 6-in. (150 mm) to 96-in. (2400 mm)		
3	Sensor size 3 — Line sizes greater than 12-in. (300 mm)		

## The Annubar Flowmeter Series

Rosemount 3095MFA Mass *ProBar* Flowmeter Ordering Information

Code	Mounting Type		
T1	Compression/Threaded Connection		
A1	150# RF ANSI		
A3	300# RF ANSI		
A6	600# RF ANSI		
A9	900# RF ANSI		
AF	1500# RF ANSI		
AT	2500 # RF ANSI		
D1	DN PN16 Flange		
D3	DN PN40 Flange		
D6	DN PN100 Flange		
R9	900# RTJ Flange		
RF	1500# RTJ Flange		
RT	2500# RTJ Flange		
Code	Opposite Side Support and Packing Gland		
0	No opposite side support or packing gland (Required for Pak-Lok and Flange-Lok models)		
Opposite Side Support – Required for Flanged Models			
C	NPT Threaded Opposite Support Assembly – Extended Tip		
D	Welded Opposite Support Assembly – Extended Tip		
Packing Gland – Required for Flo-Tap Models			
	<i>Packing Gland Material</i>	<i>Rod Material</i>	<i>Packing Material</i>
J	Stainless Steel Packing Gland / Cage Nipple	Carbon Steel	PTFE
K	Stainless Steel Packing Gland / Cage Nipple	Stainless Steel	PTFE
L	Stainless Steel Packing Gland / Cage Nipple	Carbon Steel	Graphite
N	Stainless Steel Packing Gland / Cage Nipple	Stainless Steel	Graphite
R	Hastelloy Packing Gland / Cage Nipple	Stainless Steel	Graphite
Code	Isolation Valve for Flo-Tap Models		
1	Gate Valve, Carbon Steel		
2	Gate Valve, Stainless Steel		
5	Ball Valve, Carbon Steel		
6	Ball Valve, Stainless Steel		
0 <sup>(1)</sup>	Not Applicable or Customer Supplied		
Code	Temperature Measurement		
T	Integral RTD – not available with Flanged model greater than class 600		
R	Remote Thermowell and RTD		
0	No Temperature Sensor		
Code	Transmitter Connection Platform		
3	Direct-mount, Integral 3-valve manifold– not available with Flanged model greater than class 600		
5	Direct -mount, 5-valve manifold– not available with Flanged model greater than class 600		
6	Direct-mount, high temperature 5-valve manifold– not available with Flanged model greater than class 600		
7	Remote-mount NPT Connections ( <sup>1</sup> / <sub>2</sub> -in. FNPT)		
8	Remote-mount SW Connections ( <sup>1</sup> / <sub>2</sub> -in.)		
Code	Differential Pressure Ranges		
1	0 to 25 in H <sub>2</sub> O (0 to 62,3 mbar) – not available with Sensor Material code H		
2	0 to 250 in H <sub>2</sub> O (0 to 622,7 mbar)		
3	0 to 1000 in H <sub>2</sub> O (0 to 2,49 bar)		
Code	Static Pressure Ranges		
B	0–8 to 0–800 psia (0–55,16 to 0–5516 kPa)		
C	0–8 to 0–800 psig (0–55,16 to 0–5516 kPa)		
D	0–36.26 to 0–3626 psia (0–250 to 0–25000 kPa)		
E	0–36.26 to 0–3626 psig (0–250 to 0–25000 kPa)		
Code	Output Protocol		
A	4–20 mA with digital signal based on HART protocol		
V	FOUNDATION fieldbus protocol		

## Product Data Sheet

00813-0100-4809, Rev FA  
Catalog 2008 - 2009

# The Annubar Flowmeter Series

### Rosemount 3095MFA Mass *ProBar* Flowmeter Ordering Information

Code	Transmitter Housing Style	Conduit Entry Size
1A	Polyurethane-covered aluminum	1/2-14 NPT
1B	Polyurethane-covered aluminum	M20 x 1.5 (CM20)
1C	Polyurethane-covered aluminum	G 1/2
1J	SST	1/2-14 NPT
1K	SST	M20 x 1.5 (CM20)
1L	SST	G 1/2
Code	Options	
<b>Performance Class</b>		
U3 <sup>(2)</sup>	Ultra for Flow: up to 0.90% mass flow rate accuracy, up to 10:1 turndown, 10-year stability, limited 12-year warranty	
<b>PlantWeb Control Functionality</b>		
A01 <sup>(3)</sup>	FOUNDATION fieldbus Advanced Control Function Block Suite	
<b>Pressure Testing</b>		
P1 <sup>(4)</sup>	Hydrostatic Testing with Certificate	
PX <sup>(4)</sup>	Extended Hydrostatic Testing	
<b>Special Cleaning</b>		
P2	Cleaning for Special Processes	
PA	Cleaning per ASTM G93 level D (section 11.4)	
<b>Material Testing</b>		
V1	Dye Penetrant Exam	
<b>Material Examination</b>		
V2	Radiographic Examination	
<b>Flow Calibration</b>		
W1	Flow Calibration (Average K)	
WZ	Special Calibration	
<b>Special Inspection</b>		
QC1	Visual and Dimensional Inspection with Certificate	
QC7	Inspection and Performance Certificate	
<b>Surface Finish</b>		
RL	Surface finish for Low Pipe Reynolds Number in Gas and Steam	
RH	Surface finish for High Pipe Reynolds Number in Liquid	
<b>Material Traceability Certification</b>		
Q8 <sup>(5)</sup>	Material Certificate per ISO 10474 3.1.B and EN 10204 3.1.B	
<b>Code Conformance</b>		
J1	Canadian Registration	
J2 <sup>(6)</sup>	ANSI B31.1	
J3 <sup>(6)</sup>	ANSI B31.3	
J4 <sup>(6)</sup>	ANSI B31.8	
J5 <sup>(7)(8)</sup>	NACE MR-0175 / ISO 15156	
J6	European Pressure Directive (PED)	
<b>Installed in Flanged Pipe Spool Section</b>		
H3	150# Flanged Connection with Rosemount Standard Length and Schedule	
H4	300# Flanged Connection with Rosemount Standard Length and Schedule	
H5	600# Flanged Connection with Rosemount Standard Length and Schedule	
<b>Instrument Connections for Remote Mount Option</b>		
G1	Needle Valves, Carbon Steel	
G2	Needle Valves, Stainless Steel	
G3	Needle Valves, <i>Hastelloy</i>	
G5	OS&Y Gate Valve, Carbon Steel	
G6	OS&Y Gate Valve, Stainless Steel	
G7	OS&Y Gate Valve, <i>Hastelloy</i>	
<b>Special Shipment</b>		
Y1	Mounting Hardware Shipped Separately	

# The Annubar Flowmeter Series

## Rosemount 3095MFA Mass *ProBar* Flowmeter Ordering Information

<b>Special Dimensions</b>	
VM	Variable Mounting
VT	Variable Tip
VS	Variable length Spool Section
V9	Special Dimension
<b>Transmitter Calibration Certification</b>	
Q4	Calibration Data Certificate for Transmitter
<b>Product Certifications</b>	
E1	ATEX Flameproof
I1	ATEX Intrinsic Safety
N1	ATEX Type n
K1	ATEX Flameproof, Intrinsic Safety, Type n, Dust (combination of E1, I1, N1, and ND)
ND	ATEX Dust
E5	FM Explosion-proof, Dust Ignition-proof
I5	FM Intrinsically Safe, Division 2
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5 and I5)
E6	CSA Explosion-proof, Dust Ignition-proof, Division 2
I6	CSA Intrinsically Safe, Division 2
K6	CSA Explosion-proof, Intrinsically Safe, Division 2 (combination of E6 and I6)
IE <sup>(9)</sup>	FM FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only
IF <sup>(9)</sup>	CSA FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only
IA <sup>(9)</sup>	ATEX FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only
IG <sup>(9)</sup>	IECEx FISCO Intrinsic Safety
I7	IECEx Intrinsic Safety
E4	TIIS Flameproof
ID	TIIS FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only
I3	China Intrinsic Safety
E3	China Flameproof
<b>Alternate Transmitter Materials of Construction</b>	
L1 <sup>(8)</sup>	Inert Sensor Fill Fluid
<b>Display</b>	
M5	Integral mount LCD display
<b>Terminal Blocks</b>	
T1	Transient Protection
<b>Manifold for Remote Mount Option</b>	
F1	3-Valve Manifold, Carbon Steel
F2	3-Valve Manifold, Stainless Steel
F3	3-Valve Manifold, <i>Hastelloy C</i>
F5	5-Valve Manifold, Carbon Steel
F6	5-Valve Manifold, Stainless Steel
F7	5-Valve Manifold, <i>Hastelloy C</i>

**Typical Model Number: 3095MFA L 060 D C H P S 2 T1 0 0 0 3 2 C A 1A**

- (1) Provide the "A" dimension for Flanged, Flange-Lok, and Threaded Flo-Tap models. Provide the "B" dimension for Flange Flo-Tap models.
- (2) Ultra for Flow applicable for HART protocol, DP ranges 2 and 3 with SST isolator material and silicone fill fluid options only.
- (3) Function Blocks include: Arithmetic, Integrator, Analog Output, Signal Characterizer, Control Selector, and Output Selector.
- (4) Applies to assembled flowmeter only, mounting not tested.
- (5) Isolation and Instrument valves not included in Traceability Certification.
- (6) Not available with Transmitter Connection Platform 6.
- (7) Materials of Construction comply with recommendations per NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.
- (8) Not available with DP range 1.
- (9) Consult factory for availability.

**Pipe I.D. Range Code—measured in inches (millimeters)**

See "Rosemount 3095MFA Mass ProBar Flowmeter Ordering Information" on page 41

For pipes with an Inner Diameter (I.D.) Range / Pipe Wall Thickness not found in this table or with a line size greater than 12-in. (300 mm), choose option code Z and specify the exact pipe dimensions (I.D. and Pipe Wall Thickness) on the HART Configuration Data Sheet (See document 00806-0100-4809). The Emerson process Management sizing program will determine this code, based on the application piping.

	Line Size			Pipe Wall Thickness		I.D. Range Code
	Nominal	Max. O.D.	Option Code	ANSI Pipes	Non-ANSI Pipes	
	2-in. (50 mm)	2.625-in. (66.68 mm)	020	1.784 to 1.841-in. (45.31 to 46.76 mm)	0.065 to 0.488-in. (1.7 to 12.4 mm)	A
				1.842 to 1.938-in. (46.79 to 49.23 mm)	0.065 to 0.545-in. (1.7 to 13.8 mm)	B
				1.939 to 2.067-in. (49.25 to 52.50 mm)	0.065 to 0.417-in. (1.7 to 10.6 mm)	C
				2.068 to 2.206-in. (52.53 to 56.03 mm)	0.065 to 0.407-in. (1.7 to 10.3 mm)	D
	2 1/2-in. (63.5 mm)	3.188-in. (80.98 mm)	025	2.207 to 2.322-in. (56.06 to 58.98 mm)	0.083 to 0.448-in. (2.1 to 11.4 mm)	B
				2.323 to 2.469-in. (59.00 to 62.71 mm)	0.083 to 0.417-in. (2.1 to 10.6 mm)	C
				2.470 to 2.598-in. (62.74 to 65.99 mm)	0.083 to 0.435-in. (2.1 to 11.0 mm)	D
				2.599 to 2.647-in. (66.01 to 67.23 mm)	0.083 to 0.515-in. (2.1 to 13.1 mm)	E
	3-in. (80 mm)	3.75-in. (95.25 mm)	030	2.648 to 2.751-in. (67.26 to 69.88 mm)	0.083 to 0.460-in. (2.1 to 11.7 mm)	A
				2.752 to 2.899-in. (69.90 to 73.63 mm)	0.083 to 0.416-in. (2.1 to 10.6 mm)	B
				2.900 to 3.068-in. (73.66 to 77.93 mm)	0.083 to 0.395-in. (2.1 to 10.0 mm)	C
				3.069 to 3.228-in. (77.95 to 81.99 mm)	0.083 to 0.404-in. (2.1 to 10.3 mm)	D
	3 1/2-in. (89 mm)	4.25-in. (107.95 mm)	035	3.229 to 3.333-in. (82.02 to 84.66 mm)	0.120 to 0.496-in. (3.0 to 12.6 mm)	B
				3.334 to 3.548-in. (84.68 to 90.12 mm)	0.120 to 0.386-in. (3.0 to 9.8 mm)	C
				3.549 to 3.734-in. (90.14 to 94.84 mm)	0.120 to 0.415-in. (3.0 to 10.5 mm)	D
				3.735 to 3.825-in. (94.87 to 97.16 mm)	0.120 to 0.510-in. (3.0 to 13.0 mm)	B
	4-in. (100 mm)	5.032-in. (127.81 mm)	040	3.826 to 4.026-in. (97.18 to 102.26 mm)	0.120 to 0.400-in. (3.0 to 10.2 mm)	C
				4.027 to 4.237-in. (102.29 to 107.62 mm)	0.120 to 0.390-in. (3.0 to 9.9 mm)	D
				4.238 to 4.437-in. (107.65 to 112.70 mm)	0.120 to 0.401-in. (3.0 to 10.2 mm)	E
				4.438 to 4.571-in. (112.73 to 116.10 mm)	0.134 to 0.481-in. (3.4 to 12.2 mm)	A
	5-in. (125 mm)	6.094-in. (154.79 mm)	050	4.572 to 4.812-in. (116.13 to 122.22 mm)	0.134 to 0.374-in. (3.4 to 9.5 mm)	B
				4.813 to 5.047-in. (122.25 to 128.19 mm)	0.134 to 0.380-in. (3.4 to 9.7 mm)	C
				5.048 to 5.249-in. (128.22 to 133.32 mm)	0.134 to 0.413-in. (3.4 to 10.5 mm)	D
				5.250 to 5.472-in. (133.35 to 138.99 mm)	0.134 to 0.3919-in. (3.4 to 9.9 mm)	A
Sensor Size 1	6-in. (150 mm)	6.93-in. (176.02 mm)	060	5.473 to 5.760-in. (139.01 to 146.30 mm)	0.134 to 0.481-in. (3.4 to 12.2 mm)	B
				5.761 to 6.065-in. (146.33 to 154.05 mm)	0.134 to 0.31-in. (3.4 to 7.9 mm)	C
				6.066 to 6.383-in. (154.08 to 162.13 mm)	0.134 to 0.297-in. (3.4 to 7.5 mm)	D
				5.250 to 5.472-in. (133.35 to 139.99 mm)	0.134 to 1.132-in. (3.4 to 28.7 mm)	A
Sensor Size 2	6-in. (150 mm)	6.93-in. (176.02 mm)	060	5.473 to 5.760-in. (139.01 to 146.30 mm)	0.134 to 1.067-in. (3.4 to 27.1 mm)	B
				5.761 to 6.065-in. (146.33 to 154.05 mm)	0.134 to 1.05-in. (3.4 to 26.7 mm)	C
				6.066 to 6.383-in. (154.08 to 162.13 mm)	0.134 to 1.037-in. (3.4 to 26.3 mm)	D
				6.384 to 6.624-in. (162.15 to 168.25 mm)	0.134 to 0.374-in. (3.4 to 9.5 mm)	B
Sensor Size 1	7-in. (180 mm)	7.93-in. (201.42 mm)	070	6.625 to 7.023-in. (168.28 to 178.38 mm)	0.134 to 0.216-in. (3.4 to 5.5 mm)	C
				7.024 to 7.392-in. (178.41 to 187.76 mm)	0.134 to 0.246-in. (3.4 to 6.2 mm)	D
				6.384 to 6.624-in. (162.15 to 168.25 mm)	0.134 to 1.114-in. (3.4 to 28.3 mm)	B
				6.625 to 7.023-in. (168.28 to 178.38 mm)	0.134 to 1.354-in. (3.4 to 34.4 mm)	A
Sensor Size 2	7-in. (180 mm)	7.93-in. (201.42 mm)	070	7.024 to 7.392-in. (178.41 to 187.76 mm)	0.134 to 0.956-in. (3.4 to 24.3 mm)	C
				7.393 to 7.624-in. (187.78 to 193.65 mm)	0.134 to 0.986-in. (3.4 to 25.0 mm)	D
				7.625 to 7.981-in. (193.68 to 202.72 mm)	0.250 to 0.499-in. (6.4 to 12.6 mm)	B
				7.982 to 8.400-in. (202.74 to 213.36 mm)	0.250 to 0.374-in. (6.4 to 9.5 mm)	C
Sensor Size 1	8-in. (200 mm)	9.688-in. (246.08 mm)	080	8.401 to 8.766-in. (213.39 to 222.66 mm)	0.250 to 0.312-in. (6.4 to 7.9 mm)	D
				8.767 to 9.172-in. (222.68 to 232.97 mm)	0.250 to 0.364-in. (6.4 to 9.2 mm)	E
				7.393 to 7.624-in. (187.78 to 193.65 mm)	0.250 to 1.239-in. (6.4 to 31.4 mm)	B
				7.625 to 7.981-in. (193.68 to 202.72 mm)	0.250 to 0.73-in. (6.4 to 18.5 mm)	C
Sensor Size 2	8-in. (200 mm)	9.688-in. (246.08 mm)	080	7.982 to 8.400-in. (202.74 to 213.36 mm)	0.250 to 1.018-in. (6.4 to 25.9 mm)	E
				8.401 to 8.766-in. (213.39 to 222.66 mm)	0.250 to 1.104-in. (6.4 to 28.0 mm)	D
				8.767 to 9.172-in. (222.68 to 232.97 mm)	0.250 to 1.065-in. (6.4 to 27.1 mm)	A
				9.173 to 9.561-in. (232.99 to 242.85 mm)	0.250 to 1.082-in. (6.4 to 27.5 mm)	B
	10-in. (250 mm)	11.75-in. (298.45 mm)	100	9.562 to 10.020-in. (242.87 to 254.51 mm)	0.250 to 1.012-in. (6.4 to 25.7 mm)	C
				10.021 to 10.546-in. (254.53 to 267.87 mm)	0.250 to 0.945-in. (6.4 to 24.0 mm)	D
				10.547 to 10.999-in. (267.89 to 279.37 mm)	0.250 to 1.018-in. (6.4 to 25.9 mm)	E
				11.000 to 11.373-in. (279.40 to 288.87 mm)	0.250 to 1.097-in. (6.4 to 27.9 mm)	B
	12-in. (300 mm)	13.0375-in. (331.15 mm)	120	11.374 to 11.938-in. (288.90 to 303.23 mm)	0.250 to 0.906-in. (6.4 to 23.0 mm)	C
				11.939 to 12.250-in. (303.25 to 311.15 mm)	0.250 to 1.159-in. (6.4 to 29.4 mm)	D

# The Annubar Flowmeter Series

## Rosemount 485 Annubar Primary

### SPECIFICATIONS

#### Performance

##### Performance Statement Assumptions

Measured pipe I.D.

##### Discharge Coefficient Factor

±0.75% of flow rate

##### Repeatability

±0.1%

##### Line Sizes

- Sensor Size 1: 2-in. to 8-in. (50 to 200 mm)
- Sensor Size 2: 6-in. to 96-in. (150 to 2400 mm)
- Sensor Size 3: 12-in. to 96-in. (300 to 2400 mm)

#### NOTE

Some mounting types are not available in larger line sizes.

TABLE 26. Reynolds Number and Probe Width

Sensor Size	Minimum Rod Reynolds Number ( $R_d$ )	Probe Width ( $d$ ) (inches)
1	6500	0.590-in. (14.99 mm)
2	12500	1.060-in. (26.92 mm)
3	25000	1.935-in. (49.15 mm)

Where

$d$  = Probe width (feet)

$v$  = Velocity of fluid (ft/sec)

$\rho$  = Density of fluid (lbm/ft<sup>3</sup>)

$\mu$  = Viscosity of the fluid (lbm/ft-sec)

$$R_d = \frac{d \times v \times \rho}{\mu}$$

#### Sizing

Contact an Emerson Process Management representative for assistance. A Configuration Data Sheet is required prior to order for application verification.

#### Flow Turndown

10:1 or better

#### Annubar Sensor Surface Finish

The front surface of the Annubar primary is textured for high Reynolds number applications (typically gas and steam). The surface texture creates a more turbulent boundary layer on the front surface of the sensor. The increased turbulence produces a more predictable and repeatable separation of flow at the edge of the sensor. The appropriate surface finish will be determined for each application by the Emerson Process Management sizing program, Instrument Toolkit software.

#### Functional

##### Service

- Liquid
- Gas
- Steam

##### Process Temperature Limits

Direct Mount Transmitter

- 500 °F (260 °C)
- 750 °F (398 °C) when used with a direct mount, high temperature 5-valve manifold (Transmitter Connection Platform code 6)

Remote Mount Transmitter

- 1250 °F (677 °C) – Hastelloy Sensor Material
- 850 °F (454 °C) – Stainless Steel Sensor Material

##### Pressure and Temperature Limits<sup>(1)</sup>

Direct Mount Transmitter

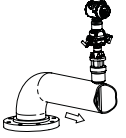
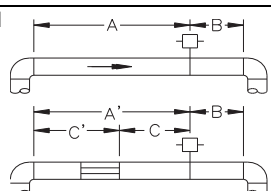
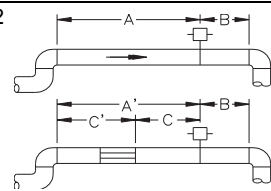
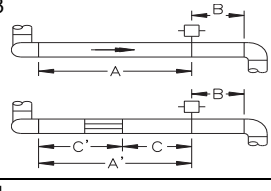
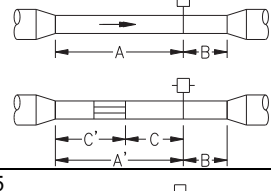
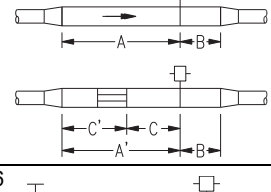
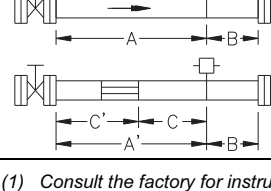
- Up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C))
- Integral temperature measurement is not available with Flanged mounting type greater than class 600

Remote Mount Transmitter

- Up to 2500# ANSI (6000 psig at 100 °F (416 bar at 38 °C)).

## Installation Considerations

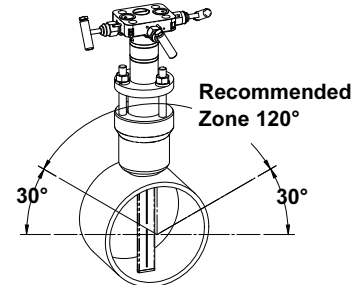
### Straight Run Requirements<sup>(1)</sup>

In Plane 	Upstream Dimensions (Pipe Diameters)					Downstream
	Without Vanes <sup>(2)</sup>		With Vanes <sup>(3)</sup>			
	In Plane A	Out of Plane A	A'	C	C'	
1 	8	10	—	—	—	4
2 	11	16	—	—	—	4
3 	23	28	—	—	—	4
4 	12	12	—	—	—	4
5 	18	18	—	—	—	4
6 	30	30	—	—	—	4

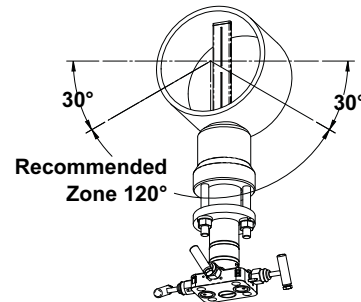
- (1) Consult the factory for instructions regarding use in square or rectangular ducts.
- (2) "In Plane A" means the bar is in the same plane as the elbow. "Out of Plane A" means the bar is perpendicular to the plane of the upstream elbow.
- (3) Use straightening vane to reduce the required straight run length.

### Flowmeter Orientation (Recommended)

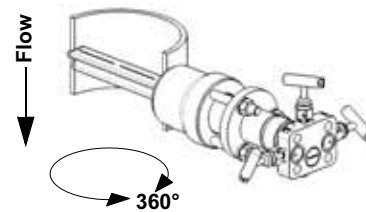
#### Gas (Horizontal)



#### Liquid and Steam (Horizontal)

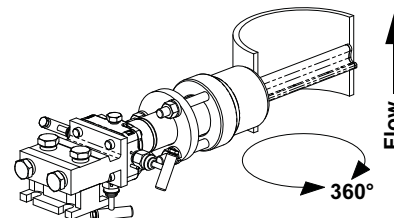


#### Gas (Vertical)



Note: Can also be mounted for Gas Vertical up applications.

#### Steam (Vertical)



### Drill Hole Size According to Sensor Size

Sensor Size	Diameter
1	3/4-in. (19 mm)
2	1 <sup>5</sup> / <sub>16</sub> -in. (34 mm)
3	2 <sup>1</sup> / <sub>2</sub> -in. (64 mm)

# The Annubar Flowmeter Series

## Physical

### Temperature Measurement

Integral RTD

- 100 Ohm platinum RTD
- 4-wire RTD ( $\alpha = 0.00385$ )

Remote RTD

- 100 Ohm platinum RTD, spring loaded with  $\frac{1}{2}$ -in. NPT nipple and union (078 series with Rosemount 644 housing)
- Remote RTD material is the same as the specified pipe material

Thermowell

- $\frac{1}{2}$ -in. x  $\frac{1}{2}$ -in NPT, 316 Stainless Steel with  $\frac{1}{2}$ -in. Carbon Steel weld couplet.

### Housing Connections

$\frac{1}{2}$ -14 NPT, G $\frac{1}{2}$ , and M20 x 1.5 (CM20) conduit. HART interface connections fixed to terminal block for output code A

### Annubar Sensor Material

- 316 Stainless Steel
- Hastelloy 276

### Annubar Type

See "Dimensional Drawings" on page 50

Pak-Lok Model (option P)

- Provided with a compression sealing mechanism rated up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C))
- Graphite Packing (-300 to 850 °F (-184 to 454 °C))

Flanged with Opposite Side Support Model (option F)

- Provided with opposite side support, which is the same material as the pipe and requires a second pipe penetration
- Sensor flange is the same material as the Annubar sensor and the mounting flange is the same material as the pipe material
- Flanged mounting hardware: nuts, studs and gaskets (DIN units supplied without nuts, studs and gaskets)
- SST: (-300 to 850 °F (-184 to 454 °C))
- Hastelloy: (-300 to 1250 °F (-184 to 677 °C))

Flange-Lok Model (option L)

- Flange-Lok assembly is supplied in 316 SST material.
- Flange-Lok mounting hardware: nuts, studs and gaskets (DIN units supplied without nuts, studs and gaskets)
- -300 to 850 °F (-184 to 454 °C)

Flo-Tap Models (options G and M)

- Opposite side support is not available
- Threaded connection is not available with Sensor Size 3
- Gear Drive is not available with Sensor Size 1
- Packing gland required
- Packing Gland Material Temperature Limits
  - PTFE: -40 to 400 °F (-40 to 204 °C)
  - Graphite: -300 to 850 °F (-184 to 454 °C)
- Isolation valve included
  - The isolation valve will carry the same pressure rating as the sensor flange and mounting flange specified in the mounting type
  - Ball valves have a 300# limitation
  - For threaded flo-tap models, the isolation valve NPT size is  $1\frac{1}{4}$ -in. (Sensor Size one) and 2-in. (Sensor Size 2).

## Annubar Type Specification Chart

Option Code	Description	Pak-Lok <sup>(1)</sup>	Flange-Lok	Flange	Manual and Gear Drive Flo-Tap
T1 <sup>(1)</sup>	Pak-Lok Body Threaded connection	X			X
A1	150# RF ANSI		X	X	X
A3	300# RF ANSI		X	X	X
A6	600# RF ANSI		X	X	X
A9 <sup>(2)</sup>	900# RF ANSI			X	
AF <sup>(2)</sup>	1500# RF ANSI			X	
AT <sup>(2)</sup>	2500# RF ANSI			X	
D1	DN PN 16		X	X	X
D3	DN PN 40		X	X	X
D6	DN PN 100		X	X	X
R9 <sup>(2)</sup>	900# RTJ Flange			X	
RF <sup>(2)</sup>	1500# RTJ Flange			X	
RT <sup>(2)</sup>	2500# RTJ Flange			X	

(1) Available up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C)) rating.

(2) Remote mount only.

## Instrument Connections Temperature Ranges

TABLE 27. Minimum / Maximum Temperature Range

Code	Description	Temperature
G1	Needle Valves, Carbon Steel	-20 to 500 °F (-29 to 260 °C)
G2	Needle Valves, Stainless Steel	-40 to 600 °F (-40 to 316 °C)
G3	Needle Valves, Hastelloy	-40 to 600 °F (-40 to 316 °C)
G5	OS&Y Gate Valve, Carbon Steel	-20 to 775 °F (-29 to 413 °C)
G6	OS&Y Gate Valve, Stainless Steel	-40 to 850 °F (-40 to 454 °C)
G7	OS&Y Gate Valve, Hastelloy	-40 to 1250 °F (-40 to 677 °C)

## Flowmeter Installed in Flanged Pipe Spool Section (option codes H3, H4, and H5)

- All pipe spool sections are flanged pipe sections
- The flanged pipe spool section is constructed from the same material as the pipe
- Consult the factory for remote temperature measurement and ANSI ratings above 600# and DIN flanges.



## Product Data Sheet

00813-0100-4809, Rev FA

Catalog 2008 - 2009

# The Annubar Flowmeter Series

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TABLE 28. Flanged Pipe Spool Section Schedule

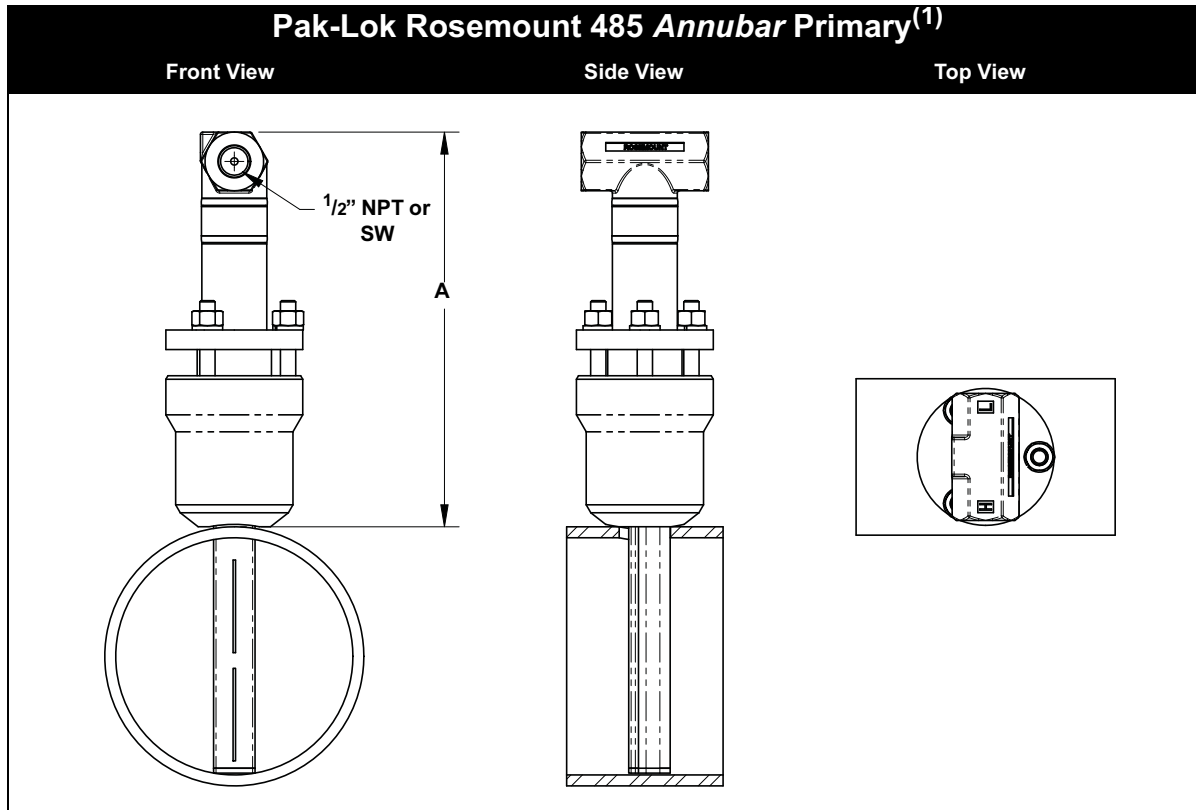
ANSI	Schedule
150# ANSI	40
300# ANSI	40
600# ANSI	80

TABLE 29. Flange Pipe Spool Section Length

Nominal Pipe Size	Length
2-in. (50 mm)	10.52-in. (267.2 mm)
3-in. (80 mm)	11.37-in. (288.8 mm)
4-in. (100 mm)	12.74-in. (323.6 mm)
6-in. (150 mm)	14.33-in. (364.0 mm)
8-in. (200 mm)	16.58-in. (421.1 mm)

# The Annubar Flowmeter Series

## DIMENSIONAL DRAWINGS

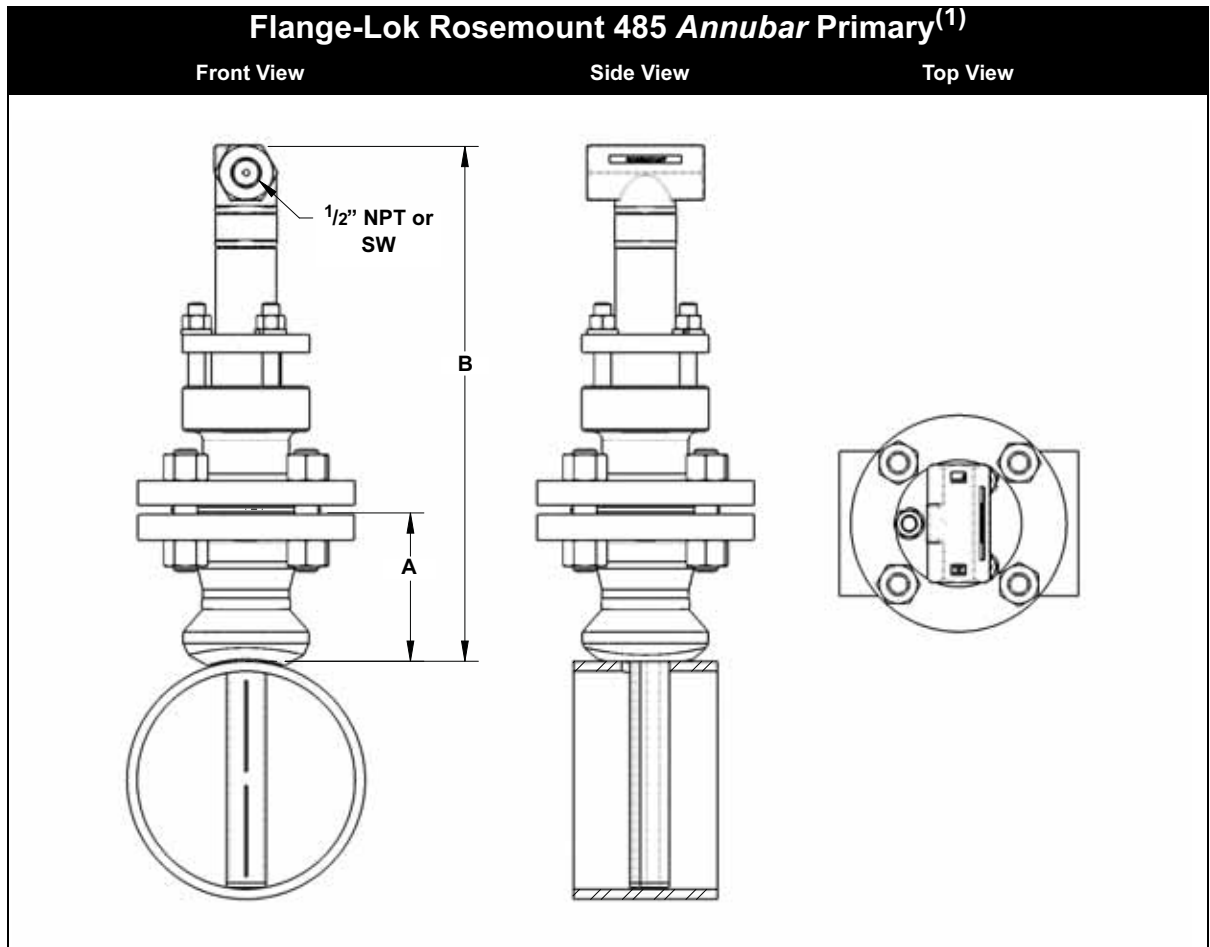


(1) The Pak-Lok Annubar model is available up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C)).

TABLE 30. Pak-Lok Rosemount 485 Annubar Primary Dimensional Data

Sensor Size	A (Max)
1	7.50 (190.5)
2	9.25 (235.0)
3	12.00 (304.8)

*Dimensions are in inches (millimeters)*



(1) The Flange-Lok Annubar model can be direct mounted up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C)).

TABLE 31. Flange-Lok 485 Annubar Primary Dimensional Data

Sensor Size	Flange Size and Rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)
1	1 1/2 – 150#	3.88 (98.6)	12.25 (311.2)
1	1 1/2 – 300#	4.13 (104.9)	12.25 (311.2)
1	1 1/2 – 600#	4.44 (112.8)	12.25 (311.2)
1	DN40/PN16	3.09 (78.5)	12.25 (311.2)
1	DN40/PN40	3.21 (81.5)	12.25 (311.2)
1	DN40/PN100	3.88 (98.6)	12.25 (311.2)
2	2 – 150#	4.13 (104.9)	14.25 (362.0)
2	2 – 300#	4.38 (111.3)	14.25 (362.0)
2	2 – 600#	4.76 (120.9)	14.25 (362.0)
2	DN50/PN16	3.40 (86.4)	14.25 (362.0)
2	DN50/PN40	3.51 (89.2)	14.25 (362.0)
2	DN50/ PN100	4.30 (109.2)	14.25 (362.0)
3	3 – 150#	4.63 (117.6)	17.50 (444.5)
3	3 – 300#	5.00 (127.0)	17.50 (444.5)
3	3 – 600#	5.38 (136.7)	17.50 (444.5)
3	DN80/PN16	3.84 (97.5)	17.50 (444.5)
3	DN80/PN40	4.16 (105.7)	17.50 (444.5)
3	DN80/ PN100	4.95 (125.7)	17.50 (444.5)

Dimensions are in inches (millimeters)

# The Annubar Flowmeter Series

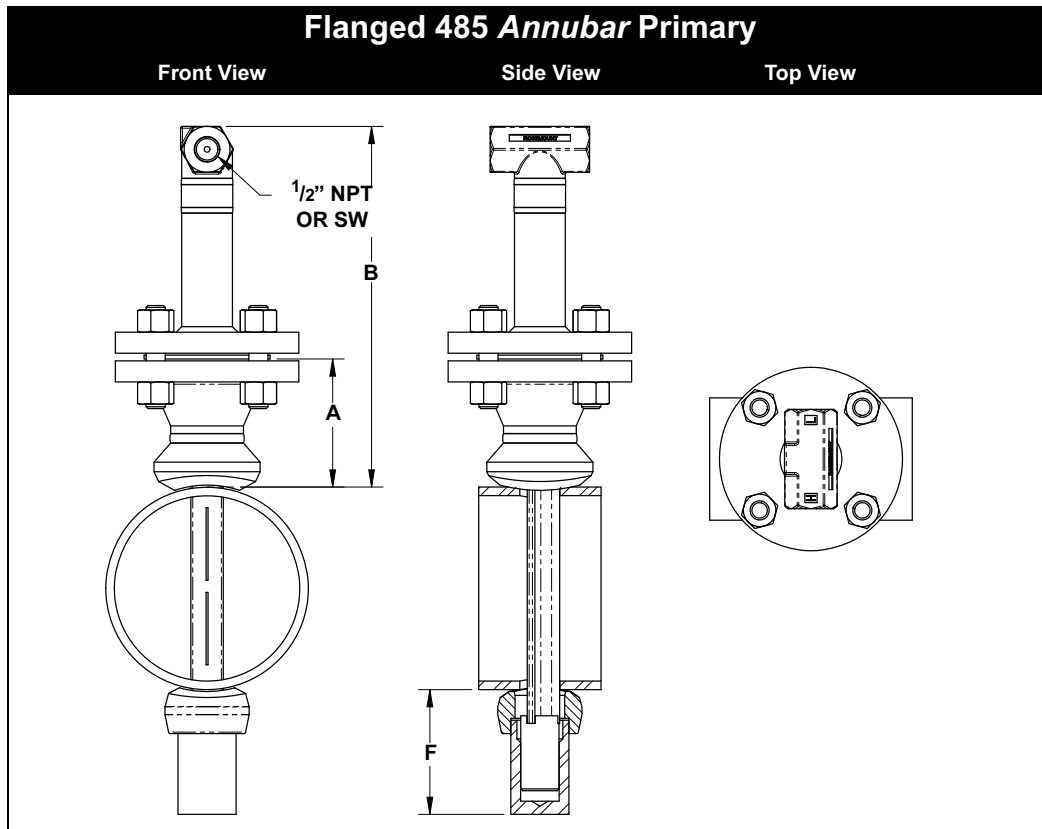


TABLE 32. Flanged Mass *ProBar* Flowmeter Dimensional Data

Sensor Size	Flange Size and Rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	F (Max)
1	1 1/2 – 150#	3.88 (98.6)	11.00 (279.4)	3.50 (88.9)
1	1 1/2 – 300#	4.13 (104.9)	11.00 (279.4)	3.50 (88.9)
1	1 1/2 – 600#	4.44 (112.8)	11.00 (279.4)	3.50 (88.9)
1	DN40/PN16	3.09 (78.5)	11.00 (279.4)	3.50 (88.9)
1	DN40/PN40	3.21 (81.5)	11.00 (279.4)	3.50 (88.9)
1	DN40/ PN100	3.88 (98.6)	11.00 (279.4)	3.50 (88.9)
1	1 1/2 – 900#	4.94 (125.5)	9.32 (236.6)	3.50 (88.9)
1	1 1/2 – 1500#	4.94 (125.5)	9.32 (236.6)	3.50 (88.9)
1	1 1/2 – 2500#	6.76 (171.7)	11.64 (295.5)	4.00 (101.6)
2	2 – 150#	4.13 (104.9)	12.00 (304.8)	5.00 (127.0)
2	2 – 300#	4.38 (111.3)	12.00 (304.8)	5.00 (127.0)
2	2 – 600#	4.76 (120.9)	12.00 (304.8)	5.00 (127.0)
2	DN50/PN16	3.40 (86.4)	12.00 (304.8)	5.00 (127.0)
2	DN50/PN40	3.51 (89.2)	12.00 (304.8)	5.00 (127.0)
2	DN50/ PN100	4.30 (109.2)	12.00 (304.8)	5.00 (127.0)
2	2 – 900#	5.88 (149.4)	10.51 (266.8)	5.00 (127.0)
2	2 – 1500#	5.88 (149.4)	10.51 (266.8)	5.00 (127.0)
2	3 – 2500#	9.87 (250.7)	15.62 (396.7)	4.50 (114.3)
3	3 – 150#	4.63 (117.6)	13.50 (342.9)	4.00 (101.6)
3	3 – 300#	5.00 (127.0)	13.50 (342.9)	4.00 (101.6)
3	3 – 600#	5.38 (136.7)	13.50 (342.9)	4.00 (101.6)
3	DN80/PN16	3.84 (97.5)	13.50 (342.9)	4.00 (101.6)
3	DN80/PN40	4.16 (105.7)	13.50 (342.9)	4.00 (101.6)
3	DN80/ PN100	4.95 (125.7)	13.50 (342.9)	4.00 (101.6)

Table 32 Continued on Next Page

## Product Data Sheet

00813-0100-4809, Rev FA

Catalog 2008 - 2009

# The Annubar Flowmeter Series

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TABLE 32. Flanged Mass *ProBar* Flowmeter Dimensional Data

Sensor Size	Flange Size and Rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	F (Max)
3	4 – 900#	8.19 (208.0)	13.44 (341.3)	7.00 (177.8)
3	4 – 1500#	8.56 (217.4)	13.81 (350.8)	7.00 (177.8)
3	4 – 2500#	11.19 (284.2)	17.32 (439.8)	7.00 (177.8)

*Dimensions are in inches (millimeters)*

# The Annubar Flowmeter Series

## Flanged Flo-Tap 485 Annubar Primary

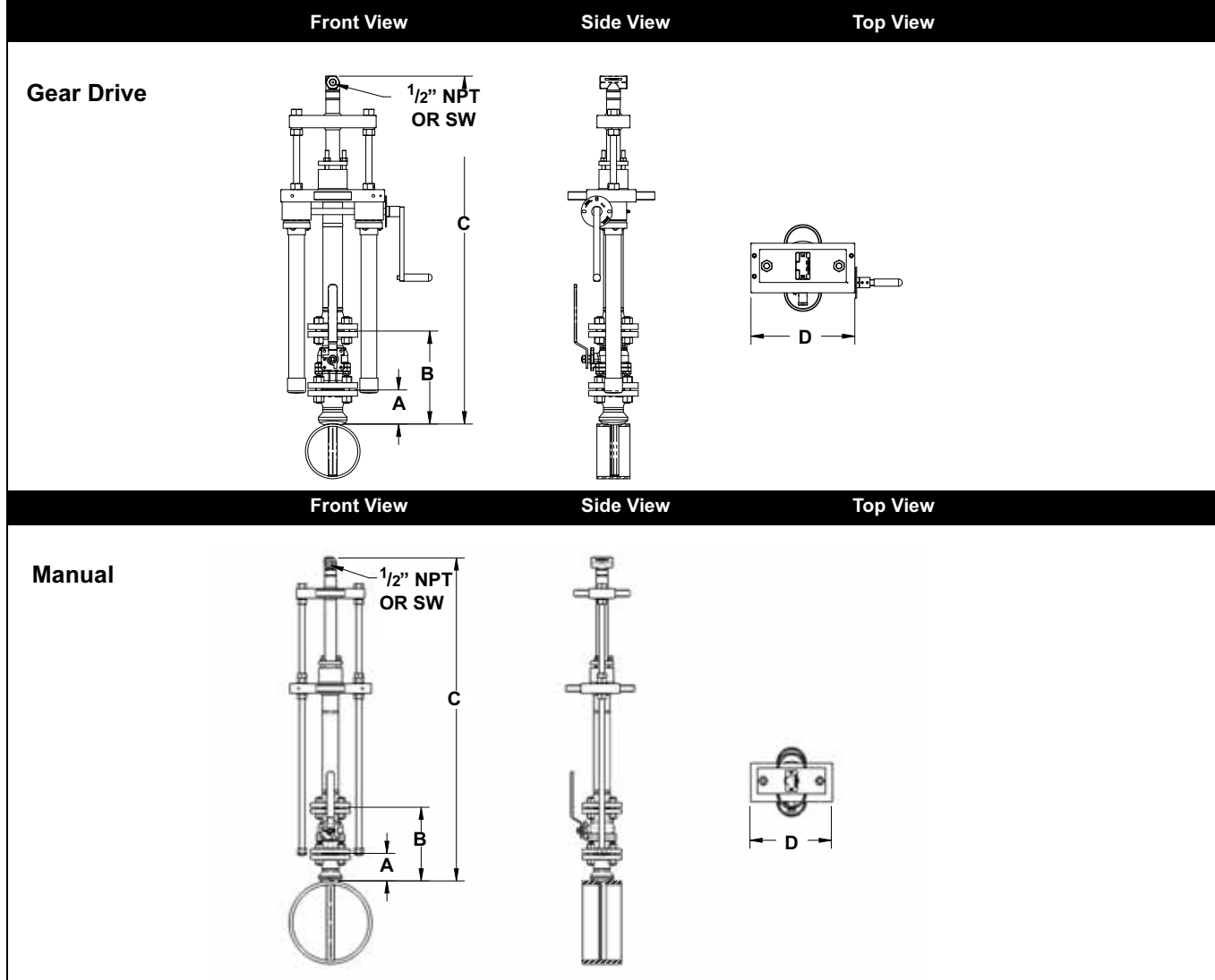


TABLE 33. Flanged Flo-Tap 485 Annubar Primary Dimensional Data

Sensor Size	Flange Size and Rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	C <sup>1</sup> (Max) (Gear Drive)	C <sup>1</sup> (Max) (Manual)	D (Max)
1	1 1/2 – 150#	3.88 (98.5)	10.50 (266.7)	—	17.9 (431.8)	10.50 (266.7)
1	1 1/2 – 300#	4.13 (104.9)	11.75 (298.5)	—	17.9 (431.8)	10.50 (266.7)
1	1 1/2 – 600#	4.44 (112.8)	14.06 (357.2)	—	17.9 (431.8)	10.50 (266.7)
1	DN40/PN16	3.09 (78.5)	10.50 (266.7)	—	17.9 (431.8)	10.50 (266.7)
1	DN40/PN40	3.21 (81.5)	11.75 (298.5)	—	17.9 (431.8)	10.50 (266.7)
1	DN40/PN100	3.88 (98.6)	14.06 (357.2)	—	17.9 (431.8)	10.50 (266.7)
2	2 – 150#	4.13 (104.9)	11.25 (285.8)	24.6 (624.8)	21.4 (543.6)	12.56 (319.0)
2	2 – 300#	4.38 (111.3)	13.00 (330.2)	24.6 (624.8)	21.4 (543.6)	12.56 (319.0)
2	2 – 600#	4.76 (120.9)	16.38 (416.0)	24.6 (624.8)	21.4 (543.6)	12.56 (319.0)
2	DN50/PN16	3.40 (86.4)	11.25 (285.8)	24.6 (624.8)	21.4 (543.6)	12.56 (319.0)
2	DN50/PN40	3.51 (89.2)	13.00 (330.2)	24.6 (624.8)	21.4 (543.6)	12.56 (319.0)
2	DN50/PN100	4.30 (109.2)	16.38 (416.0)	24.6 (624.8)	21.4 (543.6)	12.56 (319.0)
3	3 – 150#	4.63 (117.6)	12.75 (323.9)	26.5 (673.1)	23.3 (591.8)	14.13 (358.9)
3	3 – 300#	5.00 (127.0)	16.25 (412.8)	26.5 (673.1)	23.3 (591.8)	14.13 (358.9)

Table 33 Continued on Next Page

## Product Data Sheet

00813-0100-4809, Rev FA  
Catalog 2008 - 2009

# The Annubar Flowmeter Series

TABLE 33. Flanged Flo-Tap 485 Annubar Primary Dimensional Data

Sensor Size	Flange Size and Rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	C <sup>1</sup> (Max) (Gear Drive)	C <sup>1</sup> (Max) (Manual)	D (Max)
3	3 – 600#	5.38 (136.7)	19.50 (495.4)	26.5 (673.1)	23.3 (591.8)	14.13 (358.9)
3	DN80/PN16	3.84 (97.5)	12.75 (323.9)	26.5 (673.1)	23.3 (591.8)	14.13 (358.9)
3	DN80/PN40	4.16 (105.7)	16.25 (412.8)	26.5 (673.1)	23.3 (591.8)	14.13 (358.9)
3	DN80/PN100	4.95 (125.7)	19.50 (495.4)	26.5 (673.1)	23.3 (591.8)	14.13 (358.9)

**Use the appropriate formula to determine C value:**

*Inserted formula:* Pipe I.D. + Wall Thickness + Value B + C<sup>1</sup> (use the Manual Drive or Gear drive values for C<sup>1</sup>)

*Retracted formula:* [2 x (Pipe I.D. + Wall Thickness + Value B)] + C<sup>1</sup> (use the Manual Drive or Gear drive values for C<sup>1</sup>)

*Dimensions are in inches (millimeters)*

# The Annubar Flowmeter Series

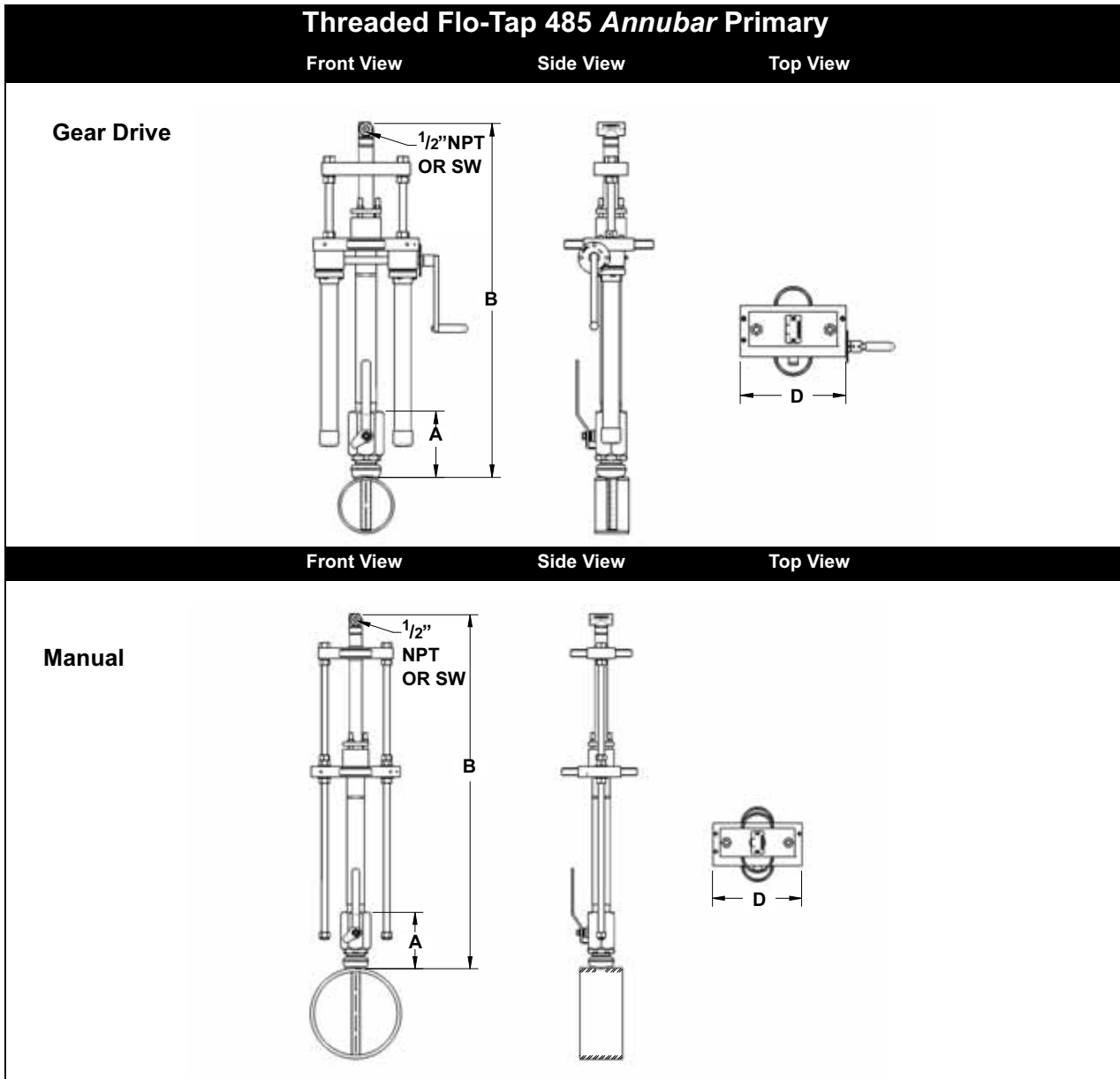


TABLE 34. Threaded Flo-Tap 485 Annubar Primary Dimensional Data

Sensor Size	A ± 0.50 (12.7)	B <sup>1</sup> (Max) (Gear Drive)	B <sup>1</sup> (Max) (Manual)	D (Max)
1	6.76 (171.8)	—	17.40 (442.0)	10.50 (266.7)
2	8.17 (207.5)	23.70 (602.0)	20.80 (528.3)	12.56 (319.0)

Sensor Size 3 is not available in a Threaded Flo-Tap.

Inserted, B Dimension = Pipe I.D. + Wall Thickness + A + B<sup>1</sup>

Retracted, B Dimension = 2 x (Pipe I.D. + Wall Thickness + A) + B<sup>1</sup>



# Product Data Sheet

00813-0100-4809, Rev FA

Catalog 2008 - 2009

# The Annubar Flowmeter Series

## ORDERING INFORMATION

### Rosemount 485 Annubar Primary Ordering Information

Model	DP Flow Primary Type
485	Annubar Primary Element

Code	Fluid Type
L	Liquid
G	Gas
S	Steam

Code	Line Size	Code	Line Size
020	2-in. (50 mm)	180	18-in. (450 mm)
025	2 <sup>1</sup> / <sub>2</sub> -in. (63.5 mm)	200	20-in. (500 mm)
030	3-in. (80 mm)	240	24-in. (600 mm)
035	3 <sup>1</sup> / <sub>2</sub> -in. (89 mm)	300	30-in. (750 mm)
040	4-in. (100 mm)	360	36-in. (900 mm)
050	5-in. (125 mm)	420	42-in. (1066 mm)
060	6-in. (150 mm)	480	48-in. (1210 mm)
070	7-in. (175 mm)	600	60-in. (1520 mm)
080	8-in. (200 mm)	720	72-in. (1820 mm)
100	10-in. (250 mm)	780	78-in. (1950 mm)
120	12-in. (300 mm)	840	84-in. (2100 mm)
140	14-in. (350 mm)	900	90-in. (2250 mm)
160	16-in. (400 mm)	960	96-in. (2400 mm)

Code	Pipe I.D. Range (Refer to the "Pipe I.D. Range Code—measured in inches (millimeters)" on page 60)
A	Range A from the Pipe I.D. table
B	Range B from the Pipe I.D. table
C	Range C from the Pipe I.D. table
D	Range D from the Pipe I.D. table
E	Range E from the Pipe I.D. table
Z	Non-standard Pipe I.D. Range or Line Sizes greater than 12 inches

Code	Pipe Material / Assembly Material
C	Carbon steel
S	316 Stainless Steel
G	Chrome-Moly Grade F-11
N	Chrome-Moly Grade F-22
J	Chrome-Moly Grade F-91
0 <sup>(1)</sup>	No mounting (customer supplied)

Code	Piping Orientation
H	Horizontal Piping
D	Vertical Piping with Downwards Flow
U	Vertical Piping with Upwards Flow

Code	Annubar Type
P	Pak-Lok
F	Flanged with opposite side support
L	Flange-Lok
G	Gear-Drive Flo-Tap
M	Manual Flo-Tap

Code	Sensor Material
S	316 Stainless Steel
H	Hastelloy C-276

# The Annubar Flowmeter Series

## Rosemount 485 Annubar Primary Ordering Information

Code	Sensor Size		
1	Sensor size 1 — Line sizes 2-in. (50 mm) to 8-in. (200 mm)		
2	Sensor size 2 — Line sizes 6-in. (150 mm) to 96-in. (2400 mm)		
3	Sensor size 3 — Line sizes greater than 12-in. (300 mm)		
Code	Mounting Type		
T1	Compression/Threaded Connection		
A1	150# RF ANSI		
A3	300# RF ANSI		
A6	600# RF ANSI		
A9	900# RF ANSI		
AF	1500# RF ANSI		
AT	2500 # RF ANSI		
D1	DN PN16 Flange		
D3	DN PN40 Flange		
D6	DN PN100 Flange		
R9	900# RTJ Flange		
RF	1500# RTJ Flange		
RT	2500# RTJ Flange		
Code	Opposite Side Support and Packing Gland		
0	No opposite side support or packing gland (Required for Pak-Lok and Flange-Lok models)		
Opposite Side Support – Required for Flanged Models			
C	NPT Threaded Opposite Support Assembly – Extended Tip		
D	Welded Opposite Support Assembly – Extended Tip		
Packing Gland – Required for Flo-Tap Models			
	<i>Packing Gland Material</i>	<i>Rod Material</i>	<i>Packing Material</i>
J	Stainless Steel Packing Gland / Cage Nipple	Carbon Steel	PTFE
K	Stainless Steel Packing Gland / Cage Nipple	Stainless Steel	PTFE
L	Stainless Steel Packing Gland / Cage Nipple	Carbon Steel	Graphite
N	Stainless Steel Packing Gland / Cage Nipple	Stainless Steel	Graphite
R	Hastelloy Packing Gland / Cage Nipple	Stainless Steel	Graphite
Code	Isolation Valve for Flo-Tap Models		
1	Gate Valve, Carbon Steel		
2	Gate Valve, Stainless Steel		
5	Ball Valve, Carbon Steel		
6	Ball Valve, Stainless Steel		
0 <sup>(1)</sup>	Not applicable or customer supplied		
Code	Temperature Measurement		
T	Integral RTD – not available with Flanged model greater than class 600		
R	Remote Thermowell and RTD		
0	No Temperature Sensor		
Code	Transmitter Connection Platform		
3	Direct-mount, Integral 3-valve manifold– not available with Flanged model greater than class 600		
5	Direct -mount, 5-valve manifold– not available with Flanged model greater than class 600		
6	Direct-mount, high temperature 5-valve manifold– not available with Flanged model greater than class 600		
7	Remote-mount NPT Connections		
8	Remote-mount SW Connections		
Code	Options		
<b>Pressure Testing</b>			
P1 <sup>(2)</sup>	Hydrostatic Testing with Certificate		
PX <sup>(2)</sup>	Extended Hydrostatic Testing		
<b>Special Cleaning</b>			
P2	Cleaning for Special Processes		
PA	Cleaning per ASTM G93 level D (section 11.4)		

# Product Data Sheet

00813-0100-4809, Rev FA  
Catalog 2008 - 2009

# The Annubar Flowmeter Series

## Rosemount 485 Annubar Primary Ordering Information

### Material Testing

V1 Dye Penetrant Exam

### Material Examination

V2 Radiographic Examination

### Flow Calibration

W1 Flow Calibration (Average K)

WZ Special Calibration

### Special Inspection

QC1 Visual and Dimensional Inspection with Certificate

QC7 Inspection and Performance Certificate

### Surface Finish

RL Surface finish for Low Pipe Reynolds Number in Gas and Steam

RH Surface finish for High Pipe Reynolds Number in Liquid

### Material Traceability Certification

Q8<sup>(3)</sup> Material Certificate per ISO 10474 3.1.B and EN 10204 3.1.B

### Code Conformance

J1 Canadian Registration

J2<sup>(4)</sup> ANSI B31.1

J3<sup>(4)</sup> ANSI B31.3

J4<sup>(4)</sup> ANSI B31.8

J5<sup>(5)</sup> NACE MR-0175 / ISO 15156

J6 European Pressure Directive (PED)

### Installed in Flanged Pipe Spool Section

H3 150# Flanged Connection with Rosemount Standard Length and Schedule

H4 300# Flanged Connection with Rosemount Standard Length and Schedule

H5 600# Flanged Connection with Rosemount Standard Length and Schedule

### Instrument Connections for Remote Mount Option

G1 Needle Valves, Carbon Steel

G2 Needle Valves, Stainless Steel

G3 Needle Valves, *Hastelloy*

G5 OS&Y Gate Valve, Carbon Steel

G6 OS&Y Gate Valve, Stainless Steel

G7 OS&Y Gate Valve, *Hastelloy*

### Special Shipment

Y1 Mounting Hardware Shipped Separately

### Attach To

H1 Attach to Transmitter

### Special Dimensions

VM Variable Mounting

VT Variable Tip

VS Variable length Spool Section

V9 Special Dimension

**Typical Model Number: 485 L 060 D C H P S 2 T1 0 0 0 3**

- (1) Provide the "A" dimension for Flanged, Flange-Lok, and Threaded Flo-Tap models. Provide the "B" dimension for Flange Flo-Tap models.
- (2) Applies to flow element only, mounting not tested.
- (3) Isolation and Instrument valves not included in Traceability Certification.
- (4) Not available with Transmitter Connection Platform 6.
- (5) Materials of Construction comply with recommendations per NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

# The Annubar Flowmeter Series

## Pipe I.D. Range Code—measured in inches (millimeters)

See "Rosemount 485 Annubar Primary Ordering Information" on page 57

For pipes with an Inner Diameter (I.D.) Range / Pipe Wall Thickness not found in this table or with a line size greater than 12-in. (300 mm), choose option code Z and specify the exact pipe dimensions (I.D. and Pipe Wall Thickness) on the HART Configuration Data Sheet (See document 00806-0100-4809). The Emerson process Management sizing program will determine this code, based on the application piping.

Line Size			Option Code	Inner Diameter (I.D.) Range	Pipe Wall Thickness		I.D. Range Code
Nominal	Max. O.D.	ANSI Pipes			Non-ANSI Pipes		
2-in. (50 mm)	2.625-in. (66.68 mm)	020	1.784 to 1.841-in. (45.31 to 46.76 mm)	0.065 to 0.545-in. (1.7 to 13.8 mm)	0.065 to 0.488-in. (1.7 to 12.4 mm)	A	
			1.842 to 1.938-in. (46.79 to 49.23 mm)			B	
			1.939 to 2.067-in. (49.25 to 52.50 mm)			C	
			2.068 to 2.206-in. (52.53 to 56.03 mm)			D	
			2.207 to 2.322-in. (56.06 to 58.98 mm)			B	
2 <sup>1</sup> / <sub>2</sub> -in. (63.5 mm)	3.188-in. (80.98 mm)	025	2.323 to 2.469-in. (59.00 to 62.71 mm)	0.083 to 0.563-in. (2.1 to 14.3 mm)	0.083 to 0.417-in. (2.1 to 10.6 mm)	C	
			2.470 to 2.598-in. (62.74 to 65.99 mm)			D	
			2.599 to 2.647-in. (66.01 to 67.23 mm)			E	
			2.648 to 2.751-in. (67.26 to 69.88 mm)			A	
3-in. (80 mm)	3.75-in. (95.25 mm)	030	2.752 to 2.899-in. (69.90 to 73.63 mm)	0.083 to 0.563-in. (2.1 to 14.3 mm)	0.083 to 0.416-in. (2.1 to 10.6 mm)	B	
			2.900 to 3.068-in. (73.66 to 77.93 mm)			C	
			3.069 to 3.228-in. (77.95 to 81.99 mm)			D	
			3.229 to 3.333-in. (82.02 to 84.66 mm)			B	
3 <sup>1</sup> / <sub>2</sub> -in. (89 mm)	4.25-in. (107.95 mm)	035	3.334 to 3.548-in. (84.68 to 90.12 mm)	0.120 to 0.600-in. (3.0 to 15.2 mm)	0.120 to 0.496-in. (3.0 to 12.6 mm)	C	
			3.549 to 3.734-in. (90.14 to 94.84 mm)			D	
			3.735 to 3.825-in. (94.87 to 97.16 mm)			B	
4-in. (100 mm)	5.032-in. (127.81 mm)	040	3.826 to 4.026-in. (97.18 to 102.26 mm)	0.120 to 0.600-in. (3.0 to 15.2 mm)	0.120 to 0.400-in. (3.0 to 10.2 mm)	C	
			4.027 to 4.237-in. (102.29 to 107.62 mm)			D	
			4.238 to 4.437-in. (107.65 to 112.70 mm)			E	
			4.438 to 4.571-in. (112.73 to 116.10 mm)			A	
			4.572 to 4.812-in. (116.13 to 122.22 mm)			B	
5-in. (125 mm)	6.094-in. (154.79 mm)	050	4.813 to 5.047-in. (122.25 to 128.19 mm)	0.134 to 0.614-in. (3.4 to 15.6 mm)	0.134 to 0.374-in. (3.4 to 9.5 mm)	C	
			5.048 to 5.249-in. (128.22 to 133.32 mm)			D	
			5.250 to 5.472-in. (133.35 to 139.99 mm)			A	
			5.473 to 5.760-in. (139.01 to 146.30 mm)			B	
			5.761 to 6.065-in. (146.33 to 154.05 mm)			C	
Sensor Size 1 6-in. (150 mm)	6.93-in. (176.02 mm)	060	6.066 to 6.383-in. (154.08 to 162.13 mm)	0.134 to 0.614-in. (3.4 to 15.6 mm)	0.134 to 0.327-in. (3.4 to 8.3 mm)	D	
			6.384 to 6.624-in. (162.15 to 168.25 mm)			B	
			6.625 to 7.023-in. (168.28 to 178.38 mm)			C	
			7.024 to 7.392-in. (178.41 to 187.76 mm)			D	
			7.393 to 7.624-in. (187.78 to 193.65 mm)			B	
Sensor Size 2 6-in. (150 mm)	6.93-in. (176.02 mm)	060	7.625 to 7.981-in. (193.68 to 202.72 mm)	0.134 to 1.354-in. (3.4 to 34.4 mm)	0.134 to 1.067-in. (3.4 to 27.1 mm)	A	
			7.982 to 8.400-in. (202.74 to 213.36 mm)			C	
			8.401 to 8.766-in. (213.39 to 222.66 mm)			D	
			8.767 to 9.172-in. (222.68 to 232.97 mm)			B	
Sensor Size 1 7-in. (180 mm)	7.93-in. (201.42 mm)	070	9.173 to 9.561-in. (232.99 to 242.85 mm)	0.134 to 0.614-in. (3.4 to 15.6 mm)	0.134 to 0.374-in. (3.4 to 9.5 mm)	B	
			9.562 to 10.020-in. (242.87 to 254.51 mm)			C	
			10.021 to 10.546-in. (254.53 to 267.87 mm)			D	
			10.547 to 10.999-in. (267.89 to 279.37 mm)			D	
Sensor Size 2 7-in. (180 mm)	7.93-in. (201.42 mm)	070	10.999 to 11.000-in. (279.40 to 288.87 mm)	0.134 to 1.354-in. (3.4 to 34.4 mm)	0.134 to 1.114-in. (3.4 to 28.3 mm)	B	
			11.000 to 11.374-in. (288.90 to 303.23 mm)			C	
			11.374 to 11.938-in. (288.90 to 303.23 mm)			D	
			11.939 to 12.250-in. (303.25 to 311.15 mm)			D	
Sensor Size 1 8-in. (200 mm)	9.688-in. (246.08 mm)	080	12.250 to 12.251-in. (311.15 to 311.15 mm)	0.250 to 0.73-in. (6.4 to 18.5 mm)	0.250 to 0.499-in. (6.4 to 12.6 mm)	B	
			12.251 to 12.252-in. (311.15 to 311.15 mm)			C	
			12.252 to 12.253-in. (311.15 to 311.15 mm)			D	
			12.253 to 12.254-in. (311.15 to 311.15 mm)			E	
			12.254 to 12.255-in. (311.15 to 311.15 mm)			B	
Sensor Size 2 8-in. (200 mm)	9.688-in. (246.08 mm)	080	12.255 to 12.256-in. (311.15 to 311.15 mm)	0.250 to 1.47-in. (6.4 to 37.3 mm)	0.250 to 1.114-in. (6.4 to 28.3 mm)	C	
			12.256 to 12.257-in. (311.15 to 311.15 mm)			D	
			12.257 to 12.258-in. (311.15 to 311.15 mm)			E	
			12.258 to 12.259-in. (311.15 to 311.15 mm)			A	
			12.259 to 12.260-in. (311.15 to 311.15 mm)			B	
10-in. (250 mm)	11.75-in. (298.45 mm)	100	12.260 to 12.261-in. (311.15 to 311.15 mm)	0.250 to 1.470-in. (6.4 to 37.3 mm)	0.250 to 1.082-in. (6.4 to 27.5 mm)	B	
			12.261 to 12.262-in. (311.15 to 311.15 mm)			C	
			12.262 to 12.263-in. (311.15 to 311.15 mm)			D	
			12.263 to 12.264-in. (311.15 to 311.15 mm)			E	
			12.264 to 12.265-in. (311.15 to 311.15 mm)			A	
12-in. (300 mm)	13.0375-in. (331.15 mm)	120	12.265 to 12.266-in. (311.15 to 311.15 mm)	0.250 to 1.470-in. (6.4 to 37.3 mm)	0.250 to 1.097-in. (6.4 to 27.9 mm)	B	
			12.266 to 12.267-in. (311.15 to 311.15 mm)			C	
			12.267 to 12.268-in. (311.15 to 311.15 mm)			D	



# The Annubar Flowmeter Series

**Product Data Sheet**

00813-0100-4809, Rev FA

Catalog 2008 - 2009

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