

# Appendix A Reference Data

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## 3051SFA ORDERING INFORMATION

Table A-1. Rosemount 3051SFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
The Expanded offering is subject to additional delivery lead time.

Model	Product Description	Measurement Type		• = Available — = Unavailable
		D	1-7	
3051SFA	Annubar Flowmeter	•	•	
<b>Measurement Type</b>				
<b>Standard</b>				<b>Standard</b>
1	MultiVariable (Fully Compensated Mass & Energy Flow) – Differential & Static Pressures w/ Temperature	—	•	★
2	MultiVariable (Compensated Flow) – Differential & Static Pressures	—	•	★
3	MultiVariable (Compensated Flow) – Differential Pressure & Temperature	—	•	★
4	MultiVariable (Compensated Flow) – Differential Pressure	—	•	★
5	MultiVariable (Direct Measurement) – Differential & Static Pressures with Temperature	—	•	★
6	MultiVariable (Direct Measurement) – Differential & Static Pressures	—	•	★
7	MultiVariable (Direct Measurement) – Differential Pressure & Temperature	—	•	★
D	Differential Pressure	•	—	★

# Annubar Flowmeter Series

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<b>Fluid Type</b>				
<b>Standard</b>				<b>Standard</b>
L	Liquid	•	•	★
G	Gas	•	•	★
S	Steam	•	•	★
<b>Line Size</b>		<b>D</b>	<b>1-7</b>	
<b>Standard</b>				<b>Standard</b>
020	2-in. (50 mm)	•	•	★
025	2 <sup>1</sup> / <sub>2</sub> -in. (63.5 mm)	•	•	★
030	3-in. (80 mm)	•	•	★
035	3 <sup>1</sup> / <sub>2</sub> -in. (89 mm)	•	•	★
040	4-in. (100 mm)	•	•	★
050	5-in. (125 mm)	•	•	★
060	6-in. (150 mm)	•	•	★
070	7-in. (175 mm)	•	•	★
080	8-in. (200 mm)	•	•	★
100	10-in. (250 mm)	•	•	★
120	12-in. (300 mm)	•	•	★
<b>Expanded</b>				
140	14-in. (350 mm)	•	•	
160	16-in. (400 mm)	•	•	
180	18-in. (450 mm)	•	•	
200	20-in. (500 mm)	•	•	
240	24-in. (600 mm)	•	•	
300	30-in. (750 mm)	•	•	
360	36-in. (900 mm)	•	•	
420	42-in. (1066 mm)	•	•	
480	48-in. (1210 mm)	•	•	
600	60-in. (1520 mm)	•	•	
720	72-in. (1820 mm)	•	•	
780	78-in (1950 mm)	•	•	
840	84-in. (2100 mm)	•	•	
900	90-in. (2250 mm)	•	•	
960	96-in (2400 mm)	•	•	
<b>Pipe I.D. Range</b>				
<b>Standard</b>				<b>Standard</b>
C	Range C from the Pipe I.D. table	•	•	★
D	Range D from the Pipe I.D. table	•	•	★
<b>Expanded</b>				
A	Range A from the Pipe I.D. table	•	•	
B	Range B 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-in. (300 mm)	•	•	
<b>Pipe Material / Mounting Assembly Material</b>				
<b>Standard</b>				<b>Standard</b>
C	Carbon steel (A105)	•	•	★
S	316 Stainless Steel	•	•	★
0 <sup>(1)</sup>	No Mounting (Customer Supplied)	•	•	★

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<b>Expanded</b>				
G	Chrome-Moly Grade F-11	•	•	
N	Chrome-Moly Grade F-22	•	•	
J	Chrome-Moly Grade F-91	•	•	
<b>Piping Orientation</b>				
<b>Standard</b>				<b>Standard</b>
H	Horizontal Piping	•	•	★
D	Vertical Piping with Downwards Flow	•	•	★
U	Vertical Piping with Upwards Flow	•	•	★
<b>Annubar Type</b>		<b>D</b>	<b>1-7</b>	
<b>Standard</b>				<b>Standard</b>
P	Pak-Lok	•	•	★
F	Flanged with opposite side support	•	•	★
<b>Expanded</b>				
L	Flange-Lok	•	•	
G	Gear-Drive Flo-Tap	•	•	
M	Manual Flo-Tap	•	•	
<b>Sensor Material</b>				
<b>Standard</b>				<b>Standard</b>
S	316 Stainless Steel	•	•	★
<b>Expanded</b>				
H	Alloy C-276	•	•	
<b>Sensor Size</b>				
<b>Standard</b>				<b>Standard</b>
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)	•	•	★
<b>Mounting Type</b>				
<b>Standard</b>				<b>Standard</b>
T1	Compression or Threaded Connection	•	•	★
A1	150# RF ANSI	•	•	★
A3	300# RF ANSI	•	•	★
A6	600# RF ANSI	•	•	★
D1	DN PN16 Flange	•	•	★
D3	DN PN40 Flange	•	•	★
D6	DN PN100 Flange	•	•	★
<b>Expanded</b>				
A9 <sup>(2)</sup>	900# RF ANSI	•	•	
AF <sup>(2)</sup>	1500# RF ANSI	•	•	
AT <sup>(2)</sup>	2500 # RF ANSI	•	•	
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	•	•	
<b>Opposite Side Support or Packing Gland</b>				
<b>Standard</b>				<b>Standard</b>
0	No opposite side support or packing gland (Required for Pak-Lok and Flange-Lok models)	•	•	★
<b>Opposite Side Support – Required for Flanged Models</b>				
C	NPT Threaded Opposite Support Assembly – Extended Tip	•	•	★
D	Welded Opposite Support Assembly – Extended Tip	•	•	★

# Annubar Flowmeter Series

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<b>Expanded</b>						
<b>Packing Gland – Required for Flo-Tap Models</b>						
	<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	Alloy C-276 Packing Gland / Cage Nipple	Stainless Steel	Graphite	•	•	
<b>Isolation Valve for Flo-Tap Models</b>				<b>D</b>	<b>1-7</b>	
<b>Standard</b>						<b>Standard</b>
0 <sup>(1)</sup>	Not Applicable or Customer Supplied			•	•	★
<b>Expanded</b>						
1	Gate Valve, Carbon Steel			•	•	
2	Gate Valve, Stainless Steel			•	•	
5	Ball Valve, Carbon Steel			•	•	
6	Ball Valve, Stainless Steel			•	•	
<b>Temperature Measurement</b>						
<b>Standard</b>						<b>Standard</b>
T <sup>(3)</sup>	Integral RTD – not available with Flanged model greater than class 600#			•	•	★
0 <sup>(4)</sup>	No Temperature Sensor			•	•	★
<b>Expanded</b>						
R <sup>(3)</sup>	Remote Thermowell and RTD			•	•	
<b>Transmitter Connection Platform</b>						
<b>Standard</b>						<b>Standard</b>
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			•	•	★
7	Remote-mount NPT Connections (1/2-in. FNPT)			•	•	★
<b>Expanded</b>						
6	Direct-mount, High Temperature 5-valve Manifold – not available with Flanged model greater than class 600			•	•	
8	Remote-mount SW Connections (1/2-in.)			•	•	
<b>Differential Pressure Range</b>						
<b>Standard</b>						<b>Standard</b>
1	0 to 25 in H <sub>2</sub> O (0 to 62,3 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)			•	•	★
<b>Static Pressure Range</b>						
<b>Standard</b>						<b>Standard</b>
A <sup>(5)</sup>	None			•	•	★
D	Absolute 0.5 to 800 psia (0,033 to 55,2 bar)			—	•	★
E <sup>(6)</sup>	Absolute 0.5 to 3626 psia (0,033 to 250 bar)			—	•	★
J	Gage -14.2 to 800 psig (-0,979 to 55,2 bar)			—	•	★
K <sup>(6)</sup>	Gage -14.2 to 3626 psig (-0,979 to 250 bar)			—	•	★
<b>Transmitter Output</b>						
<b>Standard</b>						<b>Standard</b>
A	4–20 mA with digital signal based on HART protocol			•	•	★
F	FOUNDATION fieldbus protocol (requires PlantWeb housing)			•	—	★
X <sup>(7)</sup>	Wireless (Requires wireless options and Wireless Plantweb housing)			•	—	★

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Transmitter Housing Style		Material	Conduit Entry Size			
<b>Standard</b>						<b>Standard</b>
00	None (Customer-supplied electrical connection)			•	—	★
1A	PlantWeb Housing	Aluminum	1/2-14 NPT	•	•	★
1B	PlantWeb Housing	Aluminum	M20 x 1.5	•	•	★
1J	PlantWeb Housing	SST	1/2-14 NPT	•	•	★
1K	PlantWeb Housing	SST	M20 x 1.5	•	•	★
2A	Junction Box Housing	Aluminum	1/2-14 NPT	•	—	★
2B	Junction Box Housing	Aluminum	M20 x 1.5	•	—	★
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	•	—	★
2J	Junction Box Housing	SST	1/2-14 NPT	•	—	★
2M	Junction Box housing with output for remote display and interface	SST	1/2-14 NPT	•	—	★
5A	Wireless PlantWeb housing	Aluminum	1/2-14 NPT	•	—	★
5J	Wireless PlantWeb housing	SST	1/2-14 NPT	•	—	★
7J <sup>(7)(8)</sup>	Quick Connect (A size Mini, 4-pin male termination)			•	—	★
<b>Expanded</b>						
1C	PlantWeb Housing	Aluminum	G1/2	•	•	
1L	PlantWeb Housing	SST	G1/2	•	•	
2C	Junction Box Housing	Aluminum	G1/2	•	—	
2G	Junction Box housing with output for remote display and interface	Aluminum	G1/2	•	—	
<b>Transmitter Performance Class</b>				<b>D</b>	<b>1-7</b>	
<b>Standard</b>						<b>Standard</b>
<b>3051S MultiVariable SuperModule, Measurement Types 1, 2, 5, and 6</b>						
3	Ultra for Flow: 0.8% flow rate accuracy, 14:1 flow turndown, 10-year stability. limited 12-year warranty			•	•	★
5	Classic MV: 0.85% flow rate accuracy, 8:1 flow turndown, 5-yr. stability			—	•	★
<b>3051S Single Variable SuperModule, Measurement Types 3, 4, 7, and D</b>						
1	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>(9)</sup>	Ultra for Flow: 0.8% flow rate accuracy, 14:1 flow turndown, 10-year stability, limited 12-year warranty			•	•	★

**Wireless Options** (Requires option code X and wireless PlantWeb housing)

Update Rate, Operating Frequency and Protocol				
<b>Standard</b>				
WA	User Configurable Update Rate		•	—
<b>Operating Frequency and Protocol</b>				
<b>Standard</b>				
3	2.4 GHz DSSS, WirelessHART		•	—
<b>Omnidirectional Wireless Antenna</b>				
<b>Standard</b>				
WK <sup>(10)</sup>	Long Range, Integral Antenna		•	—
<b>SmartPower™</b>				
<b>Standard</b>				
1 <sup>(11)</sup>	Power Module Adapter, Intrinsically Safe (Power Module separate)		•	—

# Annubar Flowmeter Series

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## Other Options (Include with selected model number)

<b>Pressure Testing</b>				
<b>Expanded</b>				
P1 <sup>(12)</sup>	Hydrostatic Testing with Certificate	•	•	
PX <sup>(12)</sup>	Extended Hydrostatic Testing	•	•	
<b>Special Cleaning</b>				
<b>Expanded</b>				
P2	Cleaning for Special Services	•	•	
PA	Cleaning per ASTM G93 level D (section 11.4)	•	•	
<b>Material Testing</b>				
<b>Expanded</b>				
V1	Dye Penetrant Exam	•	•	
<b>Material Examination</b>		<b>D</b>	<b>1-7</b>	
<b>Expanded</b>				
V2	Radiographic Examination	•	•	
<b>Flow Calibration</b>				
<b>Expanded</b>				
W1	Flow Calibration (Average K)	•	•	
<b>Special Inspection</b>				
<b>Standard</b>				<b>Standard</b>
QC1	Visual and Dimensional Inspection with Certificate	•	•	★
QC7	Inspection and Performance Certificate	•	•	★
<b>Surface Finish</b>				
<b>Standard</b>				<b>Standard</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>				
<b>Standard</b>				<b>Standard</b>
Q8 <sup>(13)</sup>	Material Traceability Certificate per EN 10204:2004 3.1	•	•	★
<b>Code Conformance</b>				
<b>Expanded</b>				
J2 <sup>(14)</sup>	ANSI B31.1	•	•	
J3 <sup>(14)</sup>	ANSI B31.3	•	•	
<b>Material Conformance</b>				
<b>Expanded</b>				
J5 <sup>(15)</sup>	NACE MR-0175 / ISO 15156	•	•	
<b>Country Certification</b>				
<b>Standard</b>				<b>Standard</b>
J6	European Pressure Directive (PED)	•	•	★
<b>Expanded</b>				
J1	Canadian Registration	•	•	
<b>Installed in Flanged Pipe Spool Section</b>				
<b>Expanded</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>				
<b>Standard</b>				<b>Standard</b>
G2	Needle Valves, Stainless Steel	•	•	★
G6	OS&Y Gate Valve, Stainless Steel	•	•	★

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<b>Expanded</b>				
G1	Needle Valves, Carbon Steel	•	•	
G3	Needle Valves, Alloy C-276	•	•	
G5	OS&Y Gate Valve, Carbon Steel	•	•	
G7	OS&Y Gate Valve, Alloy C-276	•	•	
<b>Special Shipment</b>				
<b>Standard</b>				<b>Standard</b>
Y1	Mounting Hardware Shipped Separately	•	•	★
<b>Special Dimensions</b>				
<b>Expanded</b>				
VM	Variable Mounting	•	•	
VT	Variable Tip	•	•	
VS	Variable length Spool Section	•	•	
<b>Transmitter Calibration Certification</b>				
<b>Standard</b>				<b>Standard</b>
Q4	Calibration Certificate for Transmitter	•	•	★
<b>Quality Certification For Safety</b>		<b>D</b>	<b>1-7</b>	
<b>Standard</b>				<b>Standard</b>
QS	Certificate of FMEDA data	•	—	★
QT <sup>(16)</sup> (17)(19)	Safety certified to IEC 61508 with certificate of FMEDA data	•	—	★
<b>Product Certifications</b>				
<b>Standard</b>				<b>Standard</b>
E1	ATEX Flameproof	•	•	★
I1	ATEX Intrinsic Safety	•	•	★
IA	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 <sup>(16)</sup>	CSA Explosion-proof, Dust Ignition-proof, Division 2	•	•	★
I6	CSA Intrinsically Safe	•	•	★
K6 <sup>(16)</sup>	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E6 and I6)	•	•	★
E7	IECEX Flameproof, Dust Ignition-proof	•	•	★
I7	IECEX Intrinsic Safety	•	•	★
K7	IECEX Flameproof, Dust Ignition-proof, Intrinsic Safety, Type n (combination of E7, I7, and N7)	•	•	★
E3	China Flameproof	•	•	★
I3	China Intrinsic Safety	•	•	★
KA <sup>(16)</sup>	ATEX and CSA Explosion-proof, Intrinsically Safe, Division 2 (combination of E1, I1, E6, and I6)	•	•	★
KB <sup>(16)</sup>	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5, E6, I5, and I6)	•	•	★
KC	FM and ATEX Explosion-proof, Intrinsically Safe, Division 2 (combination of E5, E1, I5, and I1)	•	•	★
KD <sup>(16)</sup>	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe (combination of E5, I5, E6, I6, E1, and I1)	•	•	★
<b>Alternate Transmitter Material of Construction</b>				
<b>Standard</b>				<b>Standard</b>
L1	Inert Sensor Fill Fluid <i>Note: Silicone fill fluid is standard.</i>	•	•	★
L2	Graphite-Filled (PTFE) O-ring	•	•	★
LA	Inert Sensor Fill Fluid and Graphite-Filled (PTFE) O-ring	•	•	★

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<b>Digital Display<sup>(17)</sup></b>				
<b>Standard</b>				<b>Standard</b>
M5	PlantWeb LCD display (Requires PlantWeb housing)	•	•	★
M7 <sup>(18)(19)</sup>	Remote mount LCD display and interface, no cable; PlantWeb housing, SST bracket	•	•	★
M8 <sup>(18)(19)(20)</sup>	Remote mount LCD display and interface, 50 ft. (15 m) cable; PlantWeb housing, SST bracket	•	•	★
M9 <sup>(18)(19)(20)</sup>	Remote mount LCD display and interface, 100 ft. (31 m) cable; PlantWeb housing, SST bracket	•	•	★
<b>Transient Protection</b>				
<b>Standard</b>				<b>Standard</b>
T1 <sup>(21)</sup>	Transient terminal block	•	•	★
<b>Manifold for Remote Mount Option</b>				
<b>Standard</b>				<b>Standard</b>
F2	3-Valve Manifold, Stainless Steel	•	•	★
F6	5-Valve Manifold, Stainless Steel	•	•	★
<b>Expanded</b>				
F1	3-Valve Manifold, Carbon Steel	•	•	
F3	3-Valve Manifold, Alloy C-276	•	•	
F5	5-Valve Manifold, Carbon Steel	•	•	
F7	5-Valve Manifold, Alloy C-276	•	•	
<b>PlantWeb Control Functionality</b>		<b>D</b>	<b>1-7</b>	
<b>Standard</b>				<b>Standard</b>
A01	FOUNDATION fieldbus Advanced Control Function Block Suite	•	—	★
<b>PlantWeb Diagnostic Functionality</b>				
<b>Standard</b>				<b>Standard</b>
D01	FOUNDATION fieldbus Diagnostics Suite	•	—	★
DA2 <sup>(22)</sup>	Advanced HART Diagnostic Suite	•	—	★
<b>PlantWeb Enhanced Measurement Functionality</b>				
<b>Standard</b>				<b>Standard</b>
H01 <sup>(23)</sup>	FOUNDATION fieldbus Fully Compensated Mass Flow Block	•	—	★
<b>Cold Temperature</b>				
<b>Standard</b>				<b>Standard</b>
BRR	-60 °F (-51 °C) Cold Temperature Start-up	•	•	★
<b>Alarm Limit<sup>(18)(24)</sup></b>				
<b>Standard</b>				<b>Standard</b>
C4	NAMUR Alarm and Saturation Levels, High Alarm	•	•	★
C5	NAMUR Alarm and Saturation Levels, Low Alarm	•	•	★
C6	Custom Alarm and Saturation Levels, High Alarm	•	•	★
C7	Custom Alarm and Saturation Levels, Low Alarm	•	•	★
C8	Low Alarm (Standard Rosemount Alarm and Saturation Levels)	•	•	★
<b>Hardware Adjustments and Ground Screw</b>				
<b>Standard</b>				<b>Standard</b>
D1	Hardware Adjustments (zero, span, alarm, security)	•	—	★
D4	External Ground Screw Assembly	•	•	★
DA	Hardware Adjustments (zero, span, alarm, security) and External Ground Screw Assembly	•	—	★
<b>Conduit Electrical Connector</b>				
<b>Standard</b>				<b>Standard</b>
GE <sup>(25)</sup>	M12, 4-pin, Male Connector ( <i>eurofast</i> <sup>®</sup> )	•	•	★
GM <sup>(25)</sup>	A size Mini, 4-pin, Male Connector ( <i>minifast</i> <sup>®</sup> )	•	•	★
<b>Typical Model Number: 3051SFA D L 060 D C H P S 2 T1 0 0 0 3 2A A 1A 3</b>				

(1) Provide the "A" dimension for Flanged (page A-78), Flange-Lok (page A-77), and Threaded Flo-Tap (page A-81) models. Provide the "B" dimension for Flange Flo-Tap models (page A-80).

(2) Available in remote mount applications only.

(3) Temperature Measurement Option code T or R is required for Measurement Type codes 1, 3, 5, and 7.

(4) Required for Measurement Type codes 2, 4, 6, and D.

(5) Required for Measurement Type codes 3, 4, 7, and D.



- (6) For Measurement Type 1, 2, 5, and 6 with DP range 1, absolute limits are 0.5 to 2000 psi (0,03 to 137,9 bar) and gage limits are -14.2 to 2000 psig (-0,98 to 137,9 bar).
- (7) Available approvals are FM Intrinsically Safe, Division 2 (option code I5), CSA Intrinsically Safe (option code I6), ATEX Intrinsic Safety (option code I1), and IECEx Intrinsic Safety (option code I7).
- (8) Available with output code A only.
- (9) This option is only available with differential pressure ranges 2 and 3, and silicone fill fluid.
- (10) Long-Life Power Module must be shipped separately, order Part #00753-9220-0001.
- (11) Long-life Power Module must be shipped separately, order Part No. 00753-9220-0001.
- (12) Applies to assembled flowmeter only, mounting not tested.
- (13) Instrument Connections for Remote Mount Options and Isolation Valves for Flo-tap Models are not included in the Material Traceability Certification.
- (14) Not available with Transmitter Connection Platform 6.
- (15) 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.
- (16) Not available with M20 or G ½ conduit entry size.
- (17) Not available with housing code 7J.
- (18) Not available with output code X.
- (19) Not available with output code F, option code DA2, or option code QT.
- (20) Cable supplied is Belden 3084A, rated for ambient temperatures up to 167 °F (75 °C).
- (21) Not available with Housing code 00, 5A, or 7J. External ground screw assembly (option code D4) is included with the T1 option. The T1 option is not needed with FISCO Product Certifications, transient protection is included with the FISCO Product Certification code IA.
- (22) Includes Hardware Adjustments (option code D1) as standard.
- (23) Requires Rosemount Engineering Assistant version 5.5.1 to configure.
- (24) Not available with Output Protocol code F.
- (25) Not available with Housing code 00, 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).

# Annubar Flowmeter Series

## 3051SFA SPECIFICATIONS

### 3051SFA PERFORMANCE SPECIFICATIONS

Performance assumptions include: measured pipe I.D, transmitter is trimmed for optimum flow accuracy, and performance is dependent on application parameters.

Table A-2. MultiVariable Flow Performance - Flow Reference Accuracy (Measurement Type 1)<sup>(1)</sup>

3051SFA Annubar Flowmeter			
		Classic MV (8:1 flow turndown)	Ultra for Flow (14:1 flow turndown)
Ranges 2-3		1.15% of Flow Rate	±0.80% of Flow Rate

(1) Measurement Types 2 - 4 assume that the unmeasured variables are constant. Additional uncertainty will depend on the variation in the unmeasured variables.

Table A-3. Flow Performance - Flow Reference Accuracy (Measurement Type D)<sup>(1)(2)</sup>

3051SFA Annubar Flowmeter				
		Classic (8:1 flow turndown)	Ultra (8:1 flow turndown)	Ultra for Flow (14:1 flow turndown)
Ranges 2-3		±1.4% of Flow Rate	±0.95% of Flow Rate	±0.80% of Flow Rate

(1) For Measurement Types 5 - 7, refer to the Reference Accuracy specification for the 3051SMV with Measurement Type P.

(2) These flow measurement accuracies assume a constant density, viscosity, and expansibility factor.

### 3051SFA DYNAMIC PERFORMANCE

#### Total Time Response at 75 °F (24 °C), includes dead time<sup>(1)</sup>

3051SF_D	3051SF_1, 2, 5, or 6	3051SF_3, 4, or 7
DP Ranges 2-5: 100 ms Range 1: 255 ms Range 0: 700 ms	DP Range 1: 310 ms DP Range 2: 170 ms DP Range 3: 155 ms AP & GP: 240 ms	DP Ranges 2-5: 145 ms DP Range 1: 300 ms DP Range 0: 745 ms

(1) For FOUNDATION fieldbus (output code F), add 52 ms to stated values (not including segment macro-cycle).  
For option code DA2, add 45 ms (nominal) to stated values.

#### Dead Time<sup>(1)</sup>

3051SF_D	3051SF_1-7
45 ms (nominal)	DP: 100 ms AP & GP: 140 ms RTD Interface: 1 s

(1) For option code DA2, dead time is 90 milliseconds (nominal).

#### Update Rate<sup>(1)</sup>

3051SF_D	3051SF_1-7
22 updates per sec.	DP: 22 updates per sec. AP & GP: 11 updates per sec. RTD Interface: 1 update per sec.  <u>Calculated Variables:</u> Mass / Volumetric Flow Rate: 22 updates per sec. Energy Flow Rate: 22 updates per sec. Totalized Flow: 1 update per sec.

(1) Does not apply to Wireless (output code X). See "Wireless Self-Organizing Networks" on page A-17 for wireless update rate.

## Mounting Position Effects

Models		Ultra, Ultra for Flow, Classic and Classic MV
3051SF_3, 4, 7, or D		Zero shifts up to $\pm 1.25$ inH <sub>2</sub> O (3,11 mbar), which can be zeroed Span: no effect
3051SF_1, 2, 5, or 6	DP Sensor:	Zero shifts up to $\pm 1.25$ inH <sub>2</sub> O (3,11 mbar), which can be zeroed Span: no effect
	GP/AP Sensor:	Zero shifts to $\pm 2.5$ inH <sub>2</sub> O (6,22 mbar), which can be zeroed Span: no effect

## Vibration Effect

Less than  $\pm 0.1\%$  of URL when tested per the requirements of IEC60770-1 field or pipeline with high vibration level (10-60 Hz 0.21mm displacement peak amplitude / 60-2000 Hz 3g).

For Housing Style codes 1J, 1K, 1L, 2J, and 2M:

Less than  $\pm 0.1\%$  of URL when tested per the requirements of IEC60770-1 field with general application or pipeline with low vibration level (10-60 Hz 0.15 mm displacement peak amplitude / 60-500 Hz 2g).

## Power Supply Effect

Less than  $\pm 0.005\%$  of calibrated span per volt change in voltage at the transmitter terminals

## Electromagnetic Compatibility (EMC)

Meets all relevant requirements of EN 61326 and NAMUR NE-21.<sup>(1) (2)</sup>

*(1) NAMUR NE-21 does not apply to wireless output code X.*

*(2) 3051SMV and 3051SF\_1, 2, 3, 4, 5, 6, 7 requires shielded cable for both temperature and loop wiring.*

## Transient Protection (Option T1)

Meets IEEE C62.41.2-2002, Location Category B

6 kV crest (0.5  $\mu$ s - 100 kHz)

3 kA crest (8  $\times$  20 microseconds)

6 kV crest (1.2  $\times$  50 microseconds)

Meets IEEE C37.90.1-2002 Surge Withstand Capability

SWC 2.5 kV crest, 1.0 MHz wave form

# Annubar Flowmeter Series

## 3051SFA FUNCTIONAL SPECIFICATIONS

### Range and Sensor Limits

#### Flowmeter with Coplanar Sensor Module

Range	DP Sensor (3051SF_3, 4, or 7)	
	Lower (LRL)	Upper (URL)
1	0 inH <sub>2</sub> O (0 mbar)	25 inH <sub>2</sub> O (62,3 mbar)
2	0 inH <sub>2</sub> O (0 bar)	250 inH <sub>2</sub> O (0,62 bar)
3	0 inH <sub>2</sub> O (0 bar)	1000 inH <sub>2</sub> O (2,49 bar)

#### Flowmeter with MultiVariable Sensor Module

Range	DP Sensor (3051SF1, 2, 5, or 6)	
	Lower (LRL)	Upper (URL)
1	0 inH <sub>2</sub> O (0 mbar)	25.0 inH <sub>2</sub> O (62,3 mbar)
2	0 inH <sub>2</sub> O (0 bar)	250.0 inH <sub>2</sub> O (0,62 bar)
3	0 inH <sub>2</sub> O (0 bar)	1000.0 inH <sub>2</sub> O (2,49 bar)
Range	Static Pressure Sensor (GP/AP)	
	Lower (LRL)	Upper (URL) <sup>(1)</sup>
3	GP <sup>(2)</sup> : -14.2 psig (0,98 bar) AP: 0.5 psia (34,5 mbar)	GP: 800 psig (55,16 bar) AP: 800 psia (55,16 bar)
4	GP <sup>(2)</sup> : -14.2 psig (0,98 bar) AP: 0.5 psia (34,5 mbar)	GP: 3626 psig (250 bar) AP: 3626 psia (250 bar)

(1) For SP Range 4 with DP Range 1, the URL is 2000 psi (137,9 bar).

(2) Inert Fill: Minimum pressure = 1.5 psia (0,10 bar) or -13.2 psig (-0,91 bar).

#### Process Temperature RTD Interface (3051SF\_1, 3, 5 or 7)<sup>(1)</sup>

Lower (LRL)	Upper (URL)
-328 °F (-200 °C)	1562 °F (850 °C)

(1) Transmitter is compatible with any Pt 100 RTD sensor. Examples of compatible RTDs include Rosemount Series 68 and 78 RTD Temperature Sensors.

### Minimum Span Limits

#### Transmitter with Coplanar Sensor Module (Single Variable)

Range	DP Sensor (3051SF_D, 3, 4 or 7)	
	Ultra & Ultra for Flow	Classic
1	0.5 inH <sub>2</sub> O (1,24 mbar)	0.5 inH <sub>2</sub> O (1,24 mbar)
2	1.3 inH <sub>2</sub> O (3,11 mbar)	2.5 inH <sub>2</sub> O (6,23 mbar)
3	5.0 inH <sub>2</sub> O (12,4 mbar)	10.0 inH <sub>2</sub> O (24,9 mbar)

#### Transmitter with MultiVariable Sensor Module

Range	DP Sensor (3051SF_1, 2, 5, or 6)	
	Ultra for Flow	Classic MV
1	0.5 inH <sub>2</sub> O (1,24 mbar)	0.5 inH <sub>2</sub> O (1,24 mbar)
2	1.3 inH <sub>2</sub> O (3,11 mbar)	2.5 inH <sub>2</sub> O (6,23 mbar)
3	5.0 inH <sub>2</sub> O (12,4 mbar)	10.0 inH <sub>2</sub> O (24,9 mbar)
Range	Static Pressure Sensor (GP/AP)	
	Ultra for Flow	Classic MV
3	4.0 psi (276 mbar)	8.0 psi (522 mbar)
4	18.13 psi (1,25 bar)	36.26 psi (2,50 bar)

**Process Temperature RTD Interface  
 (3051SF\_1, 3, 5, or 7)**

Minimum Span = 50 °F (28 °C)

**Service**

**3051SF\_5, 6, 7, or D (Direct Process Variable Output):**

Liquid, gas, and steam applications

**3051SF\_1, 2, 3, or 4 (Mass and Energy Flow Output):**

Some fluid types are only supported by certain measurement types

Fluid Compatibility with Pressure and Temperature Compensation      • Available      — Not available

Ordering Code	Measurement Type	Fluid Types			
		Liquids	Saturated Steam	Superheated Steam	Gas and Natural Gas
1	DP / P / T (Full Compensation)	•	•	•	•
2	DP / P	•	•	•	•
3	DP / T	•	•	—	—
4	DP only	•	•	—	—

**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**

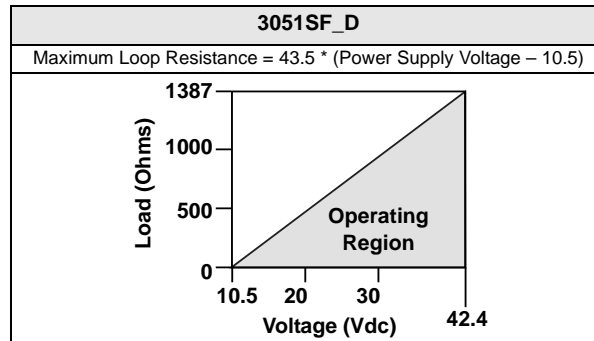
**External power supply required.**

- 3051SF\_D: 10.5 to 42.4 Vdc with no load
- 3051SF\_D with Advanced HART Diagnostics Suite: 12 to 42.4 Vdc with no load
- 3051SF\_1-7: 12 to 42.4 Vdc with no load

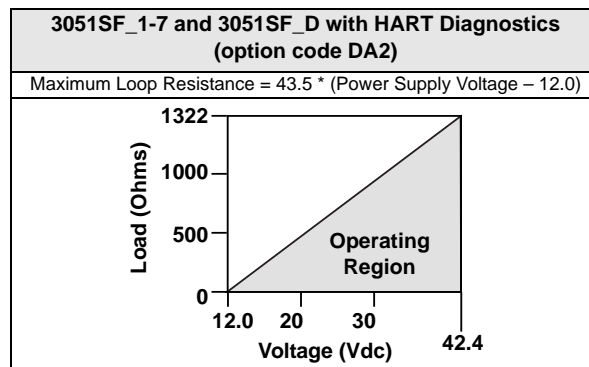
**Load Limitations**

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

# Annubar Flowmeter Series



*The Field Communicator requires a minimum loop resistance of  $250\Omega$  for communication.*



*The Field Communicator requires a minimum loop resistance of  $250\Omega$  for communication.*

## Advanced HART Diagnostics Suite (Option Code DA2)

The 3051SF provides Abnormal Situation Prevention indication for a breakthrough in diagnostic capability. The 3051SF 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 3051SF 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 Vdc 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 3051SF 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.

# Annubar Flowmeter Series

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## 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.

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)

The 3051SF ASP Diagnostics Suite for FOUNDATION fieldbus provides Abnormal Situation Prevention 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 3051SF 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

WirelessHART, 2.4 GHz DSSS.

### Local Display

The optional five-digit LCD can display user-selectable information such as primary variable in engineering units, percent of range, sensor module temperature, and electronics temperature. Display updates at up to once per minute.

### Update Rate

WirelessHART, user selectable 8 sec. to 60 min.

### Power Module

Field replaceable, keyed connection eliminates the risk of incorrect installation, Intrinsically Safe Lithium-thionyl chloride Power Module with polybutadine terephthalate (PBT) enclosure. Ten-year life at one minute update rate.<sup>(1)</sup>

<sup>(1)</sup> Reference conditions are 70 °F (21 °C), and routing data for three additional network devices.  
 NOTE: Continuous exposure to ambient temperature limits of -40 °F or 185 °F (-40 °C or 85 °C) may reduce specified life by less than 20 percent.

## Overpressure Limits

Transmitters withstand the following limits without damage:

### Coplanar Sensor Module (Single Variable)

Range	DP <sup>(1)</sup>
	3051SF_3, 4, 7, or D
1	2000 psi (137,9 bar)
2	3626 psi (250,0 bar)
3	3626 psi (250,0 bar)

<sup>(1)</sup> The overpressure limit of a DP Sensor with the P9 option is 4500 psig (310,3 bar). The overpressure limit of a DP Sensor with the P0 option is 6092 psig (420 bar).

### Coplanar MultiVariable Sensor Module (3051SF\_1, 2, 5, or 6)

Static Pressure	Differential Pressure		
	Range 1	Range 2	Range 3
Range 3 GP/AP	1600 psi (110,3 bar)	1600 psi (110,3 bar)	1600 psi (110,3 bar)
Range 4 GP/AP	2000 psi (137,9 bar)	3626 psi (250 bar)	3626 psi (250 bar)

## Static Pressure Limits

### Coplanar Sensor Module

Operates within specifications between static line pressures of:

Range	DP Sensor <sup>(1)</sup>
	3051SF_3, 4, 7, or D
1	0.5 psia to 2000 psig (0,03 to 137,9 bar)
2	0.5 psia to 3626 psig (0,03 to 150 bar)
3	0.5 psia to 3626 psig (0,03 to 150 bar)

<sup>(1)</sup> The static pressure limit of a DP Sensor with the P9 option is 4500 psig (310,3 bar). The static pressure limit of a DP Sensor with the P0 option is 6092 psig (420 bar).

# Annubar Flowmeter Series

## Coplanar MultiVariable Sensor Module (3051SF\_1, 2, 5, or 6)

Operates within specifications between static line pressures of 0.5 psia (0,03 bar) and the values in the table below:

Static Pressure	Differential Pressure		
	Range 1	Range 2	Range 3
Range 3 GP/AP	800 psi (57,91 bar)	800 psi (57,91 bar)	800 psi (57,91 bar)
Range 4 GP/AP	2000 psi (137,9 bar)	3626 psi (250 bar)	3626 psi (250 bar)

## Burst Pressure Limits

### Coplanar Sensor Module

10000 psig (689,5 bar)

## Temperature Limits

### Ambient

-40 to 185 °F (-40 to 85 °C)

With LCD display<sup>(1)</sup>: -40 to 175 °F (-40 to 80 °C)

With option code P0: -20 to 185 °F (-29 to 85 °C)

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

### Storage

-50 to 185 °F (-46 to 85 °C)

With LCD display: -40 to 185 °F (-40 to 85 °C)

With Wireless Output: -40 to 185 °F (-40 to 85 °C)

### Process Temperature Limits

For 3051SFA Temperature Limits, see page A-63.

At atmospheric pressures and above:

## Humidity Limits

0–100% relative humidity

### Turn-On Time<sup>(1)</sup>

When power is applied to the transmitter during startup, performance will be within specifications per the time period described below:

Transmitter	Turn-On Time (Typical)
3051S, 3051SF_D	2 seconds
Diagnostics	5 seconds
3051SMV, 3051SF_1-7	5 seconds

*(1) Does not apply to wireless option code X.*

## Volumetric Displacement

Less than 0.005 in<sup>3</sup> (0,08 cm<sup>3</sup>)

### Damping<sup>(1)</sup>

Analog output response time to a step change is user-selectable from 0 to 60 seconds for one time constant. For 3051SF\_1-7, each variable can be individually adjusted. Software damping is in addition to sensor module response time.

*(1) Does not apply to wireless option code X.*

## Failure Mode Alarm

### HART 4-20 mA (output option code A)

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 Alarm Configuration below).

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

### Alarm Configuration

	High Alarm	Low Alarm
Default	≥ 21.75 mA	≤ 3.75 mA
NAMUR compliant <sup>(1)</sup>	≥ 22.5 mA	≤ 3.6 mA
Custom levels <sup>(2)</sup>	20.2 - 23.0 mA	3.4 - 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.

## Safety-Certified Transmitter Failure Values<sup>(1)</sup>

Safety accuracy: 2.0%<sup>(2)</sup>

Safety response time: 1.5 seconds

(1) Does not apply to wireless option code X.

(2) 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%.

## 3051SFA PHYSICAL SPECIFICATIONS

### Electrical Connections

1/2–14 NPT, G1/2, and M20 × 1.5 conduit. HART interface connections fixed to terminal block for Output code A and X.

### Process Connections

Coplanar Sensor Module	
Standard	1/4-18 NPT on 2 1/8-in. centers

### Process-Wetted Parts

For 3051SFA wetted parts, see “Annubar Sensor Material” on page A-63.

### Process Isolating Diaphragms

Coplanar Sensor Module
316L SST (UNS S31603), Alloy C-276 (UNS N10276), Alloy 400 (UNS N04400), Tantalum (UNS R05440), Gold-Plated Alloy 400, Gold-plated 316L SST

# Annubar Flowmeter Series

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## **Drain/Vent Valves**

316 SST, Alloy C-276, or Alloy 400/K-500 material  
(Drain vent seat: Alloy 400, Drain vent stem: Alloy K-500)

## **Process Flanges and Adapters**

Plated carbon steel  
SST: CF-8M (Cast 316 SST) per ASTM A743  
Cast C-276: CW-12MW per ASTM A494  
Cast Alloy 400: M-30C per ASTM A494

## **Non-Wetted Parts**

### **Electronics Housing**

Low-copper aluminum alloy or CF-8M (Cast 316 SST)  
NEMA 4X, IP 66, IP 68 (66 ft (20 m) for 168 hours)  
Note: IP 68 not available with Wireless Output.

### **Paint for Aluminum Housing**

Polyurethane

### **Coplanar Sensor Module Housing**

SST: CF-3M (Cast 316L SST)

### **Bolts**

Plated carbon steel per ASTM A449, Type 1  
Austenitic 316 SST per ASTM F593  
ASTM A453, Class D, Grade 660 SST  
ASTM A193, Grade B7M alloy steel  
ASTM A193, Class 2, Grade B8M SST  
Alloy K-500

### **Sensor Module Fill Fluid**

Silicone or inert halocarbon

### **Cover O-rings**

Buna-N

### **Wireless Antenna**

PBT/ polycarbonate (PC) integrated omnidirectional antenna

### **Power Module**

Field replaceable, keyed connection eliminates the risk of incorrect installation, Intrinsically Safe Lithium-thionyl chloride Power Module with PBT enclosure.

**3051CFA ORDERING INFORMATION**

Table A-4. Rosemount 3051CFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
 The Expanded offering is subject to additional delivery lead time.

Model	Product Description	
3051CFA	Annubar Flowmeter	
<b>Measurement Type</b>		
<b>Standard</b>		<b>Standard</b>
D	Differential Pressure	★
<b>Fluid Type</b>		
<b>Standard</b>		<b>Standard</b>
L	Liquid	★
G	Gas	★
S	Steam	★
<b>Line Size</b>		
<b>Standard</b>		<b>Standard</b>
020	2-in. (50 mm)	★
025	2 <sup>1</sup> / <sub>2</sub> -in. (63.5 mm)	★
030	3-in. (80 mm)	★
035	3 <sup>1</sup> / <sub>2</sub> -in. (89 mm)	★
040	4-in. (100 mm)	★
050	5-in. (125 mm)	★
060	6-in. (150 mm)	★
070	7-in. (175 mm)	★
080	8-in. (200 mm)	★
100	10-in. (250 mm)	★
120	12-in. (300 mm)	★
<b>Expanded</b>		
140	14-in. (350 mm)	
160	16-in. (400 mm)	
180	18-in. (450 mm)	
200	20-in. (500 mm)	
240	24-in. (600 mm)	
300	30-in. (750 mm)	
360	36-in. (900 mm)	
420	42-in. (1066 mm)	
480	48-in. (1210 mm)	
600	60-in. (1520 mm)	
720	72-in. (1820 mm)	
780	78-in. (1950 mm)	
840	84-in. (2100 mm)	
900	90-in. (2250 mm)	
960	96-in. (2400 mm)	
<b>Pipe I.D. Range</b>		
<b>Standard</b>		<b>Standard</b>
C	Range C from the Pipe I.D. table	★
D	Range D from the Pipe I.D. table	★
<b>Expanded</b>		
A	Range A from the Pipe I.D. table	
B	Range B 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	

# Annubar Flowmeter Series

Table A-4. Rosemount 3051CFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
The Expanded offering is subject to additional delivery lead time.

<b>Pipe Material / Mounting Assembly Material</b>		
<b>Standard</b>		<b>Standard</b>
C	Carbon steel (A105)	★
S	316 Stainless Steel	★
0	No Mounting (Customer Supplied)	★
<b>Expanded</b>		
G	Chrome-Moly Grade F-11	
N	Chrome-Moly Grade F-22	
J	Chrome-Moly Grade F-91	
<b>Piping Orientation</b>		
<b>Standard</b>		<b>Standard</b>
H	Horizontal Piping	★
D	Vertical Piping with Downwards Flow	★
U	Vertical Piping with Upwards Flow	★
<b>Annubar Type</b>		
<b>Standard</b>		<b>Standard</b>
P	Pak-Lok	★
F	Flanged with opposite side support	★
<b>Expanded</b>		
L	Flange-Lok	
G	Gear-Drive Flo-Tap	
M	Manual Flo-Tap	
<b>Sensor Material</b>		
<b>Standard</b>		<b>Standard</b>
S	316 Stainless Steel	★
<b>Expanded</b>		
H	Alloy C-276	
<b>Sensor Size</b>		
<b>Standard</b>		<b>Standard</b>
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)	★
<b>Mounting Type</b>		
<b>Standard</b>		<b>Standard</b>
T1	Compression or Threaded Connection	★
A1	150# RF ANSI	★
A3	300# RF ANSI	★
A6	600# RF ANSI	★
D1	DN PN16 Flange	★
D3	DN PN40 Flange	★
D6	DN PN100 Flange	★
<b>Expanded</b>		
A9 <sup>(1)</sup>	900# RF ANSI	
AF <sup>(1)</sup>	1500# RF ANSI	
AT <sup>(1)</sup>	2500 # RF ANSI	
R1	150# RTJ Flange	
R3	300# RTJ Flange	
R6	600# RTJ Flange	
R9 <sup>(1)</sup>	900# RTJ Flange	
RF <sup>(1)</sup>	1500# RTJ Flange	
RT <sup>(1)</sup>	2500# RTJ Flange	

Table A-4. Rosemount 3051CFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
The Expanded offering is subject to additional delivery lead time.

<b>Opposite Side Support or Packing Gland</b>			
<b>Standard</b>			<b>Standard</b>
0	No opposite side support or packing gland (Required for Pak-Lok and Flange-Lok models)		★
<b>Opposite Side Support – Required for Flanged Models</b>			
C	NPT Threaded Opposite Support Assembly – Extended Tip		★
D	Welded Opposite Support Assembly – Extended Tip		★
<b>Expanded</b>			
<b>Packing Gland – Required for Flo-Tap Models</b>			
	<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	Alloy C-276 Packing Gland / Cage Nipple	Stainless Steel	Graphite
<b>Isolation Valve for Flo-Tap Models</b>			
<b>Standard</b>			<b>Standard</b>
0	Not Applicable or Customer Supplied		★
<b>Expanded</b>			
1	Gate Valve, Carbon Steel		
2	Gate Valve, Stainless Steel		
5	Ball Valve, Carbon Steel		
6	Ball Valve, Stainless Steel		
7	Ball Valve, Alloy C-276		
<b>Temperature Measurement</b>			
<b>Standard</b>			<b>Standard</b>
T	Integral RTD – not available with Flanged model greater than class 600#		★
0	No Temperature Sensor		★
<b>Expanded</b>			
R	Remote Thermowell and RTD		
<b>Transmitter Connection Platform</b>			
<b>Standard</b>			<b>Standard</b>
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		★
7	Remote-mount NPT Connections (1/2-in. NPT)		★
<b>Expanded</b>			
6	Direct-mount, high temperature 5-valve Manifold – not available with Flanged model greater than class 600		
8	Remote-mount SW Connections (1/2-in.)		
<b>Differential Pressure Range</b>			
<b>Standard</b>			<b>Standard</b>
1	0 to 25 in H <sub>2</sub> O (0 to 62,3 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)		★
<b>Transmitter Output</b>			
<b>Standard</b>			<b>Standard</b>
A	4–20 mA with digital signal based on HART Protocol		★
F	FOUNDATION fieldbus Protocol		★
W <sup>(2)</sup>	Profibus PA Protocol		★
<b>Expanded</b>			
M	Low-Power, 1-5 Vdc with Digital Signal Based on HART Protocol		

# Annubar Flowmeter Series

Table A-4. Rosemount 3051CFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Transmitter Housing Material		Conduit Entry Size	
<b>Standard</b>		<b>Standard</b>	
A	Aluminum	1/2-14 NPT	★
B	Aluminum	M20 x 1.5	★
J	SST	1/2-14 NPT	★
K	SST	M20 x 1.5	★
<b>Expanded</b>			
D	Aluminum	G1/2	
M	SST	G1/2	
<b>Transmitter Performance Class</b>			
<b>Standard</b>		<b>Standard</b>	
1	1.6% flow rate accuracy, 8:1 flow turndown, 5-yr. stability		★

## Options (Include with selected model number)

<b>Pressure Testing</b>		
<b>Expanded</b>		
P1 <sup>(3)</sup>	Hydrostatic Testing with Certificate	
PX <sup>(3)</sup>	Extended Hydrostatic Testing	
<b>Special Cleaning</b>		
<b>Expanded</b>		
P2	Cleaning for Special Services	
PA	Cleaning per ASTM G93 Level D (Section 11.4)	
<b>Material Testing</b>		
<b>Expanded</b>		
V1	Dye Penetrant Exam	
<b>Material Examination</b>		
<b>Expanded</b>		
V2	Radiographic Examination	
<b>Flow Calibration</b>		
<b>Expanded</b>		
W1	Flow Calibration (Average K)	
<b>Special Inspection</b>		
<b>Standard</b>		<b>Standard</b>
QC1	Visual & Dimensional Inspection with Certificate	★
QC7	Inspection & Performance Certificate	★
<b>Surface Finish</b>		
<b>Standard</b>		<b>Standard</b>
RL	Surface finish for Low Pipe Reynolds # in Gas & Steam	★
RH	Surface finish for High Pipe Reynolds # in Liquid	★
<b>Material Traceability Certification</b>		
<b>Standard</b>		<b>Standard</b>
Q8 <sup>(4)</sup>	Material Traceability Certification per EN 10474:2004 3.1	★
<b>Code Conformance<sup>(5)</sup></b>		
<b>Expanded</b>		
J2	ANSI/ASME B31.1	
J3	ANSI/ASME B31.3	
<b>Materials Conformance</b>		
<b>Expanded</b>		
J5 <sup>(6)</sup>	NACE MR-0175 / ISO 15156	
<b>Country Certification</b>		
<b>Standard</b>		<b>Standard</b>
J6	European Pressure Directive (PED)	★
<b>Expanded</b>		
J1	Canadian Registration	



Table A-4. Rosemount 3051CFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

<b>Installed in Flanged Pipe Spool Section</b>		
<b>Expanded</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 Options</b>		
<b>Standard</b>		<b>Standard</b>
G2	Needle Valves, Stainless Steel	★
G6	OS&Y Gate Valve, Stainless Steel	★
<b>Expanded</b>		
G1	Needle Valves, Carbon Steel	
G3	Needle Valves, Alloy C-276	
G5	OS&Y Gate Valve, Carbon Steel	
G7	OS&Y Gate Valve, Alloy C-276	
<b>Special Shipment</b>		
<b>Standard</b>		<b>Standard</b>
Y1	Mounting Hardware Shipped Separately	★
<b>Special Dimensions</b>		
<b>Expanded</b>		
VM	Variable Mounting	
VT	Variable Tip	
VS	Variable length Spool Section	
<b>PlantWeb Control Functionality</b>		
<b>Standard</b>		<b>Standard</b>
A01 <sup>(7)</sup>	FOUNDATION fieldbus Advanced Control Function Block Suite	★
<b>PlantWeb Diagnostic Functionality</b>		
<b>Standard</b>		<b>Standard</b>
D01 <sup>(7)</sup>	FOUNDATION fieldbus Diagnostics Suite	★
<b>Product Certifications</b>		
<b>Standard</b>		<b>Standard</b>
C6	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
E5	FM Explosion-proof, Dust Ignition-proof	★
E7 <sup>(8)</sup>	IECEX Flameproof, Dust Ignition-proof	★
E8	ATEX Flameproof, Dust	★
I1 <sup>(8)</sup>	ATEX Intrinsic Safety	★
I5	FM Intrinsically Safe, Division 2	★
IA	ATEX FISCO Intrinsic Safety; for FOUNDATION fieldbus protocol only	★
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5 and I5)	★
K6 <sup>(8)</sup>	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E6 and I6)	★
K8 <sup>(8)</sup>	ATEX Flameproof, Intrinsic Safety, Type n, Dust (combination of E8, I1 and N1)	★
KB	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of K5 and C6)	★
KD <sup>(8)</sup>	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe (combination of K5, C6, I1, and E8)	★
N1 <sup>(8)</sup>	ATEX Type n	★
<b>Alternate Transmitter Material of Construction</b>		
<b>Standard</b>		<b>Standard</b>
L1	Inert Sensor Fill Fluid <i>Note: Silicone fill fluid is standard.</i>	★
L2	Graphite-Filled (PTFE) O-ring	★
LA	Inert Sensor Fill Fluid and Graphite-Filled (PTFE) O-ring	★
<b>Display and Interface Options</b>		
<b>Standard</b>		<b>Standard</b>
M4 <sup>(9)</sup>	LCD Display with Local Operator Interface	★
M5	LCD Display	★

# Annubar Flowmeter Series

Table A-4. Rosemount 3051CFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

<b>Transmitter Calibration Certification</b>		
<b>Standard</b>		<b>Standard</b>
Q4	Calibration Certificate for Transmitter	★
<b>Quality Certification for Safety</b>		
<b>Standard</b>		<b>Standard</b>
QS <sup>(11)</sup>	Certificate of FMEDA data	★
<b>Transient Protection</b>		
<b>Standard</b>		<b>Standard</b>
T1 <sup>(10)</sup>	Transient terminal block	★
<b>Manifold for Remote Mount Option</b>		
<b>Standard</b>		<b>Standard</b>
F2	3-Valve Manifold, Stainless Steel	★
F6	5-Valve Manifold, Stainless Steel	★
<b>Expanded</b>		
F1	3-Valve Manifold, Carbon Steel	
F3	3-Valve Manifold, Alloy C-276	
F5	5-Valve Manifold, Carbon Steel	
F7	5-Valve Manifold, Alloy C-276	
<b>Lower Power Output</b>		
<b>Standard</b>		<b>Standard</b>
C2 <sup>(11)</sup>	0.8-3.2 Vdc Output with Digital Signal Based on Hart Protocol	★
<b>Alarm Limit</b>		
<b>Standard</b>		<b>Standard</b>
C4 <sup>(11)(12)</sup>	NAMUR Alarm and Saturation Levels, High Alarm	★
CN <sup>(11)(12)</sup>	NAMUR Alarm and Saturation Levels, Low Alarm	★
<b>Ground Screw</b>		
<b>Standard</b>		<b>Standard</b>
V5 <sup>(13)</sup>	External Ground Screw Assembly	★
<b>Typical Model Number: 3051CFA D L 060 D C H P S 2 T1 0 0 0 3 2 A A 1</b>		

(1) Available in remote mount applications only.

(2) Option code M4 - LCD Display with Local Operator Interface required for local addressing and configuration.

(3) Applies to assembled flowmeter only, mounting not tested.

(4) Instrument Connections for Remote Mount Options and Isolation Valves for Flo-tap Models are not included in the Material Traceability Certification.

(5) Not available with Transmitter Connection Platform 6.

(6) Materials of Construction comply with metallurgical requirements within NACE MR0175/ISO 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.

(7) Only valid with FOUNDATION fieldbus Output Code F.

(8) Not available with Low Power code M.

(9) Available only with output code W - Profibus PA.

(10) The T1 option is not needed with FISCO Product Certifications, transient protection is included with the FISCO Product Certification code IA.

(11) Not available with FOUNDATION fieldbus (Output Code F) or Profibus (Output Code W).

(12) NAMUR-Compliant operation is pre-set at the factory and cannot be changed to standard operation in the field.

(13) The V5 option is not needed with the T1 option; external ground screw assembly is included with the T1 option.

## 3051CFA PERFORMANCE SPECIFICATIONS

Performance assumptions include: measured pipe I.D, transmitter is trimmed for optimum flow accuracy, and performance is dependent on application parameters.

Table 1. Flow Performance - Flow Reference Accuracy

3051CFA Annubar Flowmeter		
Ranges 2-3		±1.60% of Flow Rate at 8:1 flow turndown

## 3051CFA FUNCTIONAL SPECIFICATIONS

### Range and Sensor Limits

Table 2. 3051CF Range and Sensor Limits

Range	3051CF Minimum Span	Range and Sensor Limits
1	0.5 inH <sub>2</sub> O (1,2 mbar)	0 to 25 inH <sub>2</sub> O (62,3 mbar)
2	2.5 inH <sub>2</sub> O (6,2 mbar)	0 to 250 inH <sub>2</sub> O (0,63 bar)
3	10 inH <sub>2</sub> O (24,9 mbar)	0 to 1000 inH <sub>2</sub> O (2,49 bar)

### Zero and Span Adjustment Requirements (HART and Low Power)

Zero and span values can be set anywhere within the range limits stated in Table 2 and Table 3.

Span must be greater than or equal to the minimum span stated in Table 2 and Table 3.

### Service

Liquid, gas, and vapor applications

### 4–20 mA (Output Code A)

#### Output

Two-wire 4–20 mA, 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

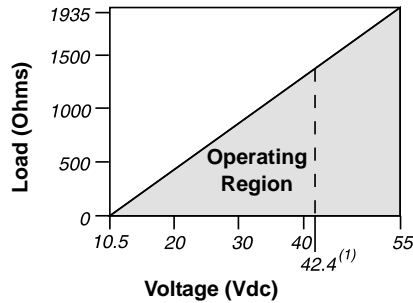
External power supply required. Standard transmitter (4–20 mA) operates on 10.5 to 55 Vdc with no load.

# Annubar Flowmeter Series

## Load Limitations

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

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



Communication requires a minimum loop resistance of 250 ohms.

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

## FOUNDATION fieldbus (output code F) and Profibus (output code W)

### Power Supply

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

### Current Draw

17.5 mA for all configurations (including LCD display option)

### FOUNDATION fieldbus Function Block Execution Times

Block	Execution Time
Resource	-
Transducer	-
LCD Block	-
Analog Input 1, 2	30 milliseconds
PID	45 milliseconds
Input Selector	30 milliseconds
Arithmetic	35 milliseconds
Signal Characterizer	40 milliseconds
Integrator	35 milliseconds

### FOUNDATION fieldbus Parameters

Schedule Entries	7 (max.)
Links	20 (max.)
Virtual Communications Relationships (VCR)	12 (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 units or custom and contains a status indicating measurement quality.

### **PID Block**

Contains all logic to perform PID control in the field including cascade and feedforward.

### **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.

## **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.

## **FOUNDATION fieldbus Diagnostics Suite (Option Code D01)**

The 3051C FOUNDATION fieldbus Diagnostics provide Abnormal Situation Prevention (ASP) indication. The integral statistical process monitoring (SPM) technology calculates the mean and standard deviation of the process variable 22 times per second. The 3051C ASP algorithm uses these values and highly flexible configuration options for customization to many user-defined or application specific abnormal situations. The detection of plugged impulse lines is the first available predefined application.

# Annubar Flowmeter Series

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## Low Power (Output Code M)

### Output

Three wire 1–5 Vdc or 0.8–3.2 Vdc (Option Code C2) user-selectable output. Also user selectable for linear or square root output configuration. Digital process variable superimposed on voltage signal, available to any host conforming to the *HART* protocol. Low-power transmitter operates on 6–12 Vdc with no load.

### Power Consumption

3.0 mA, 18–36 mW

### Minimum Load Impedance

100 k $\Omega$  ( $V_{out}$  wiring)

### Indication

Optional 5-digit LCD display

### Overpressure Limits

*Rosemount 3051CF*

- Range 0: 750 psi (51,7 bar)
- Range 1: 2000 psig (137,9 bar)
- Ranges 2–5: 3626 psig (250 bar)  
4500 psig (310,3 bar) for option code P9

### Static Pressure Limit

Operates within specifications between static line pressures of 0.5 psia and 3626 psig.

Range 1: 0.5 psia and 2000 psig (3, 4 bar and 137, 9 bar)

### Burst Pressure Limits

Burst pressure on Coplanar process flange is 10000 psig (69 MPa).

### Failure Mode Alarm

*Output Code A*

If self-diagnostics detect a gross transmitter failure, the analog signal will be driven either below 3.75 mA or to 21.75 mA to alert the user.

NAMUR-compliant values are available, option code C4. High or low alarm signal is user-selectable by internal jumper.

*Output Code M*

If self-diagnostics detect a gross transmitter failure, the analog signal will be driven either below 0.94 V or above 5.4 V to alert the user (below 0.75 V or above 4.4 V for Option C2). High or low alarm signal is user-selectable by internal jumper.

*Output Code F and W*

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

### Process Temperature Limits

For 3051CFA Temperature Limits, see page A-63.

Table 3. 3051CF Process Temperature Limits

3051CF	
Silicone Fill Sensor <sup>(1)</sup>	-40 to 250 °F (-40 to 121 °C)
Inert Fill Sensor <sup>(1)</sup>	0 to 185 °F (-18 to 85 °C)

*(1) Process temperatures above 185 °F (85 °C) require derating the ambient limits by a 1.5:1 ratio (0.6:1 ratio for the 3051H).*

### Transmitter Temperature Limits:

#### Ambient

-40 to 185 °F (-40 to 85 °C)

With LCD display<sup>(1)</sup>: -4 to 175 °F (-20 to 80 °C)

#### Storage

-50 to 230 °F (-46 to 110 °C)

With LCD display: -40 to 185 °F (-40 to 85 °C)

#### Process

At atmospheric pressures and above. See Table 3

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

### Humidity Limits

0–100% relative humidity

### Turn-On Time

Performance within specifications less than 2.0 seconds (10.0 s for Profibus protocol) after power is applied to the transmitter

### Volumetric Displacement

Less than 0.005 in<sup>3</sup> (0,08 cm<sup>3</sup>)

### Damping

Analog output response to a step input change is user-selectable from 0 to 36 seconds for one time constant. This software damping is in addition to sensor module response time.

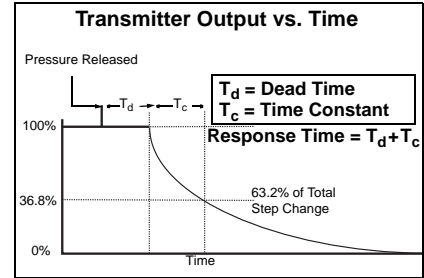
## Long Term Stability

Models	Long Term Stability
3051CF Ranges 2-3	±0.125% of URL for 5 years ±50 °F (28 °C) temperature changes, and up to 1000 psi (6,9 MPa) line pressure.
3051CF Low/Draft Range Range 1	±0.2% of URL for 1 year

# Annubar Flowmeter Series

## Dynamic Performance

	4 - 20 mA (HART protocol) <sup>(1)</sup>	Fieldbus protocol <sup>(3)</sup>	Typical HART Transmitter Response Time
<b>Total Response Time (<math>T_d + T_c</math>)<sup>(2)</sup>:</b>			
3051CF, Ranges 2-5:	100 ms	152 ms	
Range 1:	255 ms	307 ms	
<b>Dead Time (<math>T_d</math>)</b>	45 ms (nominal)	97 ms	
<b>Update Rate</b>	22 times per second	22 times per second	
<p>(1) Dead time and update rate apply to all models and ranges; analog output only  (2) Nominal total response time at 75 °F (24 °C) reference conditions.  (3) Transmitter fieldbus output only; segment macro-cycle not included.</p>			



### Vibration Effect

Less than  $\pm 0.1\%$  of URL when tested per the requirements of IEC60770-1 field or pipeline with high vibration level (10-60 Hz 0.21 mm displacement peak amplitude / 60-2000 Hz 3g).

### 3051CFA PHYSICAL SPECIFICATIONS

#### Electrical Connections

$\frac{1}{2}$ -14 NPT, PG 13.5, G $\frac{1}{2}$ , and M20 x 1.5 conduit. HART interface connections fixed to terminal block.

#### Process-Wetted Parts

For 3051CFA wetted parts, see "Annubar Sensor Material" on page A-63.

#### Process Isolating Diaphragms

316L SST, Alloy C-276, Alloy 400, Tantalum, Gold-plated Alloy 400, Gold-plate SST

### Non-Wetted Parts

#### Electronics Housing

Low-copper aluminum or CF-3M (Cast version of 316L SST, material per ASTM-A743). NEMA 4X, IP 65, IP 66

#### Coplanar Sensor Module Housing

CF-3M (Cast version of 316L SST, material per ASTM-A743)

#### Bolts

ASTM A449, Type 1 (zinc-cobalt plated carbon steel)  
ASTM F593G, Condition CW1 (Austenitic 316 SST)  
ASTM A193, Grade B7M (zinc plated alloy steel)  
Alloy K-500

#### Sensor Module Fill Fluid

Silicone oil (D.C. 200) or Fluorocarbon oil (Halocarbon or Fluorinert® FC-43 for 3051T)

#### Paint

Polyurethane

#### Cover O-rings

Buna-N



**2051CFA ORDERING INFORMATION**

Table A-5. Rosemount 2051CFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Model	Product Description	
2051CFA	Annubar Flowmeter	
<b>Measurement Type</b>		
<b>Standard</b>		<b>Standard</b>
D	Differential Pressure	★
<b>Fluid Type</b>		
<b>Standard</b>		<b>Standard</b>
L	Liquid	★
G	Gas	★
S	Steam	★
<b>Line Size</b>		
<b>Standard</b>		<b>Standard</b>
020	2-in. (50 mm)	★
025	2½-in. (63.5 mm)	★
030	3-in. (80 mm)	★
035	3½-in. (89 mm)	★
040	4-in. (100 mm)	★
050	5-in. (125 mm)	★
060	6-in. (150 mm)	★
070	7-in. (175 mm)	★
080	8-in. (200 mm)	★
100	10-in. (250 mm)	★
120	12-in. (300 mm)	★
<b>Pipe I.D. Range</b>		
<b>Standard</b>		<b>Standard</b>
C	Range C from the Pipe I.D. table	★
D	Range D from the Pipe I.D. table	★
<b>Expanded</b>		
A	Range A from the Pipe I.D. table	
B	Range B 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	
<b>Pipe Material / Mounting Assembly Material</b>		
<b>Standard</b>		<b>Standard</b>
C	Carbon steel (A105)	★
S	316 Stainless Steel	★
0 <sup>(1)</sup>	No Mounting (Customer Supplied)	
<b>Expanded</b>		
G	Chrome-Moly Grade F-11	
N	Chrome-Moly Grade F-22	
J	Chrome-Moly Grade F-91	
<b>Piping Orientation</b>		
<b>Standard</b>		<b>Standard</b>
H	Horizontal Piping	★
D	Vertical Piping with Downwards Flow	★
U	Vertical Piping with Upwards Flow	★
<b>Annubar Type</b>		
<b>Standard</b>		<b>Standard</b>
P	Pak-Lok	★
F	Flanged with opposite side support	★

# Annubar Flowmeter Series

Table A-5. Rosemount 2051CFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Sensor Material		
<b>Standard</b>		<b>Standard</b>
S	316 Stainless Steel	★
<b>Sensor Size</b>		
<b>Standard</b>		<b>Standard</b>
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)	★
<b>Mounting Type</b>		
<b>Standard</b>		<b>Standard</b>
T1	Compression or Threaded Connection	★
A1	150# RF ANSI	★
A3	300# RF ANSI	★
A6	600# RF ANSI	★
D1	DN PN16 Flange	★
D3	DN PN40 Flange	★
D6	DN PN100 Flange	★
<b>Expanded</b>		
R1	150# RTJ Flange	
R3	300# RTJ Flange	
R6	600# RTJ Flange	
<b>Opposite Side Support or Packing Gland</b>		
<b>Standard</b>		<b>Standard</b>
0	No opposite side support or packing gland (Required for Pak-Lok and Flange-Lok models)	★
<b>Opposite Side Support – Required for Flanged Models</b>		
C	NPT Threaded Opposite Support Assembly – Extended Tip	★
D	Welded Opposite Support Assembly – Extended Tip	★
<b>Isolation Valve for Flo-Tap Models</b>		
<b>Standard</b>		<b>Standard</b>
0 <sup>(1)</sup>	Not Applicable or Customer Supplied	★
<b>Temperature Measurement</b>		
<b>Standard</b>		<b>Standard</b>
T	Integral RTD – not available with Flanged model greater than class 600#	★
0	No Temperature Sensor	★
<b>Expanded</b>		
R	Remote Thermowell and RTD	
<b>Transmitter Connection Platform</b>		
<b>Standard</b>		<b>Standard</b>
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	★
7	Remote-mount NPT Connections (1/2-in. FNPT)	★
<b>Expanded</b>		
8	Remote-mount SW Connections (1/2-in.)	
<b>Differential Pressure Range</b>		
<b>Standard</b>		<b>Standard</b>
1	0 to 25 in H <sub>2</sub> O (0 to 62,3 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)	★
<b>Transmitter Output</b>		
<b>Standard</b>		<b>Standard</b>
A	4–20 mA with digital signal based on HART Protocol	★
F	FOUNDATION fieldbus Protocol	★
<b>Expanded</b>		
M	Low-Power, 1-5 Vdc with Digital Signal Based on HART Protocol	

# Reference Manual

00809-0100-4809, Rev CB

March 2012

# Annubar Flowmeter Series

Table A-5. Rosemount 2051CFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Transmitter Housing Material <sup>(2)</sup>		Conduit Entry Size	
<b>Standard</b>			<b>Standard</b>
A	Polyurethane-covered Aluminum	1/2-14 NPT	★
B	Polyurethane-covered Aluminum	M20 x 1.5	★
J	SST	1/2-14 NPT	★
K <sup>(3)</sup>	SST	M20 x 1.5	★
<b>Expanded</b>			
D	Polyurethane-covered Aluminum	G <sup>1</sup> / <sub>2</sub>	
M <sup>(3)</sup>	SST	G <sup>1</sup> / <sub>2</sub>	
<b>Transmitter Performance Class</b>			
<b>Standard</b>			<b>Standard</b>
1	2.0% flow rate accuracy, 5:1 flow turndown, 2-year stability		★

## Options (Include with selected model number)

<b>Pressure Testing</b>			
<b>Expanded</b>			
P1 <sup>(4)</sup>	Hydrostatic Testing with Certificate		
PX <sup>(4)</sup>	Extended Hydrostatic Testing		
<b>Special Cleaning</b>			
<b>Expanded</b>			
P2	Cleaning for Special Services		
PA	Cleaning per ASTM G93 Level D (Section 11.4)		
<b>Material Testing</b>			
<b>Expanded</b>			
V1	Dye Penetrant Exam		
<b>Material Examination</b>			
<b>Expanded</b>			
V2	Radiographic Examination		
<b>Special Inspection</b>			
<b>Standard</b>			<b>Standard</b>
QC1	Visual & Dimensional Inspection with Certificate		★
QC7	Inspection & Performance Certificate		★
<b>Surface Finish</b>			
<b>Standard</b>			<b>Standard</b>
RL	Surface finish for Low Pipe Reynolds # in Gas & Steam		★
RH	Surface finish for High Pipe Reynolds # in Liquid		★
<b>Material Traceability Certification</b>			
<b>Standard</b>			<b>Standard</b>
Q8 <sup>(5)</sup>	Material Traceability Certification per EN 10474:2004 3.1		★
<b>Code Conformance</b>			
<b>Expanded</b>			
J2	ANSI/ASME B31.1		
J3	ANSI/ASME B31.3		
<b>Materials Conformance</b>			
<b>Expanded</b>			
J5 <sup>(6)</sup>	NACE MR-0175 / ISO 15156		
<b>Country Certification</b>			
<b>Standard</b>			<b>Standard</b>
J6	European Pressure Directive (PED)		★
<b>Expanded</b>			
J1	Canadian Registration		

# Annubar Flowmeter Series

Table A-5. Rosemount 2051CFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
The Expanded offering is subject to additional delivery lead time.

<b>Instrument Connections for Remote Mount Options</b>		
<b>Standard</b>		<b>Standard</b>
G2	Needle Valves, Stainless Steel	★
G6	OS&Y Gate Valve, Stainless Steel	★
<b>Expanded</b>		
G1	Needle Valves, Carbon Steel	
G3	Needle Valves, Alloy C-276	
G5	OS&Y Gate Valve, Carbon Steel	
G7	OS&Y Gate Valve, Alloy C-276	
<b>Special Shipment</b>		
<b>Standard</b>		<b>Standard</b>
Y1	Mounting Hardware Shipped Separately	★
<b>Product Certifications</b>		
<b>Standard</b>		<b>Standard</b>
E1 <sup>(3)</sup>	ATEX Flameproof	★
E5	FM Explosion-proof, Dust Ignition-proof	★
E6	CSA Explosion-proof, Dust Ignition-proof, Division 2	★
E7	IECEx Flameproof, Dust Ignition-proof	★
I1 <sup>(3)</sup>	ATEX Intrinsic Safety	★
I5	FM Intrinsically Safe, Division 2	★
I6	CSA Intrinsically Safe	★
I7 <sup>(3)</sup>	IECEx Intrinsic Safety	★
IA <sup>(7)</sup>	ATEX FISCO Intrinsic Safety; for FOUNDATION fieldbus protocol only	★
IE <sup>(7)</sup>	FM FISCO Intrinsically Safe	★
IF <sup>(7)</sup>	CSA FISCO Intrinsically Safe	★
IG <sup>(7)</sup>	IECEx FISCO Intrinsically Safe	★
K1 <sup>(3)</sup>	ATEX Flameproof, Intrinsic Safety, Type n, Dust	★
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5 and I5)	★
K6	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E6 and I6)	★
K7 <sup>(3)</sup>	IECEx Flameproof, Dust Ignition-proof, Intrinsic Safety, Type n (combination of E7, I7, and N7)	★
KA <sup>(3)</sup>	ATEX and CSA Flameproof, Intrinsically Safe, Division 2	★
KB	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5, E6, I5, and I6)	★
KC <sup>(3)</sup>	FM and ATEX Explosion-proof, Intrinsically Safe, Division 2	★
KD <sup>(3)</sup>	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe (combination of E5, I5, E6, I6, E1, and I1)	★
N1 <sup>(3)</sup>	ATEX Type n	★
N7 <sup>(3)</sup>	IECEx Type n	★
ND <sup>(3)</sup>	ATEX Dust	★
<b>Alternate Transmitter Material of Construction</b>		
<b>Standard</b>		<b>Standard</b>
L1	Inert Sensor Fill Fluid	★
L2	Graphite-Filled (PTFE) O-ring	★
LA	Inert Sensor Fill Fluid and Graphite-Filled (PTFE) O-ring	★
<b>Digital Display</b>		
<b>Standard</b>		<b>Standard</b>
M5	PlantWeb LCD display (Requires PlantWeb housing)	★
<b>Transmitter Calibration Certification</b>		
<b>Standard</b>		<b>Standard</b>
Q4	Calibration Certificate for Transmitter	★
<b>Quality Certification for Safety</b>		
<b>Standard</b>		<b>Standard</b>
QS <sup>(8)</sup>	Certificate of FMEDA data	★
<b>Transient Protection</b>		
<b>Standard</b>		<b>Standard</b>
T1 <sup>(9)</sup>	Transient terminal block	★

Table A-5. Rosemount 2051CFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Manifold for Remote Mount Option		
<b>Standard</b>		<b>Standard</b>
F2	3-Valve Manifold, Stainless Steel	★
F6	5-Valve Manifold, Stainless Steel	★
<b>Expanded</b>		
F1	3-Valve Manifold, Carbon Steel	
F5	5-Valve Manifold, Carbon Steel	
<b>Hardware Adjustments</b>		
<b>Standard</b>		<b>Standard</b>
D4	Zero and Span Hardware Adjustments	★
<b>Alarm Limit</b>		
<b>Standard</b>		<b>Standard</b>
C4 <sup>(8)(10)</sup>	NAMUR Alarm and Saturation Levels, High Alarm	★
CN <sup>(8)(10)</sup>	NAMUR Alarm and Saturation Levels, Low Alarm	★
<b>Ground Screw</b>		
<b>Standard</b>		<b>Standard</b>
V5 <sup>(11)</sup>	External Ground Screw Assembly	★
<b>Typical Model Number: 2051CFA D L 060 D C H P S 2 T1 0 0 0 3 2A A 1A 3</b>		

(1) Provide the "A" dimension for Flanged (page A-89) and Pak-Lok (page A-88).

(2) Material specified is cast as follows: CF-8M is the cast version of 316 SST, CF-3M is the cast version of 316L SST. For housing, material is aluminum with polyurethane paint.

(3) Not available with Low Power Output Code M.

(4) Applies to assembled flowmeter only, mounting not tested.

(5) Instrument Connections for Remote Mount Options and Isolation Valves for Flo-tap Models are not included in the Material Traceability Certification.

(6) Materials of Construction comply with metallurgical requirements within NACE MR0175/ISO 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.

(7) Only valid with FOUNDATION fieldbus Output Code F.

(8) Not available with Output Protocol code F.

(9) Not available with Housing code 00, 5A, or 7J. The T1 option is not needed with FISCO Product Certifications, transient protection is included with the FISCO Product Certification code IA.

(10) NAMUR-Compliant operation is pre-set at the factory and cannot be changed to standard operation in the field.

(11) The V5 option is not needed with the T1 option; external ground screw assembly is included with the T1 option.

# Annubar Flowmeter Series

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## 2051CFA SPECIFICATIONS

### 2051CFA PERFORMANCE SPECIFICATIONS

Performance assumptions include: measured pipe I.D, transmitter is trimmed for optimum flow accuracy, and performance is dependent on application parameters.

Table 4. Flow Performance - Flow Reference Accuracy

2051CFA Annubar Flowmeter		
Ranges 2-3		±2.00% of Flow Rate at 5:1 flow turndown

### 2051CFA FUNCTIONAL SPECIFICATIONS

#### Range and Sensor Limits

Range	2051CF Minimum Span	Range and Sensor Limits
1	0.5 inH <sub>2</sub> O (1,2 mbar)	0 to 25 inH <sub>2</sub> O (62,3 mbar)
2	2.5 inH <sub>2</sub> O (6,2 mbar)	0 to 250 inH <sub>2</sub> O (0,62 bar)
3	10 inH <sub>2</sub> O (24,9 mbar)	0 to 1000 inH <sub>2</sub> O (2,49 bar)

#### Service

Liquid, gas, and steam applications

#### Protocols

##### 4–20 mA HART (Output Code A)

###### Output

Two-wire 4–20 mA, 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 operates on 10.5 to 42.4 Vdc with no load.

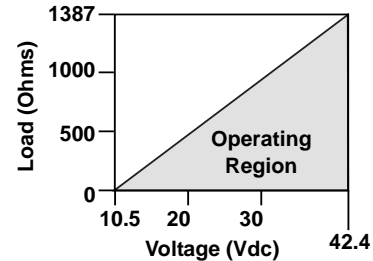
###### Turn-On Time

Performance within specifications less than 2.0 seconds after power is applied to the transmitter.

### Load Limitations

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

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



*The Field Communicator requires a minimum loop resistance of 250Ω for communication.*

### FOUNDATION fieldbus (Output Code F)

#### Power Supply

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

#### Current Draw

17.5 mA for all configurations (including LCD display option)

#### Turn-On Time

Performance within specifications less than 20.0 seconds after power is applied to the transmitter.

#### FOUNDATION fieldbus Function Block Execution Times

Block	Execution Time
Resource	-
Transducer	-
LCD Block	-
Analog Input 1, 2	30 milliseconds
PID	45 milliseconds

#### FOUNDATION fieldbus Parameters

Schedule Entries	7 (max.)
Links	20 (max.)
Virtual Communications Relationships (VCR)	12 (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 units or custom and contains a status indicating measurement quality.

# Annubar Flowmeter Series

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## *PID Block*

- Contains all logic to perform PID control in the field including cascade and feedforward.

## 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.

## 1-5 Vdc HART Low Power (Output Code M)

### Output

Three wire 1–5 Vdc output, user-selectable for linear or square root output. Digital process variable superimposed on voltage signal, available to any host conforming to the *HART* protocol.

### Power Supply

External power supply required. Standard transmitter operates on 9 to 28 Vdc with no load.

### Power Consumption

3.0 mA, 27–84 mW

### Output Load

100 k $\Omega$  or greater

### Turn-On Time

Performance within specifications less than 2.0 seconds after power is applied to the transmitter.

## Overpressure Limits

Transmitters withstand the following limits without damage:

### 2051CF Flowmeters

- Ranges 2–5: 3626 psig (250 bar)  
4500 psig (310,3 bar) for option code P9
- Range 1: 2000 psig (137,9 bar)

## Static Pressure Limit

- Operates within specifications between static line pressures of -14.2 psig (0.034 bar) and 3626 psig (250 bar)
- Range 1: 0.5 psia to 2000 psig (34 mbar and 137,9 bar)

## Burst Pressure Limits

### 2051CF

- 10000 psig (689,5 bar)

## Temperature Limits

For 2051CFA Temperature Limits, see page A-63.

### Transmitter Temperature Limits:

#### Ambient<sup>(1)</sup>

-40 to 185 °F (-40 to 85 °C)

With LCD display<sup>(2)</sup>: -40 to 175 °F (-40 to 80 °C)

#### Storage<sup>(1)</sup>

-50 to 230 °F (-46 to 110 °C)

With LCD display: -40 to 185 °F (-40 to 85 °C)

<sup>(1)</sup> Limits for silicone fill fluid only.

<sup>(2)</sup> LCD display may not be readable and LCD updates will be slower at temperatures below -4 °F (-20 °C).



### Process Temperature Limits

At atmospheric pressures and above.

Table A-6. 2051 Process Temperature Limits

2051C	
Silicone Fill Sensor <sup>(1)</sup>	-40 to 250 °F (-40 to 121 °C)
Inert Fill Sensor <sup>(1)</sup>	-40 to 185 °F (-40 to 85 °C)

(1) Process temperatures above 185 °F (85 °C) require derating the ambient limits by a 1.5:1 ratio.

### Humidity Limits

0–100% relative humidity

### Volumetric Displacement

Less than 0.005 in<sup>3</sup> (0,08 cm<sup>3</sup>)

### Damping

Analog output response to a step input change is user-selectable from 0 to 25.6 seconds for one time constant. This software damping is in addition to sensor module response time.

### Failure Mode Alarm

If self-diagnostics detect a sensor or microprocessor failure, the analog signal is driven either high or low to alert the user. High or low failure mode is user-selectable with a jumper on the transmitter. The values to which the transmitter drives its output in failure mode depend on whether it is factory-configured to *standard* or *NAMUR-compliant* operation. The values for each are as follows:

Standard Operation			
Output Code	Linear Output	Fail High	Fail Low
A	$3.9 \leq I \leq 20.8$	$I \geq 21.75 \text{ mA}$	$I \leq 3.75 \text{ mA}$
M	$0.97 \leq V \leq 5.2$	$V \geq 5.4 \text{ V}$	$V \leq 0.95 \text{ V}$

NAMUR-Compliant Operation			
Output Code	Linear Output	Fail High	Fail Low
A	$3.8 \leq I \leq 20.5$	$I \geq 22.5 \text{ mA}$	$I \leq 3.6 \text{ mA}$

### Output Code F

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

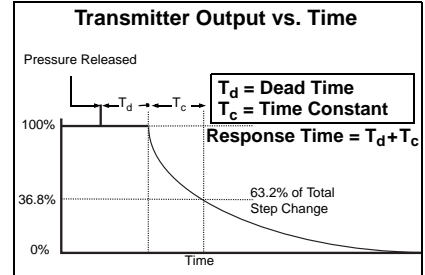
### Long Term Stability

Models	Standard	Performance Option, P8
2051CF		
Range 1 (CF)	±0.2% of URL for 1 year, Reference Stability	±0.125% of URL for 5 years, Operating Stability
Ranges 2-5	±0.1% of URL for 2 years, Operating Stability	

# Annubar Flowmeter Series

## Dynamic Performance

	4-20 mA HART <sup>(1)</sup> 1-5 Vdc HART Low Power	FOUNDATION fieldbus <sup>(3)</sup>	Typical HART Transmitter Response Time
<b>Total Response Time (<math>T_d + T_c</math>)<sup>(2)</sup>:</b>			
2051CF, Range 3-5:	115 milliseconds	152 milliseconds	
Range 1:	270 milliseconds	307 milliseconds	
Range 2:	130 milliseconds	152 milliseconds	
<b>Dead Time (<math>T_d</math>)</b>	60 milliseconds (nominal)	97 milliseconds	
<b>Update Rate</b>	22 times per second	22 times per second	
<sup>(1)</sup> Dead time and update rate apply to all models and ranges; analog output only <sup>(2)</sup> Nominal total response time at 75 °F (24 °C) reference conditions. <sup>(3)</sup> Transmitter fieldbus output only, segment macro-cycle not included.			



## Vibration Effect

Less than  $\pm 0.1\%$  of URL when tested per the requirements of IEC60770-1 field or pipeline with high vibration level (10-60 Hz 0.21mm displacement peak amplitude / 60-2000 Hz 3g).

## 2051CFA PHYSICAL SPECIFICATIONS

### Electrical Connections

$\frac{1}{2}$ –14 NPT, G $\frac{1}{2}$ , and M20  $\times$  1.5 conduit.

### 2051CF Process-Wetted Parts

For 2051CFA wetted parts, see “Annubar Sensor Material” on page A-63.

### Process Isolating Diaphragms

316L SST, Alloy C-276, or Tantalum

## Non-Wetted Parts for 2051CF

### Electronics Housing

Low-copper aluminum or CF-8M (Cast version of 316 SST). Enclosure Type 4X, IP 65, IP 66, IP68

### Coplanar Sensor Module Housing

CF-3M (Cast version of 316L SST)

### Bolts

ASTM A449, Type 1 (zinc-cobalt plated carbon steel)  
 ASTM F593G, Condition CW1 (Austenitic 316 SST)  
 ASTM A193, Grade B7M (zinc plated alloy steel)

### Sensor Module Fill Fluid

Silicone oil (D.C. 200) or Fluorocarbon oil (Halocarbon or Fluorinert<sup>®</sup> FC-43 for 2051T)

### Paint

Polyurethane

### Cover O-rings

Buna-N

**3095MFA ORDERING INFORMATION**

Table A-7. Rosemount 3095MFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
The Expanded offering is subject to additional delivery lead time.

Model	DP Flow Flowmeter Type	
3095MFA	Annubar Flowmeter	
Fluid Type		
L	Liquid	
G	Gas	
S	Steam	
Line Size		
020	2-in. (50 mm)	
025	2 <sup>1</sup> / <sub>2</sub> -in. (63,5 mm)	
030	3-in. (80 mm)	
035	3 <sup>1</sup> / <sub>2</sub> -in. (89 mm)	
040	4-in. (100 mm)	
050	5-in. (125 mm)	
060	6-in. (150 mm)	
070	7-in. (175 mm)	
080	8-in. (200 mm)	
100	10-in. (250 mm)	
120	12-in. (300 mm)	
140	14-in. (350 mm)	
160	16-in. (400 mm)	
180	18-in. (450 mm)	
200	20-in. (500 mm)	
240	24-in. (600 mm)	
300	30-in. (750 mm)	
360	36-in. (900 mm)	
420	42-in. (1066 mm)	
480	48-in. (1210 mm)	
600	60-in. (1520 mm)	
720	72-in. (1820 mm)	
780	78-in. (1950 mm)	
840	84-in. (2100 mm)	
900	90-in. (2250 mm)	
960	96-in. (2400 mm)	
Pipe I.D. Range		
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 Above 12-in. Line Size	
Pipe Material / Assembly Material		
C	Carbon steel (A105)	
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)	
Piping Orientation		
H	Horizontal Piping	
D	Vertical Piping with Downwards Flow	
U	Vertical Piping with Upwards Flow	

# Annubar Flowmeter Series

Table A-7. Rosemount 3095MFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
The Expanded offering is subject to additional delivery lead time.

<b>Annubar Type</b>			
P	Pak-Lok		
F	Flanged with opposite side support		
L	Flange-Lok		
G	Gear-Drive Flo-Tap		
M	Manual Flo-Tap		
<b>Sensor Material</b>			
S	316 Stainless Steel		
H	Alloy C-276		
<b>Sensor Size</b>			
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 12-in. (300 mm)		
<b>Mounting Type</b>			
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		
R1	150# RTJ Flange		
R3	300# RTJ Flange		
R6	600# RTJ Flange		
R9	900# RTJ Flange		
RF	1500# RTJ Flange		
RT	2500# RTJ Flange		
<b>Opposite Side Support or Packing Gland</b>			
0	No opposite side support or packing gland (Required for Pak-Lok and Flange-Lok models)		
	<b>Opposite Side Support – Required for Flanged Models</b>		
C	NPT Threaded Opposite Support Assembly – Extended Tip		
D	Welded Opposite Support Assembly – Extended Tip		
	<b>Packing Gland – Required for Flo-Tap Models</b>		
	<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	Alloy C-276 Packing Gland / Cage Nipple	Stainless Steel	Graphite
<b>Isolation Valve for Flo-Tap Models</b>			
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		
<b>Temperature Measurement</b>			
T	Integral RTD – not available with Flanged model greater than class 600		
R	Remote Thermowell and RTD		
0	No Temperature Sensor		

Table A-7. Rosemount 3095MFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

<b>Transmitter Connection Platform</b>		
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 (1/2-in. FNPT)	
8	Remote-mount SW Connections (1/2-in.)	
<b>Differential Pressure Ranges</b>		
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 623 mbar)	
3	0 to 1000 in H <sub>2</sub> O (0 to 2,5 bar)	
<b>Static Pressure Ranges</b>		
B	0–8 to 0–800 psia (0–55,16 to 0–5515,8 kPa)	
C	0–8 to 0–800 psig (0–55,16 to 0–5515,8 kPa)	
D	0–36.2 to 0–3626 psia (0–250 to 0–25000 kPa)	
E	0–36.2 to 0–3626 psig (0–250 to 0–25000 kPa)	
<b>Output Protocol</b>		
A	4–20 mA with digital signal based on HART protocol	
V	FOUNDATION fieldbus	
<b>Code</b>	<b>Transmitter Housing Style</b>	<b>Conduit Entry Size</b>
1A	Polyurethane-covered aluminum	1/2-14 NPT
1B	Polyurethane-covered aluminum	M20 x 1.5
1C	Polyurethane-covered aluminum	G 1/2
1J	SST	1/2-14 NPT
1K	SST	M20 x 1.5
1L	SST	G 1/2
<b>OPTIONS</b>		
<b>Performance Class</b>		
U3 <sup>(2)</sup>	Ultra for Flow: up to 0.95% 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>	Advanced Control Function Block Suite	
<b>Pressure Testing</b>		
P1 <sup>(4)</sup>	Hydrostatic Testing	
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 & Dimensional Inspection with Certificate	
QC7	Inspection & 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 EN 10204:2004 3.1	

# Annubar Flowmeter Series

Table A-7. Rosemount 3095MFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
The Expanded offering is subject to additional delivery lead time.

<b>Code Conformance</b>	
J2 <sup>(6)</sup>	ANSI/ASME B31.1
J3 <sup>(6)</sup>	ANSI/ASME B31.3
<b>Material Conformance</b>	
J5 <sup>(7)</sup>	NACE MR-0175 / ISO 15156
<b>Country Certification</b>	
J1	Canadian Registration
<b>Installed in Flanged Pipe Spool Section<sup>(8)</sup></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, Alloy C-276
G5	OS&Y Gate Valve, Carbon Steel
G6	OS&Y Gate Valve, Stainless Steel
G7	OS&Y Gate Valve, Alloy C-276
<b>Special Shipment</b>	
Y1	Mounting Hardware Shipped Separately
<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>	
E5	FM Approvals Explosion-proof
I5	FM Approvals Intrinsic Safety, Non-Incendive
K5	FM Approvals Explosion-proof, Intrinsic Safety, Non-Incendive (combination of E5 and I5)
E6	CSA Explosion-proof
I6	CSA Intrinsically Safe, Division 2
K6	CSA Explosion-proof, Intrinsically Safe, Division 2
I1	ATEX Intrinsic Safety
E1	ATEX Flameproof
N1	ATEX Type n
K1	ATEX Flameproof, Intrinsic Safety, Type n
ND	ATEX Dust
E4	TIIS Flameproof Certification
I7	IECEx Intrinsic Safety
<b>Alternate Transmitter Material of Construction</b>	
L1 <sup>(9)</sup>	Inert Sensor Fill Fluid
<b>Display</b>	
M5	Digital Display
<b>Terminal Blocks</b>	
T1	Transient Protection

Table A-7. Rosemount 3095MFA Annubar Flowmeter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
 The Expanded offering is subject to additional delivery lead time.

<b>Manifold for Remote Mount Option</b>	
F1	3-Valve Manifold, Carbon Steel
F2	3-Valve Manifold, Stainless Steel
F3	3-Valve Manifold, Alloy C-276
F5	5-Valve Manifold, Carbon Steel
F6	5-Valve Manifold, Stainless Steel
F7	5-Valve Manifold, Alloy C-276
<b>Typical Model Number: 3095MFA L 060 D C H P S 2 T1 0 0 0 3 2 C A 1A</b>	

- (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 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.
- (8) Available for line sizes from 2 to 8-in. (50 to 200 mm).
- (9) Not available with DP range 1.

# Annubar Flowmeter Series

## 3095MFA SPECIFICATIONS

### 3095MFA Performance Specifications

#### System Reference Accuracy

±0.95% (8:1 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 A-8. 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.
- Performance dependent on application parameters.

#### Sizing

Contact an 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



## 3095MFA Functional Specifications

### 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.

### Service

- Liquid
- Gas
- Steam

### Power Supply

4–20 mA option

- External power supply required. Standard transmitter (4–20 mA) operates on 11 to 55 Vdc 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)
- 400 °F (205 °C) when top mounted in steam service

Remote Mount Transmitter

- 1250 °F (677 °C) – Alloy C-276 Sensor Material (For superheated steam applications above 1000 °F (538 °C), it is recommended that the Rosemount 585 with Alloy 800H sensor material is used.)
- 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

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<sup>(1)</sup>

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

<sup>(1)</sup> Maximum allowable pressure will be limited by the transmitter pressure limit of 3626 psi.

# Annubar Flowmeter Series

## Overpressure Limits

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

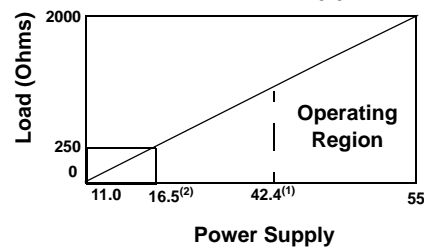
## Static Pressure Limits

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

## 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 Vdc.

(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

- 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.

# Annubar Flowmeter Series

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## 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.

## 3095MFA Physical Specifications

### 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 × 1.5 (CM20) conduit. HART interface connections fixed to terminal block for output code A

## **Annubar Sensor Material**

- 316 Stainless Steel
- Alloy C-276

## **Annubar Type**

See “3051SF Dimensional Drawings” on page A-76

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 (–100 to 850 °F (–73 to 454 °C)).
- Not available for steam above 600 °F (315 °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))
- Alloy C-276: (–300 to 1250 °F (–184 to 677 °C)).
- Top mounting is recommended for steam temperatures above 600 °F (315 °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)
- –100 to 850 °F (–73 to 454 °C).
- Not available for steam above 600 °F (315 °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: –100 to 850 °F (–73 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 1¼-in. (Sensor Size one) and 2-in. (Sensor Size 2).
  - Top mounting is recommended for steam temperatures above 600 °F (315 °C)

# Annubar Flowmeter Series

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## **Process-Wetted Parts**

### Integral Manifolds

- 316 SST
- Alloy C-276

### Remote Manifolds

- 316 SST
- Alloy C-276

### Transmitter Vent Valves and Process Flanges

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

### Process Isolation Diaphragms

- 316 SST
- Alloy 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

- Carbon Steel

## 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	X			
	Threaded connection				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
R1	150# RTJ Flange		X	X	X
R3	300# RTJ Flange		X	X	X
R6	600# RTJ Flange		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. Maximum allowable pressure will be limited by the transmitter pressure limit of 3626 psi.

## Instrument Connections Temperature Ranges

Table A-9. 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, Alloy C-276	-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, Alloy C-276	-40 to 1250 °F (-40 to 677 °C)

# Annubar Flowmeter Series

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## 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
- Available in carbon steel (A105) and stainless steel

Table A-10. Flanged Pipe Spool Section Schedule

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

Table A-11. 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)



**485 ANNUBAR PRIMARY  
 ELEMENT ORDERING  
 INFORMATION**

Table A-12. Rosemount 485 Annubar Primary Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
 The Expanded offering is subject to additional delivery lead time.

Model	DP Flow Primary Type	
485	Annubar Primary Element	
<b>Fluid Type</b>		
<b>Standard</b>		<b>Standard</b>
L	Liquid	★
G	Gas	★
S	Steam	★
<b>Line Size</b>		
<b>Standard</b>		<b>Standard</b>
020	2-in. (50 mm)	★
025	2½-in. (63,5 mm)	★
030	3-in. (80 mm)	★
035	3½-in. (89 mm)	★
040	4-in. (100 mm)	★
050	5-in. (125 mm)	★
060	6-in. (150 mm)	★
070	7-in. (175 mm)	★
080	8-in. (200 mm)	★
100	10-in. (250 mm)	★
120	12-in. (300 mm)	★
<b>Expanded</b>		
140	14-in. (350 mm)	
160	16-in. (400 mm)	
180	18-in. (450 mm)	
200	20-in. (500 mm)	
240	24-in. (600 mm)	
300	30-in. (750 mm)	
360	36-in. (900 mm)	
420	42-in. (1066 mm)	
480	48-in. (1210 mm)	
600	60-in. (1520 mm)	
720	72-in. (1820 mm)	
780	78-in. (1950 mm)	
840	84-in. (2100 mm)	
900	90-in. (2250 mm)	
960	96-in. (2400 mm)	
<b>Pipe I.D. Range</b>		
<b>Standard</b>		<b>Standard</b>
C	Range C from the Pipe I.D. table	★
D	Range D from the Pipe I.D. table	★
<b>Expanded</b>		
A	Range A from the Pipe I.D. table	
B	Range B from the Pipe I.D. table	
E	Range E from the Pipe I.D. table	
Z	Non-standard Pipe I.D. Range or Above 12-in. Line Size	

# Annubar Flowmeter Series

Table A-12. Rosemount 485 Annubar Primary Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
The Expanded offering is subject to additional delivery lead time.

<b>Pipe Material / Assembly Material</b>		
<b>Standard</b>		<b>Standard</b>
C	Carbon steel (A105)	★
S	316 Stainless Steel	★
0 <sup>(1)</sup>	No mounting (Customer Supplied)	★
<b>Expanded</b>		
G	Chrome-Moly Grade F-11	
N	Chrome-Moly Grade F-22	
J	Chrome-Moly Grade F-91	
<b>Piping Orientation</b>		
<b>Standard</b>		<b>Standard</b>
H	Horizontal Piping	★
D	Vertical Piping with Downwards Flow	★
U	Vertical Piping with Upwards Flow	★
<b>Annubar Type</b>		
<b>Standard</b>		<b>Standard</b>
P	Pak-Lok	★
F	Flanged with opposite side support	★
<b>Expanded</b>		
L	Flange-Lok	
G	Gear-Drive Flo-Tap	
M	Manual Flo-Tap	
<b>Sensor Material</b>		
<b>Standard</b>		<b>Standard</b>
S	316 Stainless Steel	★
<b>Expanded</b>		
H	Alloy C-276	
<b>Sensor Size</b>		
<b>Standard</b>		<b>Standard</b>
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)	★
<b>Mounting Type</b>		
<b>Standard</b>		<b>Standard</b>
T1	Compression/Threaded Connection	★
A1	150# RF ANSI	★
A3	300# RF ANSI	★
A6	600# RF ANSI	★
D1	DN PN16 Flange	★
D3	DN PN40 Flange	★
D6	DN PN100 Flange	★
<b>Expanded</b>		
A9 <sup>(2)</sup>	900# RF ANSI	
AF <sup>(2)</sup>	1500# RF ANSI	
AT <sup>(2)</sup>	2500 # RF ANSI	
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	

Table A-12. Rosemount 485 Annubar Primary Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
The Expanded offering is subject to additional delivery lead time.

<b>Opposite Side Support or Packing Gland</b>				
<b>Standard</b>				<b>Standard</b>
0	No opposite side support or Packing Gland (Required for Pak-Lok and Flange-Lok models)			★
<b>Opposite Side Support – Required for Flanged Models</b>				
C	NPT Threaded Opposite Support Assembly – Extended Tip			★
D	Welded Opposite Support Assembly – Extended Tip			★
<b>Packing Gland – Required for Flo-Tap Models</b>				
<b>Expanded</b>				
	<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	Alloy C-276 Packing Gland / Cage Nipple	Stainless Steel	Graphite	
<b>Isolation Valve for Flo-Tap Models</b>				
<b>Standard</b>				<b>Standard</b>
0 <sup>(1)</sup>	Not Applicable or Customer Supplied			★
<b>Expanded</b>				
1	Gate Valve, Carbon Steel			
2	Gate Valve, Stainless Steel			
5	Ball Valve, Carbon Steel			
6	Ball Valve, Stainless Steel			
<b>Temperature Measurement</b>				
<b>Standard</b>				<b>Standard</b>
T	Integral RTD – not available with Flanged model greater than class 600#			★
0	No Temperature Sensor			★
<b>Expanded</b>				
R	Remote Thermowell and RTD			
<b>Transmitter Connection Platform</b>				
<b>Standard</b>				<b>Standard</b>
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			★
7	Remote-mount NPT Connections			★
<b>Expanded</b>				
6	Direct-mount, High Temperature 5-valve Manifold– not available with Flanged model greater than class 600			
8	Remote-mount SW Connections			

**Options** (Include with selected model number)

<b>Pressure Testing</b>				
<b>Expanded</b>				
P1 <sup>(3)</sup>	Hydrostatic Testing with Certificate			
PX <sup>(3)</sup>	Extended Hydrostatic Testing			
<b>Special Cleaning</b>				
<b>Expanded</b>				
P2	Cleaning for Special Services			
PA	Cleaning per ASTM G93 level D (section 11.4)			
<b>Material Testing</b>				
<b>Expanded</b>				
V1	Dye Penetrant Exam			
<b>Material Examination</b>				
<b>Expanded</b>				
V2	Radiographic Examination			

# Annubar Flowmeter Series

Table A-12. Rosemount 485 Annubar Primary Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
The Expanded offering is subject to additional delivery lead time.

<b>Flow Calibration</b>		
<b>Expanded</b>		
W1	Flow Calibration (Average K)	
WZ	Special Calibration	
<b>Special Inspection</b>		
<b>Standard</b>		<b>Standard</b>
QC1	Visual and Dimensional Inspection with Certificate	★
QC7	Inspection and Performance Certificate	★
<b>Surface Finish</b>		
<b>Standard</b>		<b>Standard</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>		
<b>Standard</b>		<b>Standard</b>
Q8 <sup>(4)</sup>	Material Certificate per EN 10204:2004 3.1	★
<b>Code Conformance</b>		
<b>Expanded</b>		
J2 <sup>(5)</sup>	ANSI/ASME B31.1	
J3 <sup>(5)</sup>	ANSI/ASME B31.3	
<b>Materials Conformance</b>		
<b>Expanded</b>		
J5 <sup>(6)</sup>	NACE MR-0175 / ISO 15156	
<b>Country Certification</b>		
<b>Standard</b>		<b>Standard</b>
J6	European Pressure Directive (PED)	★
<b>Expanded</b>		
J1	Canadian Registration	
<b>Installed in Flanged Pipe Spool Section</b>		
<b>Expanded</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>		
<b>Standard</b>		<b>Standard</b>
G2	Needle Valves, Stainless Steel	★
G6	OS&Y Gate Valve, Stainless Steel	★
<b>Expanded</b>		
G1	Needle Valves, Carbon Steel	
G3	Needle Valves, Alloy C-276	
G5	OS&Y Gate Valve, Carbon Steel	
G7	OS&Y Gate Valve, Alloy C-276	
<b>Special Shipment</b>		
<b>Standard</b>		<b>Standard</b>
Y1	Mounting Hardware Shipped Separately	★
<b>Attach To</b>		
<b>Expanded</b>		
H1	Attach to Transmitter	

Table A-12. Rosemount 485 Annubar Primary Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
 The Expanded offering is subject to additional delivery lead time.

Special Dimensions		
<b>Expanded</b>		
VM	Variable Mounting	
VT	Variable Tip	
VS	Variable length Spool Section	
V9	Special Dimension	
<b>Typical Model Number: 485 L 060 D C H P S 2 T1 0 0 0 3</b>		

- (1) Provide the "A" dimension for Flanged (page A-99), Flange-Lok (page A-98), and Threaded Flo-Tap models (page A-102). Provide the "B" dimension for Flange Flo-Tap models (page A-100).
- (2) Available in remote mount applications only.
- (3) Applies to flow element only, mounting hardware not tested.
- (4) Instrument Connections for Remote Mount Options and Isolation Valves for Flo-tap Models are not included in the Material Traceability Certification.
- (5) Not available with Transmitter Connection Platform 6.
- (6) 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.

# Annubar Flowmeter Series

## 485 SPECIFICATIONS

### 485 Performance Specifications

#### 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 A-13. 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

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

$d$  = 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)

#### 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.

## 485 Functional Specifications

### 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). Maximum temperature limit for steam processes is 650 °F (343 °C).
- 400 °F (204 °C) when top mounted in steam service

#### Remote Mount Transmitter

- 1250 °F (677 °C) – Alloy C-276 Sensor Material (For superheated steam applications above 1000 °F (538 °C), it is recommended that the Rosemount 585 with Alloy 800H sensor material is used.)
- 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)).

(1) Static pressure selection may effect pressure limitations.

## 485 Physical Specifications

### 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 couplet (same as specified pipe material).

### Housing Connections

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

### Annubar Sensor Material

- 316 Stainless Steel
- Alloy C-276

# Annubar Flowmeter Series

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## Mounting Material

- Carbon Steel (A105)
- 316 Stainless Steel
- Chrome-Moly Grade F-11
- Chrome-Moly Grade F-22
- Chrome-Moly Grade F-91

## Annubar Type

### 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))
- -150 to 850 °F (-101 to 454 °C)
- Not available for steam above 600 °F (315 °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))
- Alloy C-276: (-150 to 1250 °F (-101 to 677 °C))
- Top mounting is recommended for steam above 600 °F (315 °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)
- -150 to 850 °F (-101 to 454 °C)
- Not available for steam above 600 °F (315 °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: -150 to 850 °F (-101 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
  - Isolation valves are not supplied with DIN flanges and must be customer supplied
- For threaded flo-tap models, the isolation valve NPT size is 1<sup>1</sup>/<sub>4</sub>-in. (Sensor Size 1) and 2-in. (Sensor Size 2).
- Top mounting is recommended for steam above 600 °F (315 °C)



## 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	X			
	Threaded connection				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
R1	150# RTJ Flange		X	X	X
R3	300# RTJ Flange		X	X	X
R6	600# RTJ Flange		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 A-14. 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, Alloy C-276	-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, Alloy C-276	-40 to 1250 °F (-40 to 677 °C)

# Annubar Flowmeter Series

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## 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.
- Available in carbon steel (A105) and 316 stainless steel

Table A-15. Flanged Pipe Spool Section Schedule

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

Table A-16. 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)

**585 ANNUBAR PRIMARY  
 ELEMENT ORDERING  
 INFORMATION**

Table A-17. Rosemount 585 Annubar Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
 The Expanded offering is subject to additional delivery lead time.

<b>Model</b>		<b>DP Flow Primary Type</b>	
585		Severe Service Annubar Primary Element	
<b>Application Type</b>			
<b>Standard</b>			<b>Standard</b>
S <sup>(1)(2)</sup>	Severe Service Annubar		★
<b>Expanded</b>			
M <sup>(3)</sup>	Main Steam Line Annubar		
<b>Fluid Type</b>			
<b>Standard</b>			<b>Standard</b>
L	Liquid		★
G	Gas		★
S	Steam		★
<b>Annubar Type</b>			
<b>Standard</b>			<b>Standard</b>
F	Flanged with Opposite Side Support		★
<b>Expanded</b>			
L	Main Steam Annubar with Opposite Side Support		
G	Gear-Drive Flo-Tap		
<b>Line Size</b>			
<b>Standard</b>			<b>Standard</b>
040	4-in. (100 mm)		★
050	5-in. (125 mm)		★
060	6-in. (150 mm)		★
080	8-in. (200 mm)		★
100	10-in. (250 mm)		★
120	12-in. (300 mm)		★
<b>Expanded</b>			
140	14-in. (350 mm)		
160	16-in. (400 mm)		
180	18-in. (450 mm)		
200	20-in. (500 mm)		
240	24-in. (600 mm)		
300	30-in. (750 mm)		
360	36-in. (900 mm)		
420	42-in. (1066 mm)		
480	48-in. (1210 mm)		
600	60-in. (1520 mm)		
720	72-in. (1820 mm)		
840	84-in. (2100 mm)		
960	96-in. (2400 mm)		
<b>Mounting Assembly Material</b>			
<b>Standard</b>			<b>Standard</b>
C	Carbon Steel (A105)		★
S	316/316L Stainless Steel		★

# Annubar Flowmeter Series

Table A-17. Rosemount 585 Annubar Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
The Expanded offering is subject to additional delivery lead time.

<b>Expanded</b>		
L	Carbon Steel (A350 LF2)	
G	Chrome-Moly Grade F-11	
N	Chrome-Moly Grade F-22	
J	Chrome-Moly Grade F-91	
0 <sup>(4)</sup>	No Mounting (Customer Supplied)	
<b>Piping Orientation</b>		
<b>Standard</b>		<b>Standard</b>
H	Horizontal Piping	★
D	Vertical Piping with Downwards Flow	★
U	Vertical Piping with Upwards Flow	★
<b>Sensor Material</b>		
<b>Standard</b>		<b>Standard</b>
S	316/316L Stainless Steel	★
<b>Expanded</b>		
H <sup>(5)</sup>	Alloy C-276	
W <sup>(3)(5)</sup>	Alloy 800H	
K <sup>(5)</sup>	PVDF (KYNAR)	
<b>Sensor Size</b>		
<b>Standard</b>		<b>Standard</b>
11	Sensor size 11	★
22 <sup>(6)</sup>	Sensor size 22	★
<b>Expanded</b>		
44 <sup>(2)(3)</sup>	Sensor size 44	
<b>Mounting Type</b>		
<b>Standard</b>		<b>Standard</b>
A	ANSI B16.5 Raised Face Flanges	★
D <sup>(7)</sup>	DIN Raised Face Flanges	★
<b>Expanded</b>		
R <sup>(8)</sup>	ANSI B16.5 Ring Type Joint Flanges	
0 <sup>(3)</sup>	Main Steam Packing Gland	
<b>Mounting Pressure Class</b>		
<b>Standard</b>		<b>Standard</b>
1	ANSI 150 / DIN PN16	★
3 <sup>(6)</sup>	ANSI 300 / DIN PN40	★
6 <sup>(6)</sup>	ANSI 600 / DIN PN100	★
<b>Expanded</b>		
N <sup>(5)(6)</sup>	ANSI 900	
F <sup>(5)(6)</sup>	ANSI 1500	
T <sup>(5)(6)</sup>	ANSI 2500	
0 <sup>(3)(5)(6)</sup>	Main Steam Packing Gland	
<b>Opposite Side Support</b>		
<b>Standard</b>		<b>Standard</b>
C <sup>(9)</sup>	NPT Threaded Opposite Support Assembly	★
D <sup>(3)</sup>	Welded Opposite Support Assembly	★
<b>Expanded</b>		
E	Flanged Opposite Support Assembly	
0 <sup>(2)</sup>	No Opposite Side Support Required	
<b>Packing Gland/ Packing</b>		
<b>Standard</b>		<b>Standard</b>
0 <sup>(1)</sup>	Not Applicable	★

Table A-17. Rosemount 585 Annubar Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
The Expanded offering is subject to additional delivery lead time.

<b>Expanded</b>		
L <sup>(2)</sup>	SS Packing Gland / Graphite Packing	
T <sup>(3)</sup>	Main Steam Packing Gland / Graphite Packing	
<b>Insertion Mechanism</b>		
<b>Standard</b>		<b>Standard</b>
0 <sup>(1)(3)</sup>	Not Applicable	★
<b>Expanded</b>		
C	Alloy Steel Insertion Rods / Nuts	
S	Stainless Steel Insertion Rods / Nuts	
<b>Isolation Valve</b>		
<b>Standard</b>		<b>Standard</b>
0 <sup>(3)(1)</sup>	Not Applicable or Customer Supplied	★
<b>Expanded</b>		
1	Gate Valve, Carbon Steel	
2	Gate Valve, Stainless Steel	
5	Ball Valve, Carbon Steel	
6	Ball Valve, Stainless Steel	
<b>Temperature Measurement</b>		
<b>Standard</b>		<b>Standard</b>
0	No Temperature Sensor Required	★
<b>Expanded</b>		
R <sup>(4)(6)(9)</sup>	Remote RTD (1/2-in. NPT Aluminum Housing) with Thermowell	
S <sup>(4)(6)(9)</sup>	Remote RTD (1/2-in. NPT Stainless Housing) with Thermowell	
<b>Transmitter Connection Platform</b>		
<b>Standard</b>		<b>Standard</b>
3 <sup>(6)(10)(11)</sup>	Direct-Mount, 3-Valve Manifold	★
<b>Expanded</b>		
4 <sup>(6)(10)(11)</sup>	Direct-Mount, Dual 3-Valve Manifolds	
6 <sup>(6)(10)(12)</sup>	High Temperature Direct-Mount 5-Valve Manifold	
7	Remote-Mount 1/2-in. Threaded Connections	
8 <sup>(3)</sup>	Remote-Mount 1/2-in. Welded Connections	
<b>Mounting Flange Bolting Materials</b>		
<b>Standard</b>		<b>Standard</b>
A	193 Gr B7 Studs w/ A194 Gr 2H Nuts	★
0	No Flange Studs/Nuts Supplied	★
<b>Mounting Flange Gasket Materials</b>		
<b>Standard</b>		<b>Standard</b>
1	Spiral Wound, 304SS, Flexible-Graphite Filler	★
0	No Flange Gasket Supplied	★
<b>Expanded</b>		
2	Ring-Joint, ANSI B16.20, Hexagonal, 316L	
3	Spiral Wound, B16.20, 316SS, PTFE Filler	

**Options** (Include with selected model number)

<b>Optional Mounting for Rectangular Ducts</b>		
<b>Expanded</b>		
RD	Annubar Mounting for rectangular ducts	
<b>Pressure Testing</b>		
<b>Expanded</b>		
P1 <sup>(13)</sup>	Hydrostatic Testing with Certificate	
PX	Extended Hydrostatic Testing	

# Annubar Flowmeter Series

Table A-17. Rosemount 585 Annubar Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
The Expanded offering is subject to additional delivery lead time.

<b>Special Cleaning</b>		
<b>Expanded</b>		
PA <sup>(6)(14)</sup>	Cleaning per ASTM G93 Level D (section 11.4)	
<b>Material Testing</b>		
<b>Expanded</b>		
V1	Dye Penetrant Weld Exam	
<b>Material Examination</b>		
<b>Expanded</b>		
V2	Radiographic Weld Examination	
<b>Flow Calibration</b>		
<b>Expanded</b>		
W1	Flow Calibration (Average K)	
<b>Special Inspection</b>		
<b>Standard</b>		<b>Standard</b>
QC1	Visual & Dimensional Inspection w/ Cert.	★
QC7	Inspection & Performance Certificate	★
<b>Material Traceability Certification</b>		
<b>Standard</b>		<b>Standard</b>
Q8 <sup>(6)(15)</sup>	Material Cert. per ISO 10474 3.1 and EN 10204 3.1	★
<b>Positive Material Testing</b>		
<b>Expanded</b>		
V4 <sup>(15)</sup>	Positive Material Identification	
<b>Code Conformance</b>		
<b>Expanded</b>		
J2	ANSI/ASME B31.1	
J3	ANSI/ASME B31.3	
<b>Materials Conformance</b>		
<b>Expanded</b>		
J5 <sup>(16)</sup>	NACE MR-0175 / ISO 15156	
<b>Country Certification</b>		
<b>Standard</b>		<b>Standard</b>
J6	European Pressure Directive (PED)	★
<b>Expanded</b>		
J1	Canadian Registration Certificate	
<b>Instrument Valves for Remote Mount Option</b>		
<b>Standard</b>		<b>Standard</b>
G2	1/2-in. Needle Valves, SS	★
G6	1/2-in. OS&Y Gate Valve, SS	★
<b>Expanded</b>		
G1	1/2-in. Needle Valves, CS	
G3	1/2-in. Needle Valves, Alloy C-276	
G5	1/2-in. OS&Y Gate Valve, CS	
<b>Instrument Valve Options</b>		
<b>Standard</b>		<b>Standard</b>
DV <sup>(17)</sup>	Double Instrument Valves (4 valves total)	★
<b>Special Shipment</b>		
<b>Standard</b>		<b>Standard</b>
Y1	Mounting Hardware Shipped Separately	★
<b>Assemble Mounting Hardware</b>		
<b>Expanded</b>		
WP <sup>(18)</sup>	Assemble Weldolet to Packing body	
<b>Special Dimensions</b>		
<b>Expanded</b>		
VM	Variable Mounting	

Table A-17. Rosemount 585 Annubar Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.  
 The Expanded offering is subject to additional delivery lead time.

<b>585 Packing Gland Plug</b>		
<b>Expanded</b>		
TP <sup>(18)</sup>	Packing Gland Plug for Steam Blow Down	
<b>585 Installation Alignment Bar</b>		
<b>Expanded</b>		
A1 <sup>(18)</sup>	Installation Alignment Bar	
<b>Typical Model Number: 585 M S L 120 J H W 44 0 0 0 T 0 0 8 0 0</b>		

- (1) Required for Annubar Type F.
- (2) Required for Annubar Type G.
- (3) Required for Annubar Type L.
- (4) Not available with Annubar Type L.
- (5) Not available with Annubar Type G.
- (6) Not available with Sensor Material K.
- (7) Mounting Flange Bolting and Gasket option code 0 must be selected.
- (8) Mounting Flange Gasket Material option code 2 or 0 must be selected.
- (9) Not available with ANSI 2500 Mounting Pressure Class.
- (10) Not available with Mounting Pressure Class N, T, or F.
- (11) Not available with Sensor Material W.
- (12) Not available with Sensor Material H or W.
- (13) Applies to flow element only, mounting not tested.
- (14) If selected with Annubar Type F, Mounting Flange Gasket Material option code 3 must be selected.
- (15) For pressure retaining parts only, isolation and instrument valves are not included.
- (16) 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.
- (17) Only available if Instrument Valves for Remote Mount Option are selected.
- (18) Only available with Annubar Type L.

# Annubar Flowmeter Series

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## 585 SPECIFICATIONS

### 585 PERFORMANCE SPECIFICATIONS

#### Performance Statement Assumptions

Measured pipe I.D.

#### Discharge Coefficient Factor

±1.50% of flow rate

#### Repeatability

±0.10%

#### Line Sizes

- Sensor Size 11: 4-in. to 24-in. (100 to 600 mm)
- Sensor Size 22: 6-in. to 36-in. (150 to 900 mm)
- Sensor Size 44: 10-in. to 96-in. (250 to 2400 mm)

Table A-18. Reynolds Number and Probe Width

Sensor Size	Minimum Rod Reynolds Number ( $R_d$ )	Probe Width ( $d$ ) (inches)
11	6500	0.80-in. (20,32 mm)
22	10000	1.20-in. (30,48 mm)
44	25000	2.28-in. (57,91 mm)

Where

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

$d$  = 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)

#### 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



## 585 FUNCTIONAL SPECIFICATIONS

### Service

- Liquid
- Gas
- Steam

### Process Temperature Limits

Table A-19. Direct Mount Transmitter Connection Platform

Transmitter Connection Platform	Temperature Limit
3-valve manifold (Option code 3)	500 °F (260 °C)
5-valve manifold (Option code 6)	750 °F (398 °C)
Note: Specification is 600 °F (315 °C) in steam service	

Table A-20. Remote Mount Transmitter Connection Platform

Sensor Material	Temperature Limit
316 Stainless Steel (Option code S)	850 °F (454 °C)
Alloy C-276 (Option code H)	1250 °F (677 °C)
Alloy 800H (Option code W)	1500 °F (816 °C)
PVDF (KYNAR) (Option code K)	250 °F (121 °C)

### Pressure and Temperature Limits

Table A-21. Main Steam Line Annubar

Mounting Material	Sensor Material	Max. Pressure @ Temp.	Max. Temp.
Chrome-Moly Grade F-11	Alloy 800H	2317 psig @ 1000 °F (160 bar @ 538 °C)	1100 °F (593 °C)
Chrome-Moly Grade F-22	Alloy 800H	2868 psig @ 1000 °F (198 bar @ 538 °C)	1100 °F (593 °C)
Chrome-Moly Grade F-91	Alloy 800H	3788 psig @ 1100 °F (261 bar @ 593 °C)	1200 °F (649 °C)

Table A-22. Severe Service Annubar

Annubar Type	Sensor Material	Max. Flange Rating
Flanged (option code F)	316 SST	2500# ANSI
	Alloy C-276	2500# ANSI
	Alloy 800H	2500# ANSI
	PVDF (KYNAR)	150# ANSI
Flanged Flo-Tap (option code G)	316 SST	600# ANSI

# Annubar Flowmeter Series

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## 585 PHYSICAL SPECIFICATIONS

### Temperature Measurement

#### Remote RTD

- Series 78 with Rosemount 644 housing 100 Ohm platinum RTD
- Spring loaded with 1/2-in. NPT nipple and union

#### Thermowell

- 1/2-in. NPT x 3/4-in. socket weld
- 316 Stainless Steel and Alloy C-276 Material
- 2.5-in. insertion length provided

### Annubar Sensor Material

- 316 Stainless Steel
- Alloy C-276
- Alloy 800H
- PVDF (KYNAR)

### Mounting Material

- Carbon Steel (A105)
- 316 Stainless Steel
- Carbon Steel (A350 LF2)
- Chrome-Moly Grade F-11
- Chrome-Moly Grade F-22
- Chrome-Moly Grade F-91

### Annubar Type

#### 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: -325 to 850 °F (-198 to 454 °C)
- Alloy C-276: -325 to 1250 °F (-198 to 677 °C)
- PVDF (KYNAR): -40 to 250 °F (-40 to 121 °C)
- Alloy 800H: -325 to 1500 °F (-198 to 816 °C)

#### Main Steam Annubar with Opposite Side Support (option L)

- Provided with opposite side support, which is the same material as the pipe and requires a second pipe penetration
- Alloy 800H: -325 to 1500 °F (-198 to 816 °C)
- Only available in sensor size 44

### Flanged Flo-Tap Models (option G)

- Opposite side support is not available
- Packing Gland Material Temperature Limits
  - Graphite: -40 to 850 °F (-40 to 454 °C)
- Isolation valve option
  - The isolation valve will carry the same pressure rating as the sensor flange and mounting flange specified in the mounting type
- SST: -325 to 850 °F (-198 to 454 °C)
- Maximum allowable insertion pressure: 1440 psig (99 bar)
- Only available in sensor size 44

### Annubar Type Specification Chart

Option Code	Mounting Type/ Pressure Class	Flanged	Main Steam	Gear-Drive Flo-Tap
A1	150# RF ANSI	X		X
A3	300# RF ANSI	X		X
A6	600# RF ANSI	X		X
AN <sup>(1)</sup>	900# RF ANSI	X		
AF <sup>(1)</sup>	1500# RF ANSI	X		
AT <sup>(1)</sup>	2500# RF ANSI	X		
D1	DIN PN 16	X		X
D3	DIN PN 40	X		X
D6	DIN PN 100	X		X
R1	150# RTJ Flange	X		X
R3	300# RTJ Flange	X		X
R6	600# RTJ Flange	X		X
RN <sup>(1)</sup>	900# RTJ Flange	X		
RF <sup>(1)</sup>	1500# RTJ Flange	X		
RT <sup>(1)</sup>	2500# RTJ Flange	X		
00 <sup>(1)</sup>	Main Steam Packing Gland		X	

(1) Remote mount only.

### Instrument Connection Temperature Ranges

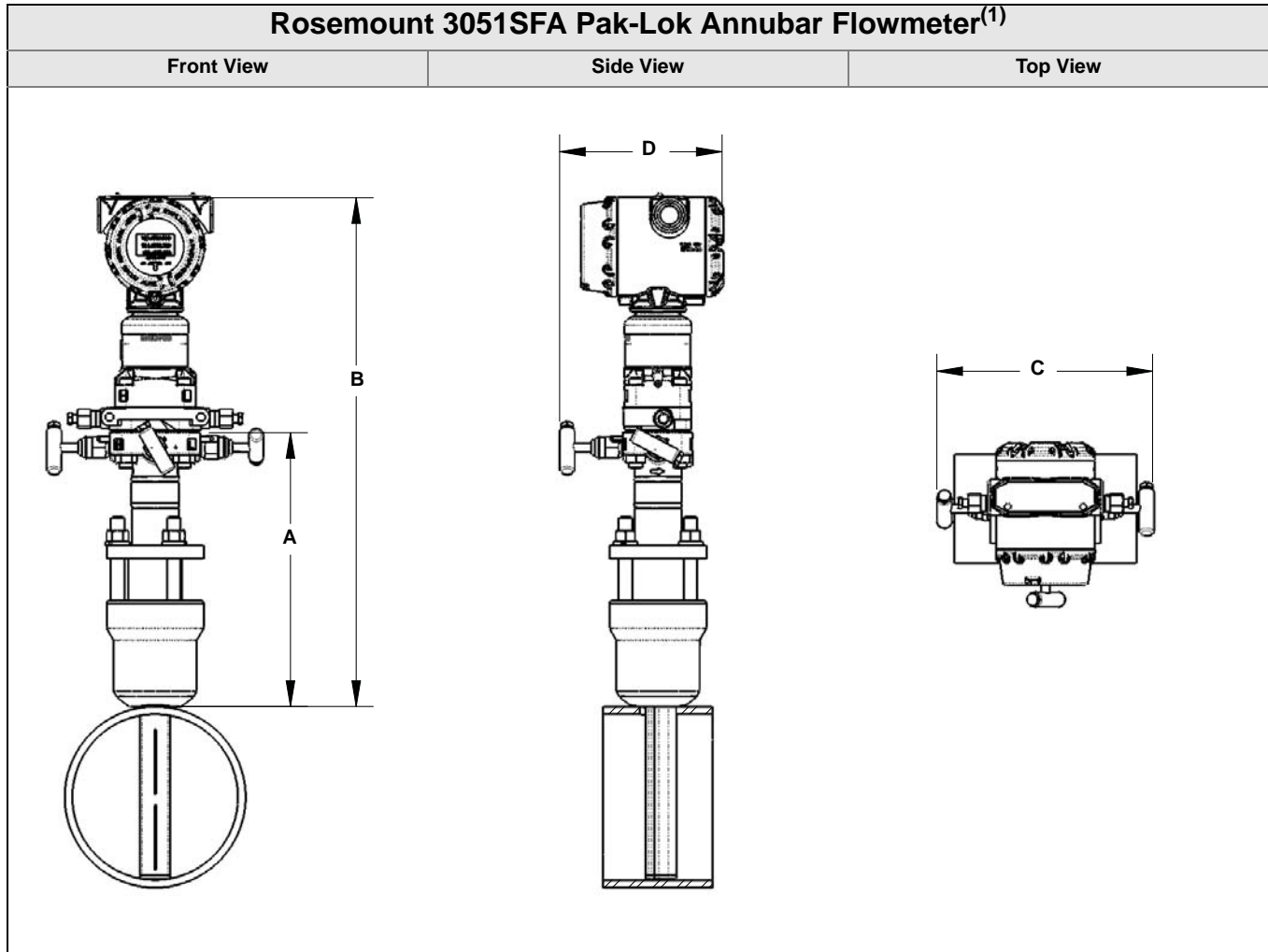
Table A-23. Minimum / Maximum Temperature Range

Code	Description	Temperature
G1	Needle Valves, Carbon Steel	-20 to 550 °F (-29 to 288 °C)
G2	Needle Valves, Stainless Steel	-20 to 1000 °F (-29 to 538 °C)
G3	Needle Valves, Alloy C-276	-20 to 1000 °F (-29 to 538 °C)
G5	OS&Y Gate Valve, Carbon Steel	-20 to 800 °F (-29 to 427 °C)
G6	OS&Y Gate Valve, Stainless Steel	-20 to 850 °F (-29 to 454 °C)

# Annubar Flowmeter Series

## Dimensional Drawings

### 3051SF DIMENSIONAL DRAWINGS

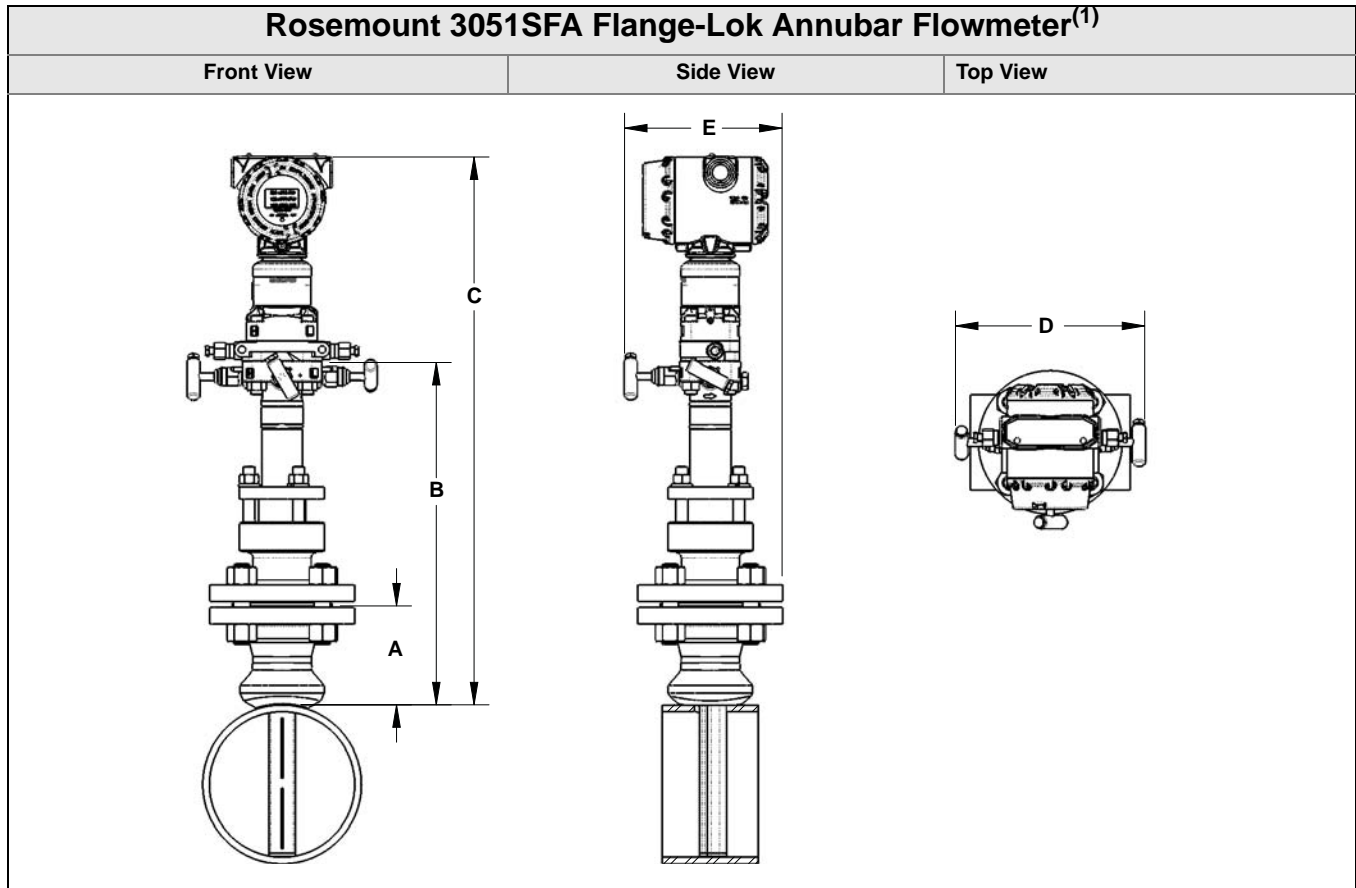


(1) The Pak-Lok Annubar model is rated equivalent to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C)).

Table A-24. Pak-Lok Annubar Flowmeter Dimensional Data

Sensor Size	A (Max)	B (Max)	C (Max)	D (Max)
1	8.50 (215.9)	16.03 (407.2)	9.00 (228.6)	6.90 (175.3)
2	11.00 (279.4)	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)*



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

Table A-25. Flange-Lok Annubar 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#	4.75 (120.7)	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	3.52 (89.4)	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	3.85 (97.8)	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)

# Annubar Flowmeter Series

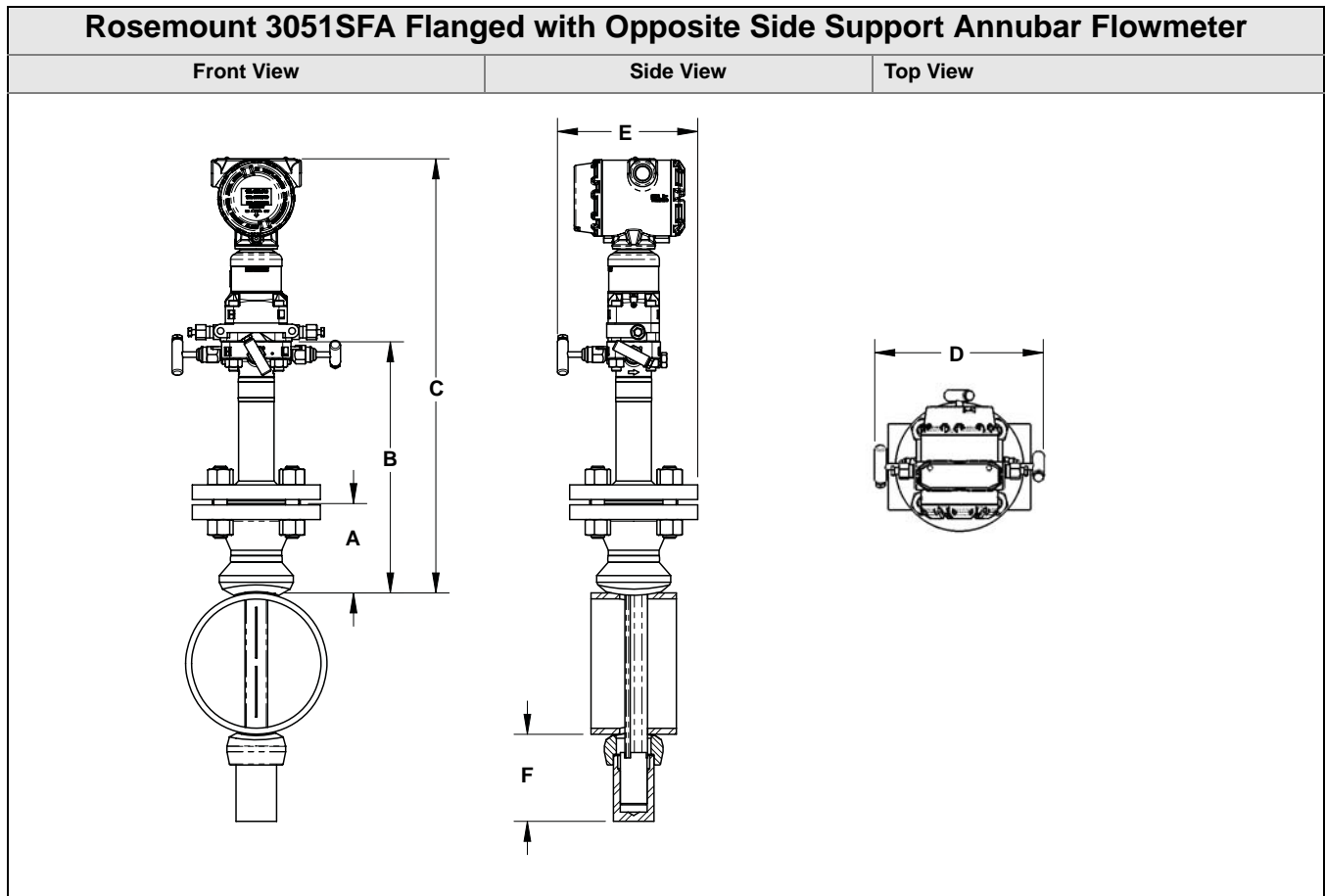


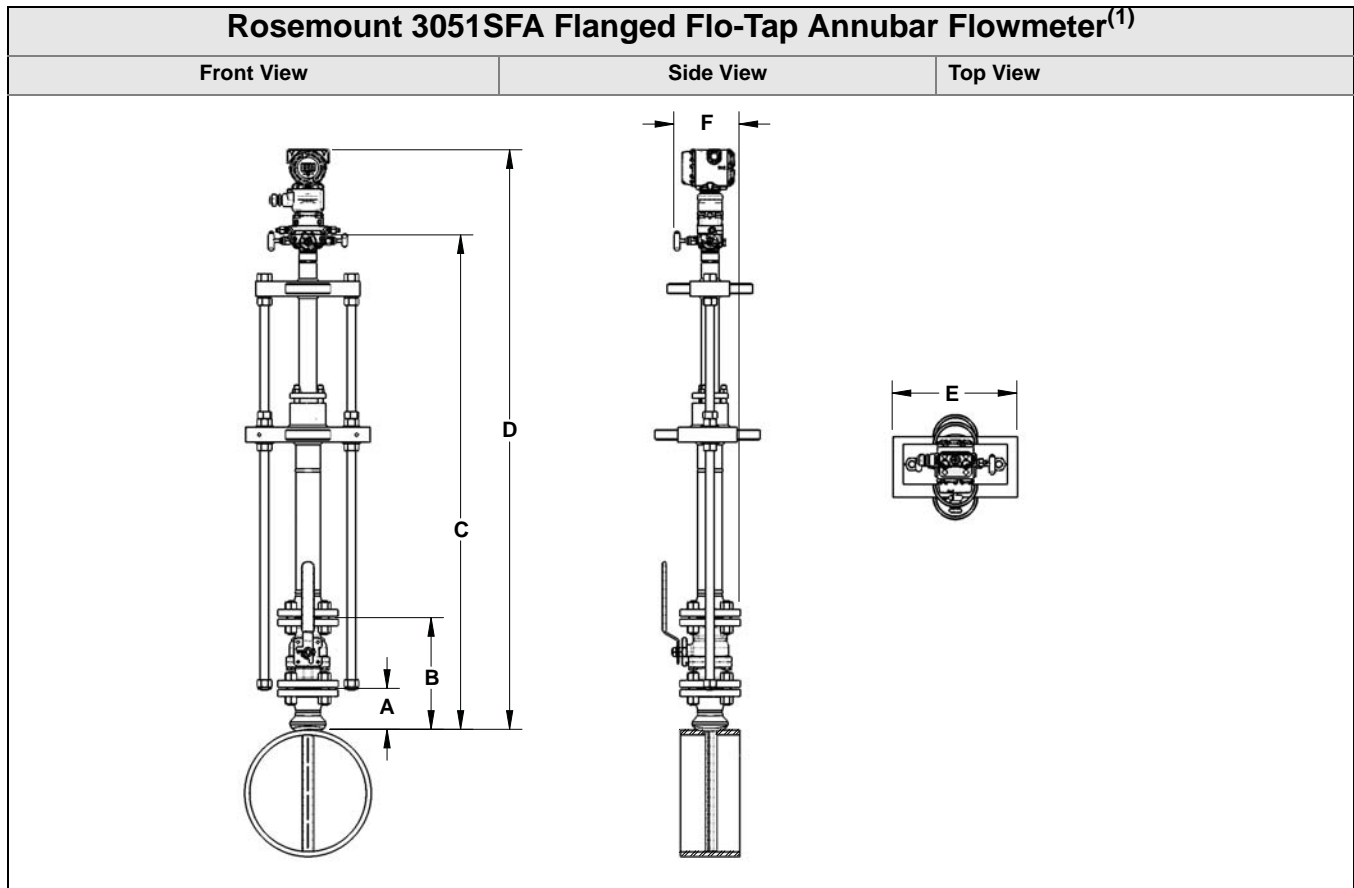
Table A-26. Flanged Annubar Flowmeter Dimensional Data

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)	9.31 (236.5)	—	—	—	3.50 (88.9)
1	1½ – 1500#	4.94 (125.5)	9.31 (236.5)	—	—	—	3.50 (88.9)
1	1½ – 2500#	6.76 (171.7)	11.63 (295.4)	—	—	—	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#	4.75 (120.7)	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	3.52 (89.4)	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)	10.50 (266.7)	—	—	—	5.00 (127.0)
2	2 – 1500#	5.88 (149.4)	10.50 (266.7)	—	—	—	5.00 (127.0)
2	3 – 2500#	9.88 (251.0)	15.63 (397.0)	—	—	—	4.50 (114.3)

Table A-26. Flanged Annubar 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 – 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)
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	3.85 (97.8)	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)	13.06 (331.7)	—	—	—	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)	17.31 (439.7)	—	—	—	7.00 (177.8)
<i>Dimensions are in inches (millimeters)</i>							

# Annubar Flowmeter Series



(1) The Flanged Flo-Tap Annubar Flowmeter is available with either the manual or gear drive options.

Table A-27. Flanged Flo-Tap Annubar 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 (98.6)	10.50 (266.7)	—	17.77 (451.4)	C + 8.53 (216.7)	10.50 (266.7)	6.30 (160.0)
1	1½ – 300#	4.13 (104.9)	11.75 (298.5)	—	17.77 (451.4)	C + 8.53 (216.7)	10.50 (266.7)	6.86 (174.2)
1	1½ – 600#	4.44 (112.8)	14.06 (357.2)	—	17.77 (451.4)	C + 8.53 (216.7)	10.50 (266.7)	6.86 (174.2)
1	DN40/PN16 <sup>(1)</sup>	3.09 (78.5)	See Note 1.	—	17.77 (451.4)	C + 8.53 (216.7)	10.50 (266.7)	6.86 (174.2)
1	DN40/PN40 <sup>(1)</sup>	3.21 (81.5)	See Note 1.	—	17.77 (451.4)	C + 8.53 (216.7)	10.50 (266.7)	6.86 (174.2)
1	DN40/PN100 <sup>(1)</sup>	3.88 (98.6)	See Note 1.	—	17.77 (451.4)	C + 8.53 (216.7)	10.50 (266.7)	6.86 (174.2)
2	2 – 150#	4.13 (104.9)	11.25 (285.8)	24.44 (620.8)	21.20 (538.5)	C + 8.53 (216.7)	12.56 (319.0)	6.80 (172.7)
2	2 – 300#	4.38 (111.3)	13.00 (330.2)	24.44 (620.8)	21.20 (538.5)	C + 8.53 (216.7)	12.56 (319.0)	7.05 (179.1)
2	2 – 600#	4.75 (120.7)	16.38 (416.0)	24.44 (620.8)	21.20 (538.5)	C + 8.53 (216.7)	12.56 (319.0)	7.05 (179.1)
2	DN50/PN16 <sup>(1)</sup>	3.40 (86.4)	See Note 1.	24.44 (620.8)	21.20 (538.5)	C + 8.53 (216.7)	12.56 (319.0)	7.05 (179.1)
2	DN50/PN40 <sup>(1)</sup>	3.52 (89.4)	See Note 1.	24.44 (620.8)	21.20 (538.5)	C + 8.53 (216.7)	12.56 (319.0)	7.05 (179.1)
2	DN50/PN100 <sup>(1)</sup>	4.30 (109.2)	See Note 1.	24.44 (620.8)	21.20 (538.5)	C + 8.53 (216.7)	12.56 (319.0)	7.05 (179.1)
3	3 – 150#	4.63 (117.6)	12.75 (323.9)	26.37 (669.8)	23.14 (587.8)	C + 8.53 (216.7)	14.13 (358.9)	7.55 (191.8)
3	3 – 300#	5.00 (127.0)	16.25 (412.8)	26.37 (669.8)	23.14 (587.8)	C + 8.53 (216.7)	14.13 (358.9)	7.93 (201.3)
3	3 – 600#	5.38 (136.7)	19.50 (495.3)	26.37 (669.8)	23.14 (587.8)	C + 8.53 (216.7)	14.13 (358.9)	7.93 (201.3)
3	DN80/PN16 <sup>(1)</sup>	3.85 (97.8)	See Note 1.	26.37 (669.8)	23.14 (587.8)	C + 8.53 (216.7)	14.13 (358.9)	7.93 (201.3)
3	DN80/PN40 <sup>(1)</sup>	4.16 (105.7)	See Note 1.	26.37 (669.8)	23.14 (587.8)	C + 8.53 (216.7)	14.13 (358.9)	7.93 (201.3)
3	DN80/PN100 <sup>(1)</sup>	4.95 (125.7)	See Note 1.	26.37 (669.8)	23.14 (587.8)	C + 8.53 (216.7)	14.13 (358.9)	7.93 (201.3)

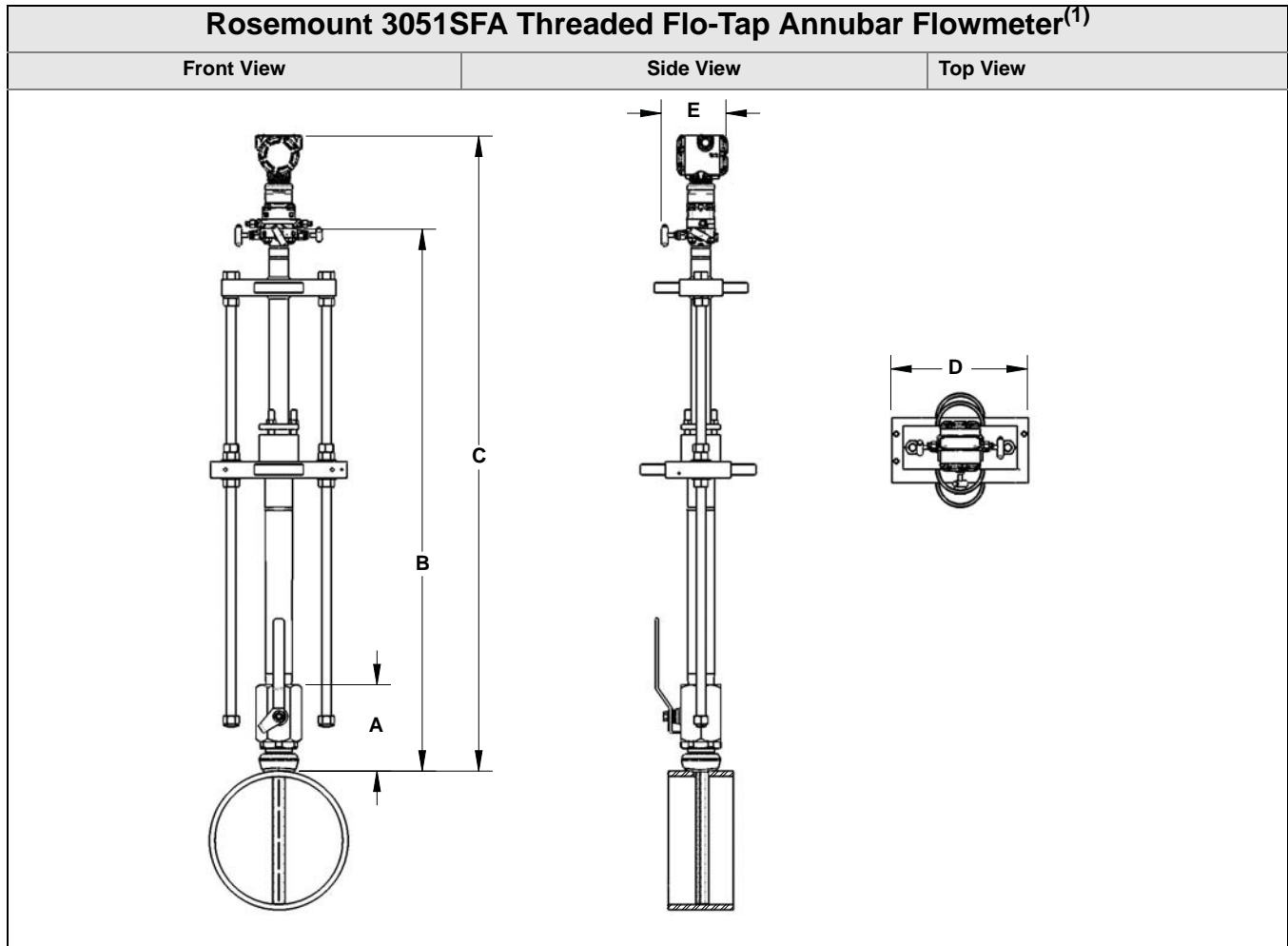
Dimensions are in inches (millimeters)

(1) DIN Valves are not offered

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>





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

Table A-28. Threaded Flo-Tap Annubar 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	7.51 (190.9)	—			
2	8.17 (207.5)	23.62 (599.9)	20.39 (517.9)	B + 8.53 (216.7)	12.56 (319.0)	6.90 (175.3)

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

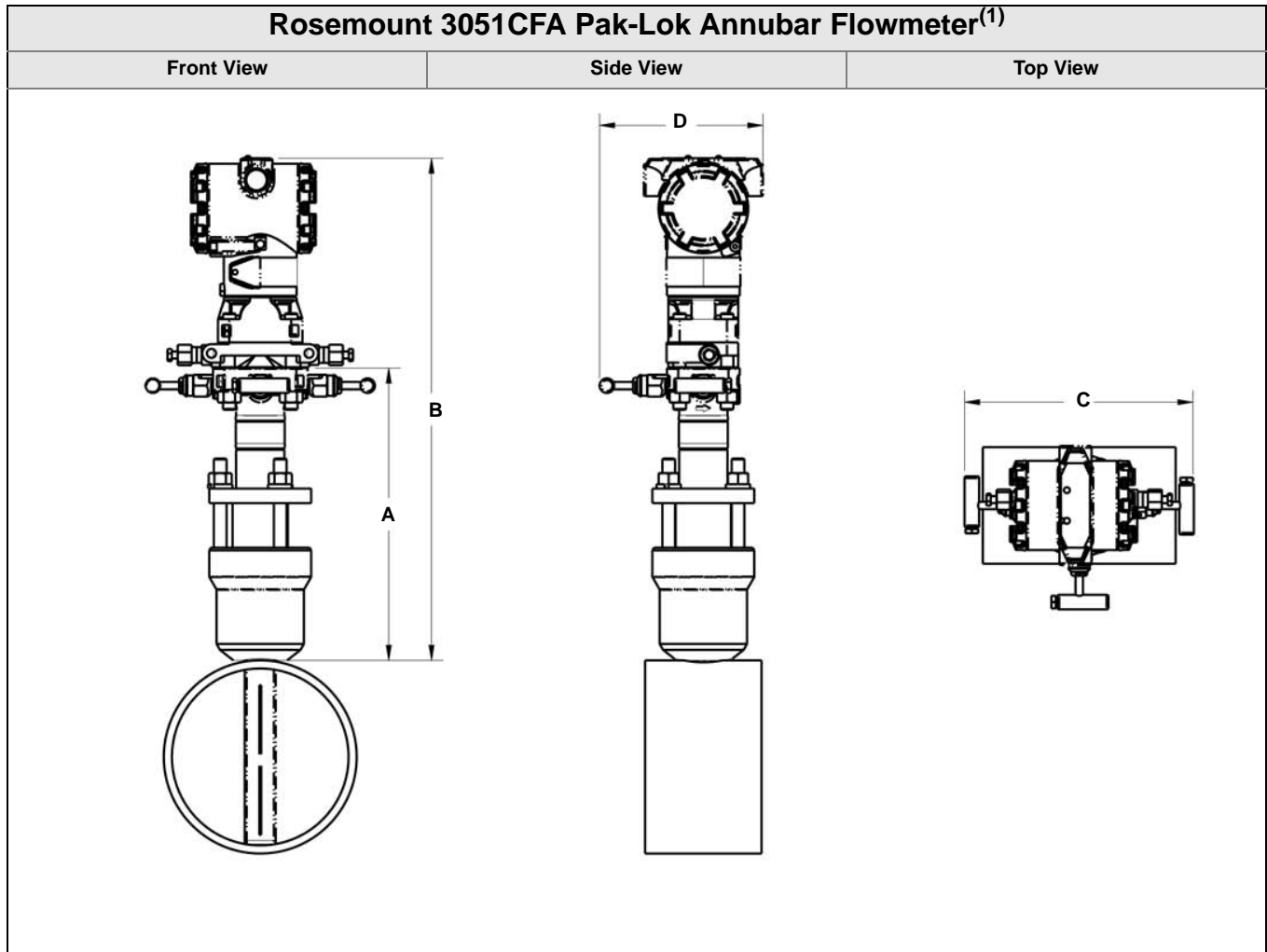
Dimensions are in inches (millimeters)

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>

# Annubar Flowmeter Series

## 3051CF DIMENSIONAL DRAWINGS

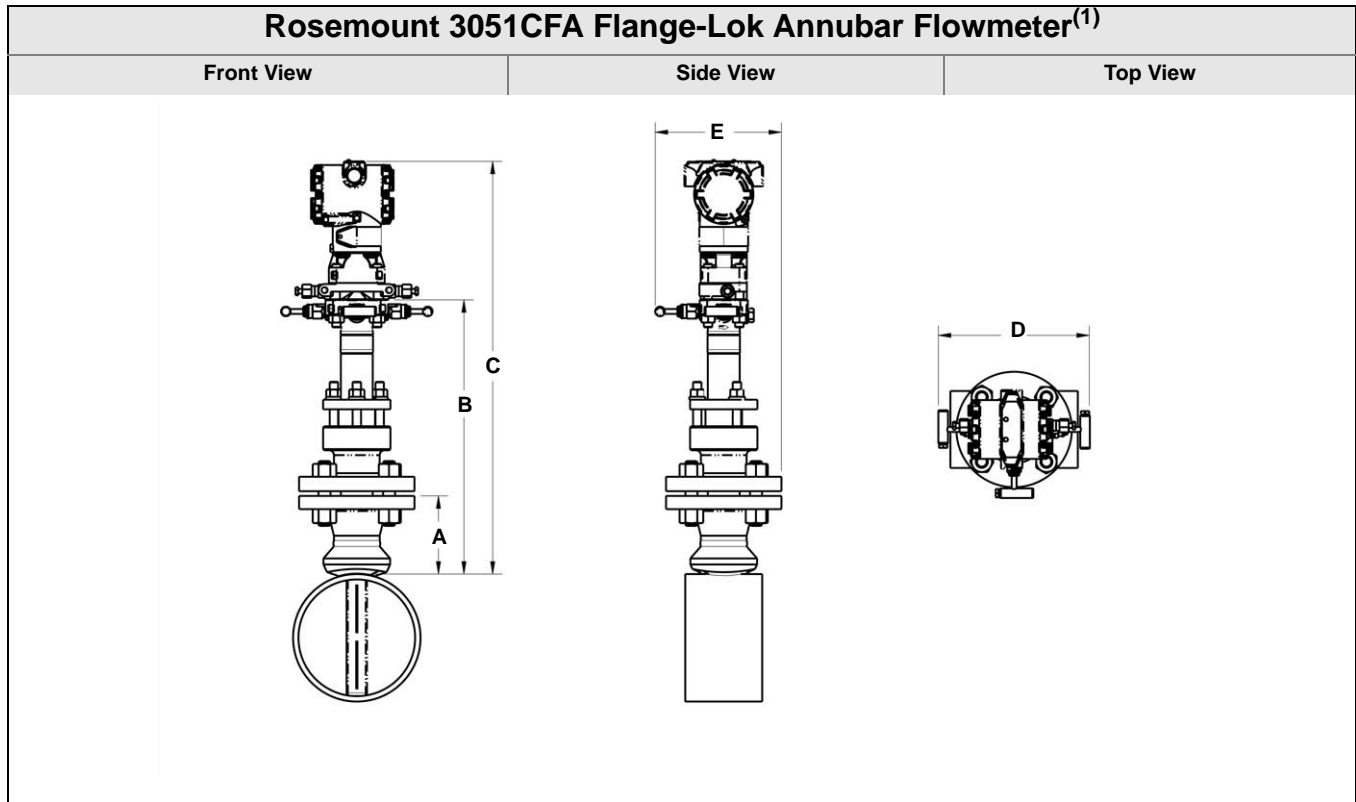


(1) The Pak-Lok Annubar model is available up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C)).

Table A-29. Pak-Lok Annubar Flowmeter Dimensional Data

Sensor Size	A (Max)	B (Max)	C (Max)	D (Max)
1	8.50 (215.9)	14.60 (370.8)	9.00 (228.6)	6.00 (152.4)
2	11.0 (279.4)	16.35 (415.3)	9.00 (228.6)	6.00 (152.4)
3	12.00 (304.8)	19.10 (485.1)	9.00 (228.6)	6.00 (152.4)

*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 A-30. Flange-Lok Annubar 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)	6.30 (160.0)
1	1½ – 300#	4.13 (104.9)	12.25 (311.2)	19.35 (491.5)	9.00 (228.6)	6.86 (174.2)
1	1½ – 600#	4.44 (112.8)	12.25 (311.2)	19.35 (491.5)	9.00 (228.6)	6.86 (174.2)
1	DN40/PN16	3.09 (78.5)	12.25 (311.2)	19.35 (491.5)	9.00 (228.6)	6.86 (174.2)
1	DN40/PN40	3.21 (81.5)	12.25 (311.2)	19.35 (491.5)	9.00 (228.6)	6.86 (174.2)
1	DN40/ PN100	3.88 (98.6)	12.25 (311.2)	19.35 (491.5)	9.00 (228.6)	6.86 (174.2)
2	2 – 150#	4.13 (104.9)	14.25 (362.0)	21.35 (542.3)	9.00 (228.6)	6.80 (172.7)
2	2 – 300#	4.38 (111.3)	14.25 (362.0)	21.35 (542.3)	9.00 (228.6)	7.05 (179.1)
2	2 – 600#	4.75 (120.7)	14.25 (362.0)	21.35 (542.3)	9.00 (228.6)	7.05 (179.1)
2	DN50/PN16	3.40 (86.4)	14.25 (362.0)	21.35 (542.3)	9.00 (228.6)	7.05 (179.1)
2	DN50/PN40	3.52 (89.4)	14.25 (362.0)	21.35 (542.3)	9.00 (228.6)	7.05 (179.1)
2	DN50/ PN100	4.30 (109.2)	14.25 (362.0)	21.35 (542.3)	9.00 (228.6)	7.05 (179.1)
3	3 – 150#	4.63 (117.6)	17.50 (444.5)	24.60 (624.8)	9.00 (228.6)	7.55 (191.8)
3	3 – 300#	5.00 (127.0)	17.50 (444.5)	24.60 (624.8)	9.00 (228.6)	7.93 (201.3)
3	3 – 600#	5.38 (136.7)	17.50 (444.5)	24.60 (624.8)	9.00 (228.6)	7.93 (201.3)
3	DN80/PN16	3.85 (97.8)	17.50 (444.5)	24.60 (624.8)	9.00 (228.6)	7.93 (201.3)
3	DN80/PN40	4.16 (105.7)	17.50 (444.5)	24.60 (624.8)	9.00 (228.6)	7.93 (201.3)
3	DN80/ PN100	4.95 (125.7)	17.50 (444.5)	24.60 (624.8)	9.00 (228.6)	7.93 (201.3)

Dimensions are in inches (millimeters)

# Annubar Flowmeter Series

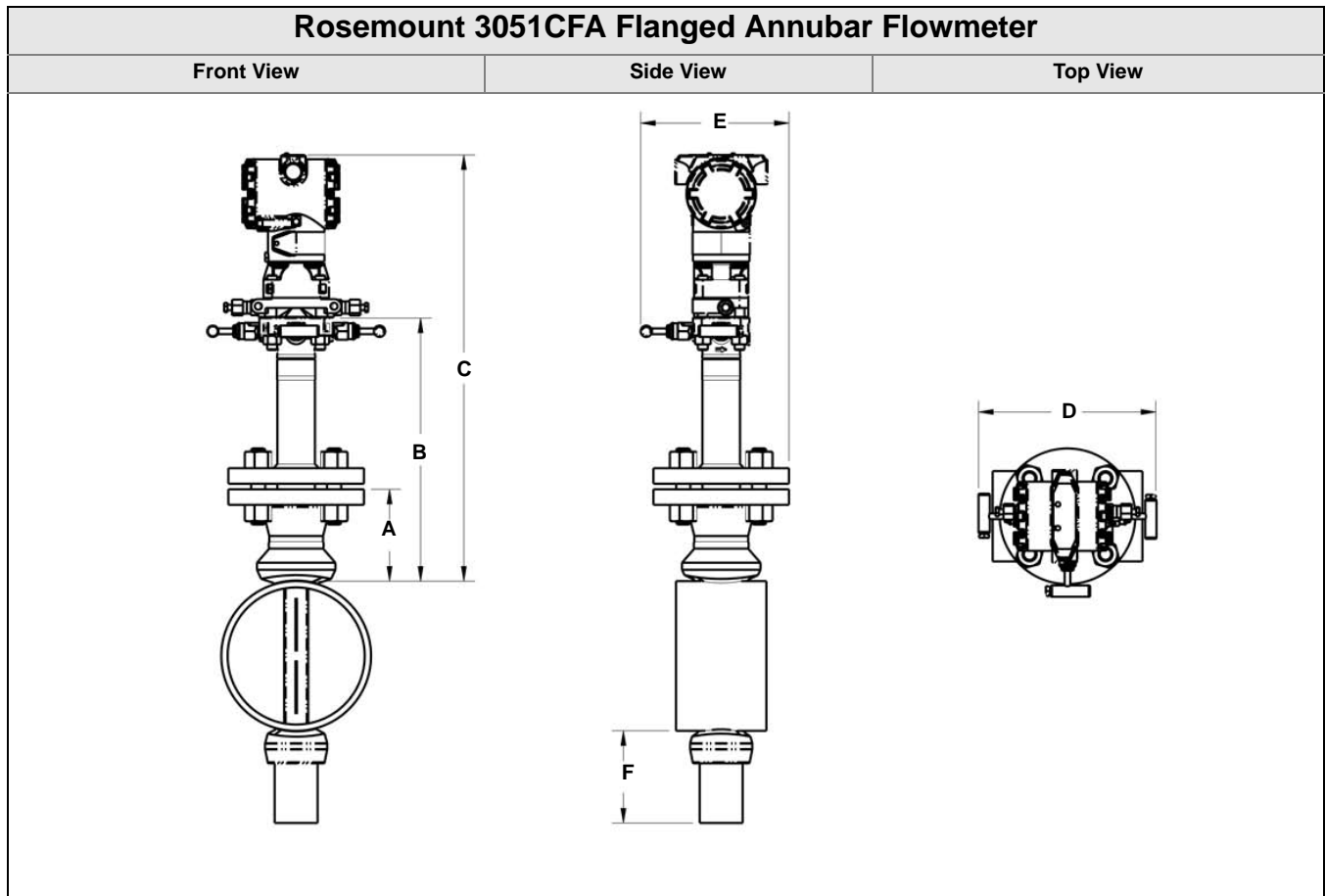


Table A-31. Flanged Annubar Flowmeter Dimensional Data

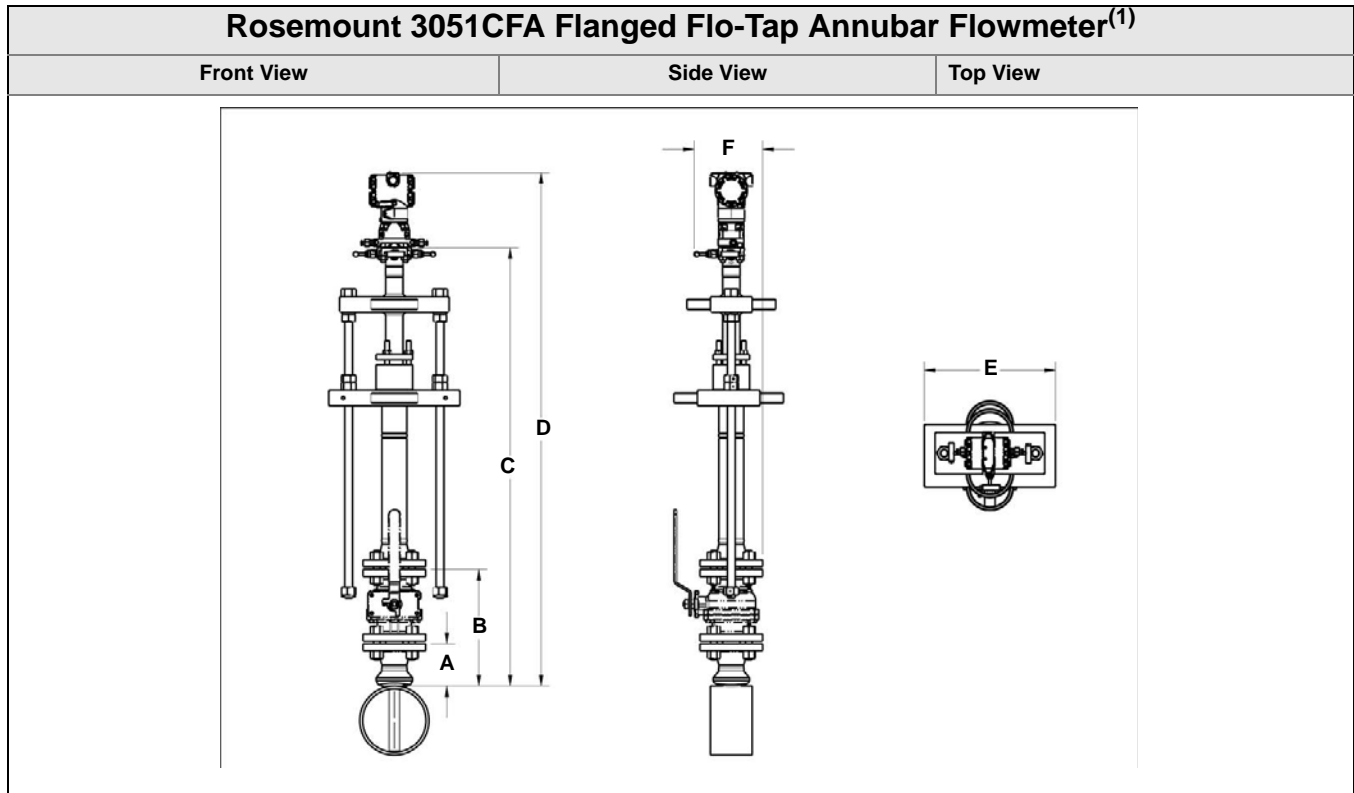
Sensor Size	Flange Size and Rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	C ± 0.25 (6.4)	D (Max)	E (Max)	F (Max)
1	1½ – 150#	3.88 (98.6)	11.00 (279.4)	18.10 (459.7)	9.00 (228.6)	6.30 (160.0)	3.50 (88.9)
1	1½ – 300#	4.13 (104.9)	11.00 (279.4)	18.10 (459.7)	9.00 (228.6)	6.86 (174.2)	3.50 (88.9)
1	1½ – 600#	4.44 (112.8)	11.00 (279.4)	18.10 (459.7)	9.00(228.6)	6.86 (174.2)	3.50 (88.9)
1	DN40/PN16	3.09 (78.5)	11.00 (279.4)	18.10 (459.7)	9.00 (228.6)	6.86 (174.2)	3.50 (88.9)
1	DN40/PN40	3.21 (81.5)	11.00 (279.4)	18.10 (459.7)	9.00 (228.6)	6.86 (174.2)	3.50 (88.9)
1	DN40/ PN100	3.88 (98.6)	11.00 (279.4)	18.10 (459.7)	9.00(228.6)	6.86 (174.2)	3.50 (88.9)
1	1½ – 900#	4.94 (125.5)	9.31 (236.5)	—	—	—	3.50 (88.9)
1	1½ – 1500#	4.94 (125.5)	9.31 (236.5)	—	—	—	3.50 (88.9)
1	1½ – 2500#	6.76 (171.7)	11.63 (295.4)	—	—	—	4.00 (101.6)
2	2 – 150#	4.13 (104.9)	12.00 (304.8)	19.10 (458.1)	9.00 (228.6)	6.80 (172.7)	5.00 (127.0)
2	2 – 300#	4.38 (111.3)	12.00 (304.8)	19.10 (458.1)	9.00 (228.6)	7.05 (179.1)	5.00 (127.0)
2	2 – 600#	4.75 (120.7)	12.00 (304.8)	19.10 (458.1)	9.00 (228.6)	7.05 (179.1)	5.00 (127.0)
2	DN50/PN16	3.40 (86.4)	12.00 (304.8)	19.10 (458.1)	9.00 (228.6)	7.05 (179.1)	5.00 (127.0)
2	DN50/PN40	3.52 (89.4)	12.00 (304.8)	19.10 (458.1)	9.00 (228.6)	7.05 (179.1)	5.00 (127.0)
2	DN50/ PN100	4.30 (109.3)	12.00 (304.8)	19.10 (458.1)	9.00 (228.6)	7.05 (179.1)	5.00 (127.0)
2	2 – 900#	5.88 (149.4)	10.50 (266.7)	—	—	—	5.00 (127.0)
2	2 – 1500#	5.88 (149.4)	10.50 (266.7)	—	—	—	5.00 (127.0)
2	3 – 2500#	9.88 (251.0)	15.63 (397.0)	—	—	—	4.50 (114.3)

Table A-31. Flanged Annubar 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 – 150#	4.63 (117.6)	13.50 (342.9)	20.60 (523.2)	9.00 (228.6)	7.55 (191.8)	4.00 (101.6)
3	3 – 300#	5.00 (127.0)	13.50 (342.9)	20.60 (523.2)	9.00 (228.6)	7.93 (201.3)	4.00 (101.6)
3	3 – 600#	5.38 (136.7)	13.50 (342.9)	20.60 (523.2)	9.00 (228.6)	7.93 (201.3)	4.00 (101.6)
3	DN80/PN16	3.85 (97.8)	13.50 (342.9)	20.60 (523.2)	9.00 (228.6)	7.93 (201.3)	4.00 (101.6)
3	DN80/PN40	4.16 (105.7)	13.50 (342.9)	20.60 (523.2)	9.00 (228.6)	7.93 (201.3)	4.00 (101.6)
3	DN80/ PN100	4.95 (125.7)	13.50 (342.9)	20.60 (523.2)	9.00 (228.6)	7.93 (201.3)	4.00 (101.6)
3	4 – 900#	8.19 (208.0)	13.06 (331.8)	—	—	—	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)	17.31 (439.7)	—	—	—	7.00 (177.8)

*Dimensions are in inches (millimeters)*

# Annubar Flowmeter Series



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

Table A-32. Flanged Flo-Tap Annubar 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 (98.6)	10.50 (266.7)	—	17.77 (451.4)	C +7.10 (180.3)	10.50 (266.7)	6.30 (160.0)
1	1½ – 300#	4.13 (104.9)	11.75 (298.5)	—	17.77 (451.4)	C +7.10 (180.3)	10.50 (266.7)	6.86 (174.2)
1	1½ – 600#	4.44 (112.8)	14.06 (357.2)	—	17.77 (451.4)	C +7.10 (180.3)	10.50 (266.7)	6.86 (174.2)
1	DN40/PN16 <sup>(1)</sup>	3.09 (78.5)	See Note 1.	—	17.77 (451.4)	C +7.10 (180.3)	10.50 (266.7)	6.86 (174.2)
1	DN40/PN40	3.21 (81.5)	See Note 1.	—	17.77 (451.4)	C +7.10 (180.3)	10.50 (266.7)	6.86 (174.2)
1	DN40/PN100	3.88 (98.6)	See Note 1.	—	17.77 (451.4)	C +7.10 (180.3)	10.50 (266.7)	6.86 (174.2)
2	2 – 150#	4.13 (104.9)	11.25 (285.8)	24.44 (620.8)	21.20 (538.5)	C +7.10 (180.3)	12.56 (319.0)	6.80 (172.7)
2	2 – 300#	4.38 (111.3)	13.00 (330.2)	24.44 (620.8)	21.20 (538.5)	C +7.10 (180.3)	12.56 (319.0)	7.05 (179.1)
2	2 – 600#	4.75 (120.7)	16.38 (416.0)	24.44 (620.8)	21.20 (538.5)	C +7.10 (180.3)	12.56 (319.0)	7.05 (179.1)
2	DN50/PN16	3.40 (86.4)	See Note 1.	24.44 (620.8)	21.20 (538.5)	C +7.10 (180.3)	12.56 (319.0)	7.05 (179.1)
2	DN50/PN40	3.52 (89.4)	See Note 1.	24.44 (620.8)	21.20 (538.5)	C +7.10 (180.3)	12.56 (319.0)	7.05 (179.1)
2	DN50/PN100	4.30 (109.2)	See Note 1.	24.44 (620.8)	21.20 (538.5)	C +7.10 (180.3)	12.56 (319.0)	7.05 (179.1)
3	3 – 150#	4.63 (117.6)	12.75 (323.9)	26.37 (669.8)	23.14 (587.8)	C +7.10 (180.3)	14.13 (358.9)	7.55 (191.8)
3	3 – 300#	5.00 (127.0)	16.25 (412.8)	26.37 (669.8)	23.14 (587.8)	C +7.10 (180.3)	14.13 (358.9)	7.93 (201.3)
3	3 – 600#	5.38 (136.7)	19.50 (495.3)	26.37 (669.8)	23.14 (587.8)	C +7.10 (180.3)	14.13 (358.9)	7.93 (201.3)
3	DN80/PN16	3.85 (97.8)	See Note 1.	26.37 (669.8)	23.14 (587.8)	C +7.10 (180.3)	14.13 (358.9)	7.93 (201.3)
3	DN80/PN40	4.16 (105.7)	See Note 1.	26.37 (669.8)	23.14 (587.8)	C +7.10 (180.3)	14.13 (358.9)	7.93 (201.3)
3	DN80/PN100	4.95 (125.7)	See Note 1.	26.37 (669.8)	23.14 (587.8)	C +7.10 (180.3)	14.13 (358.9)	7.93 (201.3)

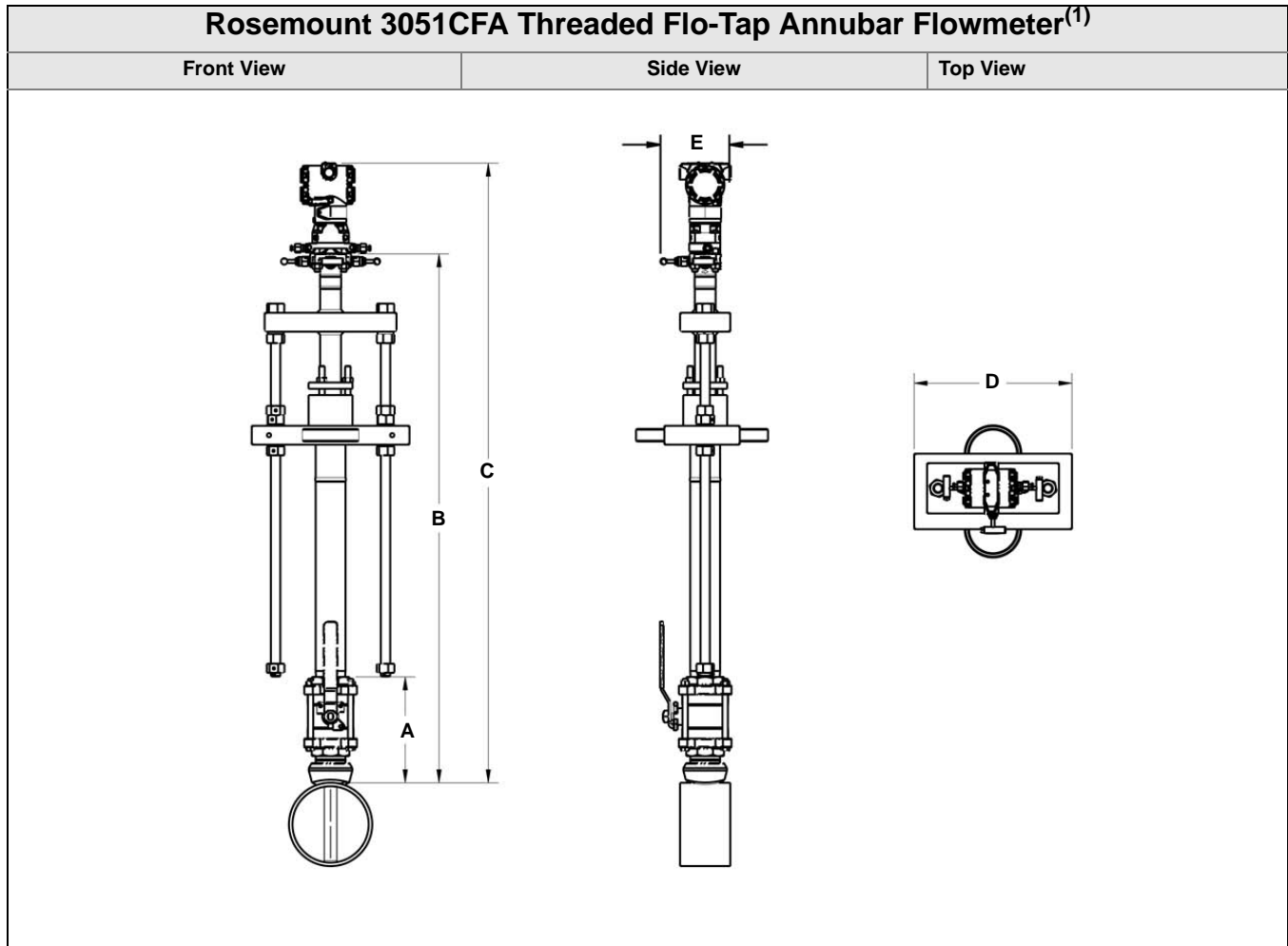
Dimensions are in inches (millimeters)

(1) DIN Valves are not offered.

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>



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

Table A-33. Threaded Flo-Tap Annubar 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	7.51 (190.9)	—			
2	8.17 (207.5)	23.62 (599.9)	20.39 (517.9)	B + 7.10 (180.3)	12.56 (319.0)	6.00 (152.4)

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

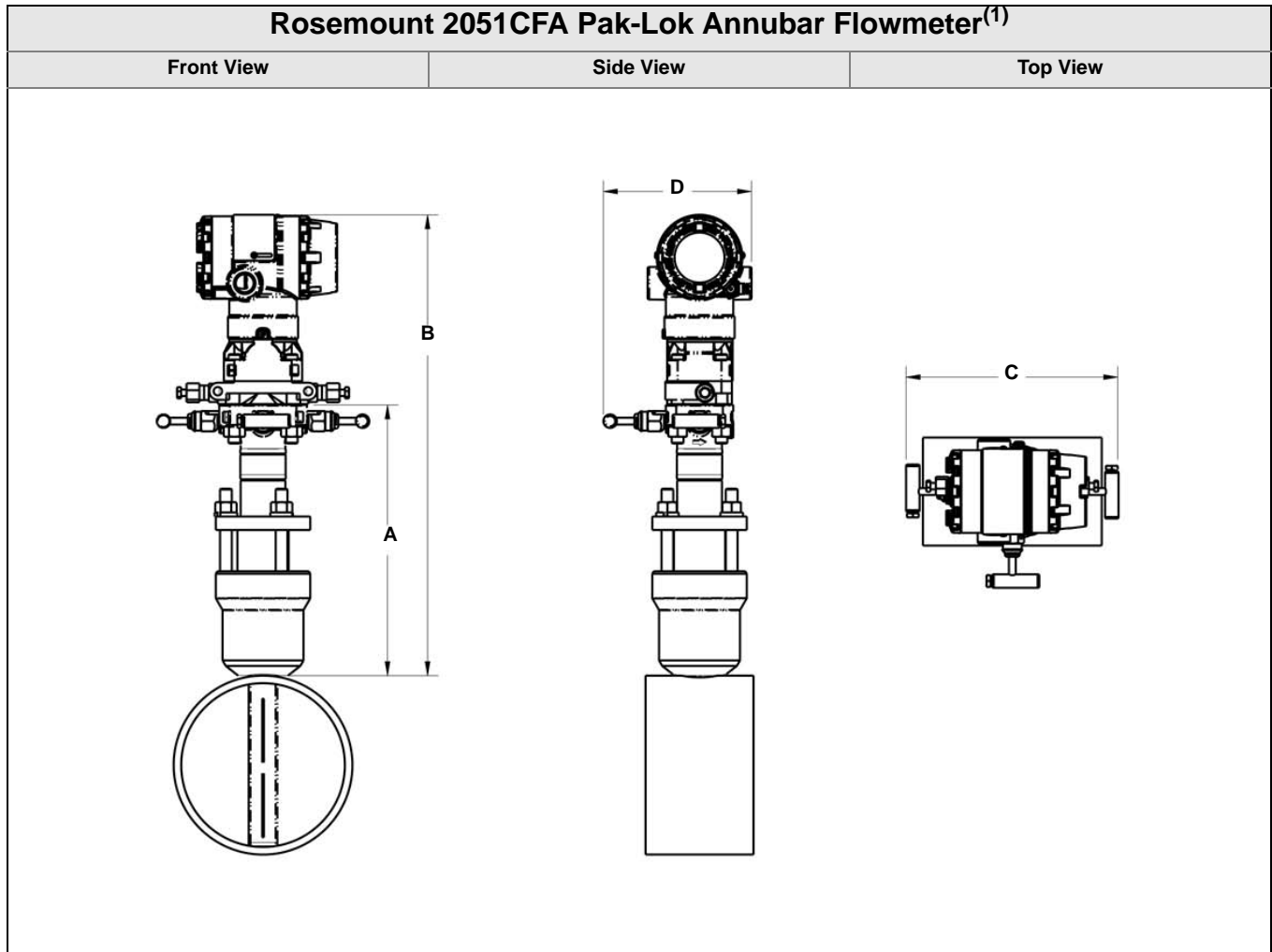
Dimensions are in inches (millimeters)

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>

# Annubar Flowmeter Series

## 2051CF 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 A-34. 2051CFA Pak-Lok Annubar Flowmeter Dimensional Data

Sensor Size	A (Max)	B (Max)	C (Max)	D (Max)
1	8.50 (215.9)	14.55 (369.6)	9.00 (228.6)	6.00 (152.4)
2	11.00 (279.4)	16.30 (414.0)	9.00 (228.6)	6.00 (152.4)
3	12.00 (304.8)	19.05 (483.9)	9.00 (228.6)	6.00 (152.4)

*Dimensions are in inches (millimeters)*



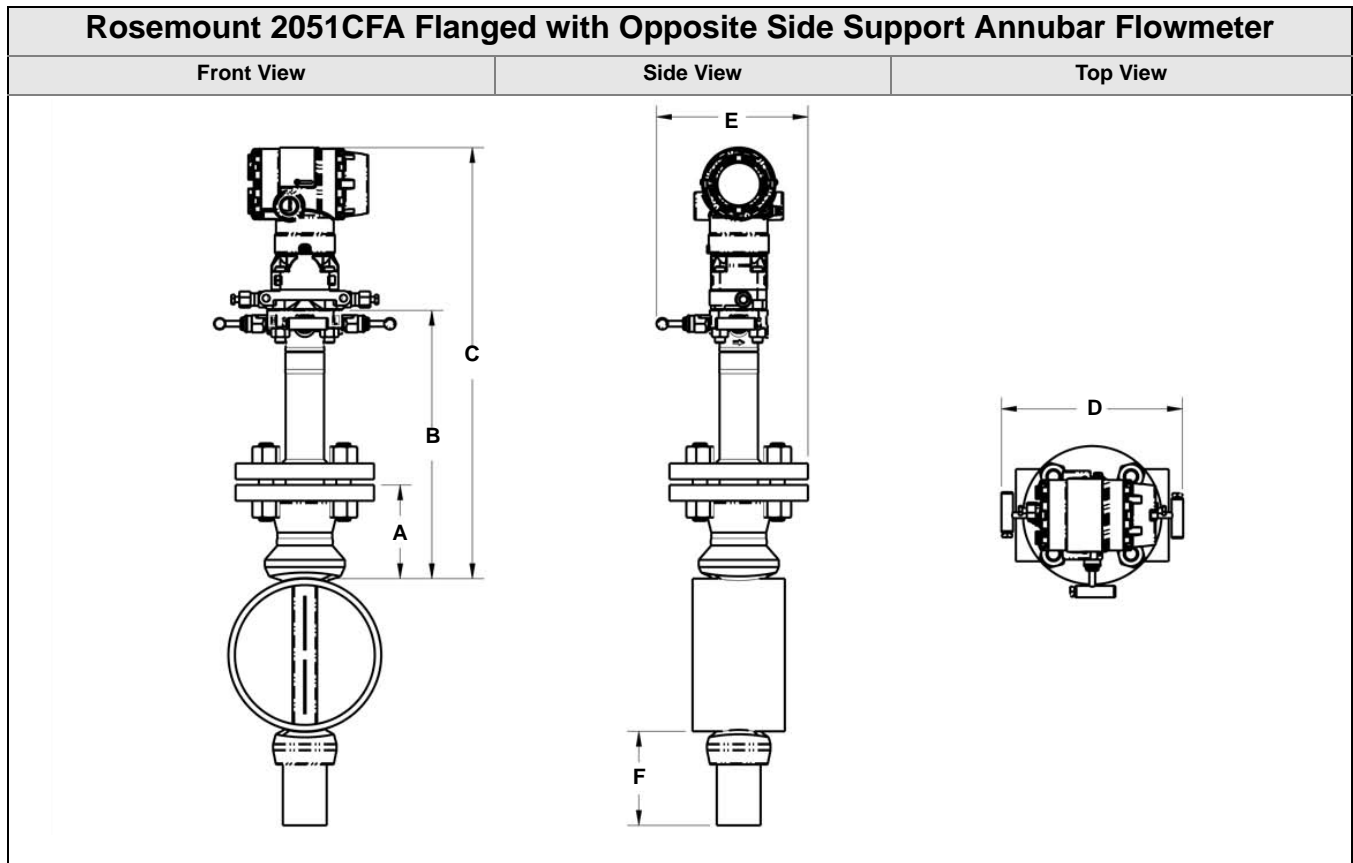


Table A-35. Flanged Annubar Flowmeter Dimensional Data

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)	18.03 (458.0)	9.00 (228.6)	6.30 (160.0)	3.50 (88.9)
1	1½ – 300#	4.13 (104.9)	11.00 (279.4)	18.03 (458.0)	9.00 (228.6)	6.86 (174.2)	3.50 (88.9)
1	1½ – 600#	4.44 (112.8)	11.00 (279.4)	18.03 (458.0)	9.00 (228.6)	6.86 (174.2)	3.50 (88.9)
1	DN40/PN16	3.09 (78.5)	11.00 (279.4)	18.03 (458.0)	9.00 (228.6)	6.30 (160.0)	3.50 (88.9)
1	DN40/PN40	3.21 (81.5)	11.00 (279.4)	18.03 (458.0)	9.00 (228.6)	6.86 (174.2)	3.50 (88.9)
1	DN40/PN100	3.88 (98.6)	11.00 (279.4)	18.03 (458.0)	9.00 (228.6)	6.86 (174.2)	3.50 (88.9)
1	1½ – 900#	4.94 (125.5)	9.31 (236.5)	-	-	-	3.50 (88.9)
1	1½ – 1500#	4.94 (125.5)	9.31 (236.5)	-	-	-	3.50 (88.9)
1	1½ – 2500#	6.76 (171.7)	11.63 (295.4)	-	-	-	4.00 (101.6)
2	2 – 150#	4.13 (104.9)	12.00 (304.8)	19.03 (483.4)	9.00 (228.6)	6.30 (160.0)	5.00 (127.0)
2	2 – 300#	4.38 (111.3)	12.00 (304.8)	19.03 (483.4)	9.00 (228.6)	6.86 (174.2)	5.00 (127.0)
2	2 – 600#	4.75 (120.7)	12.00 (304.8)	19.03 (483.4)	9.00 (228.6)	6.86 (174.2)	5.00 (127.0)
2	DN50/PN16	3.40 (86.4)	12.00 (304.8)	19.03 (483.4)	9.00 (228.6)	6.30 (160.0)	5.00 (127.0)
2	DN50/PN40	3.52 (89.4)	12.00 (304.8)	19.03 (483.4)	9.00 (228.6)	6.86 (174.2)	5.00 (127.0)
2	DN50/PN100	4.30 (109.2)	12.00 (304.8)	19.03 (483.4)	9.00 (228.6)	6.86 (174.2)	5.00 (127.0)
2	2 – 900#	5.88 (149.4)	10.50 (266.7)	-	-	-	5.00 (127.0)
2	2 – 1500#	5.88 (149.4)	10.50 (266.7)	-	-	-	5.00 (127.0)
2	2 – 2500#	9.88 (251.0)	15.63 (397.0)	-	-	-	4.50 (114.3)

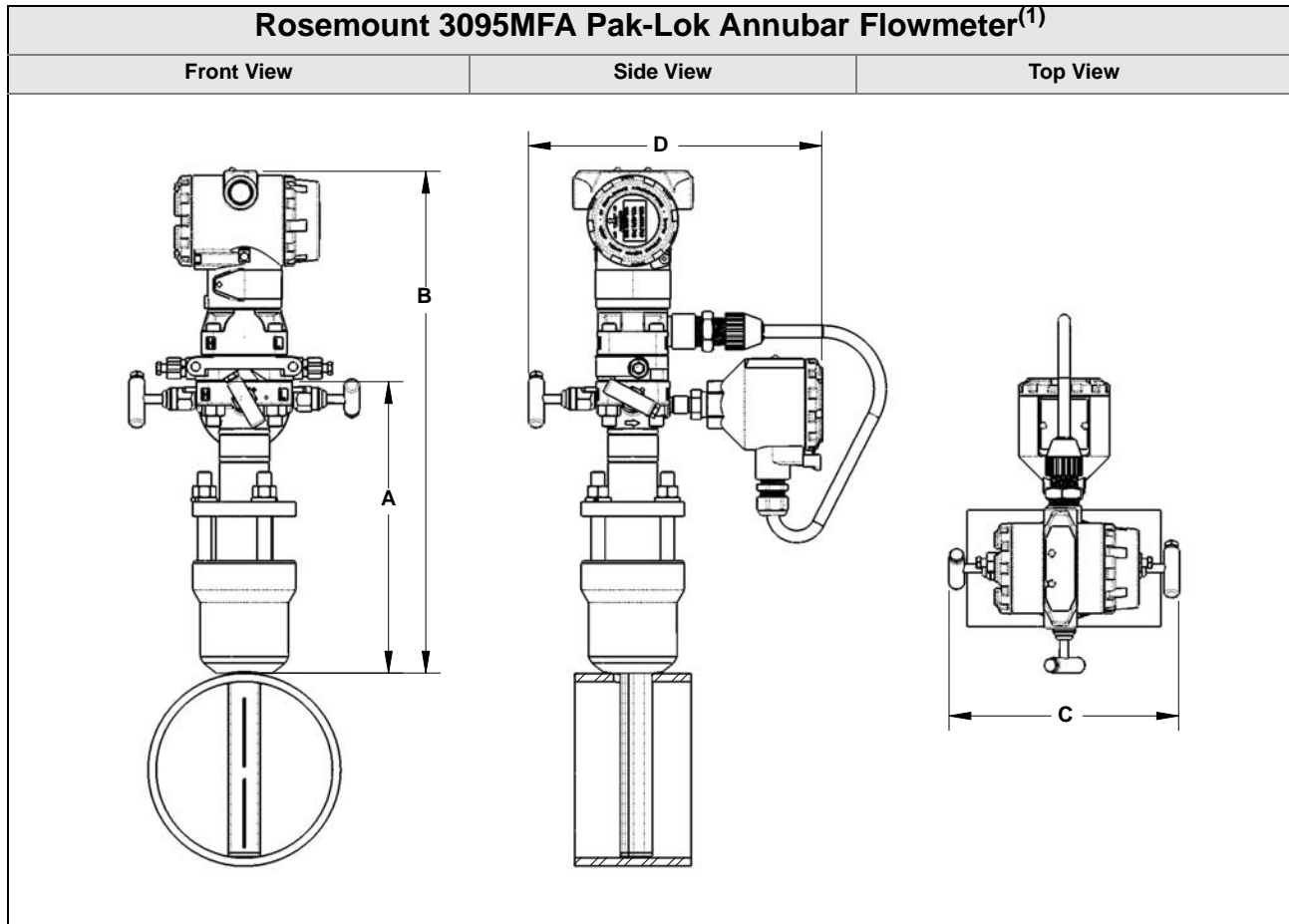
# Annubar Flowmeter Series

Table A-35. Flanged Annubar 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 – 150#	4.63 (117.6)	13.50 (342.9)	20.53 (521.5)	9.00 (228.6)	6.30 (160.0)	4.00 (101.6)
3	3 – 300#	5.00 (127.0)	13.50 (342.9)	20.53 (521.5)	9.00 (228.6)	6.86 (174.2)	4.00 (101.6)
3	3 – 600#	5.38 (136.7)	13.50 (342.9)	20.53 (521.5)	9.00 (228.6)	6.86 (174.2)	4.00 (101.6)
3	DN80/PN16	3.85 (97.8)	13.50 (342.9)	20.53 (521.5)	9.00 (228.6)	6.30 (160.0)	4.00 (101.6)
3	DN80/PN40	4.16 (105.7)	13.50 (342.9)	20.53 (521.5)	9.00 (228.6)	6.86 (174.2)	4.00 (101.6)
3	DN80/ PN100	4.95 (125.7)	13.50 (342.9)	20.53 (521.5)	9.00 (228.6)	6.86 (174.2)	4.00 (101.6)
3	3 – 900#	8.19 (208.0)	13.06 (331.7)	-	-	-	7.00 (177.8)
3	3 – 1500#	8.56 (217.4)	13.81 (350.8)	-	-	-	7.00 (177.8)
3	3 – 2500#	11.19 (284.2)	17.31 (439.7)	-	-	-	7.00 (177.8)

*Dimensions are in inches (millimeters)*

**3095MFA DIMENSIONAL DRAWINGS**



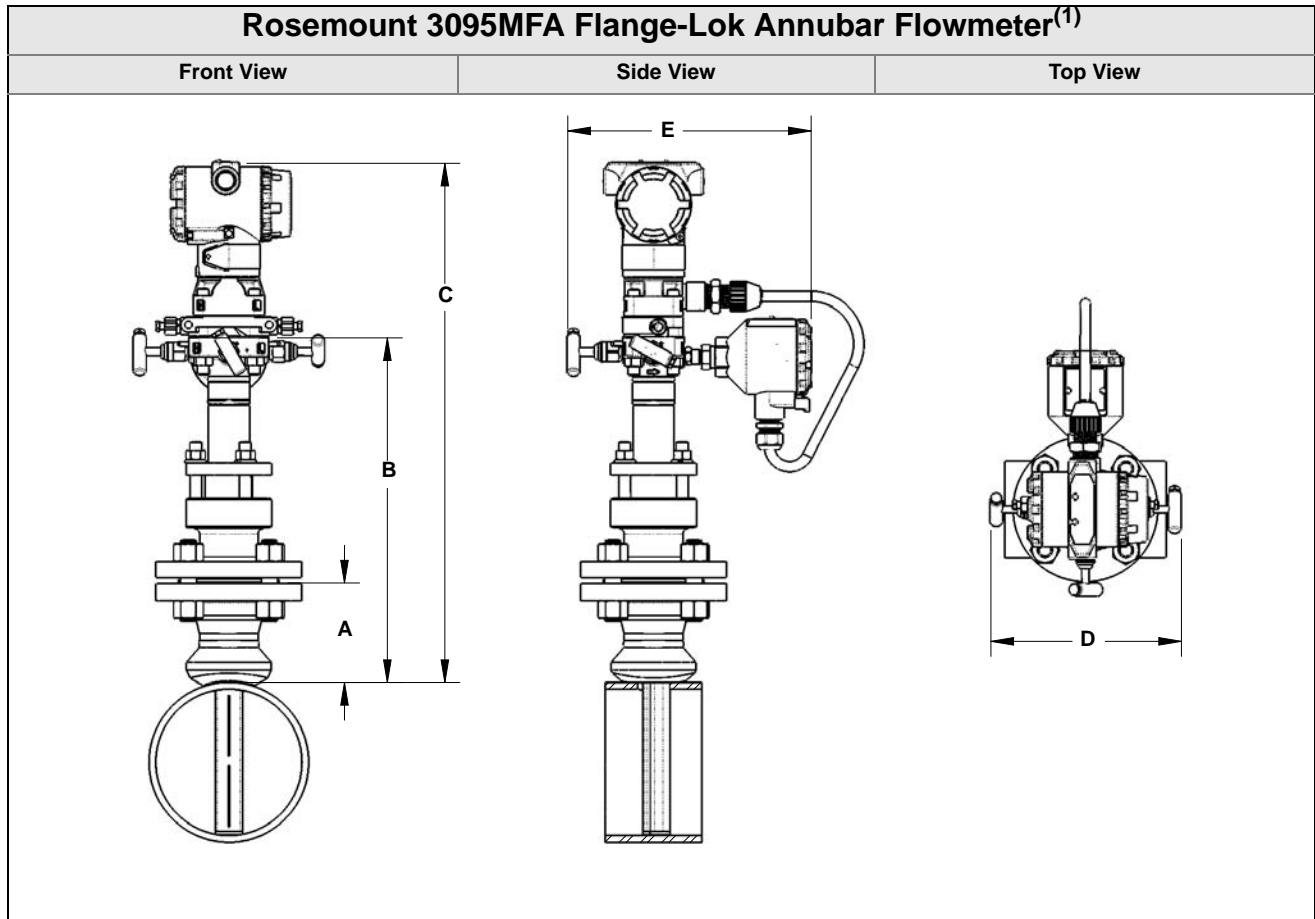
(1) The Pak-Lok Annubar model is available up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C)).

Table A-36. Pak-Lok Annubar Flowmeter Dimensional Data

Sensor Size	A (Max)	B (Max)	C (Max)	D (Max)
1	8.5 (215.9)	14.60 (370.8)	9.00 (228.6)	11.25 (285.8)
2	11.0 (279.4)	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)*

# 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 A-37. Flange-Lok Annubar 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#	4.75 (120.7)	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	3.52 (89.4)	14.25 (362.0)	21.35 (542.3)	9.00 (228.6)	11.25 (285.8)
2	DN50/PN100	4.30 (109.3)	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	3.85 (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)*

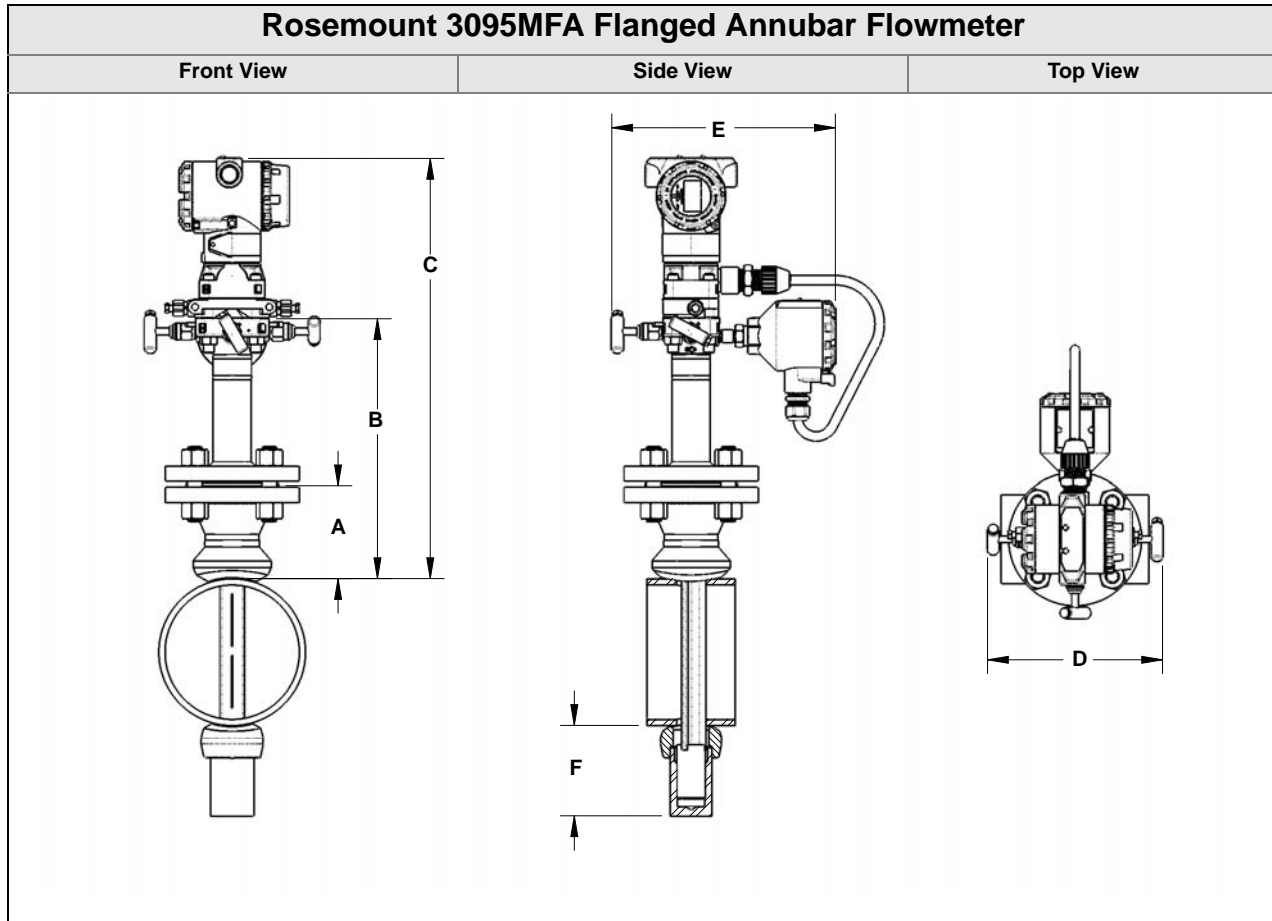


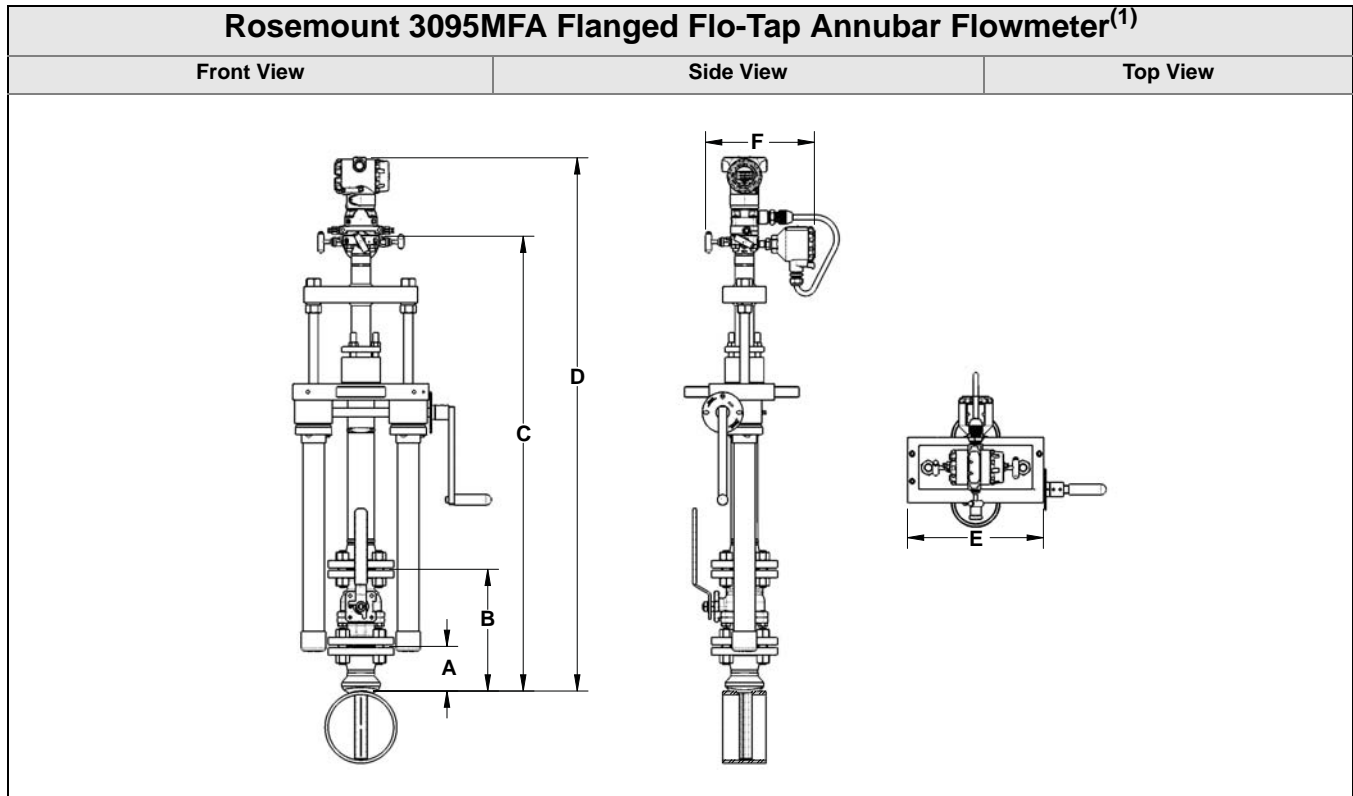
Table A-38. Flanged Annubar Flowmeter Dimensional Data

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)	9.31 (236.5)	—	—	—	3.50 (88.9)
1	1½ – 1500#	4.94 (125.5)	9.31 (236.5)	—	—	—	3.50 (88.9)
1	1½ – 2500#	6.76 (171.7)	11.63 (295.4)	—	—	—	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#	4.75 (120.7)	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	3.52 (89.4)	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 (109.3)	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)	10.50 (266.7)	—	—	—	5.00 (127.0)
2	2 – 1500#	5.88 (149.4)	10.50 (266.7)	—	—	—	5.00 (127.0)
2	3 – 2500#	9.88 (251.0)	15.63 (397.0)	—	—	—	4.50 (114.3)

# Annubar Flowmeter Series

Table A-38. Flanged Annubar 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 – 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)
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	3.85 (97.8)	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)
<i>Dimensions are in inches (millimeters)</i>							



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

Table A-39. Flanged Flo-Tap Annubar 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 (98.6)	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#	4.75 (120.7)	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	3.52 (89.4)	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/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	3.85 (97.8)	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)

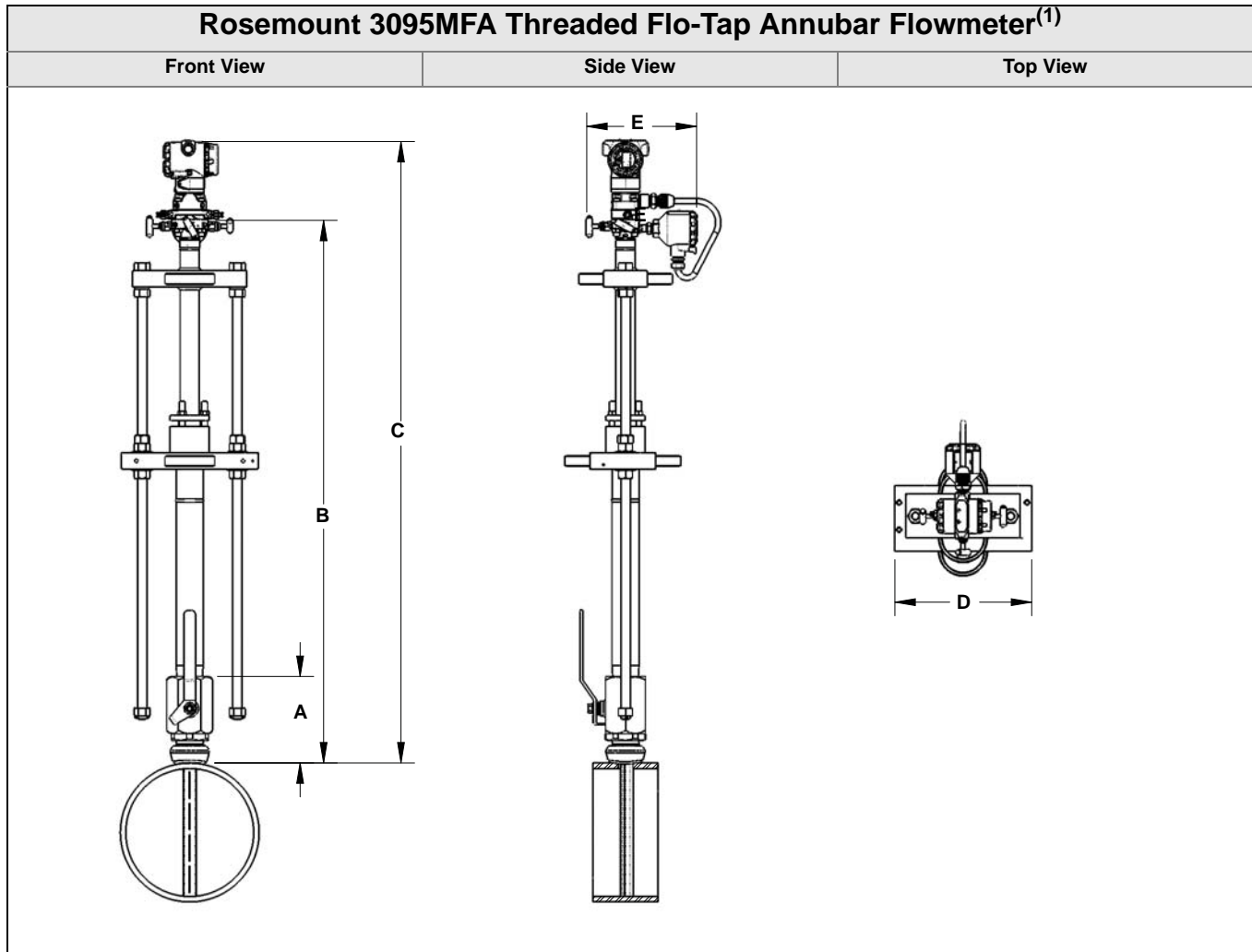
Dimensions are in inches (millimeters)

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>

# Annubar Flowmeter Series



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

Table A-40. Threaded Flo-Tap Annubar Flowmeter Dimensional Data

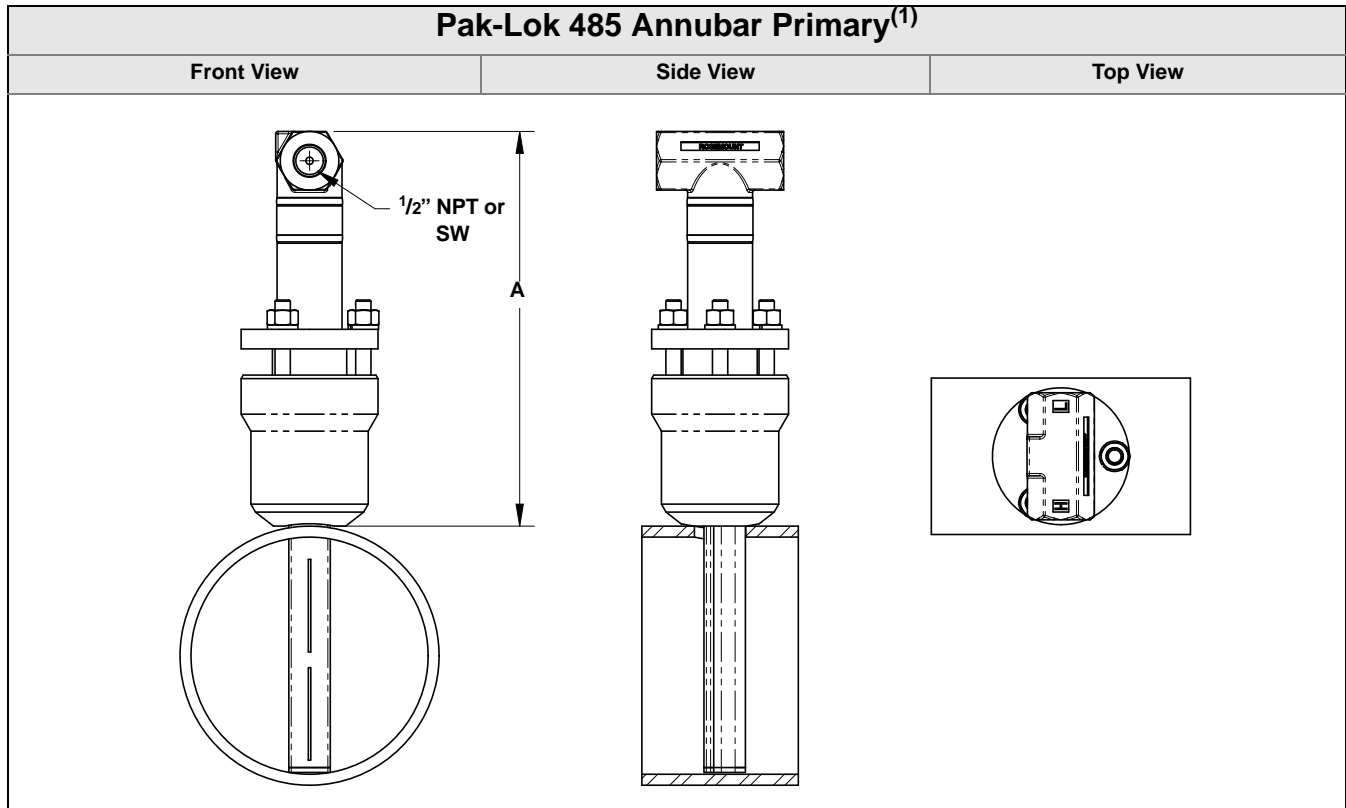
Sensor Size	A ± 0.50 (12.7)	B <sup>1</sup> (Max) (Gear Drive)	B <sup>1</sup> (Max) (Manual)	C (Max)	D (Max)	E (Max)
				B + 7.10 (180.3)		
1	7.51 (190.9)	—	16.96 (430.8)	B + 7.10 (180.3)	10.50 (266.7)	11.25 (285.8)
2	8.17 (207.5)	23.62 (599.9)	20.39 (517.9)	B + 7.10 (180.3)	12.56 (319.0)	11.25 (285.8)
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>



**485 DIMENSIONAL DRAWINGS**



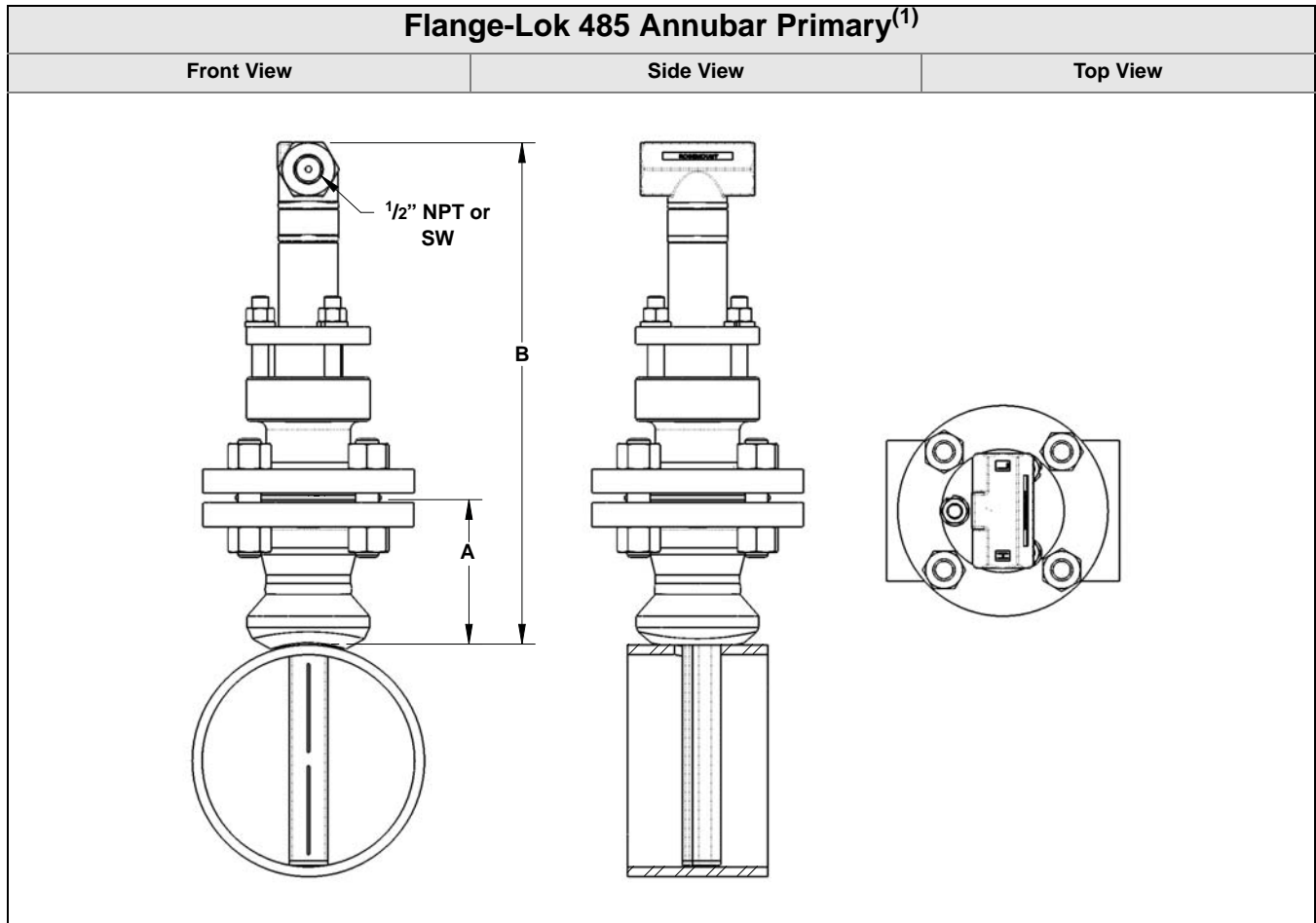
(1) The Pak-Lok Annubar model is available up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C)).

Table A-41. Pak-Lok 485 Annubar Primary Dimensional Data

Sensor Size	A (Max)
1	8.50 (215.9)
2	11.00 (279.4)
3	12.00 (304.8)

*Dimensions are in inches (millimeters)*

# 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 A-42. 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#	4.75 (120.7)	14.25 (362.0)
2	DN50/PN16	3.40 (86.4)	14.25 (362.0)
2	DN50/PN40	3.52 (89.4)	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	3.85 (97.8)	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)*

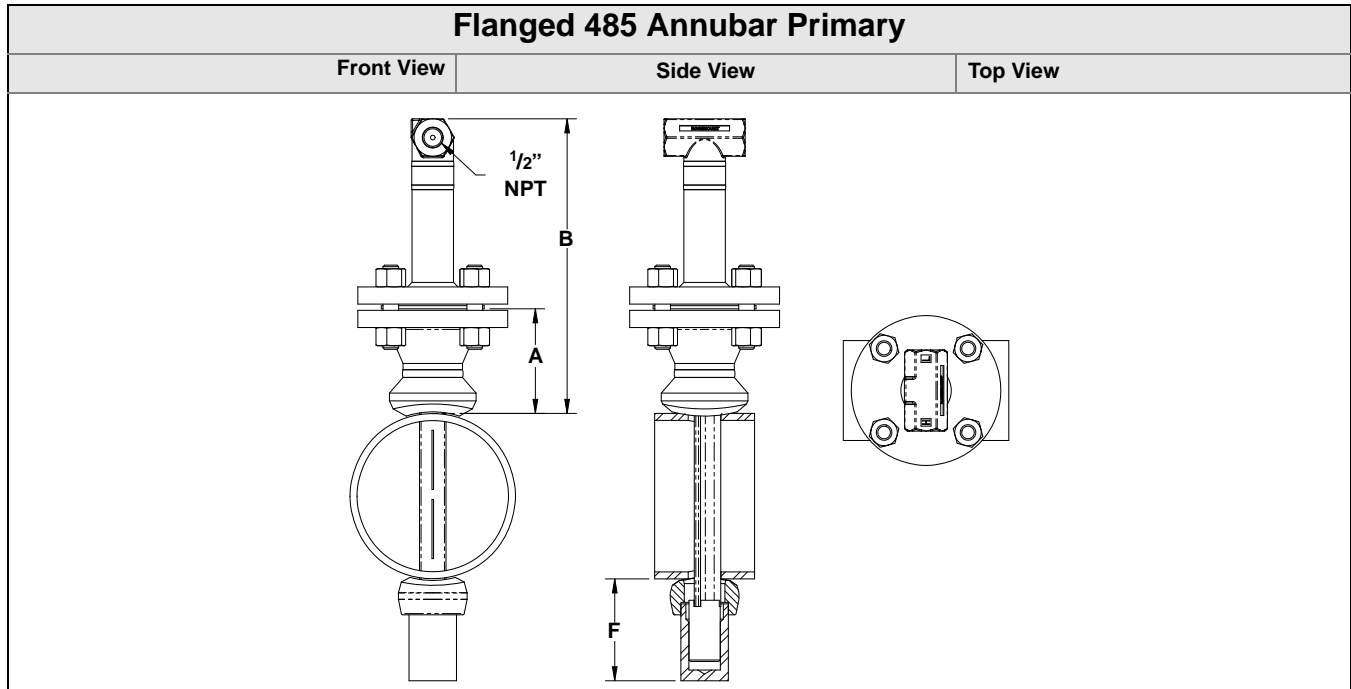


Table A-43. Flanged Annubar Flowmeter Dimensional Data

Sensor Size	Flange Size and Rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	F (Max)
1	1 <sup>1</sup> / <sub>2</sub> – 150#	3.88 (98.6)	11.00 (279.4)	3.50 (88.9)
1	1 <sup>1</sup> / <sub>2</sub> – 300#	4.13 (104.9)	11.00 (279.4)	3.50 (88.9)
1	1 <sup>1</sup> / <sub>2</sub> – 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 <sup>1</sup> / <sub>2</sub> – 900#	4.94 (125.5)	9.31 (236.5)	3.50 (88.9)
1	1 <sup>1</sup> / <sub>2</sub> – 1500#	4.94 (125.5)	9.31 (236.5)	3.50 (88.9)
1	1 <sup>1</sup> / <sub>2</sub> – 2500#	6.76 (171.7)	11.63 (295.4)	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#	4.75 (120.7)	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	3.52 (89.4)	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)	10.50 (266.7)	5.00 (127.0)
2	2 – 1500#	5.88 (149.4)	10.50 (266.7)	5.00 (127.0)
2	3 – 2500#	9.88 (251.0)	15.63 (397.0)	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	3.85 (97.8)	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)
3	4 – 900#	8.19 (208.0)	13.06 (331.7)	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)	17.31 (439.7)	7.00 (177.8)

*Dimensions are in inches (millimeters)*

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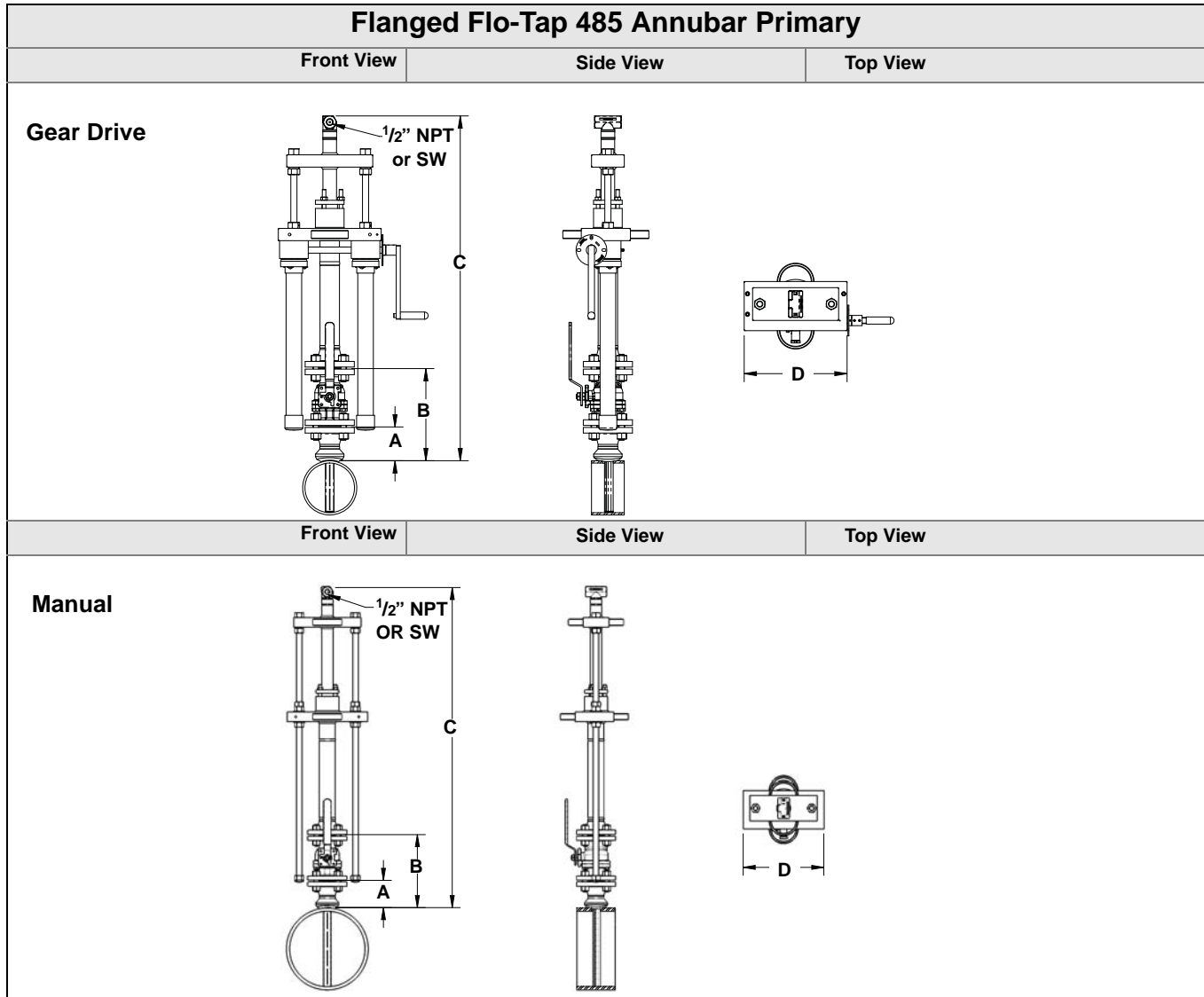


Table A-44. Flanged Flo-Tap 485 Annubar Primary Dimensional Data

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 <sup>1</sup> / <sub>2</sub> – 150#	3.88 (98.6)	10.50 (266.7)	—	<b>17.77 (451.4)</b>	10.50 (266.7)
1	1 <sup>1</sup> / <sub>2</sub> – 300#	4.13 (104.9)	11.75 (298.5)	—	<b>17.77 (451.4)</b>	10.50 (266.7)
1	1 <sup>1</sup> / <sub>2</sub> – 600#	4.44 (112.8)	14.06 (357.2)	—	<b>17.77 (451.4)</b>	10.50 (266.7)
1	DN40/PN16	3.09 (78.5)	See Note <sup>(1)</sup>	—	<b>17.77 (451.4)</b>	10.50 (266.7)
1	DN40/PN40	3.21 (81.5)	See Note <sup>(1)</sup>	—	<b>17.77 (451.4)</b>	10.50 (266.7)
1	DN40/PN100	3.88 (98.6)	See Note <sup>(1)</sup>	—	<b>17.77 (451.4)</b>	10.50 (266.7)
2	2 – 150#	4.13 (104.9)	11.25 (285.8)	24.44 (620.8)	21.20 (538.5)	12.56 (319.0)
2	2 – 300#	4.38 (111.3)	13.00 (330.2)	24.44 (620.8)	21.20 (538.5)	12.56 (319.0)
2	2 – 600#	4.75 (120.7)	16.38 (416.0)	24.44 (620.8)	21.20 (538.5)	12.56 (319.0)
2	DN50/PN16	3.40 (86.4)	See Note <sup>(1)</sup>	24.44 (620.8)	21.20 (538.5)	12.56 (319.0)
2	DN50/PN40	3.52 (89.4)	See Note <sup>(1)</sup>	24.44 (620.8)	21.20 (538.5)	12.56 (319.0)
2	DN50/PN100	4.30 (109.2)	See Note <sup>(1)</sup>	24.44 (620.8)	21.20 (538.5)	12.56 (319.0)

Table A-44. 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 – 150#	4.63 (117.6)	12.75 (323.9)	26.37 (669.8)	23.14 (587.8)	14.13 (358.9)
3	3 – 300#	5.00 (127.0)	16.25 (412.8)	26.37 (669.8)	23.14 (587.8)	14.13 (358.9)
3	3 – 600#	5.38 (136.7)	19.50 (495.4)	26.37 (669.8)	23.14 (587.8)	14.13 (358.9)
3	DN80/PN16	3.85 (97.8)	See Note <sup>(1)</sup>	26.37 (669.8)	23.14 (587.8)	14.13 (358.9)
3	DN80/PN40	4.16 (105.7)	See Note <sup>(1)</sup>	26.37 (669.8)	23.14 (587.8)	14.13 (358.9)
3	DN80/PN100	4.95 (125.7)	See Note <sup>(1)</sup>	26.37 (669.8)	23.14 (587.8)	14.13 (358.9)
<p><b>Use the appropriate formula to determine C value:</b>  <i>Inserted formula:</i> Pipe I.D. + Wall Thickness + Value B + C<sup>1</sup> (use the Manual Drive or Gear drive values for C<sup>1</sup>)  <i>Retracted formula:</i> [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>)</p>						
<i>Dimensions are in inches (millimeters)</i>						

(1) DIN Valves are not offered.

# Annubar Flowmeter Series

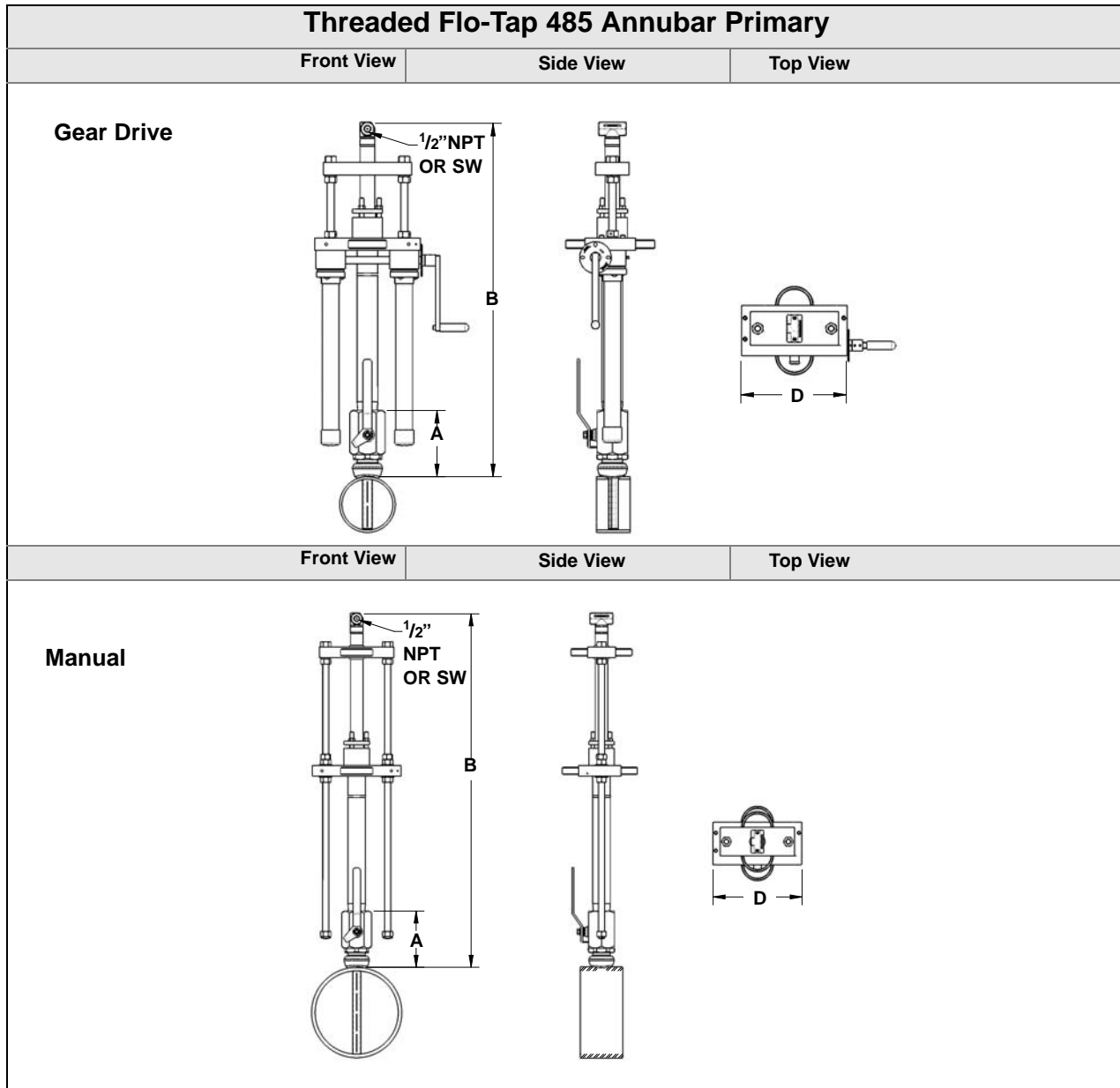


Table A-45. Threaded Flo-Tap 485 Annubar Primary Dimensional Data

Sensor Size	A ± 0.50 (12.7)	B <sup>1</sup> (Max) (Gear Drive)	B <sup>1</sup> (Max) (Manual)	D (Max)
1	7.51 (190.9)	—	16.96 (430.8)	10.50 (266.7)
2	8.17 (207.5)	23.62 (599.9)	20.39 (517.9)	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>

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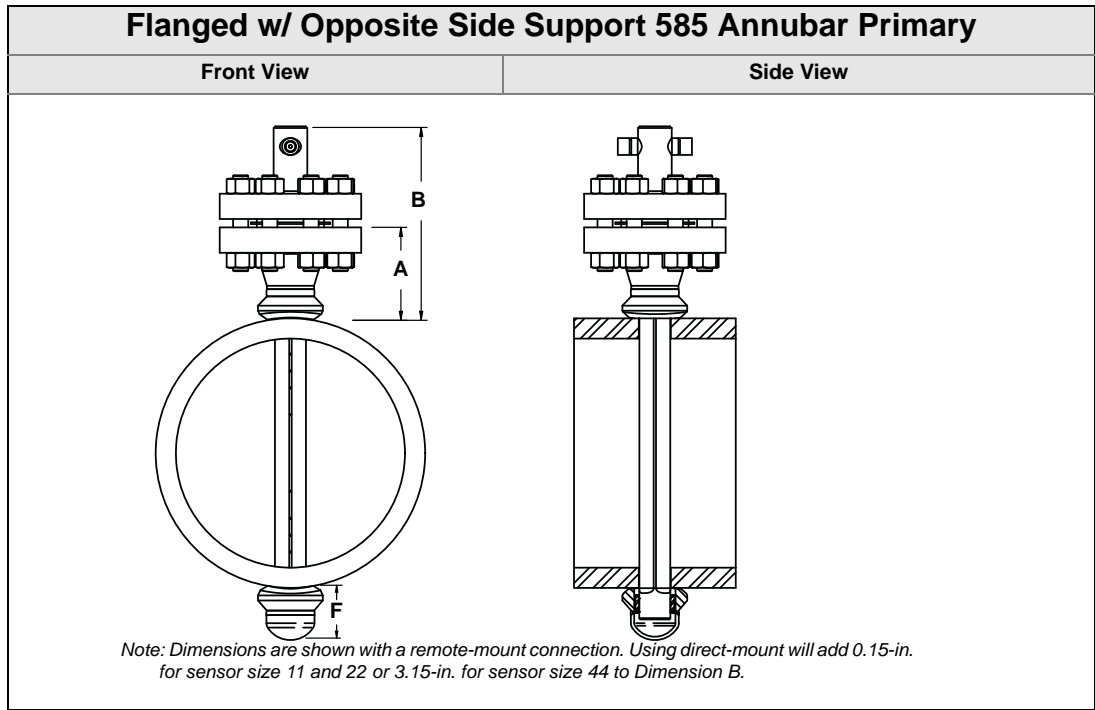


Table A-46. Flanged w/ Opposite Side Support Dimensional Data

Sensor Size	Flange Size and Rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	F (Max)
11	1½-in. – 150#	3.88 (98.6)	9.70 (246.4)	3.10 (78.7)
11	1½-in. – 300#	4.13 (104.9)	10.07 (255.8)	3.10 (78.7)
11	1½-in. – 600#	4.44 (112.8)	10.70 (271.8)	3.10 (78.7)
11	DIN40/PN16	3.21 (81.5)	9.05 (229.9)	3.10 (78.7)
11	DIN40/PN40	3.21 (81.5)	9.05 (229.9)	3.10 (78.7)
11	DIN40/ PN100	3.88 (98.6)	10.03 (254.8)	3.10 (78.7)
11	1½-in. – 900#	4.94 (125.5)	11.57 (293.9)	3.60 (91.4)
11	1½-in. – 1500#	4.94 (125.5)	11.57 (293.9)	3.60 (91.4)
11	1½-in. – 2500#	6.75 (171.5)	13.88 (352.6)	3.60 (91.4)
22	2-in. – 150#	4.13 (104.9)	10.01 (254.3)	4.50 (114.3)
22	2-in. – 300#	4.38 (111.3)	10.38 (263.7)	4.50 (114.3)
22	2-in. – 600#	4.75 (120.7)	11.13 (282.7)	4.50 (114.3)
22	DIN50/PN16	3.40 (86.4)	9.24 (234.7)	4.50 (114.3)
22	DIN50/PN40	3.52 (89.4)	9.44 (239.8)	4.50 (114.3)
22	DIN50/ PN100	4.30 (109.2)	10.53 (267.5)	4.50 (114.3)
22	2-in. – 900#	5.88 (149.4)	12.76 (324.1)	4.50 (114.3)
22	2-in. – 1500#	5.88 (149.4)	12.76 (324.1)	4.50 (114.3)
22	2-in. – 2500#	9.88 (250.1)	17.88 (454.2)	4.50 (114.3)
44	3-in. – 150#	4.63 (117.6)	10.69 (271.5)	3.90 (99.1)
44	3-in. – 300#	5.00 (127.0)	11.26 (286.6)	3.90 (99.1)
44	3-in. – 600#	5.38 (136.7)	12.00 (304.8)	3.90 (99.1)
44	DIN80/PN16	3.85 (97.8)	9.77 (248.2)	3.90 (99.1)
44	DIN80/PN40	4.16 (105.7)	10.23 (259.8)	3.90 (99.1)
44	DIN80/ PN100	4.95 (125.7)	11.34 (288.8)	3.90 (99.1)
44	4-in. – 900#	8.19 (208.8)	15.32 (389.1)	6.40 (162.6)
44	4-in. – 1500#	8.56 (217.4)	16.07 (408.2)	6.40 (162.6)
44	4-in. – 2500#	11.19 (284.2)	19.57 (497.1)	6.40 (162.6)

*Dimensions are in inches (millimeters)*

# Annubar Flowmeter Series

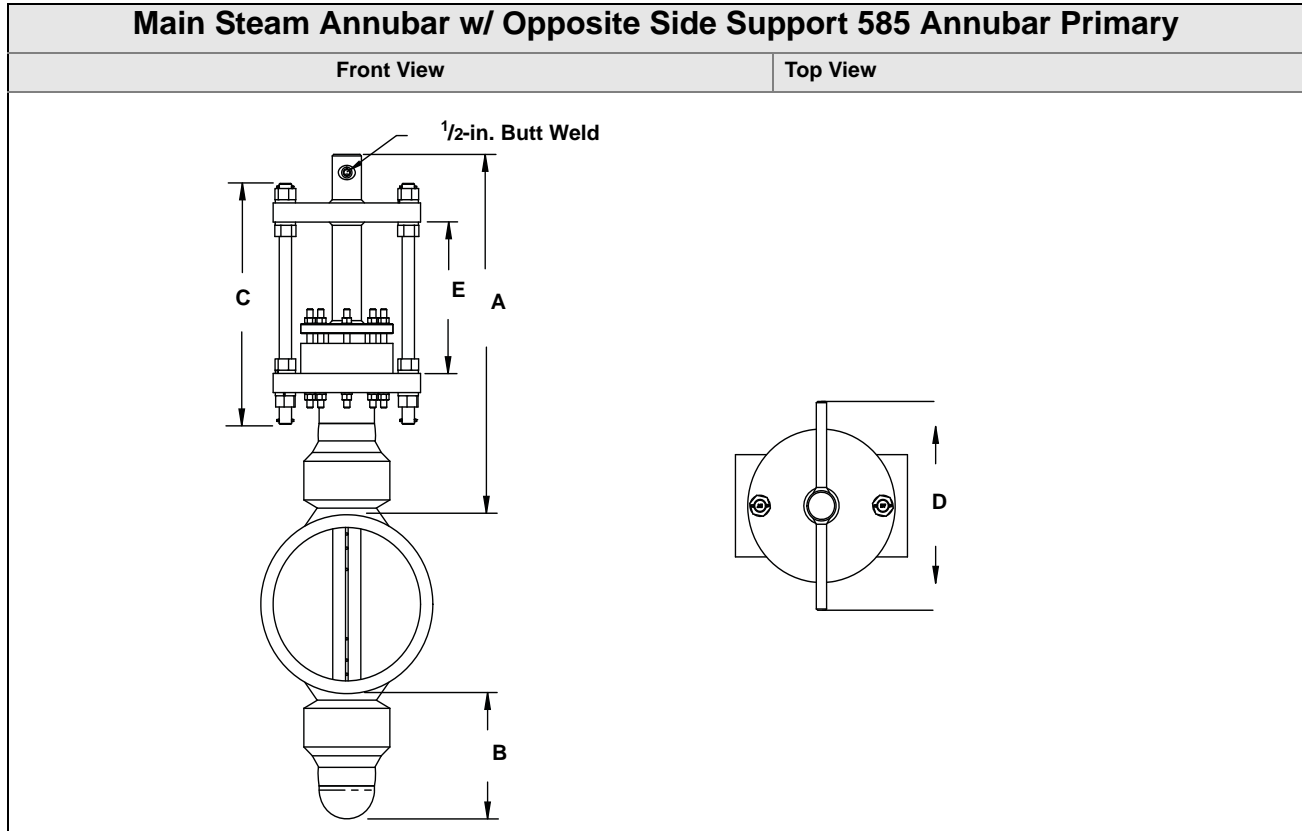


Table A-47. Main Steam Annubar w/ Opposite Side Support Dimensional Data

Sensor Size	A (Max)	B	C	D	E
44	29.67 (753.6)	10.0 (254)	19.0 (483)	16.33 (414.0)	11.0 (279)
<i>Dimensions are in inches (millimeters)</i>					

**NOTE**

Locking rods are always located 90° from the instrument connections. For horizontal installations, the instrument connections will be parallel to the pipe. For vertical installations, the instrument connections will be perpendicular to the pipe.



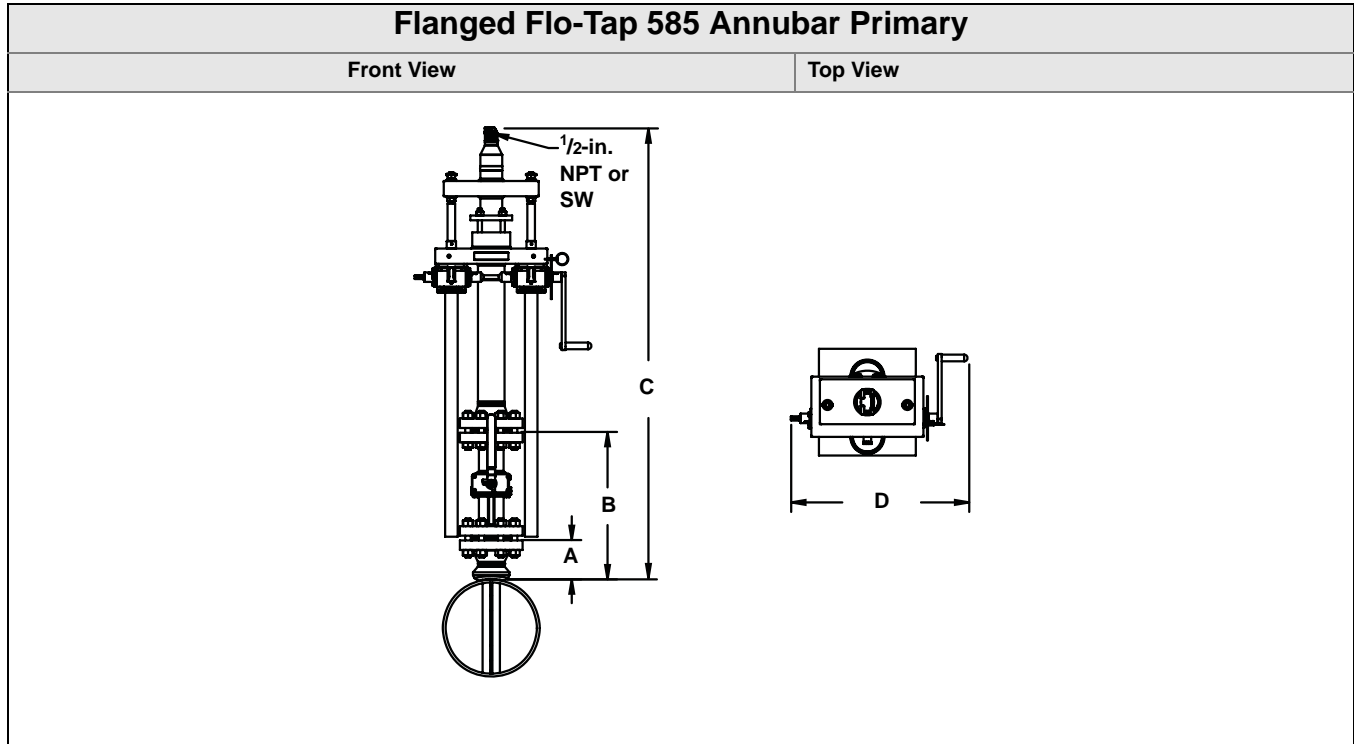


Table A-48. Flanged Flo-Tap 585 Annubar Primary Dimensional Data

Sensor Size	Flange Size and Rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	C <sup>1</sup> (Max) (Gear Drive)	D (Max)
44	3 – 150#	4.63 (117,6)	12.75 (323,9)	25.58 (649.7)	23.3 (591,8)
44	3 – 300#	5.00 (127,0)	16.25 (412,8)	25.58 (649.7)	23.3 (591,8)
44	3 – 600#	5.38 (136,7)	19.50 (495,4)	25.58 (649.7)	23.3 (591,8)
<p><b>Use the appropriate formula to determine C value:</b>                      Inserted formula: Pipe I.D. + Wall Thickness + Value B + C<sup>1</sup> (use the 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 Gear drive values for C<sup>1</sup>)</p>					
<p><i>Dimensions are in inches (millimeters)</i></p>					

# Annubar Flowmeter Series

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