

## Rosemount 485 Annubar Primary Element



Rosemount 485 Annubar Primary Element utilizes a T-shaped sensor design that offers best in class accuracy and performance.

- Up to 0.75 percent flow rate accuracy
- Lowest permanent pressure loss of any DP Flowmeter
- Available in 2 to 96-in. (50 to 2400 mm) line sizes

### Additional information

Specifications: [page 140](#)

Dimensional drawings: [page 215](#)

Installation and flowmeter orientation: [page 187](#)

**Table 23. Rosemount 485 Annubar Primary Element Ordering Information**

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Model	DP Flow primary type	
485	Rosemount Annubar Primary Element	
<b>Fluid type</b>		
L	Liquid	★
G	Gas	★
S	Steam	★
<b>Line size</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)	★
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)	

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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> (see “Pipe I.D. range code for Rosemount Annubar Flowmeters and Primary Elements” on page 143)		
C	Range C from the Pipe I.D. table	★
D	Range D from the Pipe I.D. table	★
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	
<b>Pipe material/assembly material</b>		
C	Carbon steel (A105)	★
S	316 stainless steel	★
0 <sup>(1)</sup>	No mounting (customer supplied)	★
G	Chrome-moly grade F-11	
N	Chrome-moly grade F-22	
J	Chrome-moly grade F-91	
<b>Piping orientation</b>		
H	Horizontal piping	★
D	Vertical piping with downwards flow	★
U	Vertical piping with upwards flow	★
<b>Rosemount Annubar type</b>		
P	Pak-Lok	★
F	Flanged with opposite side support	★
T <sup>(2)</sup>	Threaded	★
L	Flange-Lok	
G	Gear-drive Flo-tap	
M	Manual Flo-tap	
<b>Sensor material</b>		
S	316 stainless steel	★
H	Alloy C-276	

**Table 23. Rosemount 485 Annubar Primary Element Ordering Information**

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<b>Sensor size</b>			
1	Sensor size 1 — Line sizes 2- to 8-in. (50 to 200 mm)		★
2	Sensor size 2 — Line sizes 6- to 96-in. (150 to 2400 mm)		★
3	Sensor size 3 — Line sizes greater than 12-in. (300 mm)		
<b>Mounting type</b>			
T1	Compression/threaded connection		★
A1	Class 150 RF ANSI		★
A3	Class 300 RF ANSI		★
A6	Class 600 RF ANSI		★
D1	DN PN16 flange		★
D3	DN PN40 flange		★
D6	DN PN100 flange		★
A9 <sup>(3)</sup>	Class 900 RF ANSI		
AF <sup>(3)</sup>	Class 1500 RF ANSI		
AT <sup>(3)</sup>	Class 2500 RF ANSI		
R1	Class 150 RTJ ANSI flange		
R3	Class 300 RTJ ANSI flange		
R6	Class 600 RTJ ANSI flange		
R9 <sup>(3)</sup>	Class 900 RTJ ANSI flange		
RF <sup>(3)</sup>	Class 1500 RTJ ANSI flange		
RT <sup>(3)</sup>	Class 2500 RTJ ANSI flange		
<b>Opposite side support or packing gland</b>			
0	No opposite side support or packing gland (required for Pak-Lok, Flange-Lok, and Threaded 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>Packing gland material</b>	<b>Rod material</b>	<b>Packing material</b>
J <sup>(4)</sup>	Stainless steel packing gland/cage nipple	Carbon steel	PTFE
K <sup>(4)</sup>	Stainless steel packing gland/cage nipple	Stainless steel	PTFE
L <sup>(4)</sup>	Stainless steel packing gland/cage nipple	Carbon steel	Graphite
N <sup>(4)</sup>	Stainless steel packing gland/cage nipple	Stainless steel	Graphite
R	Alloy C-276 packing gland/cage nipple	Stainless steel	Graphite

**Table 23. Rosemount 485 Annubar Primary Element Ordering Information**

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

<b>Isolation valve for Flo-Tap models</b>		
0 <sup>(1)</sup>	Not applicable or customer supplied	★
1	Gate valve, carbon steel	
2	Gate valve, stainless steel	
5	Ball valve, carbon steel	
6	Ball valve, stainless steel	
<b>Temperature measurement</b>		
T	Integral RTD – not available with Flanged model greater than Class 600	★
0	No temperature sensor	★
R	Remote thermowell and RTD	
<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	★
7	Remote-mount NPT connections	★
6	Direct-mount, high temperature 5-valve manifold– not available with flanged model greater than Class 600	
8	Remote-mount SW connections	
A <sup>(2)</sup>	Remote-mount NPT connections, integral needle valves	★
B <sup>(2)</sup>	Remote-mount SW connections, integral needle valves	★

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

<b>Extended product warranty</b>		
WR3	3-year limited warranty	★
WR5	5-year limited warranty	★
<b>Pressure testing<sup>(5)</sup></b>		
P1	Hydrostatic testing with certificate	
PX	Extended hydrostatic testing	
<b>Special cleaning</b>		
P2	Cleaning for special services	
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	

**Table 23. Rosemount 485 Annubar Primary Element Ordering Information**

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

<b>Special inspection</b>		
QC1	Visual and dimensional inspection with certificate	★
QC7	Inspection and performance certificate	★
<b>Surface finish</b>		
RL	Surface finish for low pipe Reynolds number in gas and steam	★
RH	Surface finish for high pipe Reynolds number in liquid	★
<b>Material traceability certification<sup>(6)</sup></b>		
Q8	Material traceability certificate per EN 10204:2004 3.1	★
<b>Code conformance<sup>(7)</sup></b>		
J2	ANSI/ASME B31.1	
J3	ANSI/ASME B31.3	
<b>Materials conformance<sup>(8)</sup></b>		
J5	NACE MR-0175/ISO 15156	
<b>Country certification</b>		
J6	European Pressure Directive (PED)	★
J1	Canadian Registration	
<b>Installed in flanged pipe pool section</b>		
H3	Class 150 flanged connection with Rosemount standard length and schedule	
H4	Class 300 flanged connection with Rosemount standard length and schedule	
H5	Class 600 flanged connection with Rosemount standard length and schedule	
<b>Instrument connections for remote mount option<sup>(9)</sup></b>		
G2	Needle valves, stainless steel	★
G6	OS&Y gate valve, stainless steel	★
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>		
Y1	Mounting hardware shipped separately	★
<b>Attach to</b>		
H1	Attach to transmitter	

**Table 23. Rosemount 485 Annubar Primary Element Ordering Information**

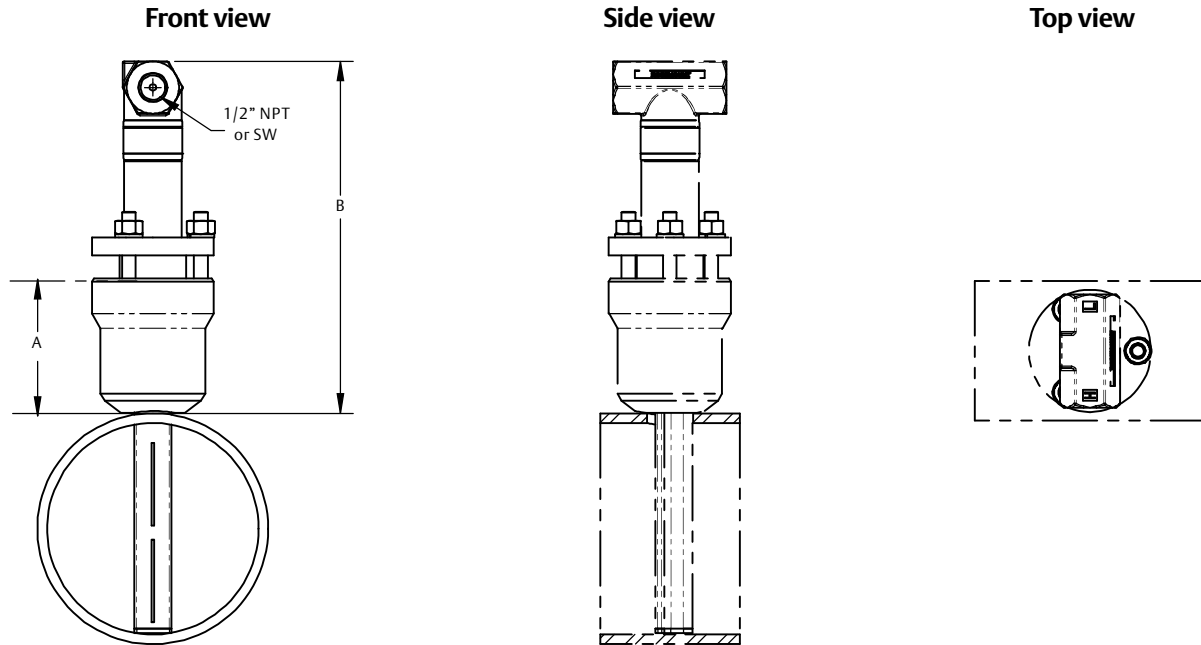
The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Special dimensions		
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. For Pak-Lok, Flanged, Threaded, and Flange-Lok, this note is only applicable if pipe material/assembly material is 0. For Flo-Taps, this note is applicable if either pipe material/assembly material is 0, or if Isolation valve is 0. Provide the "A" dimension for Flanged (page 218), Flange-Lok (page 217), Pak-Lok (page 215), Threaded (page 216) and Threaded Flo-Tap models (page 222). Provide the "B" dimension for Flanged Flo-Tap models (page 221).
2. Only available in China.
3. Available in remote mount applications only.
4. The cage nipple is constructed of 304SST.
5. Applies to flow element only, mounting hardware not tested.
6. Instrument connections for remote mount options and isolation valves for Flo-tap models are not included in the Material Traceability Certification.
7. Not available with transmitter connection platform 6.
8. 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.
9. Not available with transmitter connections platforms A and B.

## Rosemount 485 Annubar Primary Element

Figure 31. Rosemount 485 Pak-Lok Annubar Primary<sup>(1)</sup>



For A and B, see Table 90.

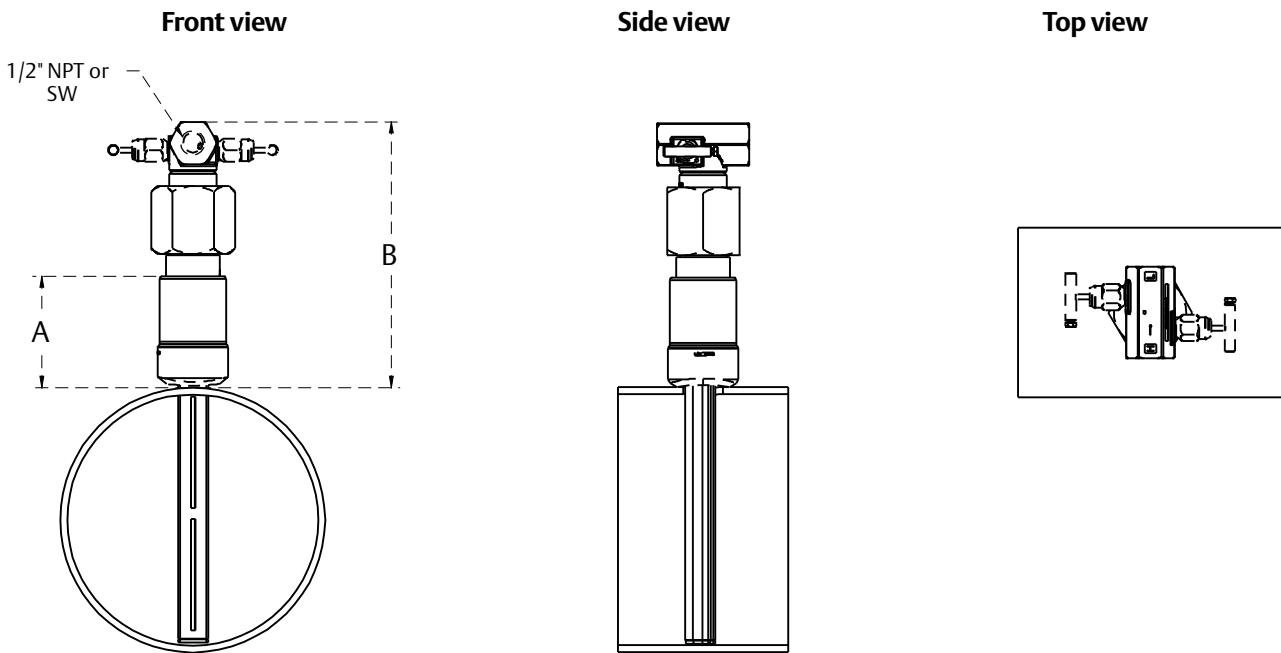
1. The Pak-Lok Annubar model is equivalent to Class 600 ANSI (1440 psig at 100 °F [99 bar at 38 °C]).

Table 90. Rosemount 485 Pak-Lok Annubar Primary Dimensional Data

Sensor size	A (Max)	B (Max)
1	2.89 (73)	8.50 (215.9)
2	3.92 (100)	11.00 (279.4)
3	3.96 (101)	12.00 (304.8)

Dimensions are in inches (millimeters).

Figure 32. Rosemount 485 Threaded Annubar Primary<sup>(1)</sup>



For A and B, see Table 91.

1. The Threaded Annubar model is available up to Class 600 ANSI (1440 psig at 100 °F [99 bar at 38 °C]).

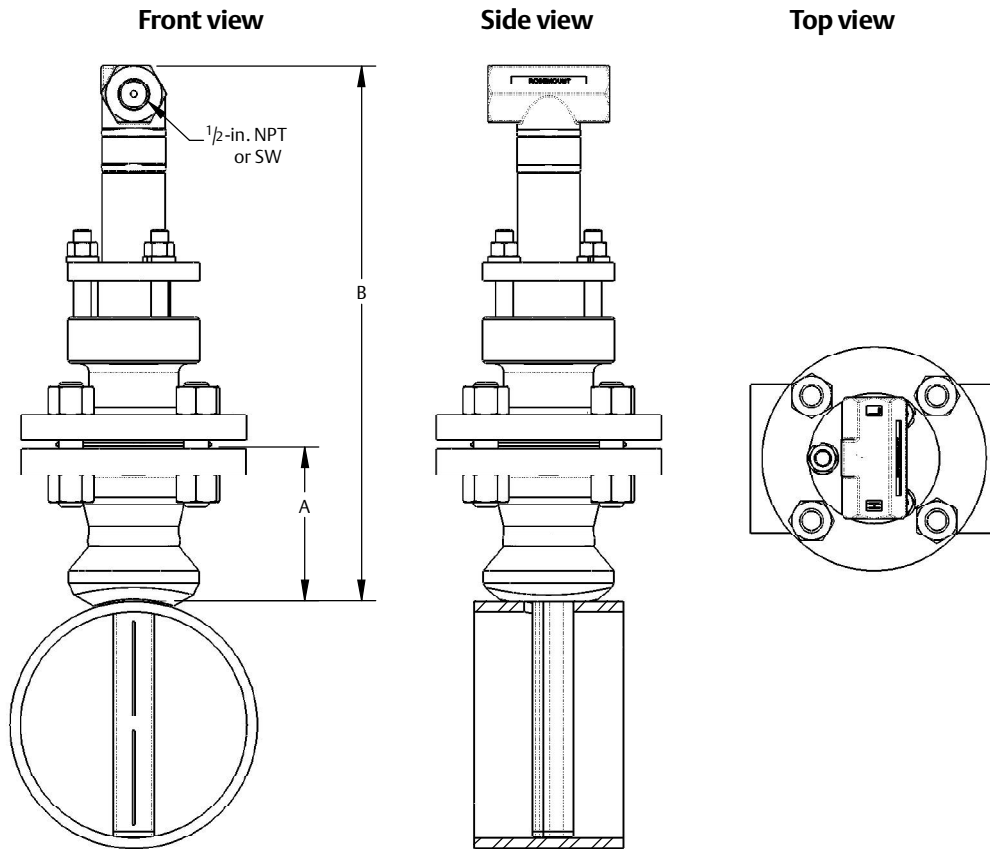
Table 91. Rosemount 485 Threaded Annubar Primary Dimensional Data

Sensor size	A (Max)	B (Max)
1	2.89 (73)	8.50 (215.9)
2	3.92 (100)	11.00 (279.4)

Dimensions are in inches (millimeters).



Figure 33. Rosemount 485 Flange-Lok Annubar Primary <sup>(1)</sup>



For A and B, see Table 92.

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

Table 92. Rosemount 485 Flange-Lok Annubar Primary Dimensional Data

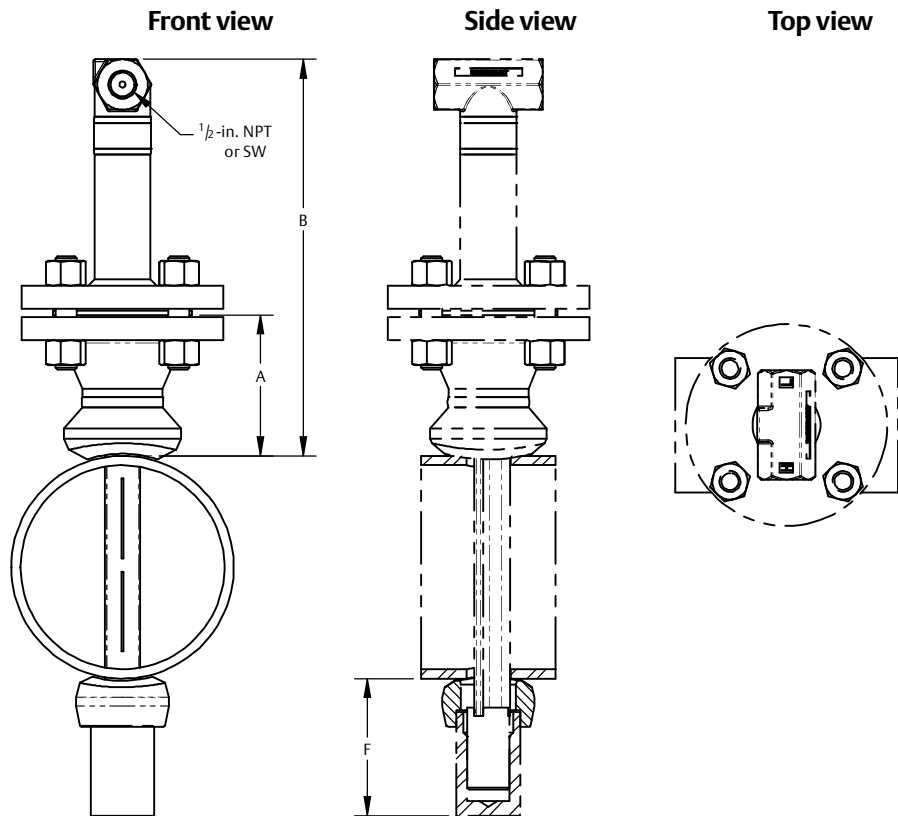
Sensor size	Flange size and rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)
1	1½ – Class 150	3.88 (98.6)	12.25 (311.2)
1	1½ – Class 300	4.13 (104.9)	12.25 (311.2)
1	1½ – Class 600	4.44 (112.8)	12.25 (311.2)
1	DN40/PN16	3.09 (78.5)	12.25 (311.2)
1	DN40/PN40	3.21 (81.5)	12.25 (311.2)
1	DN40/PN100	3.88 (98.6)	12.25 (311.2)
2	2 – Class 150	4.13 (104.9)	14.25 (362.0)
2	2 – Class 300	4.38 (111.3)	14.25 (362.0)
2	2 – Class 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 – Class 150	4.63 (117.6)	17.50 (444.5)
3	3 – Class 300	5.00 (127.0)	17.50 (444.5)
3	3 – Class 600	5.38 (136.7)	17.50 (444.5)

**Table 92. Rosemount 485 Flange-Lok Annubar Primary Dimensional Data**

Sensor size	Flange size and rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)
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).

**Figure 34. Rosemount 485 Flanged Annubar Primary**



For A and B, see Table 93.

**Table 93. Rosemount 485 Flanged Annubar Primary Dimensional Data**

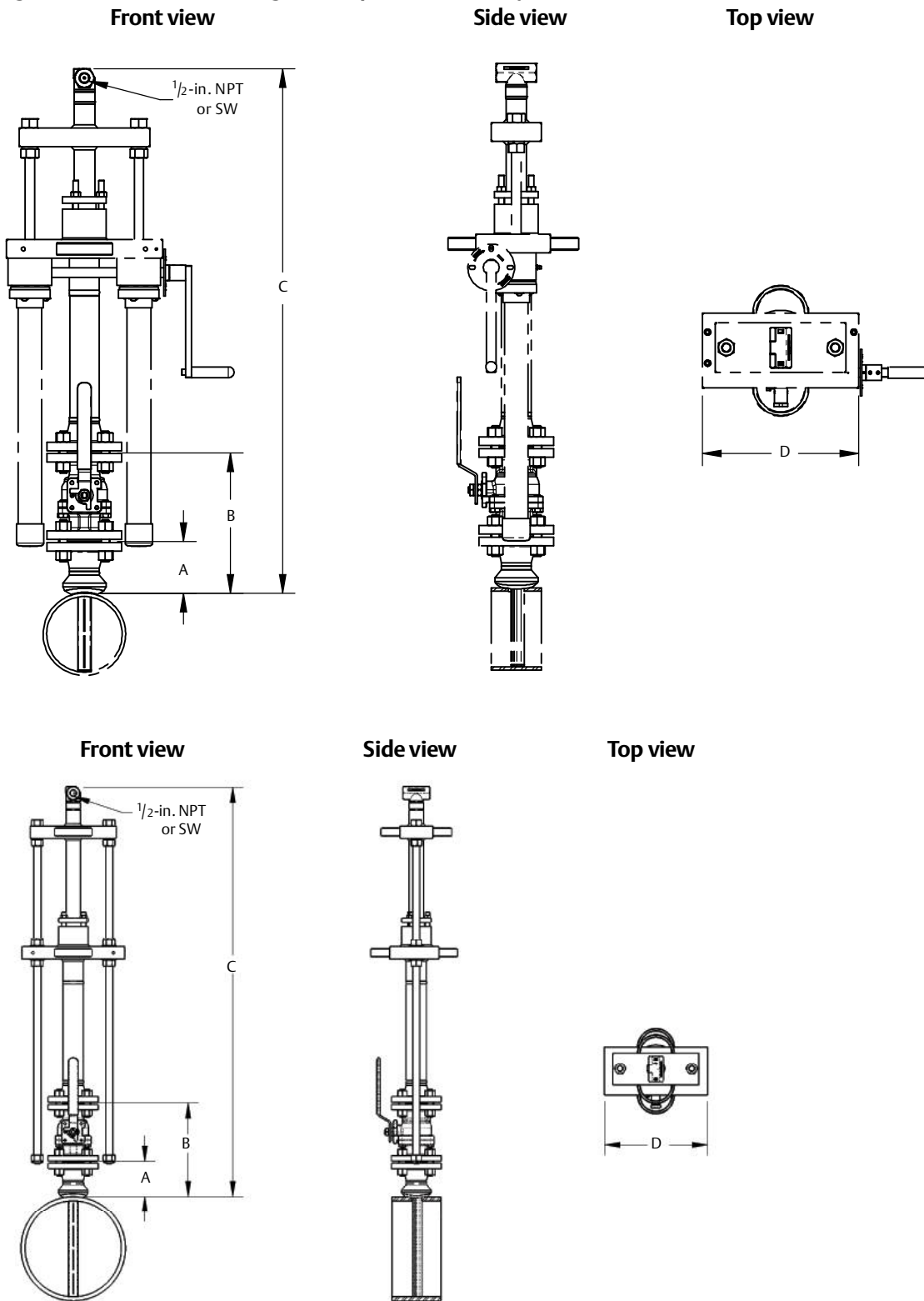
Sensor size	Flange size and rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	F (Max)
1	1½ – Class 150	3.88 (98.6)	11.00 (279.4)	3.50 (88.9)
1	1½ – Class 300	4.13 (104.9)	11.00 (279.4)	3.50 (88.9)
1	1½ – Class 600	4.44 (112.8)	11.00 (279.4)	3.50 (88.9)
1	DN40/PN16	3.09 (78.5)	11.00 (279.4)	3.50 (88.9)
1	DN40/PN40	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	1½ – Class 900	4.94 (125.5)	9.31 (236.5)	3.50 (88.9)
1	1½ – Class 1500	4.94 (125.5)	9.31 (236.5)	3.50 (88.9)
1	1½ – Class 2500	6.76 (171.7)	11.63 (295.4)	4.00 (101.6)
2	2 – Class 150	4.13 (104.9)	12.00 (304.8)	5.00 (127.0)
2	2 – Class 300	4.38 (111.3)	12.00 (304.8)	5.00 (127.0)
2	2 – Class 600	4.75 (120.7)	12.00 (304.8)	5.00 (127.0)

Table 93. Rosemount 485 Flanged Annubar Primary Dimensional Data

Sensor size	Flange size and rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	F (Max)
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 – Class 900	5.88 (149.4)	10.50 (266.7)	5.00 (127.0)
2	2 – Class 1500	5.88 (149.4)	10.50 (266.7)	5.00 (127.0)
2	3 – Class 2500	9.88 (251.0)	15.63 (397.0)	4.50 (114.3)
3	3 – Class 150	4.63 (117.6)	13.50 (342.9)	4.00 (101.6)
3	3 – Class 300	5.00 (127.0)	13.50 (342.9)	4.00 (101.6)
3	3 – Class 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 – Class 900	8.19 (208.0)	13.06 (331.7)	7.00 (177.8)
3	4 – Class 1500	8.56 (217.4)	13.81 (350.8)	7.00 (177.8)
3	4 – Class 2500	11.19 (284.2)	17.31 (439.7)	7.00 (177.8)

Dimensions are in inches (millimeters).

Figure 35. Rosemount 485 Flanged Flo-Tap Annubar Primary



For A-D, see Table 94.

## Rosemount 585 Annubar Primary Element



Rosemount 585 Annubar Primary Element utilizes a solid sensor construction that offers capabilities for severe service applications.

- Main steam line mounting hardware available
- Symmetrical sensor design allows bi-directional flow measurement
- Available in 4- to 96-in. (50 to 2400 mm) line sizes

### Additional information

Specifications: [page 151](#)

Dimensional drawings: [page 223](#)

Installation and flowmeter orientation: [page 187](#)

**Table 29. Rosemount 585 Annubar Primary Element Ordering Information**

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Model	DP Flow primary type	
585	Severe service Rosemount Annubar primary element	
<b>Application type</b>		
S <sup>(1)(2)</sup>	Severe service Rosemount Annubar	★
M <sup>(3)</sup>	Main steam line Rosemount Annubar	
<b>Fluid type</b>		
L	Liquid	★
G	Gas	★
S	Steam	★
<b>Rosemount Annubar type</b>		
F	Flanged with opposite side support	★
L	Main steam Annubar with opposite side support	
G	Gear-drive Flo-Tap	
<b>Line size</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)	★
140	14-in. (350 mm)	
160	16-in. (400 mm)	

**Table 29. Rosemount 585 Annubar Primary Element Ordering Information**

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

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)	
960	96-in. (2400 mm)	
<b>Mounting assembly material</b>		
C	Carbon steel (A105)	★
S	316/316L stainless steel	★
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>		
H	Horizontal piping	★
D	Vertical piping with downwards flow	★
U	Vertical piping with upwards flow	★
<b>Sensor material</b>		
S	316/316L stainless steel	★
H <sup>(5)</sup>	Alloy C-276	
W <sup>(3)(5)</sup>	Alloy 800H	
K <sup>(5)</sup>	PVDF	
<b>Sensor size</b>		
11	Sensor size 11	★
22 <sup>(6)</sup>	Sensor size 22	★
44 <sup>(2)(3)</sup>	Sensor size 44	

**Table 29. Rosemount 585 Annubar Primary Element Ordering Information**

he starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

<b>Mounting type</b>		
A	ANSI B16.5 raised face flanges	★
D <sup>(7)</sup>	DIN raised face flanges	★
R <sup>(8)</sup>	ANSI B16.5 ring type joint flanges	
O <sup>(3)</sup>	Main steam packing gland	
<b>Mounting pressure class</b>		
1	ANSI 150/DIN PN16	★
3 <sup>(6)</sup>	ANSI 300/DIN PN40	★
6 <sup>(6)</sup>	ANSI 600/DIN PN100	★
N <sup>(5)(6)</sup>	ANSI 900	
F <sup>(5)(6)</sup>	ANSI 1500	
T <sup>(5)(6)</sup>	ANSI 2500	
O <sup>(3)(5)(6)</sup>	Main steam packing gland	
<b>Opposite side support</b>		
C <sup>(9)</sup>	NPT threaded opposite support assembly	★
D <sup>(3)</sup>	Welded opposite support assembly	★
E	Flanged opposite support assembly	
O <sup>(2)</sup>	No opposite side support required	★
<b>Packing gland/packing</b>		
O <sup>(1)</sup>	Not applicable	★
L <sup>(2)</sup>	SS packing gland/graphite packing	★
T <sup>(3)</sup>	Main steam packing gland/graphite packing	
<b>Insertion mechanism</b>		
O <sup>(1)(3)</sup>	Not applicable	★
C	Alloy steel insertion rods/nuts	
S	Stainless steel insertion rods/nuts	
<b>Isolation valve</b>		
O <sup>(1)(3)</sup>	Not applicable or customer supplied	★
1	Gate valve, carbon steel	
2	Gate valve, stainless steel	
5	Ball valve, carbon steel	
6	Ball valve, stainless steel	
<b>Temperature measurement</b>		
0	No temperature sensor required	★
R <sup>(4)(6)(9)</sup>	Remote RTD (1/2 NPT aluminum housing) with thermowell	
S <sup>(4)(6)(9)</sup>	Remote RTD (1/2 NPT stainless housing) with thermowell	

**Table 29. Rosemount 585 Annubar Primary Element Ordering Information**

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

<b>Transmitter connection platform</b>		
3 <sup>(6)(10)(11)</sup>	Direct-mount, 3-valve manifold	★
4 <sup>(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>		
A	193 Gr B7 studs w/ A194 Gr 2H nuts	★
0	No flange studs/nuts supplied	★
<b>Mounting flange gasket materials</b>		
1	Spiral wound, 304SS, Flexible-graphite filler	★
0	No flange gasket supplied	★
2	Ring-joint, ANSI B16.20, hexagonal, 316L	
3	Spiral wound, B16.20, 316SS, PTFE filler	

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

<b>Extended product warranty</b>		
WR3	3-year limited warranty	★
WR5	5-year limited warranty	★
<b>Optional mounting for rectangular ducts</b>		
RD	Annubar mounting for rectangular ducts	
<b>Pressure testing<sup>(13)</sup></b>		
P1	Hydrostatic testing with certificate	
PX	Extended hydrostatic testing	
<b>Special cleaning<sup>(6)(14)</sup></b>		
PA	Cleaning per ASTM G93 level D (section 11.4)	
<b>Material testing</b>		
V1	Dye penetrant weld exam	
<b>Material examination</b>		
V2	Radiographic weld examination	
<b>Flow calibration</b>		
W1	Flow calibration (average K)	
<b>Special inspection</b>		
QC1	Visual and dimensional inspection with certificate	★
QC7	Inspection and performance certificate	★



Table 29. Rosemount 585 Annubar Primary Element Ordering Information

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

<b>Material traceability certification<sup>(15)</sup></b>		
Q8	Material traceability certification per EN 10204:2004 3.1	★
<b>Positive material testing<sup>(15)</sup></b>		
V4	Positive material identification	
<b>Code conformance</b>		
J2	ANSI/ASME B31.1	
J3	ANSI/ASME B31.3	
<b>Materials conformance<sup>(16)</sup></b>		
J5	NACE MR-0175/ISO 15156	
<b>Country certification</b>		
J6	European Pressure Directive (PED)	★
J1	Canadian Registration Certificate	
<b>Instrument valves for remote mount option</b>		
G2	1/2-in. needle valves, SS	★
G6	1/2-in. OS&Y gate valve, SS	★
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<sup>(17)</sup></b>		
DV	Double instrument valves (4 valves total)	★
<b>Special shipment</b>		
Y1	Mounting hardware shipped separately	★
<b>Assemble mounting hardware<sup>(18)</sup></b>		
WP	Assemble socket-weld outlet to packing body	★
<b>Special dimensions</b>		
VM	Variable mounting	
<b>585 packing gland plug<sup>(18)</sup></b>		
TP	Packing gland plug for steam blow down	
<b>585 installation alignment bar<sup>(18)</sup></b>		
A1	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 Rosemount Annubar type F.

2. Required for Rosemount Annubar type G.
3. Required for Rosemount Annubar type L.
4. Not available with Rosemount Annubar type L.
5. Not available with Rosemount 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 Rosemount 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 Rosemount Annubar Type L.

# Specifications

## Performance specifications

### Performance statement assumptions

Measured pipe I.D.

### Discharge coefficient factor

±1.50 percent of flow rate

### Repeatability

±0.10 percent

### 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 30. 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)

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

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)

### Sizing

Contact an Emerson representative for assistance. A Configuration Data Sheet is required prior to order for application verification. To complete the Configuration Data Sheet go to:

[Emerson.com/Rosemount/DP\\_Flow/Application/Pages/PCDefault.aspx](http://Emerson.com/Rosemount/DP_Flow/Application/Pages/PCDefault.aspx)

### Flow turndown

10:1 or better

## Functional specifications

### Service

- Liquid
- Gas
- Steam

### Process temperature limits

**Table 31. Direct Mount Transmitter Connection Platform**

Transmitter connection platform	Temperature limit
3-valve manifold (option codes 3, 4)	500 °F (260 °C)
5-valve manifold (option code 6) <sup>(1)</sup>	750 °F (398 °C)

1. Specification is 600 °F (315 °C) in steam service.

**Table 32. Remote Mount Transmitter Connection Platform (Option Codes 7, 8)**

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 (option code K)	250 °F (121 °C)

### Pressure and temperature limits

**Table 33. Main Steam Line Rosemount Annubar (Option Code L)**

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 34. Severe Service Rosemount Annubar**

Rosemount Annubar type	Sensor material	Max. flange rating
Flanged (option code F)	316 SST	Class 2500 ANSI
	Alloy C-276	Class 2500 ANSI
	Alloy 800H	Class 2500 ANSI
	PVDF	Class 150 ANSI
Flanged Flo-Tap (option code G)	316 SST	Class 600 ANSI

## Physical specifications

### Temperature measurement

#### Remote RTD

- Series 78 with Rosemount 644 housing 100 Ohm platinum RTD
- Spring loaded with 1/2 NPT nipple and union thermowell
- 1/2 × 3/4 NPT socket weld
- 316 stainless steel and Alloy C-276 Material
- 4-in. insertion length provided

#### Annubar sensor material

- 316 Stainless steel
- Alloy C-276
- Alloy 800H
- PVDF

#### 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

#### Rosemount Annubar type

See “Rosemount 585 Annubar Primary Element” on page 223.

#### 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
- Optional flanged mounting hardware: nuts, studs and gaskets (DIN units supplied without nuts, studs and gaskets)

#### Temperature limits by sensor material:

- SST: –325 to 850 °F (–198 to 454 °C)
- Alloy C-276: –25 to 1250 °F (–98 to 677 °C)
- PVDF: –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

#### Temperature limits by sensor material

- 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.

#### Temperature limits by sensor material

- SST: –25 to 850 °F (–98 to 454 °C)
- Maximum allowable insertion pressure: 1440 psig (99 bar)
- Only available in sensor size 44

**Table 35. Rosemount Annubar Type Specification Chart**

Option code	Mounting type/pressure class	Flanged	Main team	Gear-drive Flo-Tap
A1	Class 150 RF ANSI	X		X
A3	Class 300 RF ANSI	X		X
A6	Class 600 RF ANSI	X		X
AN <sup>(1)</sup>	Class 900 RF ANSI	X		
AF <sup>(1)</sup>	Class 1500 RF ANSI	X		
AT <sup>(1)</sup>	Class 2500 RF ANSI	X		
D1	DIN PN 16	X		X
D3	DIN PN 40	X		X
D6	DIN PN 100	X		X
R1	Class 150 RTJ ANSI flange	X		X
R3	Class 30 RTJ ANSI flange	X		X
R6	Class 600 RTJ ANSI flange	X		X
RN <sup>(1)</sup>	Class 900 RTJ ANSI flange	X		
RF <sup>(1)</sup>	Class 1500 RTJ ANSI flange	X		
RT <sup>(1)</sup>	Class 2500 RTJ ANSI flange	X		
00 <sup>(1)</sup>	Main steam packing gland		X	

1. Remote mount only.

Table 36. Instrument Connection Temperature Ranges

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)

# Installation and flowmeter orientation

## Rosemount Annubar™ Flowmeter installation considerations

Table 66. Rosemount Annubar Flowmeter Straight Run Requirements<sup>(1)</sup>

		Rosemount Annubar products			
		Rosemount 3051SFC_A, 3051CFC_A, 2051CFC_A, 3051SFA, 3051CFA, 2051CFA, 485, 405A, 585 <sup>(2)</sup>			
		without Straightening vanes <sup>(3)</sup>		with Straightening vanes <sup>(4)</sup>	
		In plane	Out plane	from Disturbance	from Straightening vane
Upstream (inlet) side of primary	Reducer	12	12	8	4
	Expander	18	18	8	4
	Single elbow (90°) or tee	8	10	8	4
	Two elbows in plane	11	16	8	4
	Two elbow out of plane	23	28	8	4
	Butterfly valve (75 to 100% open)	30	30	8	4
	Ball/gate valve full open	8	10	8	4
<b>Downstream (outlet) side</b>		4	4	4	4

1. Consult an Emerson representative if a disturbance is not listed or if multiple disturbances are present.
2. Consult the factory for instructions regarding use in square or rectangular ducts.
3. In plane means the Rosemount Annubar is in the same plane as the elbow. Out of plane means the bar is perpendicular to the plane of the upstream elbow. Refer to Figure 3 on page 187.
4. Use straightening vane to reduce the required straight run length.

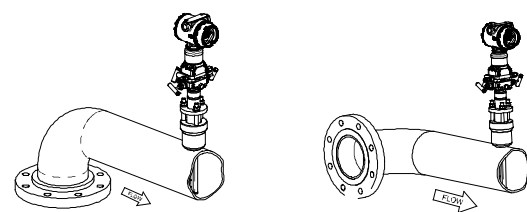
Table 67. Rosemount 3051SFA, 3051CFA, 2051CFA, 485 Drill Hole Size (Sensor Size)

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

Table 68. Rosemount 585 Drill Hole Size (Sensor Size)

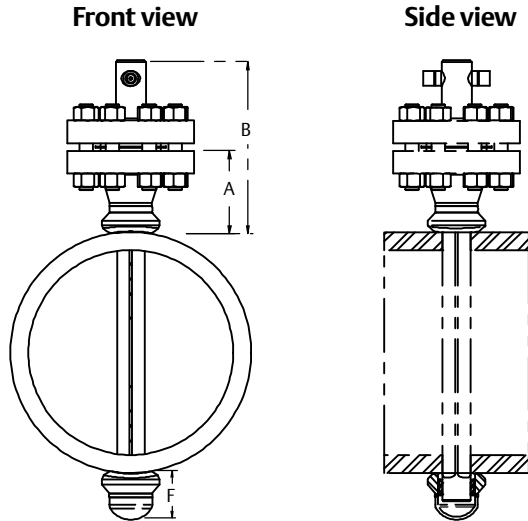
Sensor size	Hole diameter	
11	7/8-in. (23 mm)	+ 1/32-in. (0,80 mm)
		- 0.00
22	1 <sup>5</sup> / <sub>16</sub> -in. (34 mm)	+ 1/16-in. (159 mm)
		- 0.00
44	2 <sup>1</sup> / <sub>2</sub> -in. (64 mm)	+ 1/16-in. (1,59 mm)
		- 0.00

Figure 3. Rosemount Annubar In Plane and Out of Plane



## Rosemount 585 Annubar Primary Element

Figure 37. Rosemount 585 Flanged with Opposite Side Support Annubar Primary



For A, B, and F, see Table 96.

**Note**

Dimensions are shown with a remote-mount connection. Using direct-mount will add 0.15-in. for sensor size 11 and 22 or 3.15-in. for sensor size 44 to Dimension B.

Table 96. Rosemount 585 Flanged with Opposite Side Support Annubar Dimensional Data

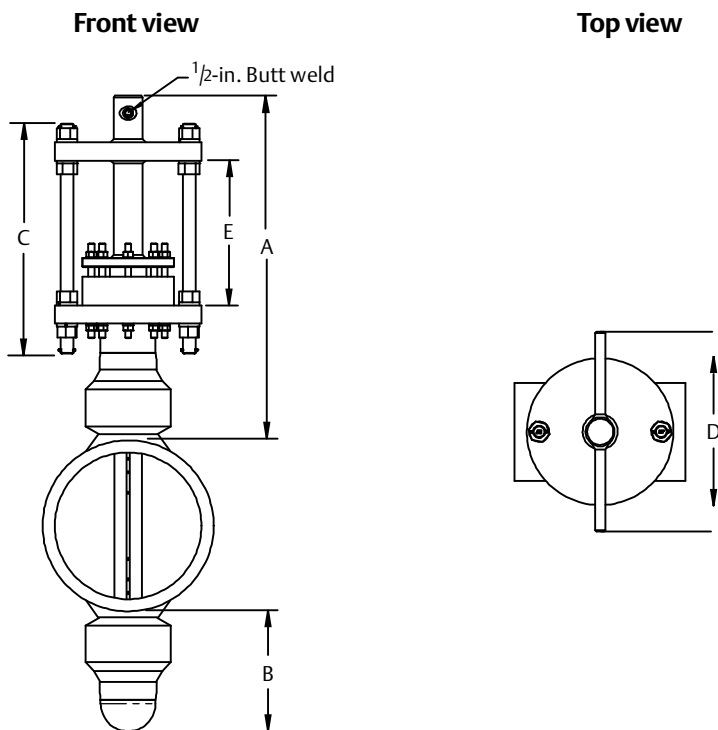
Sensor size	Flange size and rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	F (Max)
11	1½-in. – Class 150	3.88 (98.6)	9.70 (246.4)	3.10 (78.7)
11	1½-in. – Class 300	4.13 (104.9)	10.07 (255.8)	3.10 (78.7)
11	1½-in. – Class 600	4.44 (112.8)	10.70 (271.8)	3.10 (78.7)
11	DIN40/PN16	3.21 (81.5)	9.05 (229.9)	3.10 (78.7)
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. – Class 900	4.94 (125.5)	11.57 (293.9)	3.60 (91.4)
11	1½-in. – Class 1500	4.94 (125.5)	11.57 (293.9)	3.60 (91.4)
11	1½-in. – Class 2500	6.75 (171.5)	13.88 (352.6)	3.60 (91.4)
22	2-in. – Class 150	4.13 (104.9)	10.01 (254.3)	4.50 (114.3)
22	2-in. – Class 300	4.38 (111.3)	10.38 (263.7)	4.50 (114.3)
22	2-in. – Class 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. – Class 900	5.88 (149.4)	12.76 (324.1)	4.50 (114.3)
22	2-in. – Class 1500	5.88 (149.4)	12.76 (324.1)	4.50 (114.3)
22	3-in. – Class 2500	9.88 (250.1)	17.88 (454.2)	4.50 (114.3)
44	3-in. – Class 150	4.63 (117.6)	10.69 (271.5)	3.90 (99.1)
44	3-in. – Class 300	5.00 (127.0)	11.26 (286.6)	3.90 (99.1)

**Table 96. Rosemount 585 Flanged with Opposite Side Support Annubar Dimensional Data**

Sensor size	Flange size and rating	A ± 0.125 (3.2)	B ± 0.25 (6.4)	F (Max)
44	3-in. – Class 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. – Class 900	8.19 (208.8)	15.32 (389.1)	6.40 (162.6)
44	4-in. – Class 1500	8.56 (217.4)	16.07 (408.2)	6.40 (162.6)
44	4-in. – Class 2500	11.19 (284.2)	19.57 (497.1)	6.40 (162.6)

Dimensions are in inches (millimeters).

**Figure 38. Rosemount 585 Main Steam Annubar with Opposite Side Support Annubar Primary**



For A to E, see Table 97.

**Table 97. Rosemount 585 Main Steam Annubar w/ Opposite Side Support Annubar 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)

Dimensions are in inches (millimeters).

**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.



## Rosemount 405 Compact Primary Element



Rosemount 405 Compact Primary Element utilizes an easy to install direct mount primary element assembly.

- Available with Conditioning Orifice Plate Technology or Annubar™ Primary Element Technology
- Rosemount 405P/C orifice primary elements are based on ASME/ISO corner tap design

### Additional information

Specifications: [page 157](#)

Dimensional drawings: [page 226](#)

Installation and flowmeter orientation: [page 187](#)

**Table 37. Rosemount 405 Compact Primary Element Ordering Information**

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Model	Product description	
405	Compact Orifice Flowmeter	
<b>Primary element technology</b>		
A	Rosemount Annubar sensor size 1	★
C	Conditioning orifice plate	★
P	Orifice plate	★
<b>Material type</b>		
S	316 SST	★
<b>Line size</b>		
005 <sup>(1)</sup>	1/2-in. (15 mm)	★
010 <sup>(1)</sup>	1-in. (25 mm)	★
015 <sup>(1)</sup>	1 1/2-in. (40 mm)	★
020	2-in. (50 mm)	★
030	3-in. (80 mm)	★
040	4-in. (100 mm)	★
060	6-in. (150 mm)	★
080	8-in. (200 mm)	★
100 <sup>(2)(3)</sup>	10-in. (250 mm)	★
120 <sup>(2)(3)</sup>	12-in. (300 mm)	★
<b>Temperature measurement</b>		
T <sup>(4)</sup>	Integral RTD	★
N	No temperature measurement	★
R	Remote thermowell and RTD	

**Table 37. Rosemount 405 Compact Primary Element Ordering Information**

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Primary element type		
000	Rosemount Annubar sensor size 1	★
040	0.40 beta ratio ( $\beta$ )	★
050	0.50 beta ratio ( $\beta$ )	★
065 <sup>(5)</sup>	0.65 beta ratio ( $\beta$ )	★
Transmitter connection		
D3	Direct mount integral 3-valve manifold	★
R3	Remote mount, NPT connections	★
A3 <sup>(6)</sup>	Traditional, direct mount, 3-valve integral manifold with adapter plate, SST	

#### Options (include with selected model number)

Extended product warranty		
WR3	3-year limited warranty	★
WR5	5-year limited warranty	★
Installation accessories <sup>(2)</sup>		
A	ANSI alignment ring (Class 150)	★
C	ANSI alignment ring (Class 300)	★
D	ANSI alignment ring (Class 600)	★
G	DIN alignment ring (PN 16)	★
H	DIN alignment ring (PN 40)	★
J	DIN alignment ring (PN 100)	★
B	JIS alignment ring (10K)	
R	JIS alignment ring (20K)	
S	JIS alignment ring (40K)	
Remote adapters		
E	Flange adapters 316 SST (1/2 NPT)	★
High temperature application		
T	Graphite valve packing ( $T_{max} = 850$ °F)	
Flow calibration		
WC <sup>(7)</sup>	Flow calibration, 3 Pt, conditioning orifice option C (all pipe schedules)	
WD <sup>(8)(9)</sup>	Flow calibration, 10 Pt, conditioning option C (all schedules), Rosemount Annubar option A (schedule 40)	
Pressure testing		
P1	Hydrostatic testing	

**Table 37. Rosemount 405 Compact Primary Element Ordering Information**

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

<b>Special cleaning<sup>(10)</sup></b>		
P2	Cleaning for special processes	
PA	Cleaning per ASTM G93 level D (section 11.4)	
<b>Special inspection</b>		
QC1	Visual and dimensional inspection with certificate	★
QC7	Inspection and performance certificate	★
<b>Material traceability certification</b>		
Q8	Material Traceability Certification per EN10204:2004 3.1	★
<b>Code conformance</b>		
J2	ANSI/ASME B31.1	
J3	ANSI/ASME B31.3	
J4	ANSI/ASME B31.8	
J5 <sup>(11)</sup>	NACE MR-0175/ISO 15156	
J1	Canadian Registration	
<b>Typical model number: 405 C S 040 N 040 D3</b>		

1. Available with primary element technology P only.
2. For the 10- and 12-in. (250 and 300 mm) line size, the alignment ring must be ordered (installation accessories).
3. 10- and 12-in. (250 and 300 mm) line sizes not available with Primary Element Technology A.
4. Available with primary element technology A only.
5. For 2-in. (50 mm) line sizes the primary element type is 0.6 for Primary Element Technology code C.
6. A transmitter connection available with Primary Element Technology C or P only.
7. Available with Primary Element Technology C only.
8. Available with Primary Element Technology C or A only.
9. For Rosemount Annubar option A, consult factory for pipe schedules other than Sch. 40.
10. Available with Primary Element Technology C or P only.
11. 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.

# Specifications

## Performance specifications

**Table 38. Rosemount 405C Compact Conditioning Orifice Technology**

Beta ratio	Discharge coefficient uncertainty
$\beta = 0.40, 0.50, 0.65^{(1)}$	$\pm 1.00\%^{(2)}$

- For 0.65 beta and  $ReD < 10,000$  add an additional 0.5 percent to the discharge coefficient uncertainty.
- $\pm 0.50\%$  for 0.40 beta and WD calibration.

**Table 39. Rosemount 405P Compact Orifice Technology**

Line size	Discharge coefficient uncertainty
1/2-in. (15 mm)	$\pm 2.25\%$
1 to 1 1/2-in. (25 to 40 mm) line size	$\pm 1.75\%$
2 to 12-in. (50 to 300 mm) line size	$\pm 1.25\%$

**Table 40. Rosemount 405A Compact Annubar Technology**

K Factor uncertainty		
All sizes	Standard	$\pm 1.50\%$
	Calibrated	$\pm 0.75\%$

### Line sizes

- 1/2-in. (15 mm) – not available for the 405C and 405A
- 1-in. (25 mm) – not available for the 405C and 405A
- 1 1/2-in. (40 mm) – not available for the 405C and 405A
- 2-in. (50 mm)
- 3-in. (80 mm)
- 4-in. (100 mm)
- 6-in. (150 mm)
- 8-in. (200 mm)
- 10-in. (250 mm) – not available for the Rosemount 405A
- 12-in. (300 mm) – not available for the Rosemount 405A

### Sizing

Contact an Emerson Process Management sales representative assistance. A “Configuration Data Sheet” is required prior to order for application verification. To complete the Configuration Data Sheet go to:

[Emerson.com/Rosemount/DP-Flow-Configuration-Assistant](http://Emerson.com/Rosemount/DP-Flow-Configuration-Assistant).

## Functional specifications

### Service

- Liquid
- Gas
- Vapor

### Process temperature limits

#### Direct mount transmitter

- $-40$  to  $450$  °F ( $-40$  to  $232$  °C)
- Up to  $400$  °F ( $204$  °C) when top mounted in steam service

#### Remote mount transmitter

- $-148$  to  $850$  °F ( $-100$  to  $454$  °C) – stainless steel

### Differential pressure limits for primary element technology C and P for all sizes

**Table 41. Maximum Allowable DP (Measurement in inH<sub>2</sub>O [bar])**

Line size (inches)	Temp (F)	DP limit (inH <sub>2</sub> O)
$\leq 8$	850	1200
= 10	850	1000
	800	1050
	700	1050
	600	1100
	500	1150
= 12	< 400	1200
	850	700
	800	700
	700	750
	600	750
	500	800
	400	850
	< 300	900

## Differential pressure limits for primary element technology A

**Table 42. Maximum Allowable DP**  
(Measurement in inH<sub>2</sub>O [bar])

Line size	Max DP < 400 °F (200 °C)	Max DP @ 450–850 °F (200–454 °C)
2-in. (50 mm)	1500 (3.73)	1500 (3.73)
3-in. (80 mm)	900 (2.24)	790 (1.97)
4-in. (100 mm)	570(1.42)	500 (1.24)
6-in. (150 mm)	290 (0.72)	250 (0.62)
8-in. (200 mm)	190 (0.47)	160 (0.40)

### Maximum working pressure

Pressure retention per ANSI B16.5 Class 600 or DIN PN100

### Vibration effect for Rosemount 405A, 405C, and 405P

Qualified per IEC61298-3 (2008) for field with general application or pipeline with low vibration level (10–1000 Hz test frequency range, 0.15 mm displacement peak amplitude, 20 m/s<sup>2</sup> acceleration amplitude).<sup>(1)</sup>

The weight and length of the transmitter assembly shall not exceed 9.8 lb (4,45 kg) and 8.60-in. (218,44 mm).

1. *Stainless steel temperature housing is not recommended with Primary Element Technology A in applications with mechanical vibration.*

### Assembly to a transmitter

Select option code C11 for the Rosemount 3051S Transmitter (or option code S3 for the Rosemount 3051C or 2051C transmitters) to factory assemble the Rosemount 405 to a pressure transmitter. If the Rosemount 405 and transmitter are not factory assembled, they may be shipped separately. For a consolidated shipment, inform the Emerson representative when placing the order.

## Physical specifications

### Temperature measurement for primary element technology P and C

#### Integral RTD<sup>(1)</sup>

- 100 ohm platinum RTD temperature sensor assembly (316 SST Mineral Insulated Cable) with 1/4 NPT connection to wafer side and 1/2 NPT connection to transmitter RTD sensor is separated from process fluid by 1/16-in. and is pressure retaining rated for ANSI Class 600. Complies with IEC-751 Class B accuracy. Meets Intrinsic Safety certification.

1. *Only available with Rosemount 3051SFC Compact Orifice Flowmeter.*

#### Remote RTD<sup>(1)</sup>

- 100 Ohm platinum with 1/2 NPT nipple and union (078 series with Rosemount 644 housing) Model 0078D21N00A025T32Ex Connection Head: 00644-4410-0011
- Standard RTD cable is shielded armored cable, length is 12 ft. (3,66 m)
- Remote RTD material is SST thermowell
- 1/2- × 1/2 NPT, 316 SST

1. *Only available with Rosemount 3051SFC, 3051CFC, or 2051CFC Compact orifice flowmeter models.*

### Temperature measurement for primary element technology A

#### Integral RTD

100 Ohm platinum RTD  
4-wire RTD (a = 0.00385)

#### Physical details

##### Body

- 316/316L SST

##### Manifold head/valves

- 316 SST

##### Orifice Plate for primary element technologies C and P

- 50 micro-inch Ra surface finish

##### Annubar Primary Element for primary element technology A

- Roughened surface finish

##### Flange studs and nuts

- Customer supplied
- Available as a spare part

##### Transmitter connection studs and nuts

- Studs– A193 Grade B8M.
- Nuts– A194 Grade 8M.

##### Gasket and O-rings

- Gaskets are customer supplied.
- Gaskets and O-rings are available as spare parts
- Gaskets and O-rings should be replaced when the Rosemount 405 is disassembled.

**Transmitter connections**

**Direct mount**

- Available with Rosemount 3051SMV, 3051S, 3051, and 2051 Transmitters.

**Remote mount**

- Primary Element Technology C or P available with 1/4 NPT (standard) or 1/2 NPT (option code E) connections
- Remote Mount transmitter connections available with 1/2 NPT for Primary Element Technology A

**Orifice plate design**

**Orifice type**

- Square edged

**Orifice pressure taps**

- Corner

**Alignment rings**

**Table 43. Mounts Between the Following Flange Configurations**

ASME B16.5 (ANSI)	DIN	JIS
Class 150	PN16 (option code G)	10k (option code B)
Class 300	PN40 (option code H)	20k (option code R)
Class 600	PN100 (option code H)	40k (option code S)

ANSI 150 - Class 600 alignment ring is included as standard when ordering for up to 8-in. line size. For the 10-in. and 12-in. line size, the alignment ring must be ordered (Installation Accessories).

**Typical orifice hole sizes**

For Rosemount 405C, beta is calculated by:  $\beta = d_c / \text{Pipe ID}^{(1)}$ , where the calculated bore is equal to 2x typical orifice hole size ( $d_c = 2d$ ). The tables below show the diameter of the typical orifice holes.

1. Based on schedule 40.

**Table 44.  $\beta = 0.4$  (Measurement in Inches [mm])<sup>(1)</sup>**

Line size	405C	405P
1/2-in. (15 mm)	Not Available	0.249 (6.33)
1-in. (25 mm)	Not Available	0.420 (10.67)
1 1/2-in. (40 mm)	Not Available	0.644 (16.36)
2-in. (50 mm)	0.413 (10.40)	0.827 (21.01)
3-in. (80 mm)	0.614 (15.60)	1.227 (31.17)
4-in. (100 mm)	0.805 (20.45)	1.610 (40.89)
6-in. (150 mm)	1.213 (30.81)	2.426 (61.62)
8-in. (200 mm)	1.596 (40.54)	3.192 (81.08)
10-in. (250 mm)	2.004 (50.90)	4.008 (101.80)
12-in. (300 mm)	2.400 (60.96)	4.800 (121.92)

1. Tolerance =  $\pm 0.002$ -in.

**Table 45.  $\beta = 0.50$  (Measurement in Inches [mm])<sup>(1)</sup>**

Line size	405C	405P
1/2-in. (15 mm)	Not Available	0.311 (7.90)
1-in. (25 mm)	Not Available	0.525 (13.34)
1 1/2-in. (40 mm)	Not Available	0.805 (20.45)
2-in. (50 mm)	0.517 (13.13)	1.034 (26.26)
3-in. (80 mm)	0.767 (19.48)	1.534 (38.96)
4-in. (100 mm)	1.007 (25.58)	2.013 (51.13)
6-in. (150 mm)	1.516 (38.51)	3.033 (77.04)
8-in. (200 mm)	1.995 (50.67)	3.991 (101.37)
10-in. (250 mm)	2.505 (63.63)	5.010 (127.25)
12-in. (300 mm)	3.000 (76.20)	6.000 (152.40)

1. Tolerance =  $\pm 0.002$ -in.

**Table 46.  $\beta = 0.65$  (Measurement in Inches [mm])<sup>(1)</sup>**

Line size	405C	405P
1/2-in. (15 mm)	Not Available	0.404 (10.26)
1-in. (25 mm)	Not Available	0.682 (17.32)
1 1/2-in. (40 mm)	Not Available	1.047 (26.59)
2-in. (50 mm)	0.620 (15.75) <sup>(2)</sup>	1.344 (34.14)
3-in. (80 mm)	0.997 (25.32)	1.994 (50.65)
4-in. (100 mm)	1.309 (33.25)	2.617 (66.47)
6-in. (150 mm)	1.971 (50.06)	3.942 (100.13)
8-in. (200 mm)	2.594 (65.89)	5.188 (131.78)
10-in. (250 mm)	3.257 (82.73)	6.513 (165.43)
12-in. (300 mm)	3.900 (99.06)	7.800 (198.12)

1. Tolerance =  $\pm 0.002$ -in.

2. For 2-in. (50 mm) line size, the Beta ( $\beta$ ) = 0.60.

**Table 47. Rosemount 405 P or C Weight (Measurement in lb [kg])**

Line size	Direct mount (D3)	Remote mount (R3)
1/2-in. (15 mm)	3.50 (1.73)	7.5 (3.70)
1-in. (25 mm)	4.25 (2.10)	8.25 (4.07)
1 1/2-in. (40 mm)	4.75 (2.34)	8.75 (4.32)
2-in. (50 mm)	5.00 (2.47)	9.00 (4.44)
3-in. (80 mm)	7.00 (3.45)	11.00 (5.43)
4-in. (100 mm)	9.50 (4.69)	13.50 (6.67)
6-in. (150 mm)	13.00 (6.41)	17.00 (8.40)
8-in. (200 mm)	18.25 (9.00)	22.25 (10.99)
10-in. (250 mm)	23.50 (11.59)	27.50 (13.58)
12-in. (300 mm)	29.50 (14.55)	33.50 (16.54)

**Table 48. Rosemount 405A Weight (Measurement in lb [kg])**

Line size	Direct mount (D3)	Remote mount (R3)
2-in. (50 mm)	5.59 (2.53)	7.26 (3.29)
3-in. (80 mm)	7.41 (3.36)	9.08 (4.12)
4-in. (100 mm)	9.18 (4.16)	10.85 (4.92)
6-in. (150 mm)	13.10 (5.94)	14.76 (6.70)
8-in. (200 mm)	17.12 (7.77)	18.78 (8.52)

# Installation and flowmeter orientation

## Rosemount Annubar™ Flowmeter installation considerations

Table 66. Rosemount Annubar Flowmeter Straight Run Requirements<sup>(1)</sup>

		Rosemount Annubar products			
		Rosemount 3051SFC_A, 3051CFC_A, 2051CFC_A, 3051SFA, 3051CFA, 2051CFA, 485, 405A, 585 <sup>(2)</sup>			
		without Straightening vanes <sup>(3)</sup>		with Straightening vanes <sup>(4)</sup>	
		In plane	Out plane	from Disturbance	from Straightening vane
Upstream (inlet) side of primary	Reducer	12	12	8	4
	Expander	18	18	8	4
	Single elbow (90°) or tee	8	10	8	4
	Two elbows in plane	11	16	8	4
	Two elbow out of plane	23	28	8	4
	Butterfly valve (75 to 100% open)	30	30	8	4
	Ball/gate valve full open	8	10	8	4
<b>Downstream (outlet) side</b>		4	4	4	4

1. Consult an Emerson representative if a disturbance is not listed or if multiple disturbances are present.
2. Consult the factory for instructions regarding use in square or rectangular ducts.
3. In plane means the Rosemount Annubar is in the same plane as the elbow. Out of plane means the bar is perpendicular to the plane of the upstream elbow. Refer to Figure 3 on page 187.
4. Use straightening vane to reduce the required straight run length.

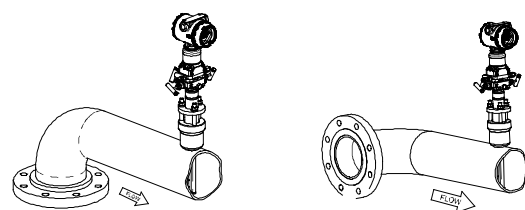
Table 67. Rosemount 3051SFA, 3051CFA, 2051CFA, 485 Drill Hole Size (Sensor Size)

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

Table 68. Rosemount 585 Drill Hole Size (Sensor Size)

Sensor size	Hole diameter	
11	7/8-in. (23 mm)	+ 1/32-in. (0,80 mm)
		- 0.00
22	1 <sup>5</sup> / <sub>16</sub> -in. (34 mm)	+ 1/16-in. (159 mm)
		- 0.00
44	2 <sup>1</sup> / <sub>2</sub> -in. (64 mm)	+ 1/16-in. (1,59 mm)
		- 0.00

Figure 3. Rosemount Annubar In Plane and Out of Plane





## Orifice plate installation considerations

**Table 69. Rosemount 405C Straight Pipe Requirements<sup>(1)</sup>**

	Beta	0.40	0.50	0.65
Upstream (inlet) side of primary	Reducer	2	2	2
	Single 90° bend or tee	2	2	2
	Two or more 90° bends in the same plane	2	2	2
	Two or more 90° bends in different planes	2	2	2
	Up to 10° of swirl	2	2	2
	Butterfly valve (75 to 100 percent open)	2	5	5
<b>Downstream (outlet) side of primary</b>		2	2	2

1. Consult an Emerson representative if a disturbance is not listed.

**Table 70. Rosemount 405P Straight Pipe Requirements<sup>(1)(2)(3)</sup>**

	Beta	0.40	0.50	0.65
Upstream (inlet) side of primary	Reducer	5	8	12
	Single 90° bend or tee	16	22	44
	Two or more 90° bends in the same plane	10	18	44
	Two or more 90° bends in different plane	50	75	60
	Expander	12	20	28
	Ball / Gate valve fully open	12	12	18
<b>Downstream (outlet) side of primary</b>		6	6	7

1. Consult an Emerson representative if disturbance is not listed.
2. Recommended lengths represented in pipe diameters per ISO 5167.
3. Refer to ISO 5167 for recommended lengths when using flow straighteners.

**Table 71. Integral Orifice Plate Straight Run Requirements<sup>(1)(2)(3)</sup>**

		Rosemount 3051SFP, 3051CFP, 2051CFP, 1195					
	Beta	<0.20	0.40	0.50	0.60	0.70	0.75
Upstream (inlet) side of primary	Reducer	20	20	20	20	23	25
	Expander	22	22	23	25	28	30
	Single elbow (90°) or tee	24	25	25	27	32	35
	Two elbows in plane	25	27	28	31	35	38
	Two elbows out of plane	30	31	33	37	42	45
	Butterfly valve fully open	22	22	23	25	28	30
	Gate valve fully open	22	22	23	25	28	30
<b>Downstream (outlet) side</b>		10	10	10	10	10	10

1. Recommended lengths are guidelines based on ASME MFC-14M.
2. All straight lengths are expressed as multiples of the pipe inside diameter D and shall be measured from the upstream face of the orifice plate to the disturbance.
3. For beta ratios not listed, use requirements of next higher beta ratio listed.

### Orifice plate pipe orientation

Pipe orientation for Rosemount 3051SFC, 3051CFC, 2051CFC, 405C, 405P, 3051SFP, 3051CFP, 2051CFP and 1195.

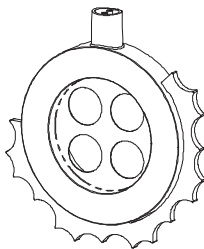
Orientation/flow direction	Process <sup>(1)</sup>		
	Gas	Liquid	Steam
Horizontal	D/R	D/R	D/R
Vertical Up	R	D/R	R
Vertical Down	D/R	NR	NR

1. D = Direct mount acceptable (recommended).  
 R = Remote mount acceptable.  
 NR = Not recommended.

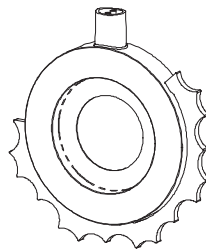
### Compact flowmeter pipe centering

Improper centering of any orifice type device can cause an error of up to ±5 percent in small line sizes. A centering mechanism (centering ring) independent of flange rating comes standard with the Rosemount 405 Compact Flowmeter Series.

**Rosemount 405C Conditioning Orifice**



**Rosemount 405P Compact Orifice**



### Rosemount 1595 Pressure Tap orientation

Orient the Rosemount 1595 Conditioning Orifice Plate so that the pressure taps are centered between any two (of four) orifice bore holes. In addition, the pressure taps should be located at 90° to the plane of the last upstream elbow under these conditions:

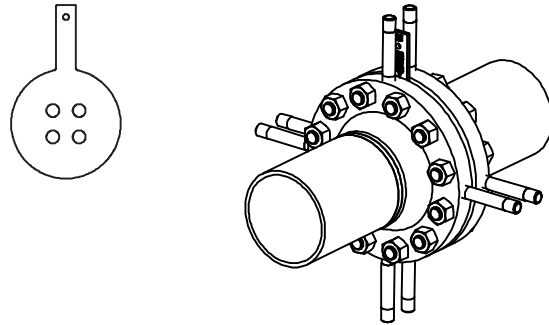
- with less than six upstream pipe diameters
- with a 0.65 beta

#### Pressure tap locations

##### At least six upstream pipe diameters

If the installation location has at least six upstream pipe diameters, the pressure taps can be located between any two of the four holes of the Rosemount 1595 Orifice Plate. See [Figure 4](#).

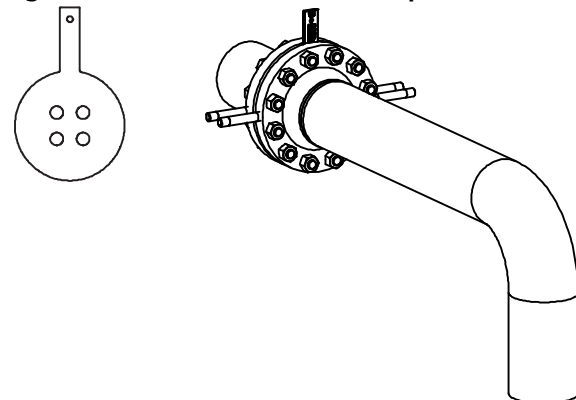
**Figure 4. Rosemount 1595 Pressure Tap Locations**



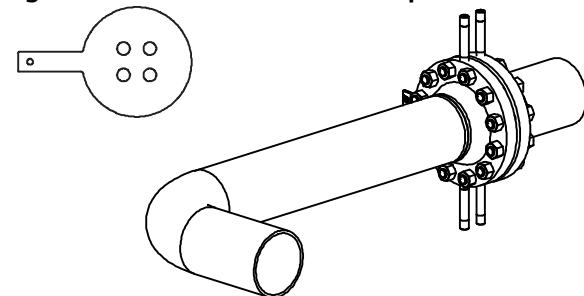
##### Within six diameters of an elbow

If the installation location has less than six upstream pipe diameters, the pressure taps can be located between two of the four holes of the Rosemount 1595 Orifice Plate 90° from the plane of the elbow. See [Figure 5](#) and [Figure 6](#).

**Figure 5. Rosemount 1595 Pressure Tap Locations**



**Figure 6. Rosemount 1595 Pressure Tap Locations**



## Rosemount 405 Flowmeter orientation

For Rosemount 3051SFC, 3051CFC, 2051CFC, 405C, and 405P

Figure 9. Rosemount 405 Direct Mount Flowmeter Orientation (Recommended)

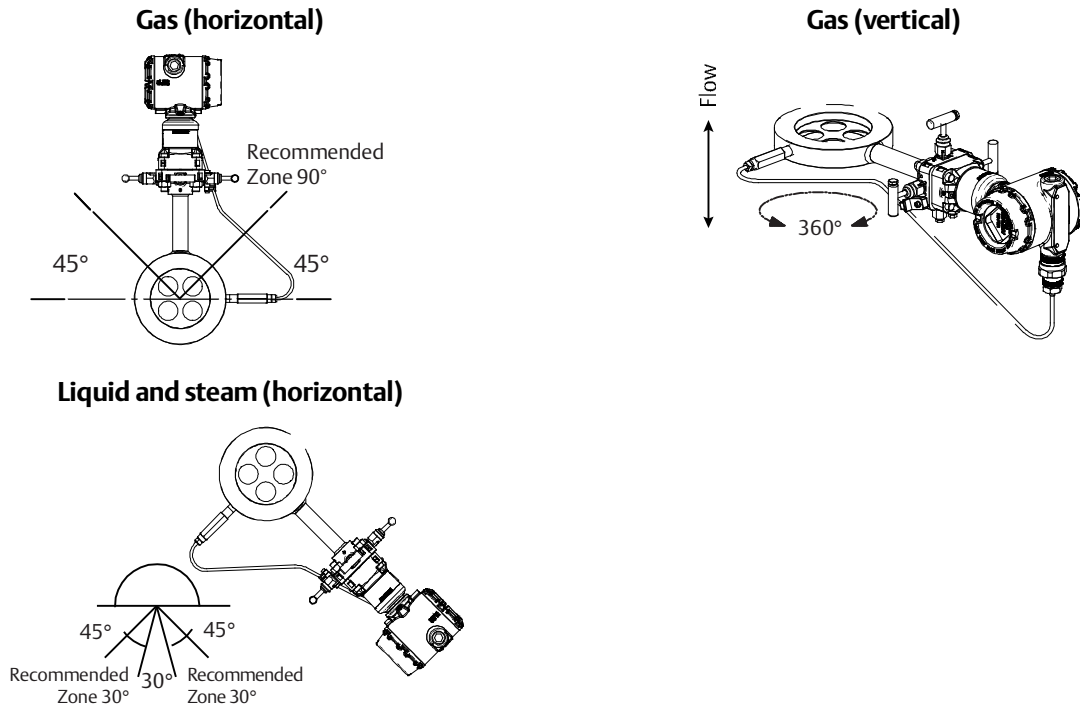


Figure 10. Rosemount 405 Remote Mount Flowmeter Orientation (Recommended)

