

## 9300A Series Flanged Magnetic Flowtubes

pfa Lined, 1 through 12 Inch;  
 ptfe Lined, 1/2 through 16 Inch;  
 Polyurethane Lined, 8 through 16 Inch



### FEATURES

- pfa Withstands Effects of Severely Corrosive and Mildly Abrasive Fluids, Has Excellent Blistering Resistance, and Can Withstand Pressure/Temperature Extremes
- Polyurethane Withstands Effects of Highly Abrasive Fluids
- ptfe Withstands Effects of Severely Corrosive and Mildly Abrasive Fluids
- Compact Design with Face-to-Face Overall Lengths that Meet ISO/DIS 13359
- Proven Electrode Seal Design Withstands Severe Temperature Cycling and High Pressure Surges
- Metric PN10 to PN40, or ANSI Class 150 and 300 Flanges in Carbon or Stainless Steel
- Transmitter Can Be Direct Mounted to Flowtube
- NEMA 4X/NEMA 4 (1/2 to 6 inch ptfe lined), All-Welded Construction with Total Submergence Capability
- Optional Grounding Electrode (8 to 16 in only)
- Standard 2-Year Warranty
- Total Quality Management, Including ISO 9001 Certification and Conformance to Applicable European Community Standards

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## RUGGED INTEGRAL DESIGN

The permanently attached and retained pfa liner option (sizes 1 to 12 in) is sufficiently stable to withstand applications involving high temperatures, severe temperature cycling, strong pipeline vibration, and severe pressure cycling, including full vacuum.

The ptfе liner option (sizes 1/2 to 16 in) is more cost effective than pfa and can withstand severe corrosion and/or mild abrasion.

The polyurethane liner option (sizes 8 to 16 in) is also more cost effective than pfa in larger size meters, and can withstand mild corrosion and/or severe abrasion.

Refer to TI 27-71f which lists recommended liner materials for over 150 common process fluids.

The welded housing design of the 9300A Series flowtubes provides a very rugged and environmentally superior flowtube assembly that can be installed in harsh in-plant or outdoor environments. The flowtube enclosure is weatherproof, as defined by IEC IP66, and provides watertight and corrosion-resistant protection of NEMA 4X for all tubes except 1/2 to 6 inch ptfе lined, which is NEMA 4. The flowtube is also capable of total submergence, when used with a remote mounted transmitter.

## COMPACT FLOWTUBE

The 9300A has a compact design that provides face-to-face overall lengths in each size that conform to recommended flowtube dimensions contained in ISO/DIS 13359.

## PULSED DC FLOWTUBES USED WITH REMOTE OR INTEGRALLY MOUNTED TRANSMITTERS

The 9300A Series Magnetic Flowtubes are calibrated for use with pulsed dc coil excitation. Foxboro offers the intelligent I/A Series IMT25 and IMT25L Magnetic Flow Transmitters for use with these flowtubes. The IMT25 and IMT25L may be integrally mounted to the flowtube itself, or remote mounted (on a pipe or flat

surface) for distances up to 1000 ft (300 m). These flowtubes are also backward compatible with the previous 8000, IMT10, and IMT20 Series pulsed dc transmitters.

## SELECTION OF FLOWTUBE SIZES, FLANGES, AND ELECTRODES

The 9300A flowtubes are offered as 1/2, 1, 1-1/2, 2, 3, 4, 6, 8, 10, 12, 14, and 16 inches (15, 25, 40, 50, 80, 100, 150, 200, 250, 300, 250, and 400 mm).

PN10 to PN40 or ANSI Class 150 and 300 flanged end connection options, in carbon or stainless steel, are available (see Model Code for liner restrictions).

Electrode material options for pfa- and ptfе-lined flowtubes include 316 ss, Hastelloy C, Titanium, Tantalum-Tungsten, or Platinum-Iridium.

Polyurethane-lined flowtubes are available with 316 ss electrodes only. Refer to TI 27-71f which lists the recommended electrode materials for over 150 common process fluids.

## CONICAL ELECTRODE OPTIONS

Conical electrodes are offered in both 316 ss and Hastelloy C with flowtubes of size 1 in (25 mm) or larger. These are excellent selections for applications which coat conventional flush-with-lining electrodes. Conical electrodes extend into the process where the natural sweeping action of the fluid across the electrode face produces a self-cleaning action.

## FLOWTUBE CALIBRATION

All flowtubes are wet calibrated to verify their specified accuracy with traceability to the U.S. National Institute of Science and Technology (NIST).

## CE COMPLIANCE

The 9300A Series flowtubes conform to the applicable European Community Standards when used in conjunction with IMT25 Series transmitters.

## MODEL CODE

Selection	Model
15 mm (1/2 in) Line Size, Flanged	930HA
25 mm (1 in) Line Size, Flanged	9301A
40 mm (1 1/2 in) Line Size, Flanged	931HA
50 mm (2 in) Line Size, Flanged	9302A
80 mm (3 in) Line Size, Flanged	9303A
100 mm (4 in) Line Size, Flanged	9304A
150 mm (6 in) Line Size, Flanged	9306A
<u>Tube Construction</u>	
AISI Type 304 or 305 ss (Stainless Steel); Face-to-Face Dimensions Conform to ISO/DIS 13359	-SI
<u>End Connections</u>	
ANSI Class 150 Carbon Steel Flange(b)	BA
ANSI Class 150, 316 ss Flange	BB
ANSI Class 300 Carbon Steel Flange(b)	BD
ANSI Class 300, 316 ss Flange(b)	BC
Metric PN 10 Carbon Steel Flange(c,d)	ZD
Metric PN 16 Carbon Steel Flange(c,d)	ZE
Metric PN 25 Carbon Steel Flange(b,c,d)	ZF
Metric PN 40 Carbon Steel Flange(b,c,d)	ZG
Metric PN 10, 316 ss Flange(c,d)	ZL
Metric PN 16, 316 ss Flange(c,d)	ZM
Metric PN 25, 316 ss Flange(b,c,d)	ZN
Metric PN 40, 316 ss Flange(b,c,d)	ZP
<u>Lining Material</u>	
pfa (Perfluoroalkoxy)	-P
ptfe (polytetrafluoroethylene)	-T
<u>Electrodes</u>	
Tantalum-Tungsten	B
Conical 316L ss (9301A through 9306A Only)	C
Hastelloy C(b)	H
Conical Hastelloy C (9301A through 9306A Only)	K
Platinum-Iridium	P
316L ss	S
Titanium	T
<u>Coil Drive/Supply</u>	
Pulsed dc	J
<u>Housing Construction/Transmitter Mounting</u>	
NEMA 4 (ptfe)/NEMA 4X (pfa) Housing Construction, Remote-Mounted Trans.	-G
Total/Accidental Submergence Housing, Remote-Mounted Trans.	-N
NEMA 4 (ptfe)/NEMA 4X Housing, Integrally Mounted to 8000, IMT10, or IMT20 Trans.(e)	-T
NEMA 4 (ptfe)/NEMA 4X Housing, Integrally Mounted to IMT25 Trans.(e)	-I
<u>Electrical Safety</u>	
CSA, Ordinary Locations	K
CSA, Class I, Division 2	L
FM, Ordinary Locations	M
FM, n	N
CENELEC, e, ia (Environment and Pipeline Zone 1)	S
European, Nonincendive, Zone 2	U
No Testing Laboratory Certification or Approval Required	Z
<u>Optional Selection</u>	
Cable Glands for Nonconduit Applications(f)	-G
Teflon Lining Protector(a, d)	-T

(a) Available with ptfe (-T Lining) only.

(b) Available with 9301A through 9312A pfa (-P Lining) only.

(c) Foxboro supplies PN40 flanges (which can mate to PN10, 16, 25, and 40) for sizes 15 to 18 mm (1/2 to 3 in); and PN16 (which can mate to PN10 and 16) or PN40 (which can mate to PN25 and 40) for sizes 100 and 150 mm (4 and 6 in).

(d) The -T Option not available with metric End Connection Options.

(e) Not available with (S Electrical Certification).

(f) The cable glands (-G option) provide a sealed cable entry for field wiring to the flowtube junction box, and are generally specified in nonconduit applications. For flowtubes with integrally-mounted transmitters (-T or -I Housing), cable glands may be specified with the transmitter options (not for -L or -N electrical safety codes).

(g) 930HA can be ordered with NEMA 4X housing using ECEP 973401 or with B,C, H, K, P, or T electrode option using EXEP 973403. Consult Foxboro for price and availability.

MODEL CODE (Cont.)

Selection	Model
200 mm (8 in) Line Size, Flanged	9308A
250 mm (10 in) Line Size, Flanged	9310A
300 mm (12 in) Line Size, Flanged	9312A
350 mm (14 in) Line Size, Flanged	9314A
400 mm (16 in) Line Size, Flanged	9316A
<u>Tube Construction</u>	
AISI Type 304 Stainless Steel (304 ss); Face-to-Face Dimensions Conform to ISO/DIS 1335	-SI
<u>End Connections</u>	
ANSI Class 150 Carbon Steel Flange	BA
ANSI Class 150, 316 ss Flange	BB
ANSI Class 300 Carbon Steel Flange(a)	BD
ANSI Class 300, 316 ss Flange(a)	BC
Metric PN 10 Carbon Steel Flange(b)	ZD
Metric PN 16 Carbon Steel Flange(b)	ZE
Metric PN 25 Carbon Steel Flange(a,b)	ZF
Metric PN 40 Carbon Steel Flange(a,b)	ZG
Metric PN 10, 316 ss Flange(b)	ZL
Metric PN 16, 316 ss Flange(b)	ZM
Metric PN 25, 316 ss Flange(a,b)	ZN
Metric PN 40, 316 ss Flange(a,b)	ZP
<u>Lining Material</u>	
Polyurethane	-A
pfa (Perfluoroalkoxy)(c)	-P
ptfe (Polytetrafluoroethylene)	-T
<u>Electrodes</u>	
Tantalum-Tungsten(d)	B
Conical 316 ss(d)	C
Hastelloy C(d)	H
Conical Hastelloy C(d)	K
Platinum-Iridium(d)	P
316 ss	S
Titanium(d)	T
<u>Coil Drive/Supply</u>	
Pulsed dc	J
<u>Housing Construction/Transmitter Mounting</u>	
NEMA 4X Housing Construction, Remote-Mounted Trans.	-G
Total/Accidental Submergence Housing, Remote-Mounted Trans.	-N
NEMA 4X Housing, Integrally-Mounted to 8000, IMT10, or IMT20 (e)	-T
NEMA 4X Housing, Integrally-Mounted to IMT25 Trans.(e)	-I
<u>Electrical Safety</u>	
CSA, Ordinary Locations	K
CSA, Class I, Division 2	L
FM, Ordinary Locations	M
FM, n	N
CENELEC, e, ia (Environment and Pipeline Zone 1)	S
European, Nonincendive, Zone 2	U
No Testing Laboratory Certification or Approval Required	Z
<u>Optional Selection</u>	
Cable Glands for Nonconduit Applications(f)	-G
Grounding Electrode(9308A-9316A only)(g)	-E
Teflon Lining Protector(b)	-T

(a) Available with 9301A through 9312A pfa (-P Lining) only.

(b) The -T Option not available with metric End Connection Options.

(c) pfa (-P Lining) not available in 9314A and 9316A.

(d) Available with pfa (-P Lining) and ptfe (-T Lining) only.

(e) Not available with (S Electrical Certification).

(f) The cable glands (-G option) provide a sealed cable entry for field wiring to the flowtube junction box, and are generally specified in nonconduit applications. For flowtubes with integrally-mounted transmitters (-T or -I Housing), cable glands may be specified with the transmitter options (not for -L or -N electrical safety codes).

(g) The -E Option supplied in same material as selected for Electrodes.

**OPERATING CONDITIONS****pfa-Lined Flanged Tubes(a) (Remote Mounted Transmitter)**

<b>Influence</b>	<b>Reference Operating Conditions</b>	<b>Normal Operating Conditions</b>	<b>Operating Limits</b>
Ambient Temperature	25°C 77°F	-40 to +70°C -40 to +158°F	-40 to +70°C -40 to +158°F
Process Temperature			
1 to 6 in	25°C 77°F	-40 to +180°C -40 to +356°F	-40 to +180°C -40 to +356°F
8 to 12 in		-40 to +120°C -40 to +250°F	-40 to +120°C -40 to +250°F
Process Pressure			
1 to 6 in	0.528 MPa 75 psi	Full Vacuum to 5.1 MPa at 38°C (740 psi at 100°F) Full Vacuum to 4.4 MPa at 180°C (645 psi at 356°F)	5.1 MPa at 38°C (740 psi at 100°F) 4.4 MPa at 180°C (645 psi at 356°F)
8 to 12 in		Full Vacuum to 5.1 MPa at 38°C (740 psi at 100°F) Full Vacuum to 4.7 MPa at 120°C (665 psi at 250°F)	5.1 MPa at 38°C (740 psi at 100°F) 4.7 MPa at 120°C (665 psi at 250°F)

**Polyurethane Lined Flanged Tubes(a) (Remote Mounted Transmitter)**

<b>Influence</b>	<b>Reference Operating Conditions</b>	<b>Normal Operating Conditions</b>	<b>Operating Limit</b>
Ambient Temperature	25°C 77°F	-29 to +70°C -20 to +158°F	-29 and +70°C -20 and +158°F
Process Temperature	25°C 77°F	-29 to +71°C -20 to +160°F	-29 to +71°C -20 to +160°F
Process Pressure	0.525 MPa 75 psi	Full Vacuum to 2.0 MPa at 38°C (285 psi at 100°F)	2.0 MPa at 38°C (285 psi at 100°F)
8 to 16 in		Full Vacuum to 1.9 MPa at 71°C (270 psi at 160°F)	1.9 MPa at 71°C (270 psi at 160°F)

**ptfe-Lined Flanged Tubes(a) (Remote Mounted Transmitter)**

<b>Influence</b>	<b>Reference Operating Conditions</b>	<b>Normal Operating Conditions</b>	<b>Operating Limit</b>
Ambient Temperature	25°C 77°F	-40 to +70°C -40 to +158°F	-40 to +70°C -40 to +158°F
Process Temperature	25°C 77°F	-40 to +180°C -40 to +356°F	-40 to +180°C -40 to +356°F
Process Pressure	0.525 MPa 75 psi	No vacuum to 2.0 MPa at 38°C (285 psi at 100°F)	2.0 MPa at 38°C (285 psi at 100°F)
1/2 to 16 in		No vacuum to 1.5 MPa at 180°C (213 psi at 356°F)	1.5 MPa at 180°C (213 psi at 356°F)

(a) Flowtube must be ordered with the correct flanges to achieve desired pressure rating (See Pressure-Temperature Limits of 9300A Flowtubes).

**OPERATING CONDITIONS (Continued)**

**pfa-Lined Flanged Tubes(a) (Tube Mounted Transmitter)**

<b>Influence</b>	<b>Reference Operating Conditions</b>	<b>Normal Operating Conditions</b>	<b>Operating Limits</b>
Ambient Temperature	25°C 77°F	-20°C to +55°C -4°F to +131°F	-30°C to +70°C(b) -22°F to +158°F
Process Temperature	25°C 77°F	-40 to +120°C -40 to +250°F	-40 to +120°C -40 to +250°F
Process Pressure 1 to 12 in	0.525 MPa 75 psi	Full Vacuum to 5.1 MPa at 38°C (740 psi at 100°F)	5.1 MPa at 38°C (740 psi at 100°F)
		Full Vacuum to 4.7 MPa at 120°C (665 psi at 250°F)	4.7 MPa at 120°C (665 psi at 250°F)

**ptfe-Lined Flanged Tubes(a) (Tube Mounted Transmitter)**

<b>Influence</b>	<b>Reference Operating Conditions</b>	<b>Normal Operating Conditions</b>	<b>Operating Limit</b>
Ambient Temperature	25°C 77°F	-20°C to +55°C -4°F to +131°F	-30°C to +70°C(b) -22°F to +158°
Process Temperature	25°C 77°F	-40 to +120°C -40 to +250°F	-40 to +120°C -40 to +250°F
Process Pressure 1/2 to 16 in	0.525 MPa 75 psi	No vacuum to 2.0 MPa at 38°C (285 psi at 100°F)	2.0 MPa at 38°C (285 psi at 100°F)
		No vacuum to 1.7 MPa at 120°C (245 psi at 250°F)	1.7 MPa at 120°C (245 psi at 250°F)

**Polyurethane Lined Flanged Tubes(a) (Tube Mounted Transmitter)**

<b>Influence</b>	<b>Reference Operating Conditions</b>	<b>Normal Operating Conditions</b>	<b>Operating Limit</b>
Ambient Temperature	25°C 77°F	-20°C to +55°C -4°F to +131°F	-30°C to +55°C(b) -22°F to +158°
Process Temperature	25°C 77°F	-20 to +71°C -4 to +160°F	-20 to +71°C -4 to +160°F
Process Pressure 8 to 16 in	0.525 MPa 75 psi	Full Vacuum to 2.0 MPa at 38°C (285 psi at 100°F)	2.0 MPa at 38°C (285 psi at 100°F)
		Full Vacuum to 1.9 MPa at 71°C (270 psi at 160°F)	1.9 MPa at 71°C (270 psi at 160°F)

(a) Flowtube must be ordered with the correct flanges to achieve desired pressure rating (see Pressure-Temperature Limits of 9300A Flowtubes).

(b) With IMT25 Integral Display Option, lower operating limit is -20°C (-4°F).

### Pressure-Temperature Limits of 9300A Flowtubes

DIN Flange Rating	Maximum Permissible Operating Pressure at Temperature Listed							
	316 ss Stainless Steel				Carbon Steel (ASME/ANSI Group No. 1.1)			
	-40°C	50°C	100°C	180°C	-40°C	50°C	100°C	180°C
PN10(a)	9.0 bar	9.0 bar	7.6 bar	6.4 bar	10.0 bar	10.0 bar	10.0 bar	8.4 bar
PN25(b)	22.6 bar	22.6 bar	18.9 bar	16.1 bar	25.0 bar	25.0 bar	25.0 bar	20.2 bar
PN16(a,c,d)	16 bar	16 bar	16 bar	12.8 bar	13.6 bar	16 bar	16 bar	13.6 bar
PN40(b,c,d)	40 bar	40 bar	35 bar	32.8 bar	34 bar	40 bar	40 bar	36.3 bar
ANSI Flange Rating(e)	-40°F	100°F	200°F	356°F	-40°F	100°F	200°F	356°F
Class 150(a,c,d)	275 psig	275 psig	240 psig	205 psig	285 psig	285 psig	260 psig	213 psig
Class 300(b,c)	720 psig	720 psig	620 psig	538 psig	740 psig	740 psig	675 psig	644 psig

(a) 200 to 400 mm (8 to 16 in) flowtubes are supplied with Class 150, PN10, 16 flanges.

(b) 200 to 300 mm (8 to 12 in) flowtubes pfa-lined only are available with Class 300, PN25 and 40 flanges.

(c) 25 to 80 mm (1 to 3 in) pfa-lined flowtubes are supplied with ANSI 150, 300 PN40 flanges (can mate to PN10, 16, 25, or 40); 100 and 150 mm (4 and 6 in) pfa-lined flowtubes are supplied with ANSI 150, 300 PN16 flanges (can mate to PN10 or 16) or PN40 flanges (can mate to PN25 or 40).

(d) 15 to 80 mm (1/2 to 3 in) pte-lined flowtubes are supplied with ANSI 150, PN 40 flange (can mate to PN 10, 16); 100 to 150 mm (4 to 6 in) pte-lined flowtubes are supplied with ANSI 150, PN 16 flange (can mate to PN 10, 16).

(e) Per ASME/ANSI Standard B16.5-1988.

NOTE: For process temperatures > 120°C (>250°F), the transmitter must be remotely mounted.

### PERFORMANCE SPECIFICATIONS

#### (Combined Flowtube and Transmitter System Under Reference Operating Conditions)

Flowmeter System	Refer to
9300A Flowtube with 8000 Series Transmitter	Contact Foxboro
9300A Flowtube with IMT10 Series Transmitter	Contact Foxboro
9300A Flowtube with IMT20 Series Transmitter	Contact Foxboro
9300A Flowtube with IMT25 Series Transmitter	PSS 1-6F5 A
9300A Flowtube with IM25L Series Transmitter	PSS 1-6F6 A

### FUNCTIONAL SPECIFICATIONS

#### Nominal Line Sizes

15, 25, 40, 50, 80, 100, 200, 250, 300, 350, 400 mm  
(1/2, 1, 1-1/2, 2, 3, 4, 6, 8, 10, 12, 14, 16 in.)

can correspond to the 20 mA signal. For example: for the 25 mm (1 in) flowtube, the minimum range is 0 to 3.5 U.S. gpm, and this generates 4 to 20 mA.

#### End Connections

ANSI and Metric PN flanges. Refer to Model Code section for flange types and ratings available.

#### Installation Requirements

Flowtube must be mounted so the electrodes are in a horizontal plane, the minimum upstream straight pipe length recommended is five pipe diameters, and the minimum downstream straight pipe length is three diameters. The pipe length is measured outward from the center of the flowtube. During measurement, the flowtube must remain full with the process fluid to achieve the stated performance. Installation in a vertical pipe with flow going upward is ideal.

#### Process Pressure and Temperature Limits

Refer to the table in the "Operating Conditions" section.

#### Minimum and Maximum Upper Range Flow Rates and Velocities

See Table 1. In this table, the minimum upper range value (URV) is not the lowest flow rate that the flowtube can measure; it is the lowest flow rate which

## FUNCTIONAL SPECIFICATIONS (Continued)

### Total/Accidental Submergence

This Housing Construction selection (-N) consists of a welded housing with a NEMA 4X finish for all tubes (except 1/2 to 6 inch ptfе lined, which is NEMA 4) plus special RTV sealing techniques for continuous operation under 10 m (33 ft) of water maximum. A

supply of RTV 600 two-part potting compound is included for the user to seal the signal and power connections during installation. The selection is available with all 9300A Series Flowtubes when used with a remote-mounted transmitter.

Table 1. Minimum and Maximum Upper Range Values

Nominal Line Size		Nominal Tube I.D.		Flange Options	Liner Option	Flow Rate Minimum and Maximum URV	
mm	in	mm	in			L/M*	GPM*
15	1/2	12.2	.48	--	ptfe	3.8 and 76	1 and 20
25	1	22.1	.87	--	pfa/ptfe	13.2 and 265	3.5 and 70
40	1-1/2	37.1	1.46	--	pfa/ptfe	34.1 and 644	9.0 and 170
50	2	45	1.77	--	pfa/ptfe	49 and 946	13 and 250
80	3	70.6	2.78	--	pfa/ptfe	117 and 2366	31 and 625
100	4	93	3.66	--	pfa/ptfe	208 and 4164	55 and 1100
150	6	138.7	5.46	--	pfa/ptfe	462 and 9236	122 and 2440
200	8	206	8.11	BA, BB, ZD, ZE, ZL, ZM	pfa	1003 and 20060	265 and 5300
		197	7.76	BC, BD, ZF, ZG, ZN, ZP	pfa	927 and 18546	245 and 4900
200	8	202	7.95	--	ptfe	965 and 19303	255 and 5100
200	8	193	7.59	--	poly	890 and 17790	235 and 4700
250	10	259	10.21	BA, BB, ZD, ZE, ZL, ZM	pfa	1590 and 31794	420 and 8400
		249	9.81	BC, BD, ZF, ZG, ZN, ZP	pfa	1476 and 29523	390 and 7800
250	10	255	10.05	--	ptfe	1552 and 31037	410 and 8200
250	10	246	9.69	--	poly	1438 and 28766	380 and 7600
300	12	309	12.18	BA, BB, ZD, ZE, ZL, ZM	pfa	2270 and 45420	600 and 12000
		299	11.79	BC, BD, ZF, ZG, ZN, ZP	pfa	2120 and 42392	560 and 11200
300	12	305	12.02	--	ptfe	2215 and 44285	585 and 11700
300	12	296	11.66	--	poly	2082 and 41635	550 and 11000
350	14	341	13.42	--	ptfe	2763 and 55260	730 and 14600
350	14	328	12.90	--	poly	2555 and 51098	675 and 13500
400	16	392	15.42	--	ptfe	3634 and 72670	960 and 19200
400	16	378	14.90	--	poly	3406 and 68130	900 and 18000

\*Flow rates for minimum and maximum URV correspond to velocities of approximately 1.64 ft/sec (0.5 m/sec) and 33 ft/sec (10 m/sec).



**FUNCTIONAL SPECIFICATIONS (Continued)****Flowtube Replacement**

For installations presently with 8300 Series flowtubes, the 9300A Series can be used as a direct replacement. However, because of the shorter face-to-face dimensions of the 9300A flowtubes, a spool piece or equivalent spacer is required when replacing an 8300 with a 9300A flowtube.

**Process Fluid Conductivity and Signal Cable Length**

The maximum allowable cable length is a function of the cable type, process fluid conductivity, and whether the cables are in the same or separate conduits. Standard system accuracy is maintained when the installations are in accordance with Table 3.

Table 2. Face-to-Face Dimensions, 9300A vs. 8300 Series Flowtubes, and Spool Length

Flowtube Size		Face-to-Face Dimensions					
		9300A, pfa/ptfe Lining		8300, ptfe Lining		Spool Length	
mm	in	mm	in	mm	in	mm	in
15	1/2	200	7.87	365	14.4	165	6.5
25	1	200	7.87	365	14.4	165	6.5
40	1-1/2	200	7.87	365	14.4	165	6.5
50	2	200	7.87	365	14.4	165	6.5
80	3	200	7.87	418	16.4	218	8.6
100	4	250	9.84	418	16.4	168	6.6
150	6	300	11.81	522	20.6	222	8.7
200	8	350	13.8	624	24.6	274	10.8
250	10	450	17.7	726	28.6	277	10.9
300	12	500	19.7	828	32.6	329	12.9
350	14	550	21.7	724	28.5	173	6.8
400	16	600	23.6	775	30.5	175	6.9

Table 3. Process Fluid Conductivity and Cabling(a)

Maximum Cable Length	Minimum Fluid Conductivity	Signal and Coil Drive Cables
300 m (1000 ft)	5 $\mu$ S/cm	Signal and coil drive cables in separate conduit. Signal Cable to be Foxboro Part No. R0101ZS (feet) or B4017TE (meters).
225 m (700 ft)	5 $\mu$ S/cm	Signal and coil drive cables in same conduit. Signal Cable to be Foxboro Part No. R0101ZS (feet) or B4017TE (meters).
150 m (500 ft)	20 $\mu$ S/cm	Signal cable may be in same conduit as coil drive cable. Signal cable to be good quality twisted shielded pair, preferable no smaller than 1.0 mm <sup>2</sup> (or 18 AWG) for mechanical considerations (Belden 8760 or 9318, Alpha 5610/1801 or 5611/1801, or equivalent).

(a) Values in table are fluid conductivity minimums, and maximum distance between transmitter and flowtube. Refer to TI 027-072 for conductivities of various process liquids.

## PHYSICAL SPECIFICATIONS

### Flowtube Construction

15 mm (1/2 in) SIZE

Cast 304 ss (CF8) or 305 ss, exceeds Schedule 10 wall thickness

25 to 150 mm (1 to 6 in) SIZES

Cast 304 ss (CF8) or 305 ss, exceeds Schedule 40 wall thickness

200 to 400 mm (8 to 16 in) SIZES

304 ss Schedule 10 or 40 wall thickness

### Flowtube Liner

Perfluoroalkoxy (pfa) liner (1 to 12 in). Designed to be permanently retained within flowtube without slipping, rotating, collapsing, or other movement.

ptfe liner (1/2 to 16 in); polyurethane liner (8 to 16 in).

Refer to TI 27-71f for liner material recommendations for over 150 common process fluids.

### Flowtube Housing

1/2 to 6 in

Ductile iron housing. Finish provides the environmental and corrosion resistant requirements of NEMA 4X (pfa lined) or NEMA 4 (ptfe lined).

8 to 16 in

Carbon steel housing. Finish provides the environmental and corrosion resistant requirements of NEMA 4X.

### Electrodes

Tantalum-Tungsten, Hastelloy C, Platinum-Iridium, 316 ss, or Titanium, as specified. The Hastelloy C and 316 ss are also available in a conical configuration. Polyurethane-lined tubes are available with stainless-steel electrodes only.

### Junction Box (Remote Mounted. Transmitters Only)

Cast aluminum housing mounted and sealed to top surface of flowtube.

Junction box sealed to flowtube with cork-silicon rubber gasket.

Junction box cover sealed with silicone sponge rubber gasket.

### Flanges

ANSI Class 150, 300 Metric PN16 or PN40 (mates on PN10 through PN40), in either carbon steel or 316 ss; rating and material as specified.

### Flange Gaskets

Provided by user.

### Mounting Position

The flowtube can be mounted in any orientation provided that it remains full of fluid, and the electrodes

are in the horizontal plane. Installation in a vertical line with flow going up is ideal. Recommended straight run of pipe is five pipe diameters upstream and three pipe diameter downstream.

### Electrical Connections

#### WITH REMOTE-MOUNTED TRANSMITTER

Junction box on top surface of flowtube provides for signal, power, and fluid ground connections. Holes tapped for 1/2 NPT conduit, or accommodate optional cable glands for nonconduit applications.

Access to wiring is by simply removing junction box cover. All unused conduit holes must be plugged to maintain the electrical and environmental integrity of the transmitter.

#### WITH INTEGRAL-MOUNTED TRANSMITTER

Transmitter mounted to top surface of flowtube. All field wiring is accommodated by the transmitter. Refer to transmitter documents.

### Approximate Mass (Flowtube with ANSI Class 150 Flanges)

15 mm (1/2 in) SIZE

2.8 kg (6.2 lb)

25 mm (1 in) SIZE

5.1 kg (11.3 lb)

40 mm (1-1/2 in) SIZE

8.0 kg (17.50lb)

50 mm (2 in) SIZE

10.5 kg (23.2 lb)

80 mm (3 in) SIZE

14.2 kg (31.3 lb)

100 mm (4 in) SIZE

22.7 kg (50.0 lb)

150 mm (6 in) SIZE

34.0 kg (74.7 lb)

200 mm (8 in) SIZE

47.6 kg (105 lb)

250 mm (10 in) SIZE

65.3 kg (144 lb)

300 mm (12 in) SIZE

90.7 kg (200 lb)

350 mm (14 in) SIZE

128 kg (283 lb)

400 mm (16 in) SIZE

154 kg (339 lb)

### Approximate Mass (When Mounted to IMT Transmitter)

Add 2.9 kg (6.5 lb) with IMT25/IMT25L, Single Compartment

Add 3.9 kg (8.7 lb) with IMT25, Dual Compartment

## ELECTRICAL SAFETY SPECIFICATIONS

Testing Laboratory, Types of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
<b>CENELEC</b> Zone 1, Gas Group IIC.	Temperature Class T3-T6. Electrodes are intrinsically safe when connected to certified intrinsically safe equipment.	S
<b>CSA</b> for use in general purpose (ordinary) locations.	—	K
<b>CSA</b> for use in Class I, Division 2, Groups A, B, C, and D; Class II, Division 2, Groups F and G; Class III, Division 2 hazardous locations.	Temperature Class T6.	L
<b>FM</b> for use in general purpose (ordinary) locations.	—	M
<b>FM</b> nonincendive Class I, Division 2, Groups A, B, C, and D; suitable for Class II and III, Division 2, Groups F and G hazardous locations.	Temperature Class T6. For use on non-hazardous process only.	N
<b>European</b> nonincendive, Zone 2, Gas Group IIC.	Temperature Class T2-T6.	U
No Certification	—	Z

NOTE: These flowtubes have been designed to meet the electrical safety descriptions listed above. For detailed information, or status of testing laboratory approvals or certifications, contact Foxboro.

## OPTIONAL FEATURES

**Cable Glands**

For Remote-Mounted Transmitter and nonconduit applications only. Used to provide rain tight, strain relieved entrance for 6.8 to 12.2 mm (0.27 to 0.48 in) diameter cable. External 1/2 NPT threads into internal 1/2 NPT thread on flowtube junction box surface. Body and seal nut are nylon, and compression gland is neoprene. Selectable using Model Code option -G.

**Grounding Rings**

Grounding rings are needed if mating piping is nonmetallic or lined. When required, grounding rings must be at both ends of the flowtube. Grounding rings (i.e., orifice plates) are available from Foxboro, if needed. Contact Foxboro for further information.

**Foxboro Signal Cable**

For Remote-Mounted Transmitter applications only. Two-core (two-conductor), multiscreened (multi-shielded) cable with two driven screens (shields). Maximum length is 300 m (1,000 ft). This cable (Part Number R0101ZS when ordering in feet, and Part Number B4017TE when ordering in meters) is identified here for reference only. This cable is generally specified with transmitter order.

**Grounding Electrode**

For 9308A to 9316A flowtubes only. The grounding electrode is a third electrode added to the flowtube, as an alternative to grounding rings, if mating pipe is nonmetallic or lined. Selection using Model Code option -E, same material as specified in Model Code for electrodes is supplied for grounding electrode.

**ptfe Liner Protector**

For 930HA to 9316A flowtubes only, supplied with ptfe liners and ANSI 150 flanged ends. Selection using Model Code option -T. This feature adds a metal ring and a ptfe gasket on each face of the flowtube to protect the lining flare. The metal ring protects the flare from damage during installation as removal of the flowtube from the pipeline. The gasket protects the flare against crushing due to over torquing.

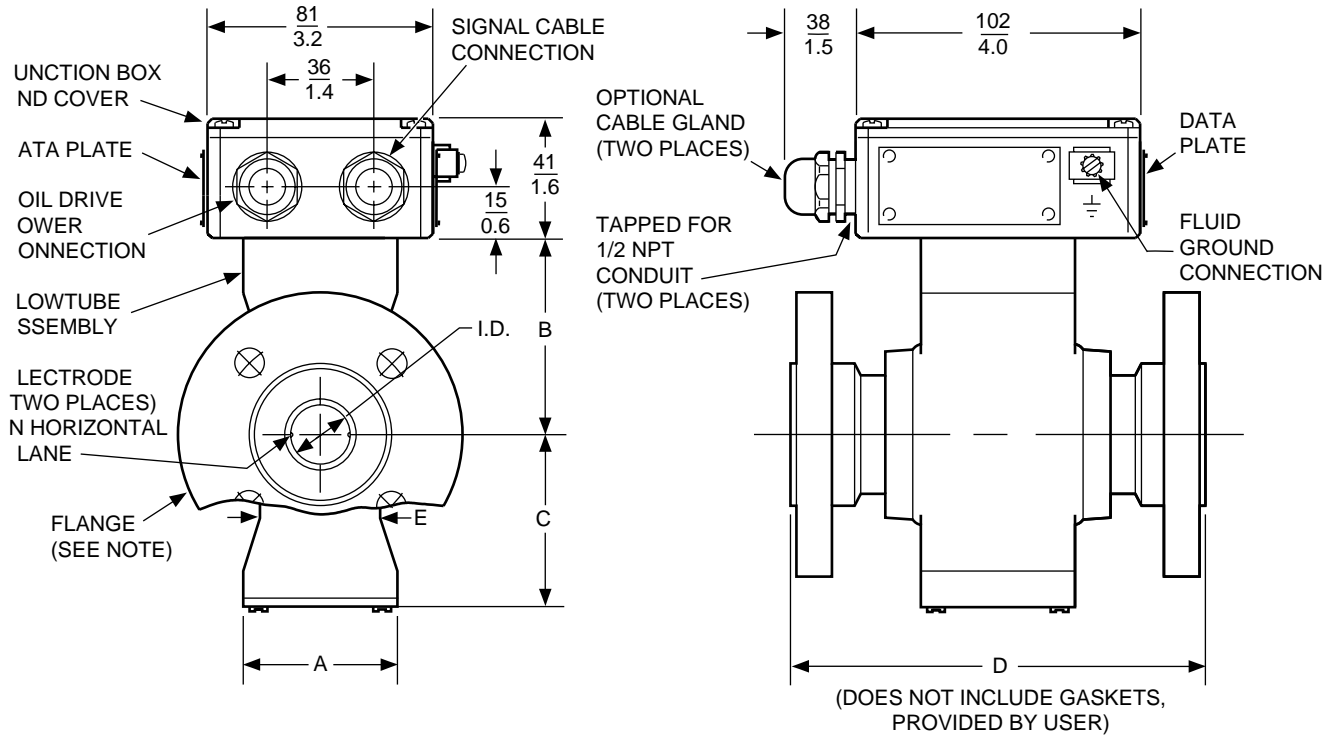
**Low Voltage Electronic Cleaning Assembly (Voltage Boil-Off Procedure)**

The low voltage electrode cleaning assembly provides a convenient means of applying a low voltage to the electrodes, while simultaneously protecting the transmitter by short-circuiting the signal input. This procedure removes sludge or film deposits from the electrodes. Offered for indoor use only and not to be used in "hose down" applications. Supply voltage is 120 V ac, 50 to 60 Hz. Flowtube must be in an ordinary location. Specify Foxboro Part No. D0128JW.

**DIMENSIONS-NOMINAL**

mm  
in

930HA TO 931HA FLANGED FLOWTUBES USED WITH REMOTE-MOUNTED TRANSMITTERS



Flowtube Model	Nominal Line Size		Actual Flowtube I.D.	Dimensions				
	mm	in		A	B	C	D	E
930HA	15	1/2	$\frac{12.19}{0.480}$	$\frac{53}{2.1}$	$\frac{61}{2.4}$	$\frac{58}{2.3}$	$\frac{200}{7.87}$	$\frac{28}{1.1}$
9301A	25	1	$\frac{22.10}{0.870}$	$\frac{53}{2.1}$	$\frac{69}{2.7}$	$\frac{66}{2.6}$	$\frac{200}{7.87}$	$\frac{41}{1.6}$
931HA	40	1 1/2	$\frac{37.08}{1.46}$	$\frac{53}{2.1}$	$\frac{84}{3.3}$	$\frac{76}{3.0}$	$\frac{200}{7.87}$	$\frac{53}{2.1}$

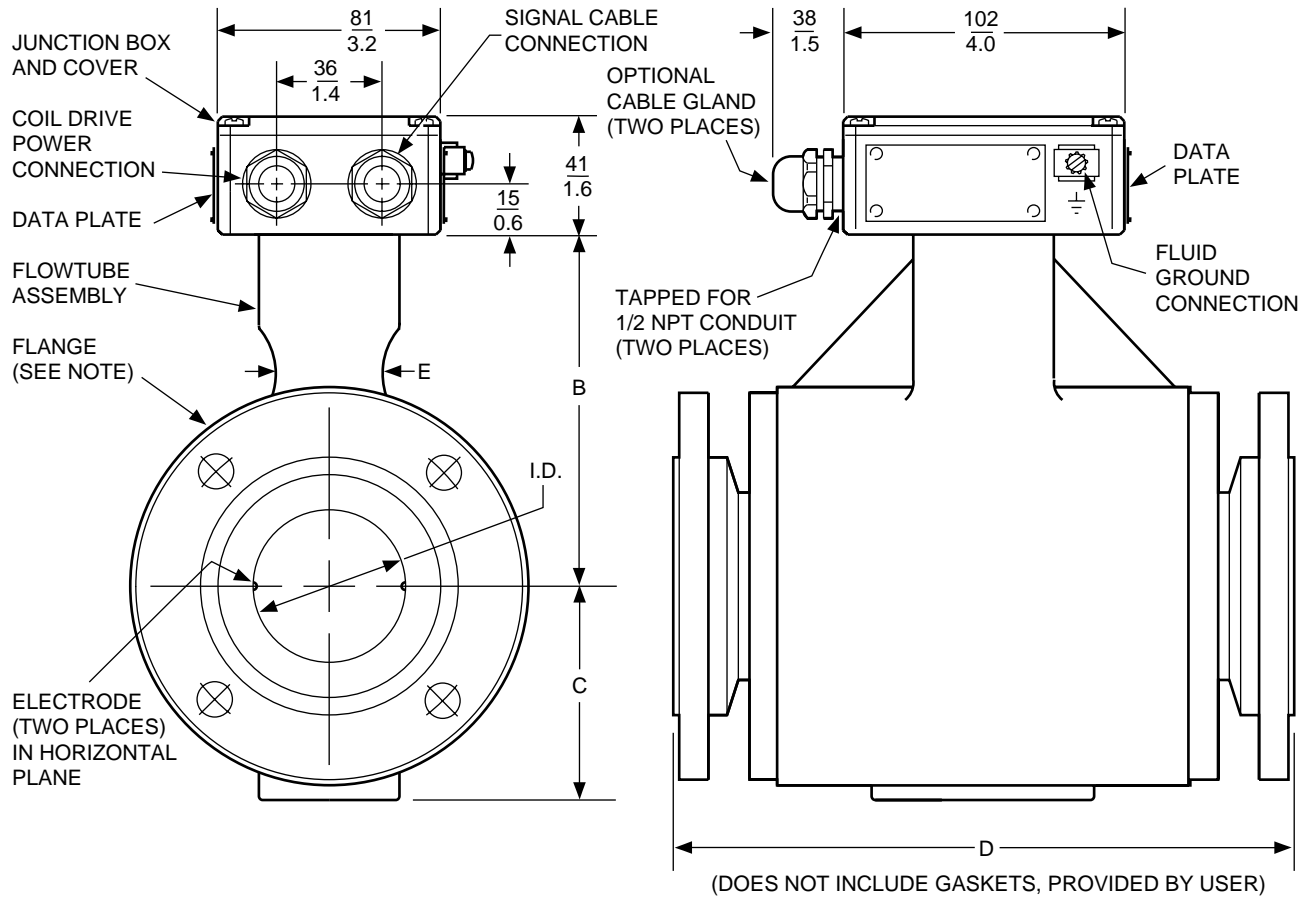
**NOTES**

1. Flowtube mounts between the following pipeline flanges: Metric PN 10, PN 16, PN 25, and PN 40; and ANSI Classes 150 and 300.
2. For ptfe-lined flowtubes, Dimension "D" applies only when end flanges are clamped in place.

**DIMENSIONS-NOMINAL (Cont.)**

**mm**  
**in**

**9302A TO 9306A FLANGED FLOWTUBES USED WITH REMOTE-MOUNTED TRANSMITTERS**



Flowtube Model	Nominal Line Size		Actual Flowtube I.D.	Dimensions			
	mm	in		B	C	D	E
9302A	50	2	45.6 1.77	91 3.6	61 2.4	200 7.87	28 1.1
9303A	80	3	70.6 2.78	107 4.2	76 3.0	200 7.87	41 1.6
9304A	100	4	93.0 3.66	135 5.3	89 3.5	250 9.84	41 1.6
9306A	150	6	138.7 5.46	165 6.5	114 4.5	300 11.81	48 1.9

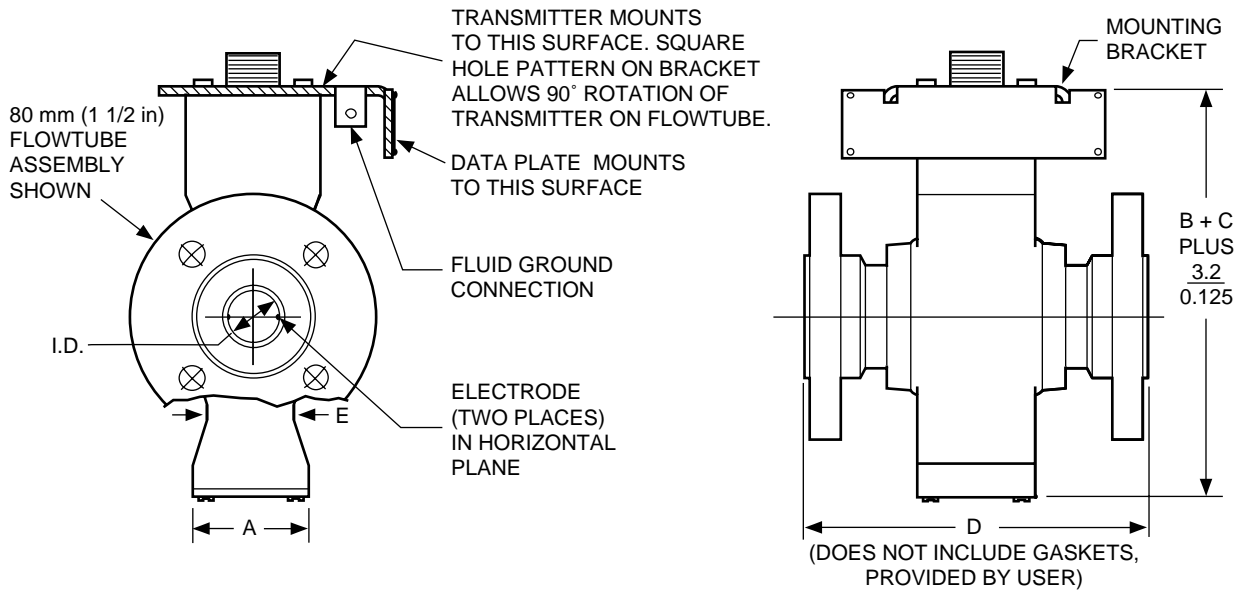
**NOTES**

1. Flowtube mounts between the following pipeline flanges: Metric PN 10, PN 16, PN 25, and PN 40; and ANSI Classes 150 and 300.
2. For pte-lined flowtubes, Dimension "D" applies only when end flanges are clamped in place.

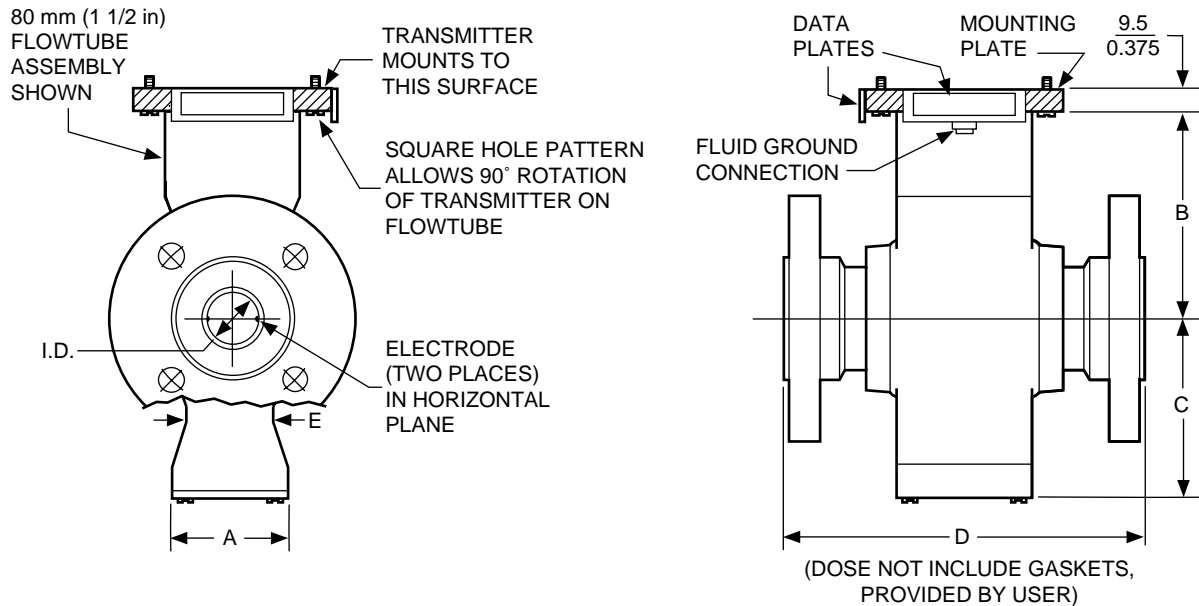
**DIMENSIONS-NOMINAL (Cont.)**

**mm**  
**in**

**930HA TO 9306A FLANGED FLOWTUBES USED WITH  
IMT25 SERIES FLOWTUBE-MOUNTED TRANSMITTERS**



**930HA TO 9306A FLANGED FLOWTUBES USED WITH  
MODELS 8000, IMT10 AND IMT20 FLOWTUBE-MOUNTED TRANSMITTERS**

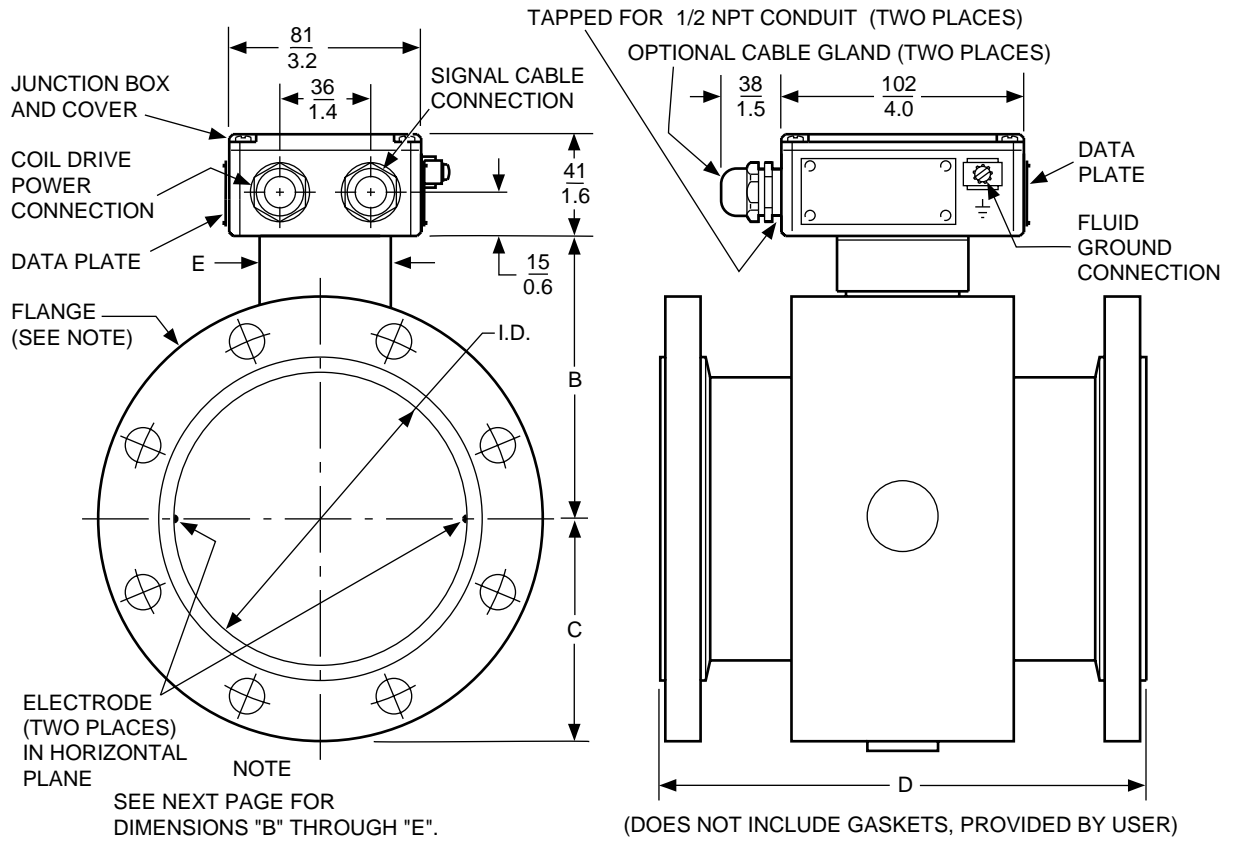


NOTE: SEE PREVIOUS PAGES FOR FLOWTUBE DIMENSIONS.

**DIMENSIONS-NOMINAL (Cont.)**

**mm**  
**in**

**9308A TO 9316A FLANGED FLOWTUBES USED WITH REMOTE-MOUNTED TRANSMITTERS**



**DIMENSIONS-NOMINAL (Cont.)**

mm  
in

Flowtube Model	Nominal Line Size		Liner	Actual Flowtube I.D.		Nom. Dim. B	Nominal Dimension C				Nom. Dim. D	Nom. Dim. E		
	mm	in		Sch. 10	Sch. 40		(ANSI Class)		(Metric PN)					
							(150)	(300)	(10)	(16)			(25)	(40)
9308A	200	8	pfa	<u>206</u> 8.11	<u>197</u> 7.76	<u>187</u> 7.4	<u>171</u> 6.7	<u>191</u> 7.5	<u>169</u> 6.7	<u>169</u> 6.7	<u>180</u> 7.1	<u>187</u> 7.4	<u>350</u> 13.8	<u>72</u> 2.8
			ptfe	<u>202</u> 7.95	N/A									
			poly	<u>193</u> 7.59	N/A									
9310A	250	10	pfa	<u>259</u> 10.21	<u>249</u> 9.81	<u>214</u> 8.4	<u>202</u> 8.0	<u>222</u> 8.8	<u>197</u> 7.8	<u>202</u> 7.9	<u>213</u> 8.4	<u>225</u> 8.9	<u>450</u> 17.7	<u>72</u> 2.8
			ptfe	<u>255</u> 10.05	N/A									
			poly	<u>246</u> 9.69	N/A									
9312A	300	12	pfa	<u>309</u> 12.18	<u>299</u> 11.79	<u>239</u> 9.4	<u>241</u> 9.5	<u>260</u> 10.3	<u>222</u> 8.7	<u>229</u> 9.0	<u>243</u> 9.6	<u>258</u> 10.1	<u>500</u> 19.7	<u>72</u> 2.8
			ptfe	<u>305</u> 12.02	N/A									
			poly	<u>296</u> 11.66	N/A									
9314A	350	14	ptfe	<u>341</u> 13.42	N/A	<u>255</u> 10.0	<u>266</u> 10.5	N/A	<u>252</u> 9.9	<u>259</u> 10.2	N/A	N/A	<u>550</u> 21.7	<u>72</u> 2.8
			poly	<u>328</u> 12.90	N/A									
9316A	400	16	ptfe	<u>392</u> 15.42	N/A	<u>280</u> 11.0	<u>298</u> 11.7	N/A	<u>282</u> 11.1	<u>289</u> 11.4	N/A	N/A	<u>600</u> 23.6	<u>72</u> 2.8
			poly	<u>378</u> 14.90	N/A									

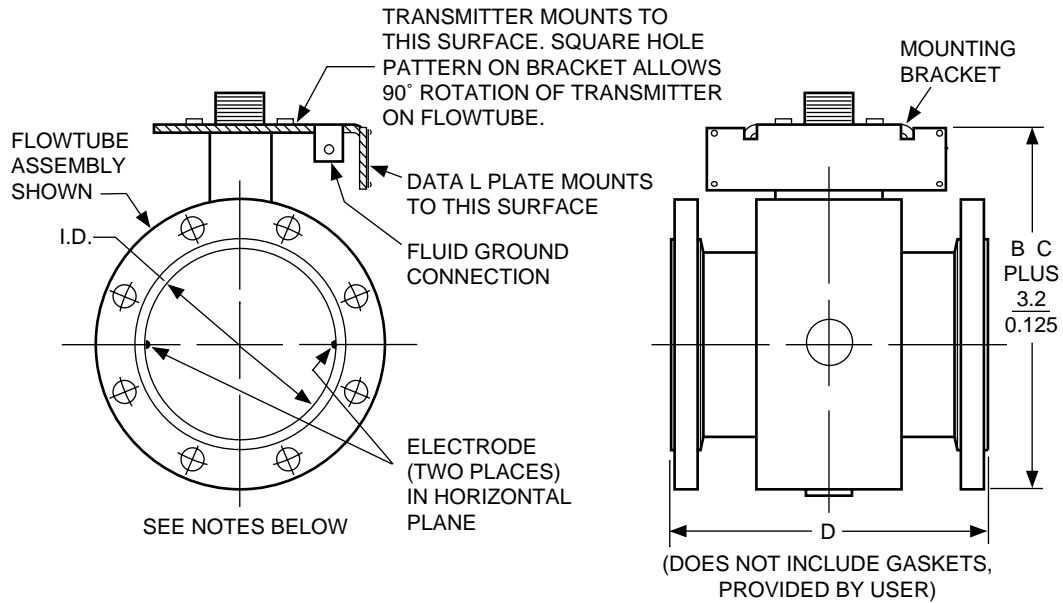
NOTE: FOR PTFE-LINED FLOWTUBES, DIMENSION "D" APPLIES ONLY WHEN END FLANGES ARE CLAMPED IN PLACE.



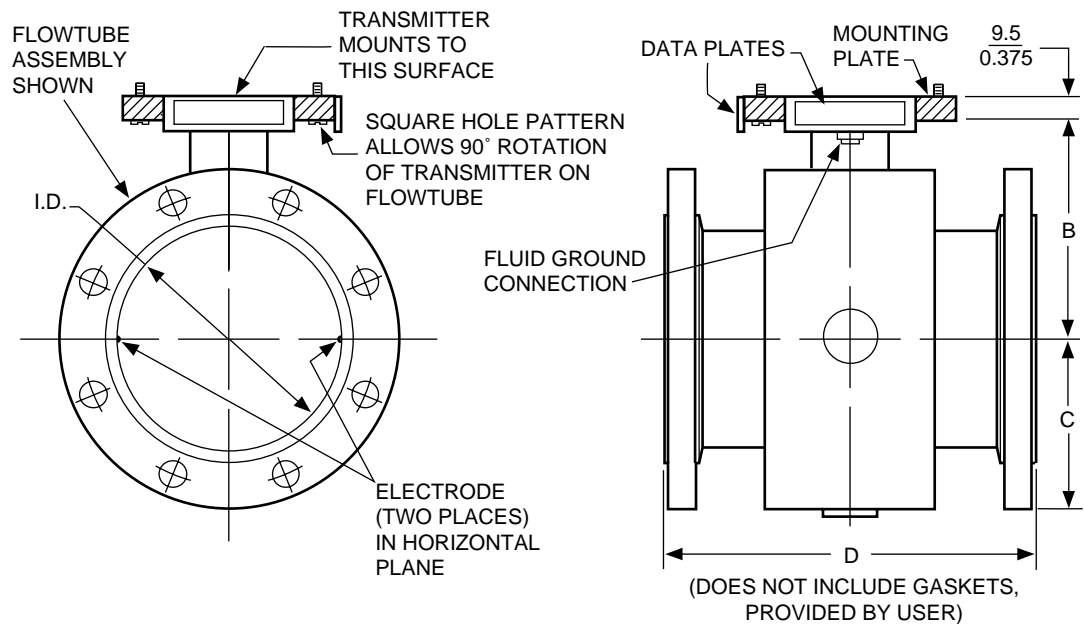
**DIMENSIONS-NOMINAL (Cont.)**

**mm**  
**in**

**9308A TO 9316A FLANGED FLOWTUBES USED WITH  
IMT25 SERIES FLOWTUBE-MOUNTED TRANSMITTERS**



**930HA TO 9306A FLANGED FLOWTUBES USED WITH  
MODELS 8000, IMT10, AND IMT20 FLOWTUBE-MOUNTED TRANSMITTERS**



NOTE: SEE PREVIOUS PAGES FOR FLOWTUBE DIMENSIONS.





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### ORDERING INSTRUCTIONS

1. Model Number.
2. Flow Rate and Engineering Units. Value Specified Must be within Minimum and Maximum Values listed in Table 1.
3. Process Pressure-Temperature Range.
4. Process Composition and Conductivity.
5. Grounding Rings (if Mating Piping is Nonmetallic or Lined Metallic Piping).
6. Other Options not Listed in Model Number.
7. User Tag Data.

### RELATED LITERATURE

9300A Series Flanged Magnetic Flowtubes Parts List	PL 008-742
9300A Series Flanged Magnetic Flowtubes Dimensional Print	DP 021-364
9300A Series Flanged Magnetic Flowtubes Installation	MI 021-386
Magnetic Flowtube, Sealing Kit for Submergence Option	MI 021-151
I/A Series Magnetic Flow Transmitter Model IMT25 Product Specification Sheet	PSS 1-6F5 A
Material Selection Guide	TI 27-71f
Electrical Conductivity of Process Liquids	TI 027-072

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