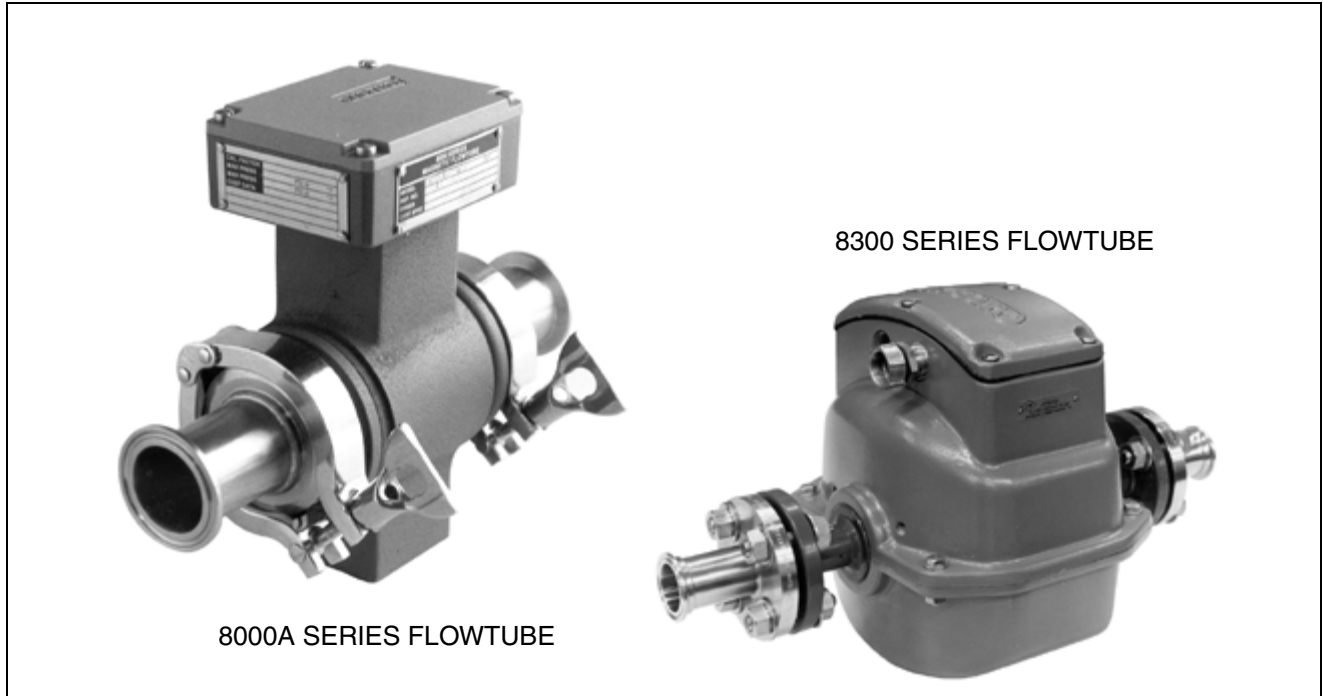


8000A and 8300 Series Sanitary Magnetic Flowtubes Ceramic-Lined and ptfе-Lined 15 to 80 mm (1/2 to 3 in) Sizes



8000A SERIES FLOWTUBE

8300 SERIES FLOWTUBE

The 8000A and 8300 Series Flowtubes, together with a Model IMT25 Intelligent Magnetic Flow Transmitter, combine to form an easy-to-use, versatile Sanitary Magnetic Flowmeter. The flowmeter is an economical microprocessor-based magnetic flow system for use with most common everyday conductive liquids used in sanitary process applications. The transmitter converts the low level, high impedance signal from lined flowtubes to a standard scaled transmission signal, either 4 to 20 mA, digital, or pulse output, that is directly proportional to the volumetric flow rate.

SUPERIOR REPUTATION FOR DEPENDABILITY AND QUALITY

Invensys Process Systems introduced magnetic flow measurement systems to the process industries in 1954 and has demonstrated the broadest and most time-proven application expertise with tens of thousands of successful installations.

AN INTELLIGENT PATH TO SANITARY MAGNETIC FLOW SYSTEMS

The merging of the latest technology in flowtube design and a microprocessor-based transmitter provides the process industries a significant advancement in sanitary liquid flow measurement. This flowmeter is a natural path to the future: high or low rate pulse output and a 4 to 20 mA dc signal for today's systems; and also full digital communications with FoxCom, HART, or FOUNDATION Fieldbus Communication protocols.

SANITARY METERING TUBE

The metering tube basically consists of a ductile iron housing with ceramic lining, or a low copper aluminum alloy with ptfе lining. All materials are consistent with U.S. Food and Drug Administration regulations for food contact service. The assembled flowtube complies with 3-A Sanitary Standards for flowmeters used with milk and milk products.

CLEAN-IN-PLACE AND QUICK-DISCONNECT CONSTRUCTION

The ptfе-lined or polished ceramic-lined flowtube and crevice-free construction provide CIP operation. The quick-disconnect sanitary end connections permit ease of flowtube installation and removal from line.

A VARIETY OF APPLICATIONS

The flowtube is unaffected by changes in process liquid density and viscosity. It is ideally suited for many food applications. Proven high performance with dairy products such as milk and ice cream mixes, as well as other products such as beer, soft drinks, coffee, molasses, and corn syrup. Processed products such as catsup and other viscous, sticky, or otherwise difficult-to-measure liquids are easily measured.

LOW POWER CONSUMPTION

All Flowmeter configurations are designed to consume less than 15 W (30 VA maximum) of power at reference voltage and frequency.

EXCELLENT ZERO STABILITY

Excellent zero stability is inherent in the design. The mechanical design and electronic package feature accurately located and securely mounted coil and electrode assemblies, spring-loaded electrodes, optimized field characterization, and power-driven screens (shields) on the signal leads. All of these features ensure the ultimate in long-term stability, signal integrity, and accurate measurement.

USED WITH PULSED DC SUPPLY

The 8000A and 8300 Series Sanitary Magnetic Flowtubes are calibrated for use with pulsed dc coil excitation. Invensys Process Systems offers the Model IMT25 Intelligent Magnetic Flow Transmitter for use with these flowtubes.

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), and corresponding organizations outside the U.S.A.

FLOWTUBE CONFIGURATIONS

The ceramic-lined flowtubes have platinum electrodes, and sanitary, quick-disconnect Tri-Clamp type couplings are attached to a wafer body flowtube. The ptfе-lined flowtubes have 316 ss electrodes and the Tri-Clamp type couplings are attached to a flanged body. The ceramic- and ptfе-lined flowtubes are both offered in 15 through 80 mm (1/2 through 3 in) sizes and are used with transmitters that mount remotely to a pipe or surface.

WEATHERPROOF AND CORROSION RESISTANT CONSTRUCTION

These Sanitary Flowtubes are designed to operate in harsh outdoor or in-plant environments. The enclosure is weatherproof as defined by IEC IP66, and provides the watertight and corrosion resistant protection of NEMA Type 4X.

PED QUALIFICATION

This product is qualified for SEP (Standard Engineering Practice) Category 1 with Group 2 fluids (nonhazardous).

FlowExpertPro™

FlowExpertPro is a program primarily used to size Foxboro flowmeters. It also ensures that the user has selected the proper flowmeter type for his application. Invensys provides this meter selection tool as a free web site to all users, without the need for registration. In addition to flowmeter selection and sizing, FlowExpertPro includes the following features:

- Incorporates a large library of the physical properties of typical process fluids.
- Displays results in tabular or graphic format.
- Allows user to save, print, or E-mail results.
- Provides reference to applicable flowmeter PSSs and other related flowmeter documentation.

The program calculates minimum and maximum flow rates, rangeability, pressure loss, and Reynolds Number, using established flow equations. It also allows for material and flange selection, and provides ANSI or metric flange recommendations for predicted flow pressure and temperature. You are invited to visit www.FlowExpertPro.com to access this program, or contact Invensys for further information, and technical support.

OPERATING CONDITIONS

Influence	Reference Operating Conditions	Normal Operations Condition Limits	Operative Limits
Ambient Temperature Ceramic-Lined Flowtube	23 ±2°C (73 ±3°F)	-20 and +70°C (-4 and +158°F)	-30 and +70°C (-22 and +158°F)
Ambient Temperature ptfe-Lined Flowtube	23 ±2°C (73 ±3°F)	-7 and +49°C (20 and 120°F)	-29 and +60°C (-20 and +140°F)
Process Temperature	Refer to Table 1 and Figure 1 in Functional Specifications section.		

PERFORMANCE SPECIFICATIONS

(Combined Flowtube and Transmitter System under Reference Operating Conditions)

Flowmeter System

8000A and 8300 Flowtube with IMT25 Transmitter (FoxCom and HART)
8000A and 8300 Flowtube with IMT25 Transmitter (FOUNDATION Fieldbus)

Refer to

PSS 1-6F5 A
PSS 1-6F5 B

FUNCTIONAL SPECIFICATIONS

Process Pressure and Temperature Limits (Table 1 and Figure 1)

Table 1. Process Pressure and Temperature Limits – Ceramic-Lined Flowtubes (8000A Series)

Flowtube Model Code	Process Pressure and Temperature Limits (a)	Gasket Material
800HA-SCR through 8002A-SCR	Full Vacuum to 3100 kPa from -40 to +38°C (Full Vacuum to 450 psi from -40 to +100°F)	BUNA-N or VITON
	Decreasing to 2070 kPa at 99°C (to 300 psi at 210°F)	BUNA-N
	Decreasing to 1035 kPa at 177°C (to 150 psi at 350°F)	VITON
8003A-SCR	Full Vacuum to 2410 kPa from -40 to +38°C (Full Vacuum to 350 psi from -40 and +100°F)	BUNA-N or VITON
	Decreasing to 1724 kPa at 99°C (to 250 psi at 210°F)	BUNA-N
	Decreasing to 862 kPa at 177°C (to 125 psi at 350°F)	VITON

(a) Maximum allowable step change in temperature between process and ceramic is an increase of 125°C (225°F), and a decrease in temperature of 75°C (135°F). Low temperature limit for Viton is -29°C (-20°F).

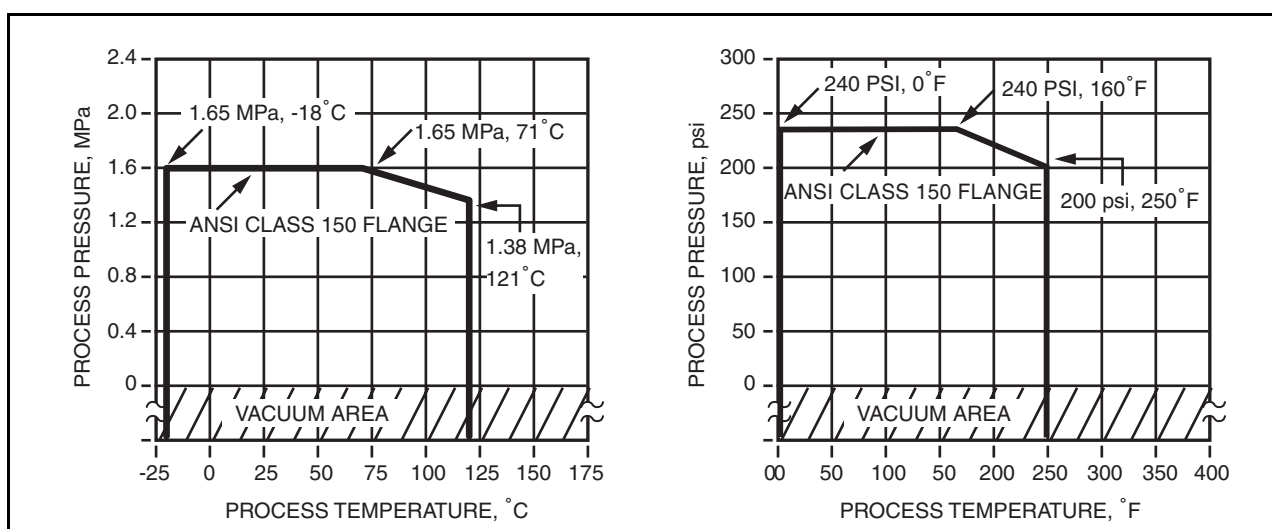


Figure 1. Process Pressure and Temperature Limits for ptfе-Lined Flowtubes (8300 Series)

CAUTION

Mating end connections, clamps, and gaskets selected and provided by user may have a lower pressure limit than that shown in Table 1 and Figure 1. In this situation, the pressure limit of the flowtube and end connection combination will be limited by the mating parts selected.

FUNCTIONAL SPECIFICATIONS (Cont.)

Minimum and Maximum Upper Range Values

See Table 2. 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 can correspond to the 20 mA signal. For example: for the 800HA, the minimum range is 0 to 1.0 U.S. gpm, and this will generate 4 to 20 mA.

Polished Ceramic Lining (8000A Series)

The ceramic lining is polished to provide a crevice-free process surface. The ceramic also provides excellent corrosion and abrasion resistance and is suitable for high pressure, high temperature, or vacuum service applications.

ptfe Lining (8300 Series)

The ptfe lining meets the sanitary material requirements of FDA. It is excellent when used with sanitary, clean, mildly corrosive, or severe corrosive fluids. It is satisfactory when used with mild abrasive fluids, and it is not recommended for use with severe abrasive fluids.

Signal and Coil Driver Cable

Two conductor (number 22 AWG standard wire), multiscreened (multishielded) cable with two driven screens (shields). The maximum allowable cable length between flowtube and transmitter is 300 m (1000 ft). See OPTIONAL FEATURES AND ACCESSORIES section for ordering instructions.

Table 2. Flow Rate Upper Range Values (URV's)

Flowtube Model Code	Minimum and Maximum Upper Range Values (a)	
	L/m	U.S. gpm
800HA	4.0 and 80	1.0 and 20
8001A	14 and 280	3.5 and 73
801HA	34 and 680	9 and 170
8002A	51 and 1000	13 and 250
8003A	125 and 2500	31 and 625
830H	4.0 and 80	1.0 and 20
8301	14.5 and 290	3.8 and 76
831H	37 and 740	10 and 195
8302	63 and 1260	17 and 335
8303	145 and 2900	39 and 770

(a) The difference in URV's between the 8000A and 8300 flowtubes for the same line sizes is because of the difference in I.D.'s of the ceramic and ptfe liners of these flowtubes, respectively.

Process Fluid Conductivity

The minimum process fluid conductivity required is 5 µS/cm. Refer to TI 27-072 for conductivities of various process liquids.

Power Consumption

Less than 15 W (30 VA) at reference voltage and frequency.

PHYSICAL SPECIFICATIONS

HOUSING CONSTRUCTION

These flowtubes are offered with a selection of the following housing construction depending on the Model selected: a Weatherproof construction housing, an Accidental Submergence construction housing, and a High Humidity/Condensate construction housing. See paragraphs below.

Weatherproof Construction Housing

Available with both the 8000A and 8300 Series flowtubes. This housing is designed for harsh in-plant or outdoor environments. It is weatherproof as defined by IEC IP65, and provides the watertight and corrosion-resistant protection of NEMA Type 4X. Select Housing Code -G.

Accidental Submergence Construction Housing

Available with 8000A Series flowtubes only. This housing is factory sealed to allow 48 hours of operation after being accidentally submerged in a maximum depth of 9 m (30 ft) of water. A field kit is provided to the customer for final sealing after site installation. Select Housing Code -H.

High Humidity/High Condensate Construction

Available with 8300 Series flowtubes only. This construction consists of special sealing techniques to help prevent internal formation of condensate in applications involving cold process temperature and warm ambient, e.g., brewery or dairy processes. Select using Flowtube Housing Code -C.

Mounting Position

The flowtube can be mounted at any position without degrading performance. The only requirement is that the flowtube be completely full with the process liquid during measurement, and the electrodes be in the horizontal plane.

Enclosure Finish

High-build epoxy paint.

Materials – 8000A Series Tubes

FLOWTUBE HOUSING

Ductile iron

JUNCTION BOX

Cast aluminum

FLOWTUBE LINER

Ceramic (99.5% aluminum oxide) with Process-wetted Surface polished to a 25 Ra micrometer finish.

ELECTRODES

Platinum

GASKETS

White BUNA-N is standard (not recommended with steam). VITON is optional.

Materials – 8300 Series Tubes

FLOWTUBE HOUSING

Cast from low copper aluminum alloy

FLOWTUBE LINER

ptfe

ELECTRODES

AISI Type 316L low carbon stainless steel (361L ss)

SEALANT

Silicone rubber sealant applied to all joints.

Electrical Connections

Refer to "DIMENSIONS—NOMINAL" section.

End Connections

Stainless steel. Tri-Clamp type quick-disconnect couplings. Refer to "Dimensions—Nominal" section.

Approximate Mass

Flowtube Size		8000A		8300	
mm	in	kg	lb	kg	lb
15	1/2	2.6	5.7	22.7	50
25	1	3.4	7.6	20.4	45
40	1 1/2	4.0	8.9	23.2	51
50	2	5.2	11.4	25.4	56
80	3	7.8	17.1	33.1	73

PRODUCT SAFETY SPECIFICATIONS

Electrical Classification

Testing Laboratory, Types of Protection and Area Classification	Conditions of Certification	Electrical Certification Code
FM approved for use in general purpose (ordinary) locations.	—	FGZ

OPTIONAL FEATURES AND ACCESSORIES**Option -G: Cable Glands**

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 cable entry surface. Body and seal nut are nylon, and compression gland is neoprene. Select Model Code option "-G".

Option -S: Signal Cable Seal

Available with 8300 Series flowtubes only. Usually selected for conduit applications to provide a means of clamping and sealing the signal cable. External 3/4 NPT threads into flowtube terminal housing. As installed, the cable seal accommodates a 1/2 NPT conduit. By removing the reducer, a 3/4 NPT conduit can be used. One signal cable seal is provided. Select Model Code Option -S.

Option V: Viton Gasket

For 800HA to 8003A Flowtubes only. Generally selected in place of the Buna-N gasket for higher temperatures and steam cleaning applications. Select Model Code Option "-V".

Options -U, -W, and -Z: Ultrasonic Electrode Cleaning Options

Available on 8302 and 8303 flowtubes only. Vibrations of 65 ± 10 kHz are continuously applied to electrodes to prevent accumulation of coatings, or to remove certain coatings which can interfere with the flow measurement.

Optional Selection -U consists of two main components: a pair of electrode drivers (transducers) internal to the flowtube housing, and a pipe or wall mounted oscillator power supply unit, with 7.6 m (25 ft) connecting cable.

Optional Selection -W provides an ultrasonic driver assembly with cable and junction box for use with a portable ultrasonic electrode cleaner (Part No. D0183NG).

Optional Selection -Z is selected to facilitate field-addition of ultrasonic cleaning, if needed. Electrode drivers are built in, and the oscillator power supply can be ordered later. Contact Invensys Process Systems for further details.

Low Voltage Electrode 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. The low voltage and current remove sludge or film deposits from the electrodes so that the system continues normal, accurate operation. This assembly is for indoor use only, and not to be used in "hose down" environments. Supply voltage is 120 V ac, 50 to 60 Hz, and the flowtube must be in ordinary locations. This assembly is available for all flowtube sizes. Specify Part No. D0128JW.

Air Purge Connection

Used with 8302 and 8303 flowtubes having ultrasonic cleaner power supply only. For increased corrosion resistance, ultrasonic cleaner power supply can be air purged. Air supply connection can be either R 1/4 or 1/4 NPT. Specify Auxiliary Specification (AS) Reference APC.

Signal Cable

Two-core (two-conductor), multiscreened (multishielded) cable with two driven screens (shields). Maximum length is 300 m (1000 ft). Specify Part Number R0101ZS and length required in feet, or Part Number B4017TE and length required in meters. Unless otherwise specified, a minimum continuous length of 75 m or 250 ft shall be supplied.

MODEL CODES

8000A Series Sanitary Magnetic Flowtubes

<u>Description</u>	<u>Model</u>
Sanitary Magnetic Flowtube, 1/2 in flowtube Size, 1 in Nominal Line Size	800HA
Sanitary Magnetic Flowtube, 1 in flowtube Size, 1 in Nominal Line Size	8001A
Sanitary Magnetic Flowtube, 1 1/2 in flowtube Size, 1 1/2 in Nominal Line Size	801HA
Sanitary Magnetic Flowtube, 2 in flowtube Size, 2 in Nominal Line Size	8002A
Sanitary Magnetic Flowtube, 3 in flowtube Size, 3 in Nominal Line Size	8003A
 <u>Tube Construction/End Connection</u>	
Sanitary with Tri-Clamp Type Coupling	-S
 <u>Lining Material</u>	
Ceramic (Alumina Oxide)	C
 <u>Transmitter Mounting</u>	
Remote (Pipe or Surface) Mounting	R
 <u>Electrodes</u>	
Platinum	-P
 <u>Coil Drive/Supply</u>	
Pulsed dc	J
 <u>Housing Construction</u>	
General Purpose NEMA 4X Housing	G
Accidental Submergence (a)	H
 <u>Electrical Classifications (also see Product Safety Specifications section)</u>	
FM, Ordinary Locations	FGZ
 <u>Optional Selections</u>	
Cable Glands (for Nonconduit Applications) (b)	-G
VITON Gasket (c)	-V
 Examples: 8003A-SCR-PJGCGZ-GV	

(a) Sealed for accidental operation under water up to 9 m (30 ft) deep for 48 hours. Supplied with a field sealing kit for final sealing by user after installation.

(b) When "-G" is selected, the cable glands are assembled to the flowtube junction box. Cable glands are typically used for nonconduit applications.

(c) VITON gasket is recommended with steam processes, or if process temperature exceeds 99°C (210°F).

MODEL CODES (Cont.)

8300 Series Sanitary Magnetic Flowtubes

Description	Model
Sanitary Magnetic Flowtube, 1/2 in flowtube Size, 1 in Nominal Line Size	830H
Sanitary Magnetic Flowtube, 1 in flowtube Size, 1 1/2 in Nominal Line Size	8301
Sanitary Magnetic Flowtube, 1 1/2 in flowtube Size, 2 in Nominal Line Size	831H
Sanitary Magnetic Flowtube, 2 in flowtube Size, 3 in Nominal Line Size	8302
Sanitary Magnetic Flowtube, 3 in flowtube Size, 4 in Nominal Line Size	8303
 <u>Tube Construction</u>	
304 ss, Schedule 10 Pipe (8301 to 8303 only)	-SA
304 ss, Schedule 40 Pipe (830H only)	-SB
 <u>End Connections (a)</u>	
Tri-Clamp Type Couplings attach to Tube having ANSI Class 150 Carbon Steel Flanges	TA
Tri-Clamp Type Couplings attach to Tube having ANSI Class 150 316 ss Flanges	TB
 <u>Lining Material</u>	
ptfe	-T
 <u>Electrodes</u>	
316 ss	S
 <u>Coil Drive/Supply</u>	
Pulsed dc	J
 <u>Housing Construction</u>	
General Purpose NEMA 4X Housing	-G
High Humidity/Condensate Housing (a)	-C
 <u>Electrical Safety (also see Electrical Safety Specifications section)</u>	
FM, Ordinary Locations	FGZ
 <u>Optional Selections</u>	
Cable Glands; Select for Nonconduit Applications (Not with "-S" option) (b)	-G
Signal Cable Seal; Select for Conduit Applications (Not with "-G" option) (b)	-S
Ultrasonic electrode cleaning-transducer with oscillator and cable (8302 and 8303 only)	-U
Ultrasonic electrode cleaning-transducer, cable, and junction box for portable oscillator (8302 and 8303 only)	-W
Ultrasonic electrode cleaning-transducer, only (8302 and 8303 only)	-Z
 Examples: 8302-SATB-TSJ-GCGZ-GU	

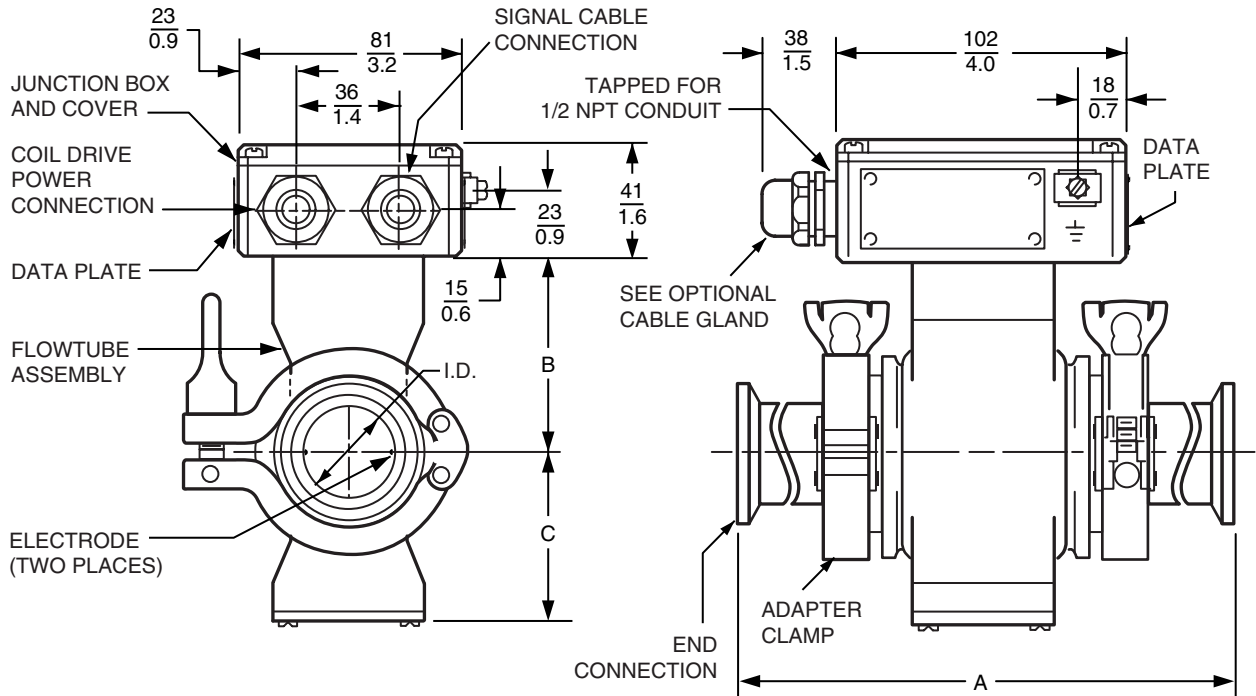
(a) The -C Housing is recommended for warm ambient, cold process service; e.g., brewery and dairy processes.

(b) The cable glands ("-G" option) selected here provide glands for field wiring to the flowtube junction box. Glands are generally specified in nonconduit applications. For conduit applications, specify Signal Cable Seal Option "-S".

DIMENSIONS—NOMINAL

$\frac{\text{mm}}{\text{in}}$

800HA-SCR TO 801HA-SCR CERAMIC-LINED SANITARY FLOWTUBES

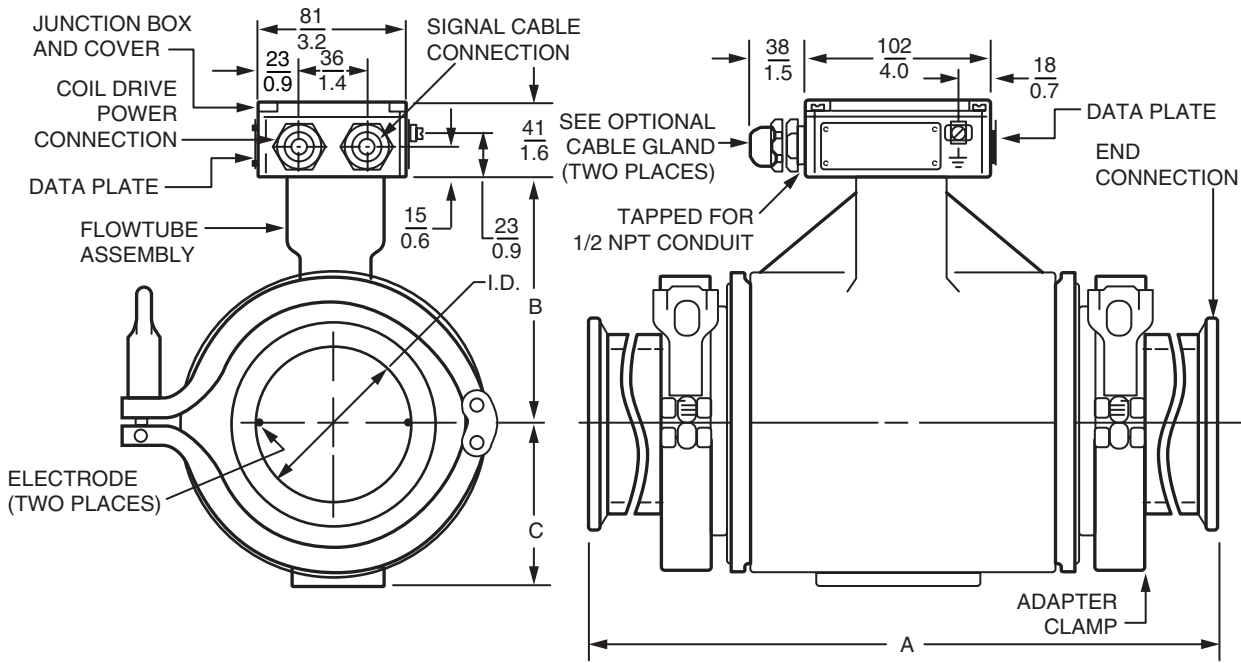


FLOWTUBE MODEL	FLOWTUBE SIZE		NOMINAL DIMENSIONS				TRI-CLAMP END CONN. LINE SIZE	APPROXIMATE MASS	
	mm	in	A	B	C	I.D.		kg	lb
800HA-SCR	15	1/2	229 9.0	61 2.4	56 2.2	12.7 0.50	1-inch LINE SIZE	2.6	5.7
8001A-SCR	25	1	229 9.0	69 2.7	64 2.5	21.6 0.85	1-inch LINE SIZE	3.4	7.6
801HA-SCR	40	1 1/2	239 9.4	84 3.3	74 2.9	33.8 1.33	1 1/2-inch LINE SIZE	4.0	8.9

DIMENSIONS—NOMINAL (Cont.)

mm
in

8002A-SCR TO 8003A-SCR CERAMIC-LINED SANITARY FLOWTUBES

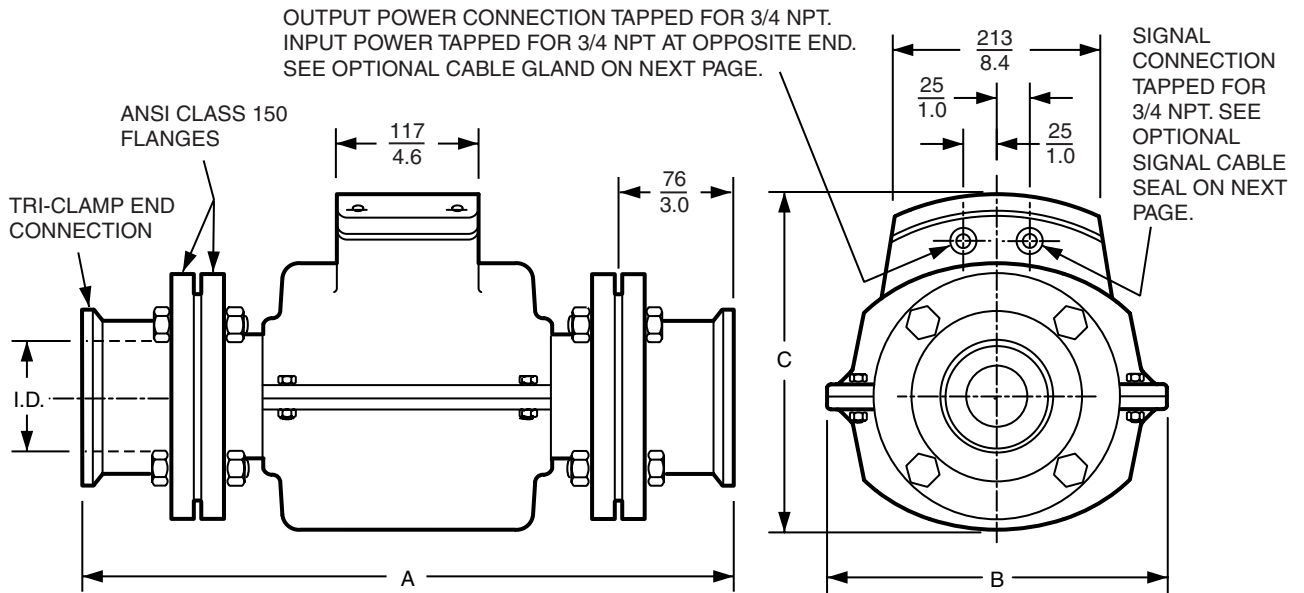


FLOWTUBE MODEL	FLOWTUBE SIZE		NOMINAL DIMENSIONS				TRI-CLAMP END CONN. LINE SIZE	APPROXIMATE MASS	
	mm	in	A	B	C	I.D.		kg	lb
8002A-SCR	50	2	<u>262</u> 10.3	<u>91</u> 3.6	<u>61</u> 2.4	<u>45.0</u> 1.77	2-inch LINE SIZE	5.2	11.4
8003A-SCR	80	3	<u>356</u> 14.0	<u>107</u> 4.2	<u>76</u> 3.0	<u>70.6</u> 2.78	3-inch LINE SIZE	7.8	17.1

DIMENSIONS—NOMINAL (Cont.)

$\frac{\text{mm}}{\text{in}}$

830H-SBT□ TO 8303-SAT□, pte-LINED SANITARY FLOWTUBES

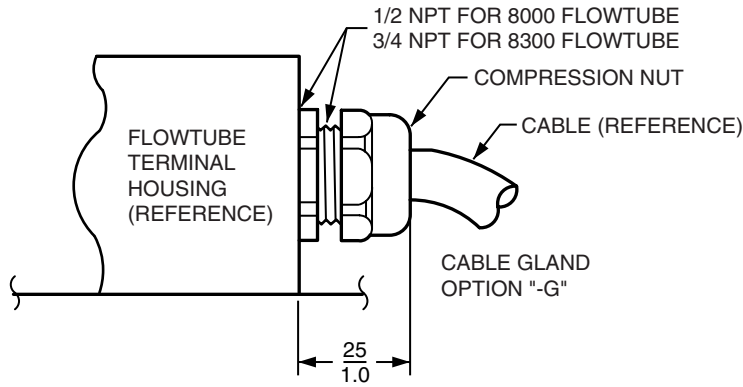


FLOWTUBE MODEL	FLOWTUBE SIZE		NOMINAL DIMENSIONS				TRI-CLAMP END CONN. LINE SIZE	APPROXIMATE MASS	
	mm	in	A	B	C	I.D.		kg	lb
830H-SBT□	15	1/2	518 20.4	273 10.8	294 11.6	12.70 0.500	1-inch LINE SIZE	22.7	50
8301-SAT□	25	1	518 20.4	273 10.8	294 11.6	24.71 0.973	1 1/2-inch LINE SIZE	20.4	45
831H-SAT□	40	1 1/2	518 20.4	273 10.8	294 11.6	39.57 1.558	2-inch LINE SIZE	23.2	51
8302-SAT□	50	2	518 20.4	273 10.8	294 11.6	51.71 2.036	3-inch LINE SIZE	25.4	56
8303-SAT□	80	3	568 22.4	292 11.5	289 11.4	78.44 3.088	4-inch LINE SIZE	33.1	73

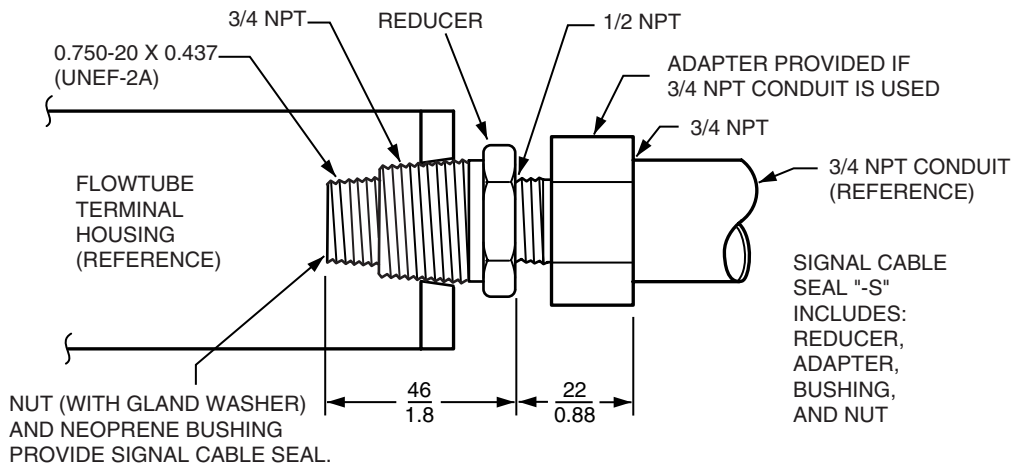
DIMENSIONS—NOMINAL (Cont.)

$\frac{\text{mm}}{\text{in}}$

OPTIONAL CABLE GLAND FOR NONCONDUIT APPLICATIONS



OPTIONAL SIGNAL CABLE SEAL FOR CONDUIT APPLICATIONS (8300 SERIES ONLY)



ORDERING INSTRUCTIONS

1. Model Number.
2. Flow Rate and Engineering Units Required – Value specified must be within minimum and maximum upper range values listed in Table 2.
3. Operating Temperature - Normal and Maximum.
4. Operating Pressure - Normal and Maximum.
5. Process Composition and Conductivity.
6. Options and Accessories not included in Model Code.
7. Signal Cable Length.
8. User Tag Data.

OTHER M&I PRODUCTS

Invensys Process Systems provides a broad range of measurement and instrument products, including solutions for pressure, flow, analytical, positioners, temperature, controlling and recording. For a listing of these offerings, visit the Invensys Foxboro web site at:

www.foxboro.com/instrumentation