insight metering systems

iSonic 8X/8L Series Ultrasonic Flowmeter

User Manual – Safety and Installation

January 2024

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Important Safety Information

OPERATORS SHOULD NOT REQUIRE ACCESS TO THE INTERIOR OF THE FLOWMETER. ONLY QUALIFIED PERSONNEL SHOULD SERVICE THE iSONIC SYSTEM. DO NOT ATTEMPT TO DISASSEMBLE THE INSTRUMENT OR OTHERWISE SERVICE THE INSTRUMENT UNLESS YOU ARE A TRAINED MAINTENANCE TECHNICIAN.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment's safety features may be impaired. Insight Metering Systems is not responsible for damages or injuries sustained as a result of inappropriate use.

Before performing system verification and repair procedures, contact Insight Metering Systems (see contact information at end of manual).

Terms Used

This symbol identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

This symbol indicates actions or procedures which if not performed correctly may lead to personal injury or incorrect function of the instrument or connected equipment.

Note – Indicates actions or procedures which may affect instrument operation or may lead to an instrument response which is not planned.

Conditions for Safe Use – All Models

Warning/Caution – Do not open transmitter when an explosive atmosphere is present.

Avertissement/Attention – N'ouvrez pas le transmetteur en présence d'une atmosphère explosive.

Warning/Caution – All NPT Plugs installed into the transmitter must not be tampered with and must remain fully installed with a minimum of 5 full turns of thread engagement.
Avertissement/Attention – Toutes les fiches NPT installées dans le transmetteur ne doivent pas être altérées et doivent être entièrement installées avec un minimum de 5 tours complets d'engagement de filetage.

Warning/Caution – All M20 Conduit Entry Plugs must be fully installed with a minimum of 8 full turns of thread engagement and the O-ring compressed.

Avertissement/Attention – Tous les bouchons d'entrée de conduit M20 doivent être entièrement installés avec un minimum de 8 tours complets d'engagement de filetage et le joint torique comprimé.

Warning/Caution – All cables, conductors and/or cable glands must be rated to 85 C. All conductors must be copper 20 AWG or heavier.

Avertissement/Attention – Tous les câbles, conducteurs et/ou presse-étoupes doivent être évalués à 85 C. Tous les conducteurs doivent être en cuivre 20 AWG ou plus lourd.

Conditions for Safe Use – Temperature Code

Temperature Code affected by Installation Temperatures:

The applicable temperature code for normal installations is T6 (fluid or gas through the meter is less than 85C).

If the meter is installed where the process (fluid or gas flowing through the meter) has a maximum temperature that is between 85C and 100C, then the applicable temperature code is T5.

If the meter is installed where the process (fluid or gas flowing through the meter) has a maximum temperature that is between 100C and 110C, then the applicable temperature code is T4.

Code de température affecté par les températures d'installation :

Le code de température applicable pour les installations normales est T6 (fluide ou gaz à travers le compteur est inférieur à 85C).

Si le compteur est installé là où le processus (fluide ou gaz traversant le compteur) a une température maximale comprise entre 85 C et 100 C, le code de température applicable est T5.

Si le compteur est installé à un endroit où le procédé (fluide ou gaz traversant le compteur) a une température maximale comprise entre 100 C et 110 C, le code de température applicable est T4.

Conditions for Safe Use – For Units with Antennas

Warning/Caution – Potential Electrostatic Charging Hazard

Avertissement/Attention – Risque potentiel de charge électrostatique

To avoid the possibility of an electrostatic discharge – the antenna(s) should be wiped down with a rag damp with water to address potential charges.

Conditions for Safe Use – For US Installations

For USA Installations:

Warning/Caution – To reduce the risk of ignition of hazardous atmospheres, conduit runs must have a sealing fitting connected within 18 inches of the enclosure.

Avertissement/Précaution – Pour réduire le risque d'inflammation des atmosphères dangereuses, les longueurs de conduit doivent avoir un raccord d'étanchéité connecté à moins de 18 pouces de l'enceinte.

Conditions for Safe Use – For Canadian and International Installations

For Canadian and International Installations:

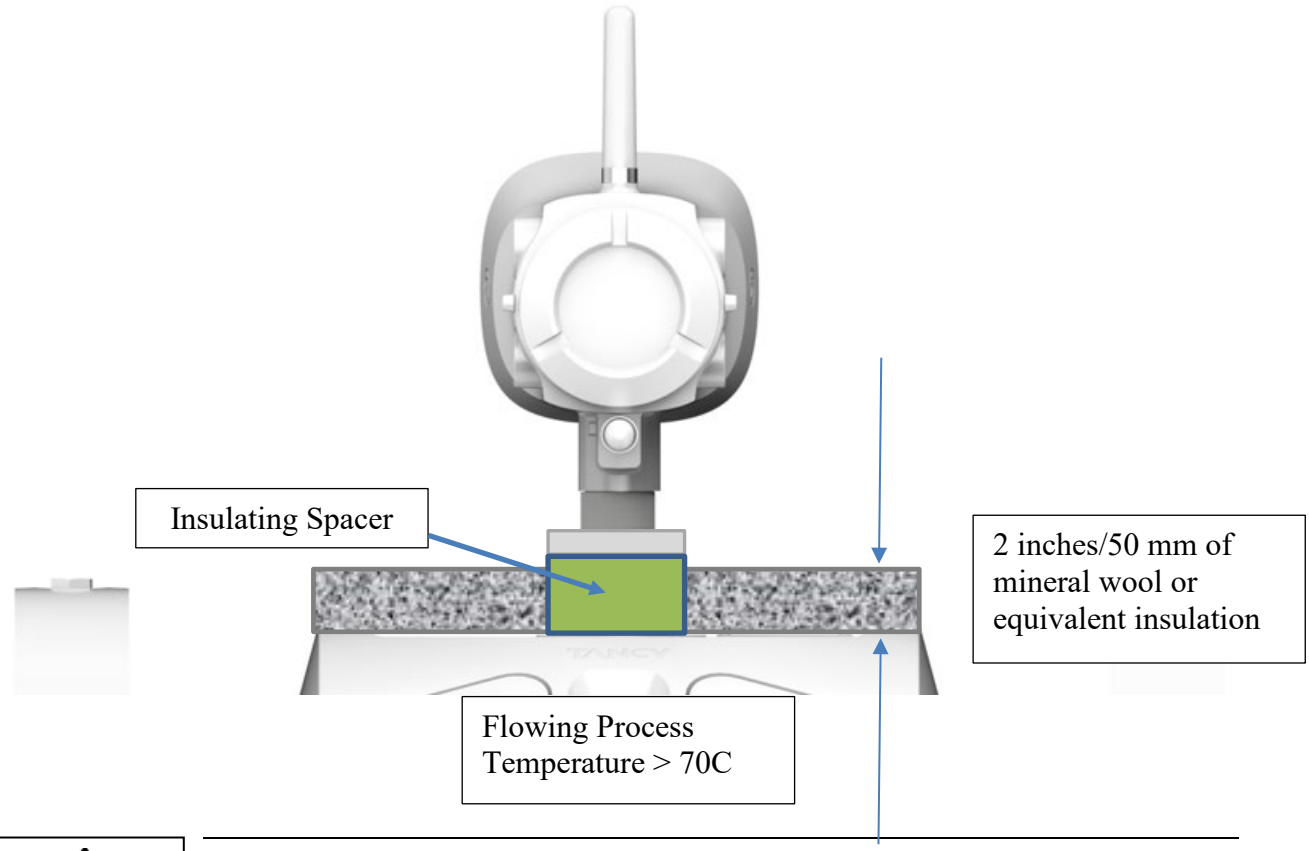
Warning/Caution – Seal entries within 50 mm of the enclosure.
Avertissement/Attention – Entrées de mer à moins de 50 mm de l'enceinte.

Conditions for Safe Use – Installations with Process Temperatures Greater than 70 degC

WARNING

Warning - For installations where the process gas/fluid is hotter than 70 deg C, an insulating spacer and 2 inches/50 mm of mineral wool Insulation or equivalent shall be used between the electronics and the meter body.

Avertissement - Pour les installations où le gaz/fluide de procédé est plus chaud que 70 degrés C, une entretoise isolante et 2 pouces/50 mm d'isolation en laine minérale ou équivalent doivent être utilisés entre l'électronique et le corps du compteur.



WARNING

Warning/Caution – Potential Electrostatic Charging Hazard

Avertissement/Attention – Risque potentiel de charge électrostatique

Systems with Insulation and Insulating Spacer between Transmitter and Meter Body

To avoid the possibility of an electrostatic discharge – the insulating spacer should be wiped down with a rag damp with water to address potential charges when maintenance needs to be performed.

Relevant Safety Standards

- UL 1203, Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations, Edition 5, Revision Date 04/05/2022
- UL 913 8th Edition, UL Standard for Safety Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations
- UL 60079-0, Explosive Atmospheres - Part 0: Equipment - General Requirements, Edition 7, Revision Date 04/15/2020
- UL 60079-1, Standard for Explosive Atmospheres Part 1: Equipment Protection by Flameproof Enclosures “d”, Edition 7, Revision Date 01/23/2020
- UL 60079-11 6th Edition, Explosive Atmospheres - Part 11: Equipment Protection by Intrinsic Safety
- UL 60079-18, Standard for Explosive Atmospheres - Part 18: Equipment Protection by Encapsulation “m”, Edition 4, Revision Date 02/07/2019
- CAN/CSA C22.2 No. 30, Explosion-proof Equipment, Edition 4, Issue Date 04/2020 (Rev. 07/2020)
- CAN/CSA C22.2 No. 60079-0, Electrical Apparatus for Explosive Gas Atmospheres - Part 0: General Requirements, Edition 4, Issue Date 02/2019
- CAN/CSA C22.2 No. 60079-1, Explosive Atmospheres - Part 1: Equipment Protection by Flameproof Enclosures "d", Edition 3, Issue Date 05/2016
- CAN/CSA-C22.2 NO. 60079-11:14 (R2018) Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"
- CAN/CSA C22.2 No. 60079-18, Explosive Atmospheres - Part 18: Equipment Protection by Encapsulation "m", Edition 2, Issue Date 08/2016
- IEC 60079-0, Explosive Atmospheres. Pt. 0: Equipment General Requirements, Edition 7, Issue Date 12/2017
- IEC 60079-1, Electrical Apparatus For Explosive Gas Atmospheres - Part 1: Flameproof Enclosures "D", Edition 7, Issue Date 06/2014
- IEC 60079-11, 6th Edition, Explosive Atmospheres – Part 11: Equipment Protection By Intrinsic Safety "i"
- IEC 60079-18, Explosive Atmospheres - Part 18: Equipment Protection By Encapsulation "M", Edition 4, AMD 1, Revision Date 08/2017
- EN IEC 60079-0, Explosive Atmospheres - Part 0: Equipment - General Requirements, Issue Date 07/2018
- EN 60079-1, Explosive Atmospheres - Part 1: Equipment Protection By Flameproof Enclosures "D", Issue Date 10/2014
- EN 60079-11, Explosive Atmospheres - Part 11: Equipment Protection By Intrinsic Safety "i", Issue Date 01/2012

- EN 60079-18, Explosive atmospheres – Part 18: Equipment protection by encapsulation “m”, AMD 1, Revision Date 2017

Section 1 Introduction

Equipment Description

The iSonic 8X/8L series ultrasonic flowmeter is a state of the art bidirectional flow measurement system. It employs ultrasonic transit time to measure gas/fluid velocity and flow rate. The iSonic 8X/8L uses advanced signal and data processing circuitry to ensure highest levels of accuracy and repeatability.

The iSonic 8X/8L system contains fault detection for verifying performance and alerting users to alerts and failures. For ease of troubleshooting, the system provides easy-to-interpret diagnostic information via Modbus and Ethernet/Wi-Fi interfaces. Insight Metering Systems proudly provides an easy to use interface that can communicate with the iSonic 8X/8L via Ethernet or Wi-Fi. A local display with push-button sensor is provided with diagnostic information.

Insight Metering Systems offers continuous monitoring of the iSonic 8X/8L flowmeter via highly secure and encrypted Cloud communications.

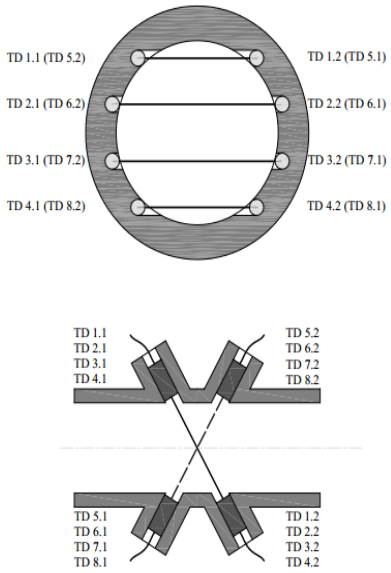
This manual provides detailed instructions on the installation and operation of the flowmeter to include the viewing of flow parameters and interpretation of diagnostic data viewed via the transmitter's display. Users looking for a more detailed view of diagnostic acoustic data can access the flow meter information via Insight Metering Systems' SmartLink software. See the SmartLink User Manual for details.

iSonic 8X/8L: Transmitter mounted to the meter body (see Section 2 for installation). This model has a factory installed seal between the transmitter and the meter body. This meter has 8 paths (or 6 paths on the 3 inch size) and will be described in subsequent chapters.

Figure 1.1 iSonic 8X/8L components, typical

iSonic 8X/8L Meter Body

The meter body or *metering section*, as it is sometimes referenced, contains either six (3 inch only) or eight pairs of acoustic transducers as shown in the figures below.



iSonic 8X/8L

The meter body contains up to eight pairs of housings that are positioned to provide acoustic paths at approximately a 62.5° angle to the flow direction. They are spaced in accordance with the Gaussian Method of flow integration. The transducers are installed inside these housings.

The transducer modules may be removed from their housings for maintenance while the meter body is in the pipeline without affecting the pressure boundary.

iSonic 8X/8L Series Transmitter

The transmitter houses the display that provides readout of flow data including flow rate, total flow volume, fluid properties, analog input data, alarm indication, fault detection, and acoustic diagnostic information.

Figure 1.2— iSonic 8X/8L Transmitter

The transmitter measures acoustic pulses and determine flow rate. The transmitter has been designed to achieve exceptionally high sampling rates, provide stable ultrasonic signals, and eliminate zero drift.

The transmitter offers the following inputs/outputs:

Standard volume pulse output

The K-factors used to configure transmitters at the factory are listed in. The user may configure the K-factor to meet their needs.

Two analog inputs (4-20 mA)

These inputs can be mapped to temperature, pressure, density or even viscosity.

Two analog outputs (4-20 mA)

Flow

Temperature

Table 1.1: Standard K-Factors Gas Meters (typical)

NPS	Q_{max} m^3/hr	KFactor pules/m^3	Q_{max} ft^3/hr	Kfactor pules/ft^3
3	603	9,000	21,284	33,800
3.5	825	6,500	29,129	24,700
4	1,021	5,300	36,046	20,000
6	2,494	2,200	88,067	12,000
8	4,258	1,300	150,363	7,900
10	6,870	790	242,624	4,900
12	9,069	600	320,277	3,700
14	10,869	500	383,821	2,800
16	14,253	380	503,340	2,100
18	18,096	300	639,035	1,700
20	22,902	240	808,779	1,340
24	32,979	160	1,164,642	930

Standard K-Factors Liquid Meters (typical)

NPS	Extended Q_{min}	Standard Q_{min}	Q_t	Q_{max}	$Q_{overrange}$	Kfactor
	BPH	BPH	BPH	BPH	BPH	pulse/bbl
4	48.1	80.2	100.3	2006	2407	1795
6	69.7	174.3	217.8	4357	5228	826
8	121.7	304.3	380.4	7608	9129	473
10	196.4	491.0	613.8	12276	14731	293
12	259.3	648	810	16204	19445	222
14	341.8	854	1068	21361	25634	169
16	448.2	1121	1401	28013	33616	129
18	569.0	1423	1778	35565	42678	101
20	720	1800	2251	45012	54015	80.0
24	1037	2593	3241	64818	77781	55.5

NPS	Extended Q_{min}	Standard Q_{min}	Q_t	Q_{max}	$Q_{overrange}$	Kfactor
	m^3/hr	m^3/hr	m^3/hr	m^3/hr	m^3/hr	pulse/m^3
4	7.7	12.8	15.9	319	383	11286
6	11.1	27.7	34.6	693	831	5197
8	19.4	48.4	60.5	1210	1452	2976
10	31.2	78.1	97.6	1952	2342	1844
12	41.2	103	129	2576	3092	1397
14	54.3	136	170	3396	4076	1060
16	71.3	178	223	4454	5345	808
18	90.5	226	283	5655	6786	637
20	115	286	358	7157	8588	503
24	165	412	515	10306	12367	349

Tools used in this manual

The following list identifies tools needed to support maintenance activities:

- Allen wrench 5 mm - for meter body covers
- Socket wrench 12 mm (O-ratchet – thin wall) – for transducer replacement
- Small blade screwdriver – for transducer wire terminals or for pushing down spring loaded terminations in transmitter
- Phillips head screwdriver – for transmitter disassembly and assembly

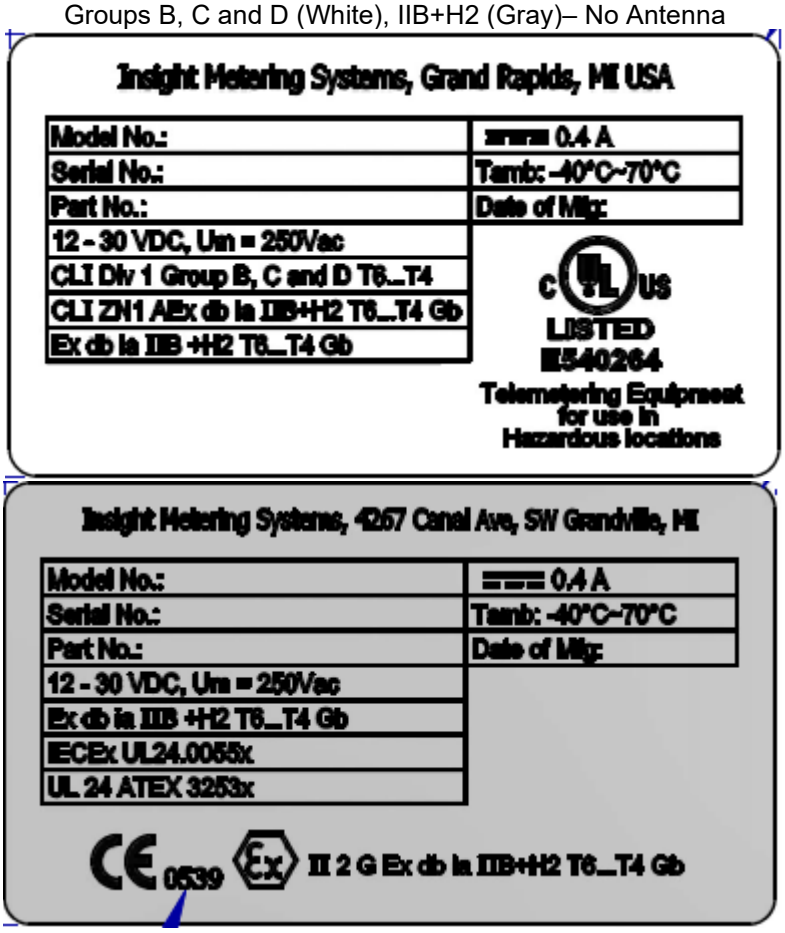
Flowmeter Identification

Both the transmitter and the meter body have nameplates that identify and define the subcomponents.

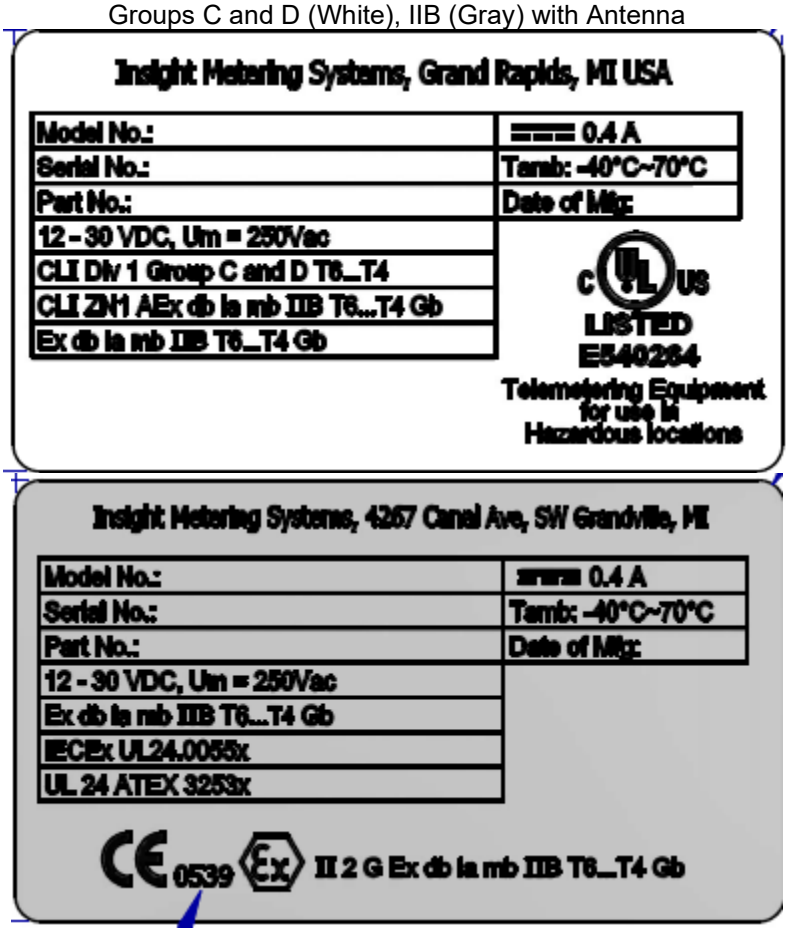
Figure 1.3—iSonic 8X/8L Certification and Electronics Nameplate

Groups C and D (White), IIB (Gray) No Antenna

Groups B, C and D (White), IIB+H2 (Gray)– No Antenna



Groups C and D (White), IIB (Gray) with Antenna



Groups B, C and D (White), IIB+H2 (Gray) with Antenna

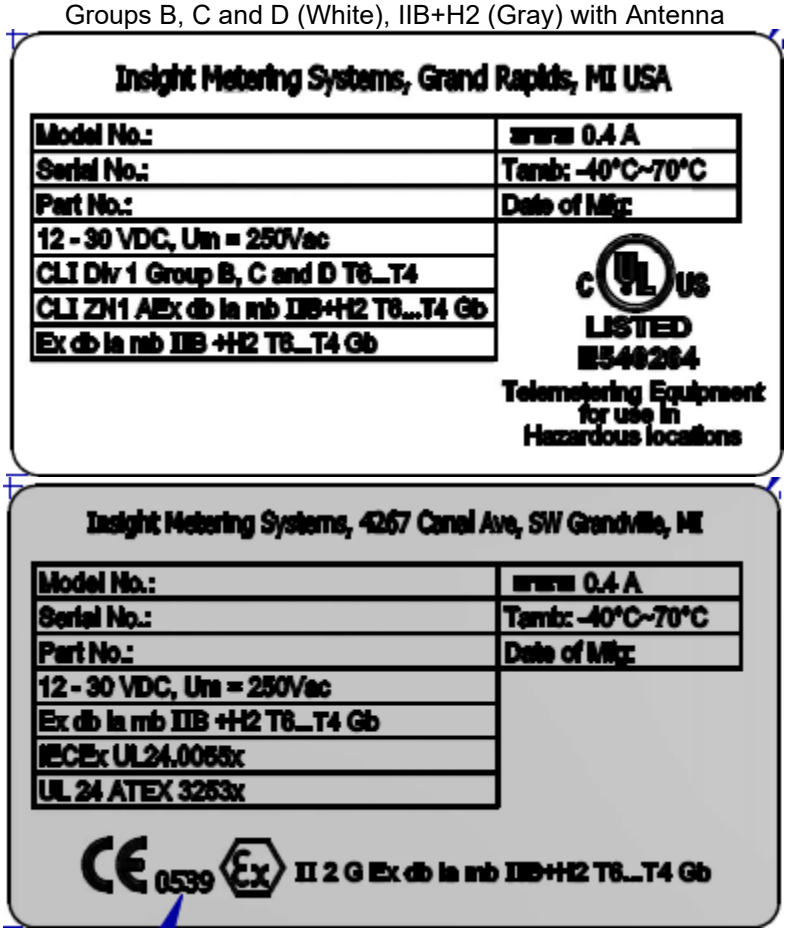
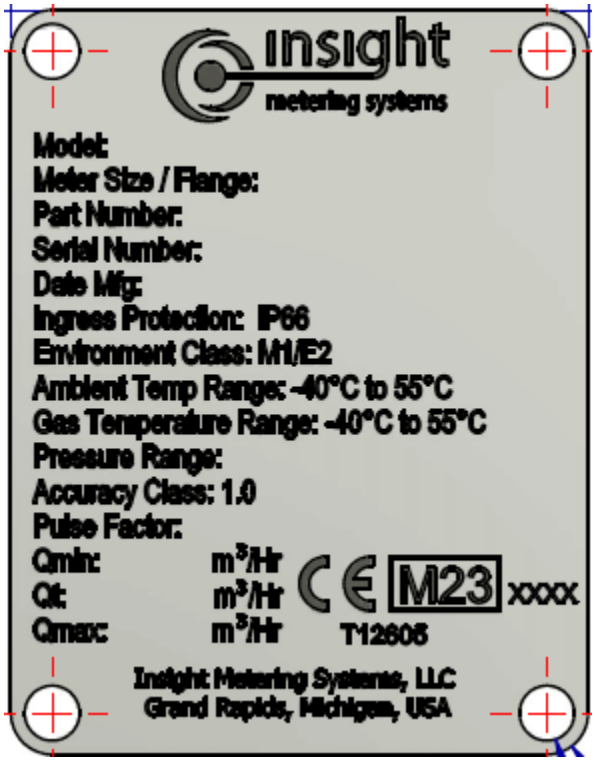
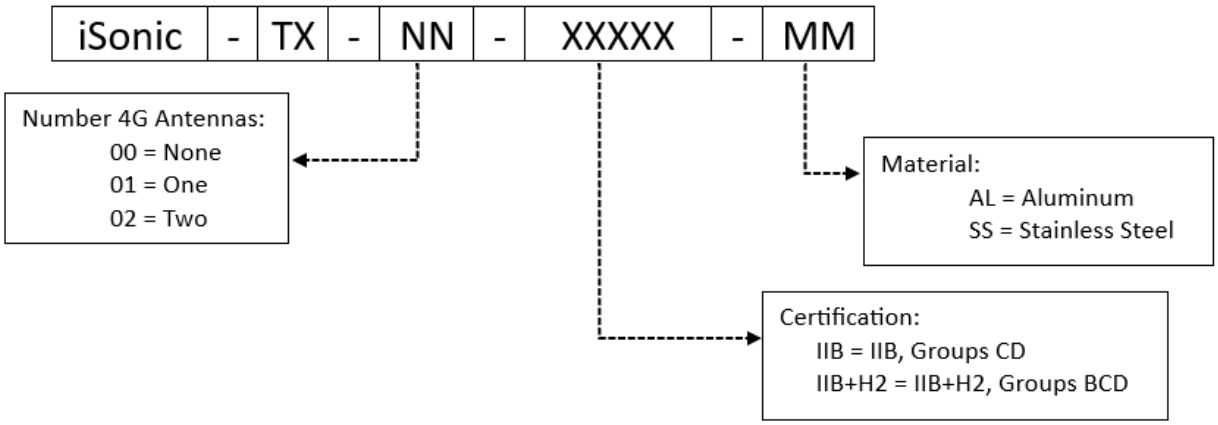


Figure 1.4—iSonic 8X/8L Meter Body Nameplate, Typical



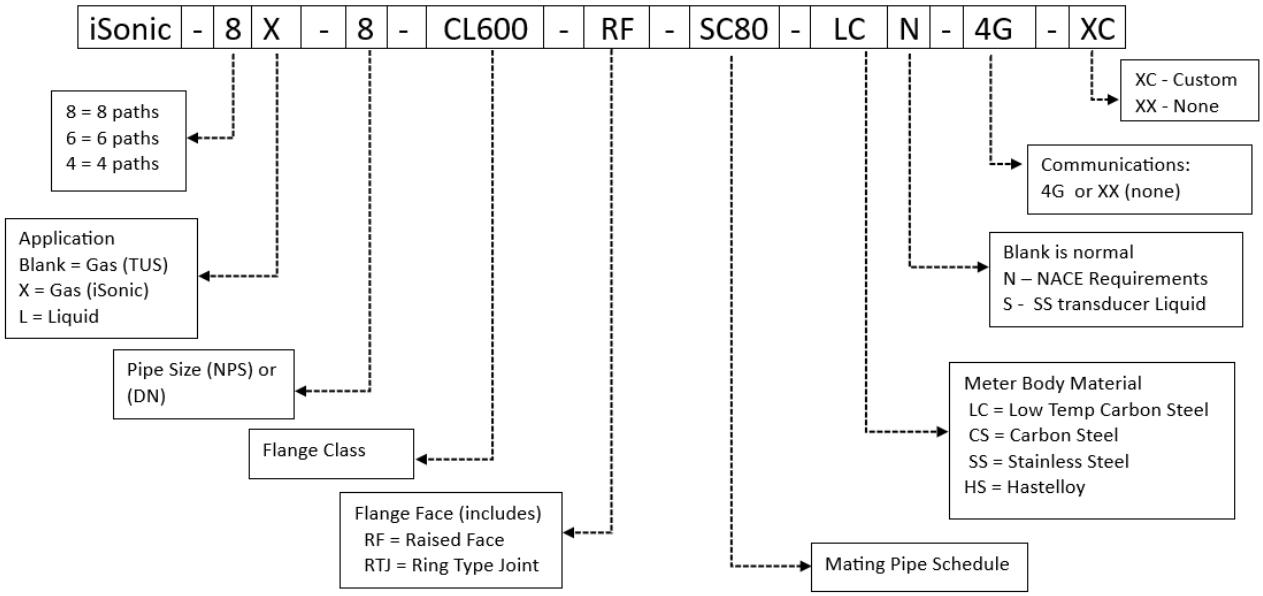
Transmitter Model Number

The model number defines construction and features. For transmitters:



Meter Body Model Number

The model number defines construction and features. From the model number, a user can identify and verify the model, NPS (nominal pipe size), piping schedule, construction material, flange rating, and enclosure type.



Flowmeter Specifications

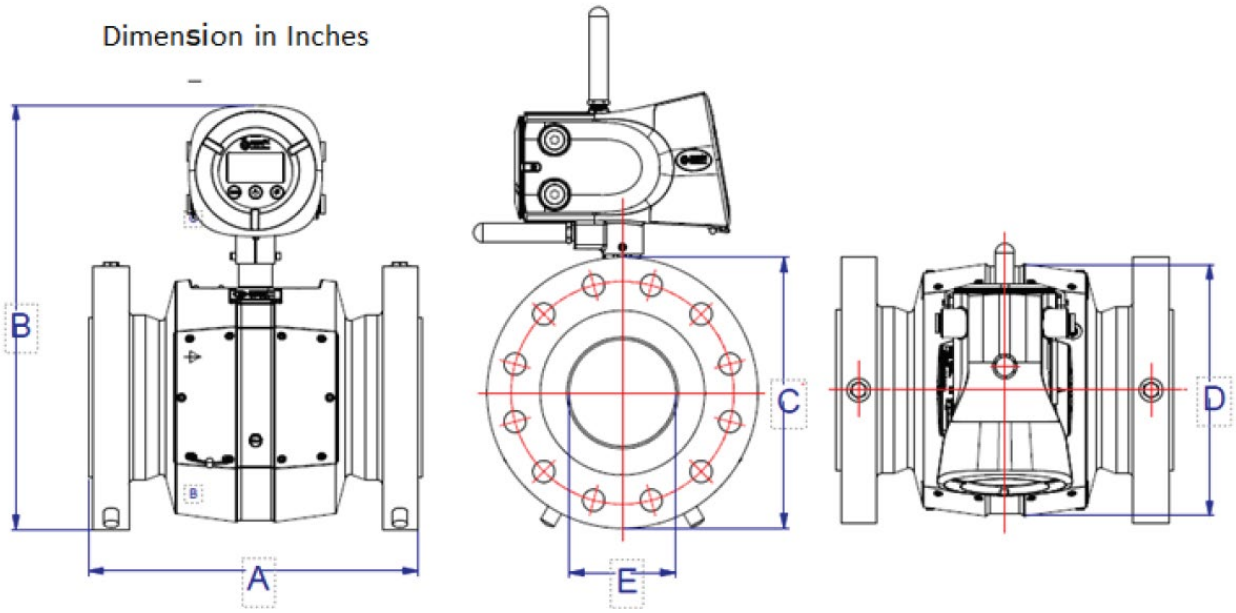
Table 1.2—iSonic 8X/8L Specifications

Meter Body Material	Per ASME B31.3 Carbon Steel (Standard) Stainless Steel or Duplex Steel upon request
Transmitter Material	 Aluminum (Standard) Stainless Steel upon request
Pressure	Per ASME B16.5 Flange rating (see nameplate)
Power Requirements	
Voltage Req'd	24 VDC (18 VDC to 30 VDC) NEC/CEC Class 2
Current Draw	24 VDC at 300 mA
Power Consumption	6 W max – when 4G is transmitting 5 W typical
Pulse Outputs/Communications	
Pulse Output (2)	Open collector
Alarm Status (2)	Open collector
Serial Communications	
RS-485	3 each RS-485 COM ports
Modbus	See Modbus specifications
Ethernet	JSON protocol
Wireless Communications	
4G	
Wi-Fi	IEEE 802.11
Analog Outputs (2)	 4-20 mA (max load 650 Ohms)
Analog Inputs (2)	 4-20 mA Meter body RTD is standard
Measuring ranges	Qmin See Table Qmax See Table Measuring ranges depend on nominal pipe size
Repeatability	Class 0.5
Accuracy	 Error limits Qt ... Qmax 6 & 8-path versions: ≤ ± 0.1 % With flow calibration – excludes the uncertainty of calibration test facility

Piping requirements according to OIML Certifications and Operating Manual	
Temperature Range	
-Gas temperature range	–40 °C ... +110 °C
-Storage Temperature	-40°F (-40°C) to 185°F (85°C)
-Ambient Temperature	Transmitter: -40°F (-40°C) to 140°F (70°C) Meter Process Gas: -40°F (-40°C) to 230°F (110°C)
Relative Humidity	Up to 95% non-condensing.
Pollution Degree	2
Conformities	
iSonic 8X, 6X	OIML R 137-1&2:2012, ISO 17089-1
iSonic 8X, 6X	AGA-Report No. 9
iSonic 8L	OIML R 117-1 2007 (pending)
	MID: 2014/32/EU PED: 2014/68/EU ATEX: 2014/34/EU
Hazardous Area Approvals	Class I Div 1 Groups B, C, D T6 is Class I Zone 1 AEx db mb ia IIB+H2 T6 Gb Ex db mb ia IIB+H2 T6 Gb
Secondary Seals	*Compliance to Canadian Electric Code (CEC) regarding Secondary Seals.* *ISA 12.27.01*
Data archives (on-line on meter)	1 minute averaged data archives (10,000 entries) 1 hour averaged data archives (10,000 entries) 1 day averaged data archives (5,000 entries)
Logbooks (on-line on meter)	Event logbook (10,000 entries) Parameter logbook (1000 entries) Metrology logbook (1000 entries)

Meter Dimensions

iSonic 8X/8L Meter Body Dimensions



Top Side and End View
Figure 1.6: iSonic 8X/8L Dimensions

Table 1.4—Dimensions and Weights for iSonic 8X/8L Meter Body with Electronics

Standard	NPS	Flange	Weight	A	B	B + Antenna	C	D	E	Weight with Transmitter
ASME B16.5	3	150	33	240	437.1	535.2	190.5	212.3	73.0	36
ASME B16.5	3	300	36	240	446.7	544.7	209.6	212.3	73.0	40
ASME B16.5	3	600	37	240	446.7	544.7	209.6	212.3	73.0	41
ASME B16.5	3	900	54	400	462.5	560.6	241.3	212.3	73.0	57
ASME B16.5	3.5	150	39	267	456.2	554.2	215.9	224.1	85.4	43
ASME B16.5	3.5	300	44	267	462.5	560.6	228.6	224.1	85.4	47
ASME B16.5	3.5	600	45	267	462.5	560.6	228.6	224.1	85.4	48
ASME B16.5	4	150	52	300	468.9	566.9	228.6	248.6	95.0	56
ASME B16.5	4	300	59	300	481.6	579.6	254.0	248.6	95.0	63
ASME B16.5	4	600	67	300	491.1	589.2	273.1	248.6	95.0	70
ASME B16.5	4	900	92	500	500.6	598.7	292.1	248.6	95.0	96
ASME B16.5	6	150	161	450	546.7	644.7	279.4	355.6	140.0	164
ASME B16.5	6	300	175	450	565.7	663.8	317.5	355.6	140.0	179
ASME B16.5	6	600	197	450	584.8	682.8	355.6	355.6	140.0	201
ASME B16.5	6	900	257	750	597.5	695.5	381.0	355.6	140.0	261
ASME B16.5	8	150	255	600	603.8	701.9	342.9	419.1	185.0	258
ASME B16.5	8	300	278	600	622.9	720.9	381.0	419.1	185.0	281
ASME B16.5	8	600	315	600	641.9	740.0	419.1	419.1	185.0	318
ASME B16.5	8	900	362	600	667.3	765.4	469.9	419.1	185.0	365
ASME B16.5	10	150	376	750	662.6	760.6	406.4	478.6	235.0	379
ASME B16.5	10	300	410	750	681.6	779.7	444.5	478.6	235.0	414
ASME B16.5	10	600	481	750	713.4	811.4	508.0	478.6	235.0	484
ASME B16.5	10	900	532	750	732.4	830.5	546.1	478.6	235.0	536
ASME B16.5	12	150	586	900	726.1	824.1	482.6	537.2	270.0	589
ASME B16.5	12	300	632	900	745.1	843.2	520.7	537.2	270.0	636
ASME B16.5	12	600	698	900	764.2	862.2	558.8	537.2	270.0	702
ASME B16.5	12	900	786	900	789.6	887.6	609.6	537.2	270.0	790
ASME B16.5	14	150	667	1050	767.3	865.4	533.4	569.4	310.0	671
ASME B16.5	14	300	736	1050	792.7	890.8	584.2	569.4	310.0	740
ASME B16.5	14	600	792	1050	802.3	900.3	603.3	569.4	310.0	796
ASME B16.5	14	900	893	1050	821.3	919.4	641.4	569.4	307.9	896
ASME B16.5	16	150	823	850	824.5	922.5	596.9	623.2	355.0	827
ASME B16.5	16	300	895	850	849.9	947.9	647.7	623.2	355.0	899
ASME B16.5	16	600	985	850	868.9	967.0	685.8	623.2	355.0	988
ASME B16.5	16	900	1077	900	878.5	976.5	704.9	623.2	354.0	1080

Standard	NPS	Flange	Weight	A	B	B + Antenna	C	D	E	Weight with Transmitter
ASME B16.5	18	150	977	900	868.9	967.0	635.0	679.6	400.0	980
ASME B16.5	18	300	1088	900	907.0	1005.1	711.2	679.6	400.0	1092
ASME B16.5	18	600	1205	900	922.9	1021.0	743.0	679.6	400.0	1208
ASME B16.5	18	900	1403	1000	945.1	1043.2	787.4	679.6	398.5	1407
ASME B16.5	20	150	1196	975	926.1	1024.1	698.5	736.8	450.0	1200
ASME B16.5	20	300	1330	975	964.2	1062.2	774.7	736.8	450.0	1334
ASME B16.5	20	600	1487	975	983.2	1081.3	812.8	736.8	450.0	1490
ASME B16.5	20	900	1765	1100	1005.5	1103.5	857.3	736.8	442.9	1769
ASME B16.5	24	150	1715	1075	1034.0	1132.1	812.8	846.3	540.0	1718
ASME B16.5	24	300	1929	1075	1084.8	1182.9	914.4	846.3	540.0	1933
ASME B16.5	24	600	2138	1075	1097.5	1195.6	939.8	846.3	540.0	2142
ASME B16.5	24	900	2855	1250	1148.3	1246.4	1041.4	846.3	531.8	2859

Table 1.5 —iSonic 8X Flow Ranges

NPS	Extended Q_{min}	Standard Q_{min}	Q_t	Q_{max}	$Q_{overrange}$	Extended Q_{min}	Standard Q_{min}	Q_t	Q_{max}	$Q_{overrange}$
	m^3/hr	m^3/hr	m^3/hr	m^3/hr	m^3/hr	ft^3/hr	ft^3/hr	ft^3/hr	ft^3/hr	ft^3/hr
3	4.5	15.1	30.1	603	723	160	532	1,064	21,284	2,373
3.5	6.2	20.6	41.2	825	990	218	729	1,456	29,129	3,247
4	7.7	25.5	38.3	1,021	1,225	270	901	1,352	36,046	4,019
6	12.7	55.4	83.1	2,494	2,993	450	1,957	2,936	88,067	9,818
8	19.4	96.8	145.2	4,258	5,109	683	3,417	5,126	150,363	16,763
10	31.2	156.1	234.2	6,870	8,244	1,103	5,514	8,271	242,624	27,049
12	41.2	206.1	309.2	9,069	10,883	1,456	7,279	10,919	320,277	35,706
14	54.3	271.7	407.6	10,869	13,042	1,919	9,596	14,393	383,821	42,790
16	71.3	356.3	534.5	14,253	17,104	2,517	12,584	18,875	503,340	56,114
18	90.5	452.4	678.6	18,096	21,715	3,195	15,976	23,964	639,035	71,242
20	114.5	572.6	858.8	22,902	27,483	4,044	20,219	30,329	808,779	90,166
24	164.9	824.5	1236.7	32,979	39,575	5,823	29,116	43,674	1,164,642	129,839

iSonic 8L Flow Ranges

NPS	Extended Q_{min}	Standard Q_{min}	Q_t	Q_{max}	$Q_{overrange}$	Kfactor
	BPH	BPH	BPH	BPH	BPH	pulse/bbl
4	48.1	80.2	100.3	2006	2407	1795
6	69.7	174.3	217.8	4357	5228	826
8	121.7	304.3	380.4	7608	9129	473
10	196.4	491.0	613.8	12276	14731	293
12	259.3	648	810	16204	19445	222
14	341.8	854	1068	21361	25634	169
16	448.2	1121	1401	28013	33616	129
18	569.0	1423	1778	35565	42678	101
20	720	1800	2251	45012	54015	80.0
24	1037	2593	3241	64818	77781	55.5

NPS	Extended Q_{min}	Standard Q_{min}	Q_t	Q_{max}	$Q_{overrange}$	Kfactor
	m^3/hr	m^3/hr	m^3/hr	m^3/hr	m^3/hr	$pulse/m^3$
4	7.7	12.8	15.9	319	383	11286
6	11.1	27.7	34.6	693	831	5197
8	19.4	48.4	60.5	1210	1452	2976
10	31.2	78.1	97.6	1952	2342	1844
12	41.2	103	129	2576	3092	1397
14	54.3	136	170	3396	4076	1060
16	71.3	178	223	4454	5345	808
18	90.5	226	283	5655	6786	637
20	115	286	358	7157	8588	503
24	165	412	515	10306	12367	349

Section 2 iSonic 6X/8X/8L Meter Body Installation

The flowmeter body is fabricated of stainless steel, carbon steel, or duplex steel, depending on customer requirements. The flowmeter is designed to be stronger than the adjacent pipe of the same schedule, pressure class and material. For site stress analysis, the meter can be conservatively treated as equivalent pipe.

For all iSonic 8X/8L meters, the physical properties, acoustic properties, and calibration of the meter body are pre-programmed into the transmitter; therefore, the meter body and transmitter are manufactured as a matched set and must be installed as a pair. Failure to install transmitters and meter bodies as matched sets can result in erroneous flow measurements.

Do not repair any flameproof joints on the transmitter.

Important	**All equipment should be installed by a licensed electrician in accordance with NEC/CEC or local codes. At a minimum, install a disconnect switch in series with the transmitter power input.**

Note	All wiring to and from the transmitter must be routed through grounded metal conduit or equivalent.

Flow Meter Body Installation

Shipping Meter to User

The iSonic 6X/8X/6L/8L will be delivered in rugged shipping crates. Nevertheless, when unpacking the device:

- Please check for possible damage during shipping
- Please use care during uncrating to not inadvertently to scratch or damage the meter.
- Check the inside of the meter body, any visible transducer housings and the sealing surfaces on the flanges.
- Important - make sure the actual site conditions (design pressure and electric supply) match the information provided on the meter nameplates.

Note: Any damage must be documented and reported to the Insight Metering immediately.

Please also check the packing list to ensure all components are included – a typical shipment includes:

- iSonic 8X/8L (meter body and transmitter)
- SmartLink and iSonic operation manuals

Handling/Storage

The see weights of the flow meter body. Never use the transmitter for lifting or maneuvering the meter body, as it is not designed for the forces required to move the meter body and could be damaged.

No external supports or special mounting pads are required or recommended for the meter body. However, the piping immediately upstream and downstream of the flowmeter should be well supported in accordance with good piping practices and site seismic requirements. See Section 1 for iSonic 8X/8L weight and size information.

Installation recommendations:

- Horizontal with the transmitter on top. This reduces chances of debris/liquids accumulating in the sensor wells.

When transporting and storing the iSonic 8X/8L , make sure that:

- The meter is firmly secured at all times
- Measures are taken to avoid mechanical damage
- Humidity and ambient temperature are within specified limits (Section 1).

If the device is to be stored outside for more than one day, sealing surfaces of the flanges and the interior of the meter body must be protected from corrosion, and using a rust inhibitor on carbon steel meters is strongly encouraged.

Due to natural temperature fluctuations moisture may condense on any material. Carbon steel surfaces may corrode if left unprotected.

Lifting requirements

Only lifting gear and equipment (e.g. lifting straps) which is suitable for the weight to be lifted.

Max. load information is listed on apporoved lifting gear. It is recommended to use only the eye bolts when lifting the meter by itself.

Installation

Generally, the installation arrangement is specified during the project planning phase. Meter size, material and flange pressure rating should match the requirements.

Notes:

- Meter pipe schedule should match the meter's inlet and outlet.
- Fastening bolts, nuts and flange seals used must be according to pressure class and comply with legal regulations and relevant standards.

General:

- The iSonic 8X/8L typically has straight inlet and outlet pipes.
- Adjacent pipes must match meter pipe size and schedule.
- The meter body may be installed in a horizontal or vertical position.
    - In horizontal installations, the meter body has the transmitter on top (this results in the acoustic planes formed are in the horizontal orientation. Having the meter horizontal minimizes dirt build up in the meter.
    - Vertical installation acceptable only if the measuring system is used for dry, non-condensing gases or liquids without gas. The gas/fluid flow must be free from any foreign material, dusts and liquids.

- Caution: Do not mount equipment or fittings which may adversely affect the flow directly upstream the iSonic 8X/8L .
- Seals at the flange connections between meter body and pipeline must not protrude into the pipeline.
- Pressure transmitter shall be connected to the pressure tap provided. The pressure tap is 1/4 inch NPT (female) port.
    - It is recommended that PTFE tape be used on the pressure connection adapter. After Installation the leak-tightness must be checked. All leaks must be repaired.

Note: The installation requirements have been verified according to the flow disturbance sensitivity tests according:

- (iSonic 8X) OIML R 137-1&2, 2012 "Gas meters", Annex B
- (iSonic 8X) ISO 17089-1, 2010, "Measurement of Fluid Flow in Closed Conduits - Ultrasonic Meters for Gas - Part 1: Meters for custody transfer and allocation measurement.",
- (iSonic 8L) OIML R 117-1 2007 " Measuring Systems for Liquids other than Water - Part 1: Metrological and technical requirements", (pending)

All iSonic 8X/8L installations shall be approved by Insight Metering Systems.

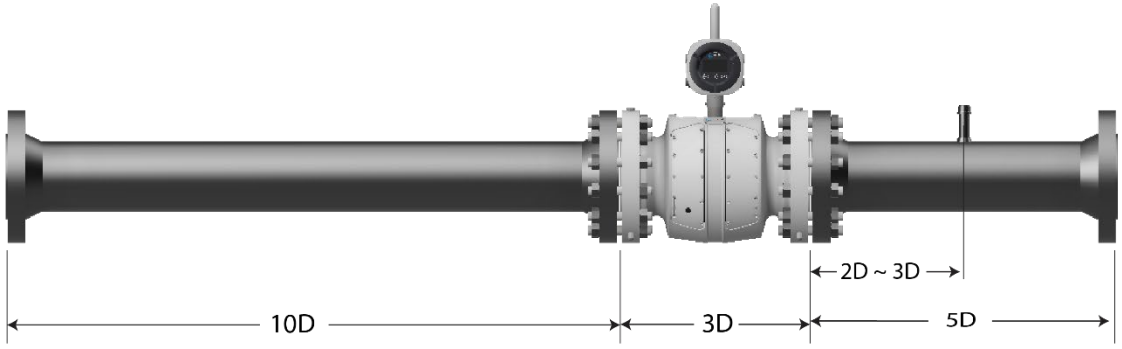
Installation Recommendations

- Horizontal with the transmitter on top. This reduces chances of debris/liquids accumulating in the sensor wells.

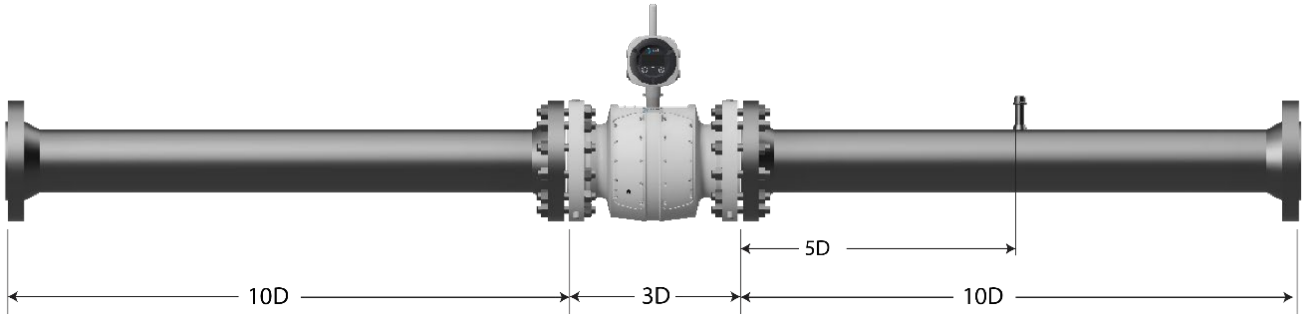
Recommended installation practices are detailed below.

- The iSonic 8X has been validated to meet the performance requirements of OIML R137 Class 0.5 and ISO 17089 Class 1. The iSonic 8L[1] has been validated to meet the performance requirements of OIML R117 Class 0.5.

- Upstream, consult the following figures for the required diameters of straight pipe upstream and downstream. Typically – there are 10 diameters upstream of the meter as shown:

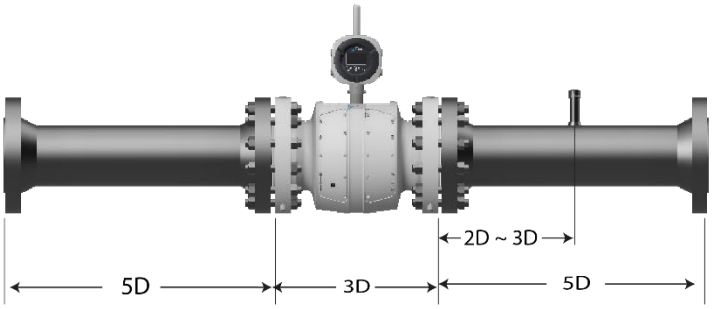


- For bi-directional flow applications, then the configuration is typically as follows:



- However, the meter can be installed in a compact configuration (see below) – as long as Insight Metering Systems is consulted as to the overall piping and verified it meets the conditions verified in R137/R117 certifications.

[1] Pending Approvals.



Installation Hydraulics Recommendations

Number Paths	Configuration	OIML Class	Upstream (DN)	Downstream (DN)
8	Standard	0.5	10	5
8	Compact	0.5	5	5

- Flow is in the direction indicated by an arrow on the meter body. This ensures that the flow direction (sign) indication is displayed correctly.

WARNING

Remember – There is a "flow" arrow on the meter indicating the main or positive flow direction.

Remember/Warning:

- Always use lifting eye bolts for moving the meter.

WARNING

Lifting hardware is designed for the weight of the meter ONLY.

- Prior to tightening, confirm proper seating and alignment of flange gaskets after installing the flange bolts.
- Align piping to minimize steps and offsets between the inside surfaces of the inlet pipe and meter body. For bi-directional systems – do the same on the outlet pipe and meter body ID.
- It is recommended to insert the fastening bolts and tighten the nuts clockwise. The tightening torque applied must not be lower than specified by site procedures.
- Mount the pressure sensing line between pressure tap and pressure transmitter.

Section 3 iSonic 8X/8L Transmitter Installation

Transmitter Terminations

WARNING

Before inspecting components, open the power supply circuit breaker. Failure to do so can result in electrical shock and/or explosion.

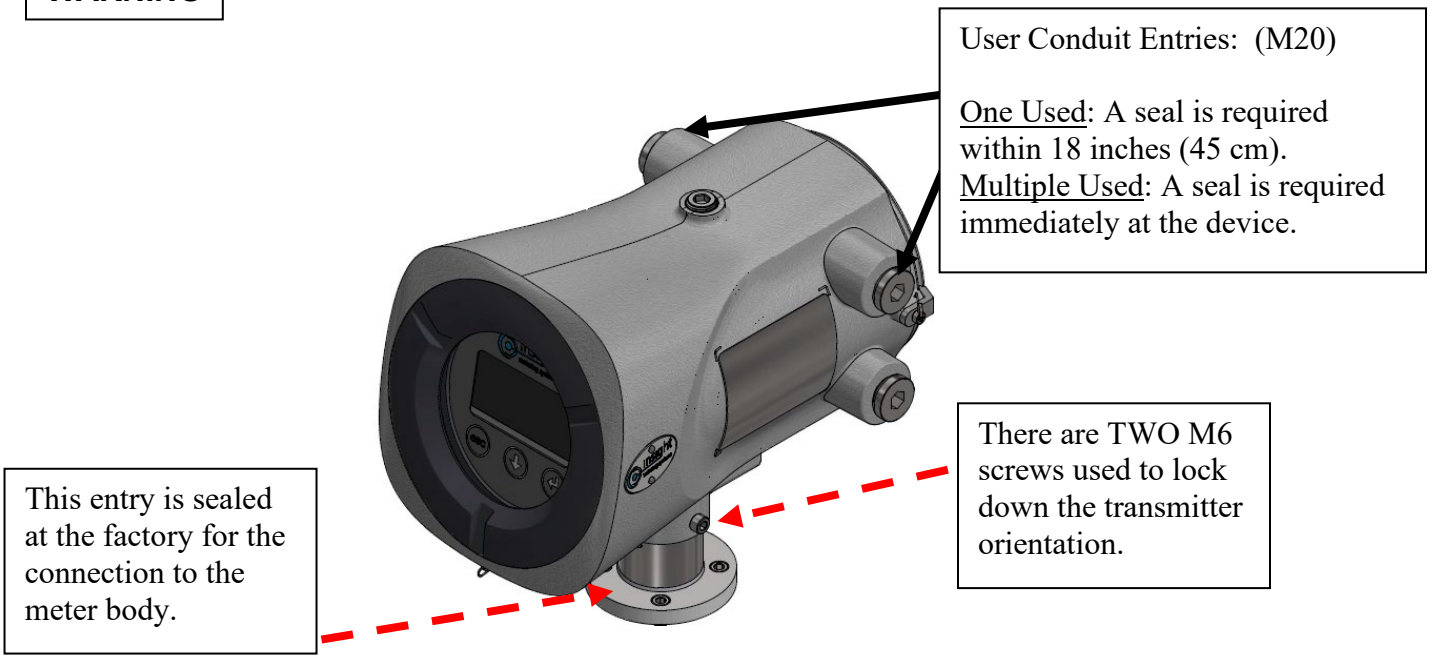


Figure 3.1: Fully assembled transmitter – Isometric View

The four conduit entries at the rear of the transmitter are for user connections. If one entry is used, then a hazardous area conduit seal must be installed within 18 inches (45 cm) of the device. If both entries need to be used, a hazardous area conduit seal is required on both entries immediately at the device.

WARNING

If ATEX approved glands are to be used, they shall be types that include compound filled seals around individual cores. (Refer to EN 60079-14 clause 10.4.2).

The wires should then be routed so that the termination can be made. The terminations are made under the rear cover at the terminal blocks (see Figures 4.2 and 4.3).

Figure 3.2: Transmitter with rear cover removed

NOTE: All the outputs and inputs to the transmitter are galvanically isolated.

Figure 3.3: User Terminations

Description	Text	Terminal
RS485-1 A	1A	TB1-1
RS485-1 B	1B	TB1-2
RS485-3 A (Master)	3A	TB1-3
RS485-3 B (Master)	3B	TB1-4
RS485-2 A	2A	TB1-5
RS485-2 B	2B	TB1-6

Description	Text	Terminal
Analog Output 1 (Pos)	AO1+	TB6-1
Analog Output 1 (Neg)	AO1-	TB6-2
Analog Output 2 (Pos)	AO2+	TB6-3
Analog Output 2 (Neg)	AO2-	TB6-4

Description	Text	Terminal
ENET Transmit +	TX_P	TB5-1
ENET Transmit -	TX_N	TB5-2
ENET Receive +	RX_P	TB5-3
ENET Receive -	RX_N	TB5-4

Description	Text	Terminal
24 VDC IN	Pos(+)	TB2-3
24 VDC RTN	Neg (-)	TB2-2
Chassis Termination	⏚	TB2-1

Description	Text	Terminal
Pulse Output 2	Pulse_2	TB7-1
Digital Ouput 2	DO2	TB7-2
Pulse Output 1	Pulse_1	TB7-3
Digital Ouput 1	DO1	TB7-4
External Power RTN	V_ext (+)	TB7-5
External Power (+)	V_ext (+)	TB7-6

Description	Text	Terminal
Analog Input 1 (Pos)	AI1+	TB3-1
Analog Input 1 (Neg)	AI1-	TB3-2
Analog Input 2 (Pos)	AI2+	TB3-3
Analog Input 2 (Neg)	AI2-	TB3-4

Description	Text	Terminal
Loop Power 2	V2 +	TB4-1
Loop Power 2 (RTN)	V2 -	TB4-2
Loop Power 1	V1 +	TB4-3
Loop Power 1 (RTN)	V1 -	TB4-4

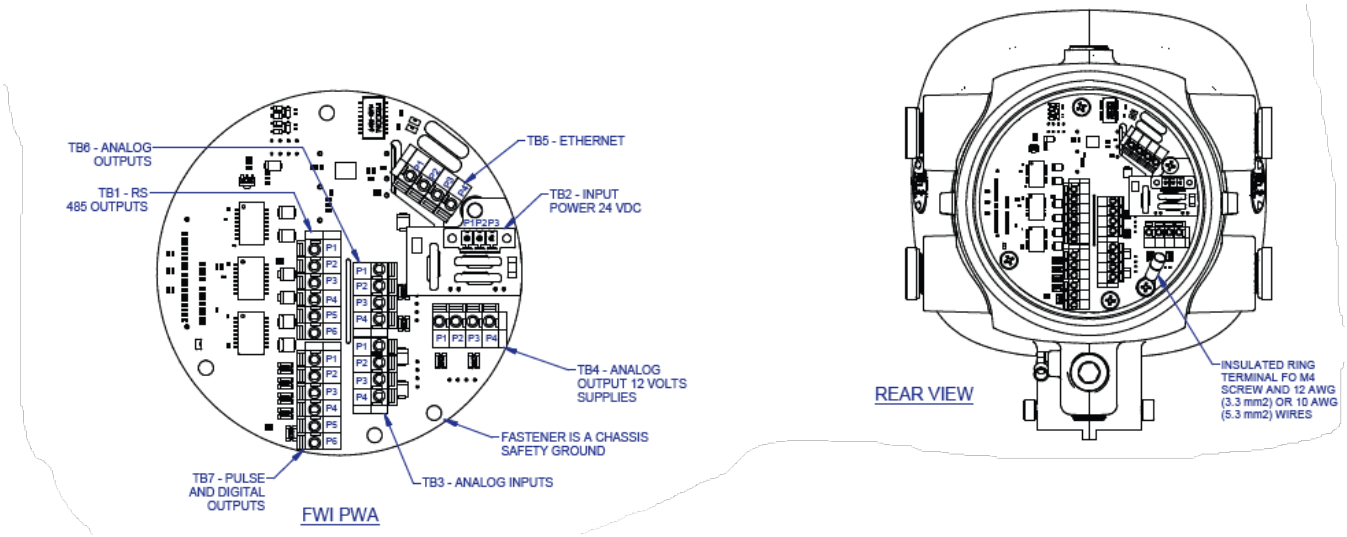
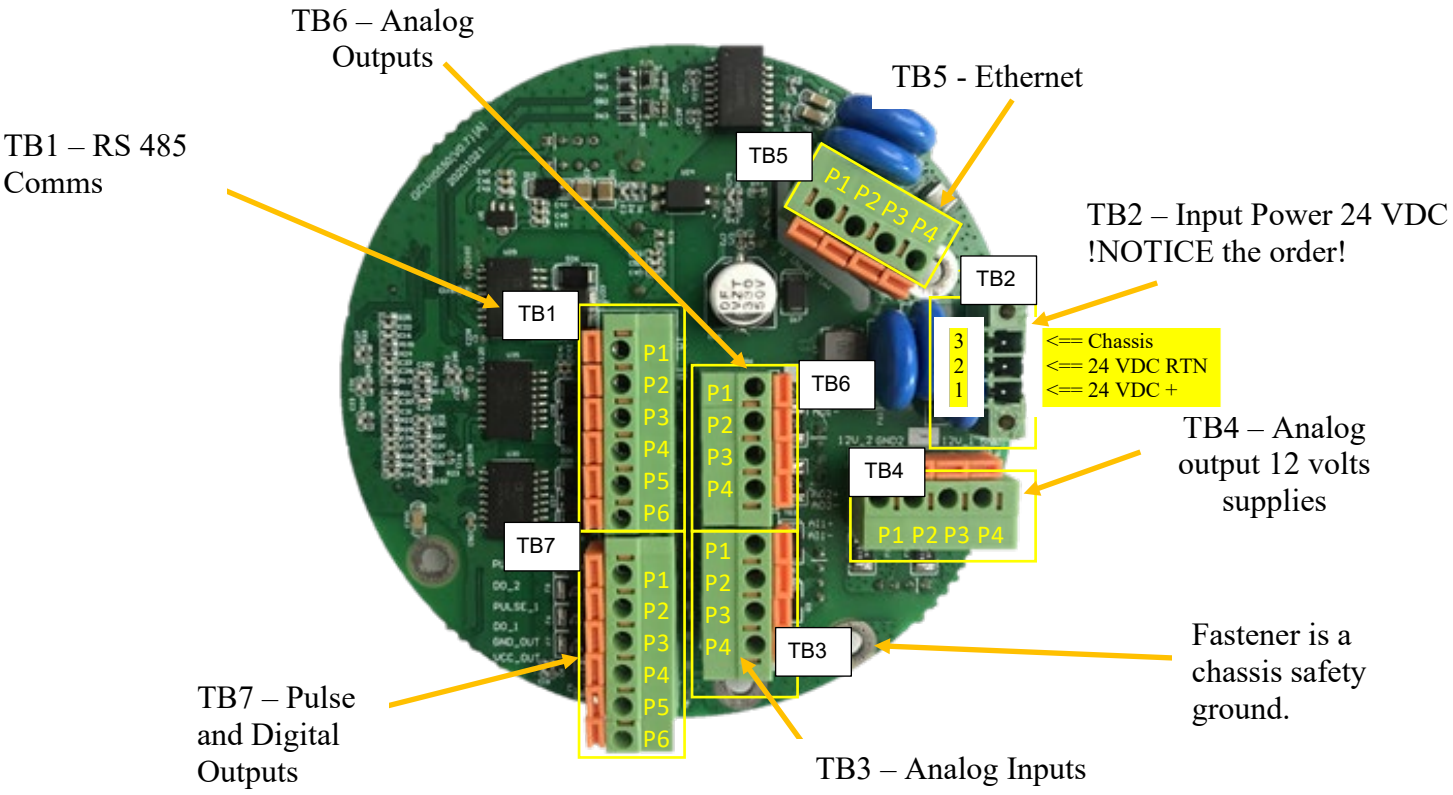


Figure 3.4: User Terminations, Close Up



The figure above shows the location of the transmitter terminations.

Ethernet connection (Terminal Block 5)
TB5 contains the Ethernet connections.

TB5-1 – RXO Negative (Orange)
TB5-2 – RXO Positive (Orange-White Stripe)
TB5-3 – TXO Negative (Green)
TB5-4 – TXO Positive (Green-White Stripe)

Analog Inputs (Terminal Block 3)
TB3 contain the transmitter's analog inputs.

TB3-1 – Analog 1 Input - Positive
TB3-2 – Analog 1 Input - Return
TB3-3 – Analog 2 Input - Positive
TB3-4 – Analog 2 Input - Return

Analog Outputs (Terminal Block 6)
TB6 contain the transmitter's analog output terminals.

TB6-1 – Analog 1 Output - Positive

TB6-2 – Analog 1 Output - Return
TB6-3 – Analog 2 Output - Positive
TB6-4 – Analog 2 Output - Return

Analog Output Power (Terminal Block 4)

TB4 contain the transmitter's isolated power to power the analog output loop. Alternatively, the output loop can be powered remotely.

TB4-1 – Analog 1 Output – Loop Power (12 volts)
TB4-2 – Analog 1 Output – Loop Ground
TB4-3 – Analog 2 Output – Loop Power (12 volts)
TB4-4 – Analog 2 Output – Loop Ground

Digital Outputs (Terminal Block 7)

TB7 contains the transmitter's digital outputs (for high impedance loads). The voltages, +V, for the digital signals may come from TB4 or from an external supply:

Pulse B can be configured to indicate volume or flow direction. The desired function is selected by configuration. Refer to SmartLink manual for changing parameters.

External supply (when provided) maximum 26 VDC, 50mA, NEC/CEC Class 2.

TB7-1 – Pulse 2 Output
TB7-2 – Digital 2 Output
TB7-3 – Pulse 1 Output
TB7-4 – Digital 1 Output
TB7-5 – External Ground Return
TB7-6 – Pulse/Digital External Power

Power Terminations (Terminal Block 2)

TB2 contains the power terminations (NEC/CEC Class 2):

Terminal	Name
TB2, Pin 1	+24 VDC
TB2, Pin 2	-24 VDC (RETURN)
TB2, Pin 3	Earth/ground

NOTICE the order! Pin 1 is on the bottom.

WARNING

Proper grounding is required to meet the requirements of 60079-11 for the Intrinsic Safety certification and 60079-0 Clause 15. Either the internal or external ground point must be used with a wire that conforms to 60079-11 Paragraph 6.5 and 60079-0.

Refer to 60079-11 and 60079-0 with regards to the size of earthing conductor connections, size of the equipotential bonding conductor connections, protection against corrosion of those connection facilities (i.e., stainless steel fasteners), and securing/preventing the loosening/twisting of these components.

Notes:

- There is an internal location for chassis ground adjacent to the power terminal block. See Figure 3.3 (ground wire should be between 12 to 10 AWG (3.2 to 5.3 mm^2).
- There are external grounding points on the meter body and on the outside of the transmitter (near the base). Per UL and hazardous location standards – the external ground should be 8 AWG (or 8.4 mm^2) wire.

The external terminals are for a supplementary bonding connection where local codes or authorities permit or require such connections.

Follow all site guidelines regarding grounding/ earth connections. See Figure 4.4 for the external ground point on the transmitter body. TB3, Pin 1 is the internal ground connection.

Remote Data Communications (Terminal Block 1)

The iSonic 8X/8L transmitter has two slave Modbus ports and one master Modbus port using the Modbus protocol. See the iSonic 8X/8L Modbus Manual for details. The serial communications are configured to be Half Duplex.

Table 3.1: Terminations for Serial Communications

PORT NAME	Termination
COM2 (slave)	TB1-1, 2B
	TB1-2, 2A
COM3 (master)	TB1-3, 3B
	TB1-4, 3A
COM1 (slave)	TB1-5, 1B
	TB1-6, 1A

Metrological Configuration Lockout

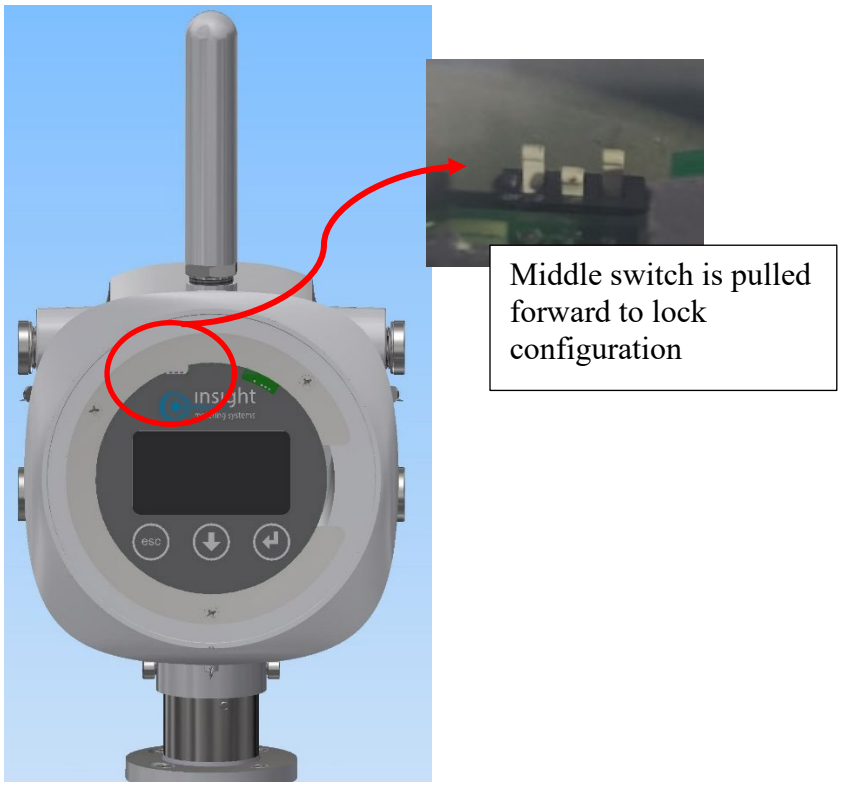
WARNING

Never open the transmitter when it is energized. Before inspecting components, open the power supply circuit breaker. Failure to do so can result in electrical shock or an explosion.

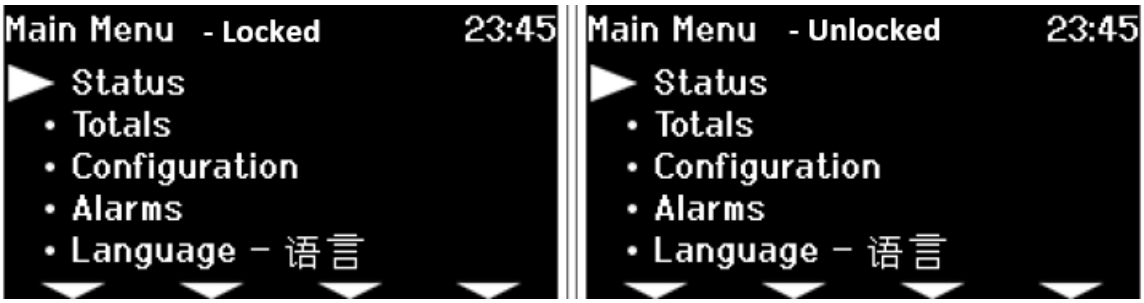
Prior to any metrological seals being applied to the meter – the configuration that controls the flow measurement can locked out from change – even changes by administrators or the manufacturer (please see SmartLink operation manual for the different types of users and passwords).

The configuration can be locked by removing the front (glass) cover and pulling the middle switch forward (the switches are at about 11 o'clock on the display board).

Figure 3-5: Transmitter with Front Cover Removed – Middle Switch Locks out changes



Depending on the setting of switch #2 – the main menu screen (see Section 4) will look like the following:



Other things to know:

- The metrological checksum is viewable on the display AND through SmartLink
- Any revision to the configuration is captured and recorded by the meter with the time, the user and what fields were changed, so all changes are completely auditable.
- The user interface SmartLink has powerful audit tools for the user.
- The leftmost switch is used to reprogram the transmitter (this is done by trained technicians) and the rightmost switch forces the transmitter's IP address to 192.168.1.10. Meters are shipped with DHCP as the typical IP setting.

Meter Installation Check-Out

Never open the transmitter when it is energized. Before inspecting components, open the power supply circuit breaker. Failure to do so can result in electrical shock or an explosion.

To test or validate a meter's installation, perform the following procedure. For troubleshooting information, see Section 6 of this manual.

Verify the meter is oriented with the transmitter on top of the meter body, and the upstream hydraulics is adequate. Verify the upstream pipe diameter is concentric with the meter body.

1 Verify all field terminations have proper continuity and isolation from each other and earth. Verify connections are good with respect to insulation.
2 Verify electronics turn on by the Display.
3 Verify Modbus communications are operational. (via the RS-485 connection)
4 Verify communications on Ethernet (Use SmartLink software)
5 Verify communications on Wi-Fi (Use SmartLink software)
6 Verify meter operation according to SmartLink manual. This lets the software force outputs (current and pulses).

For more information on forced outputs, see Test Modes in the SmartLink software manual.

Note: Always return the meter to normal operation following the use of forced outputs in Output Test mode.

Section 4 Operations

Definitions

SNR – Signal to Noise Ratio

Gain – Required gain to amplify signal

%Good – Percentage of data processed and accepted

SOS – Velocity/Speed of Sound

Normal Operating Conditions

If the iSonic 8X/8L series flow meter is properly installed, the display will begin working when power is supplied to the unit. The indicator will illuminate, and the display will yield readout of flow total, flow rate, fluid properties and basic acoustic diagnostic information. If more detailed diagnostic data is needed beyond what is available via the display, consider accessing transmitter diagnostic data via the SmartLink software.

Except when troubleshooting, do not remove the enclosure covers from the transmitter. The diagnostic information is easily read from the display with the covers in place.

Display Description

The updating OLED display indicates that power is on and that the instrument is operating normally.

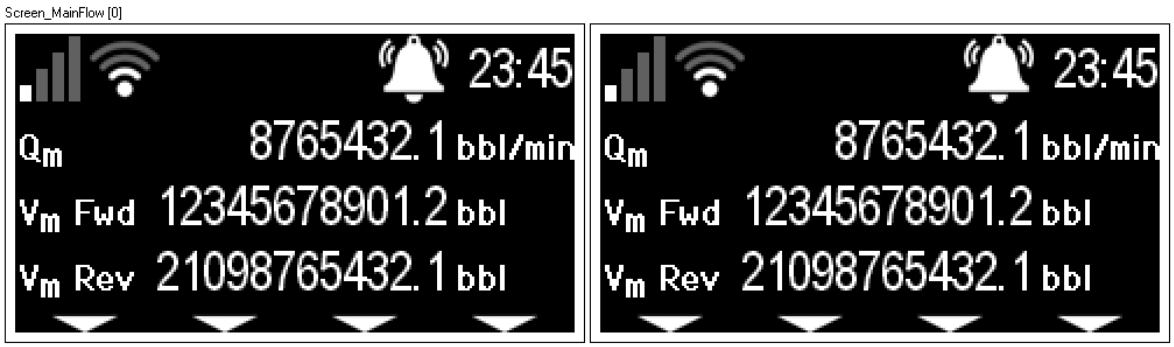


Figure 6.1: Main Screen Diagnostics

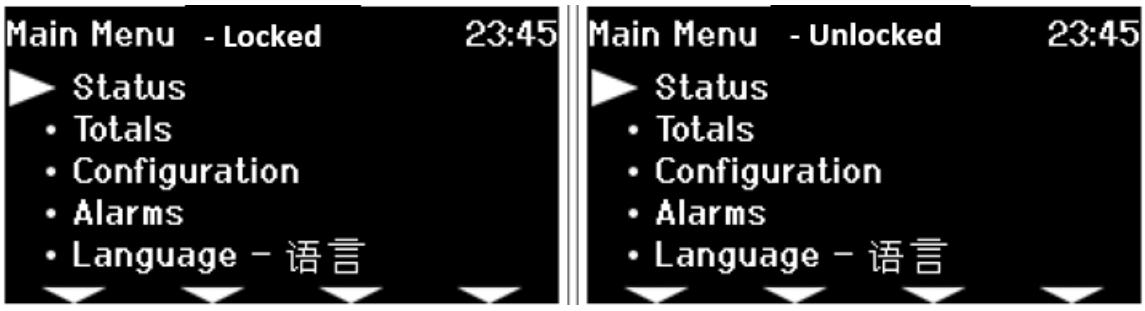
Hitting any button will change the screen to the menus. The screen supports both English and Chinese. Both versions of screens are shown in this document. (English LEFT side and Chinese RIGHT side). Language of display is changed through the Language screen.

Use the up/down arrows to navigate the screens and enter to go into a menu item. "ESC" backs the user up a menu.

Sections are "indented" to show the menu level.

Navigating the Screens

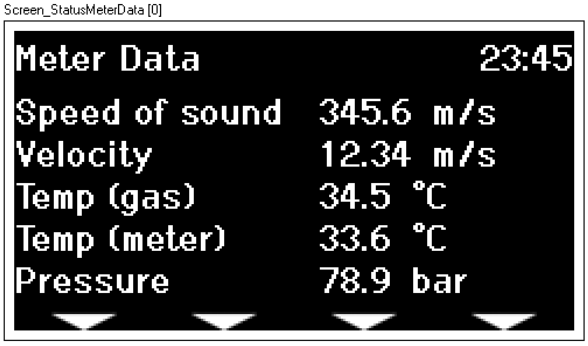
Main Menu



Status Menu

Meter Data Status Screen

Screen_StatusMeterData [0]

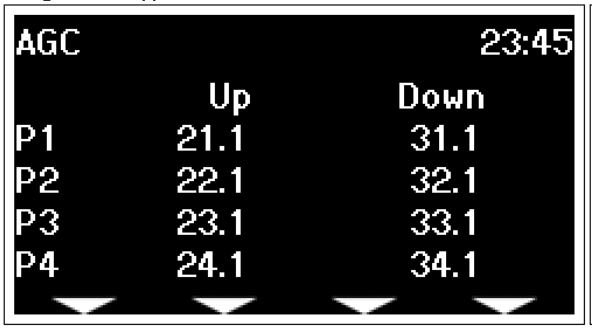


Path Data Status Screen

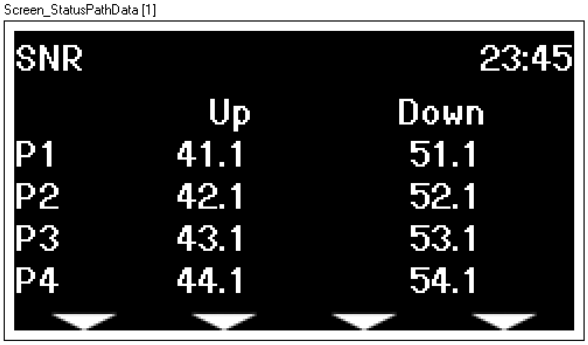
Hitting Up/Down at this screen toggles between paths shown.]

Hitting Enter advances between the different status data.

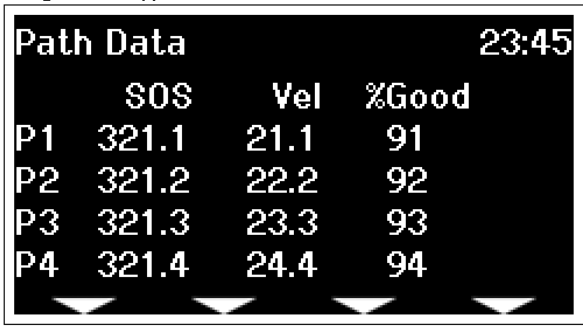
Screen_StatusPathData [0]



Screen_StatusPathData [1]

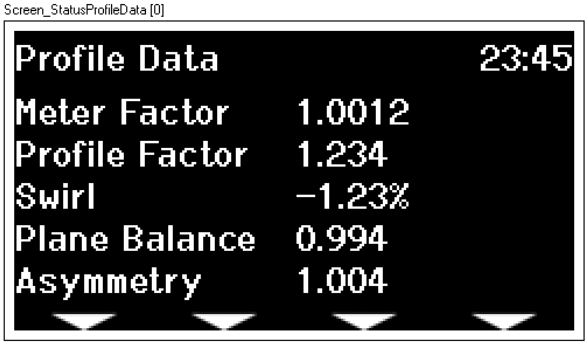


Screen_StatusPathData [2]



Profile Data

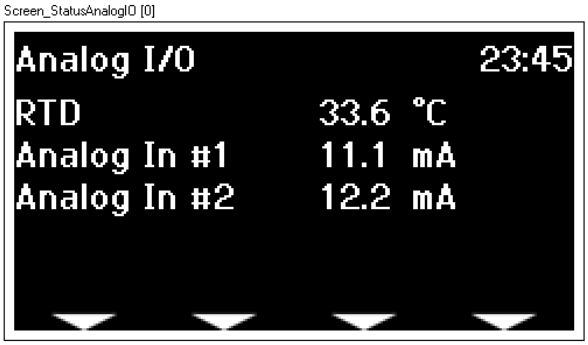
Screen_StatusProfileData [0]



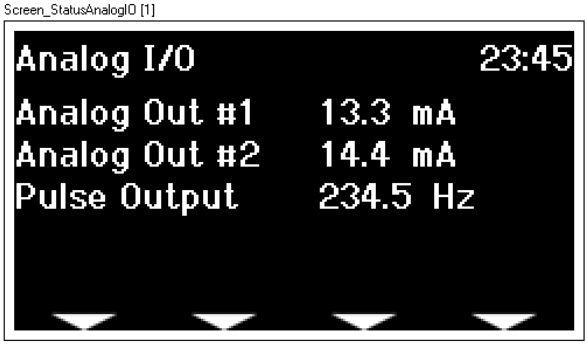
Analog Input/Output Status Data

Hitting Enter advances between the different status data.

Screen_StatusAnalogIO [0]



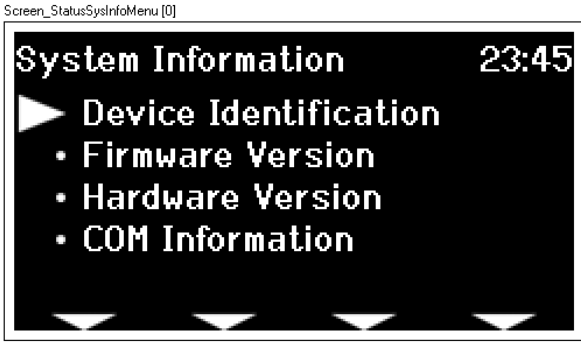
Screen_StatusAnalogIO [1]



System Information

Going to Status Information – provides a sub menu as follows:

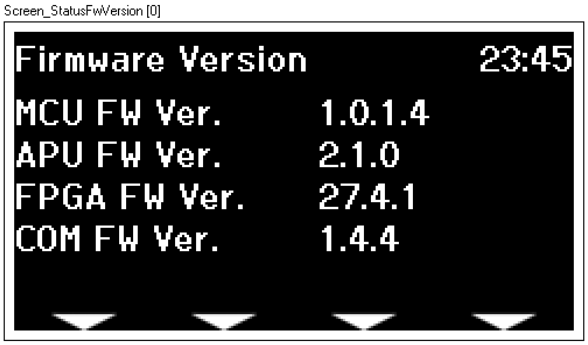
Screen_StatusSysInfoMenu [0]



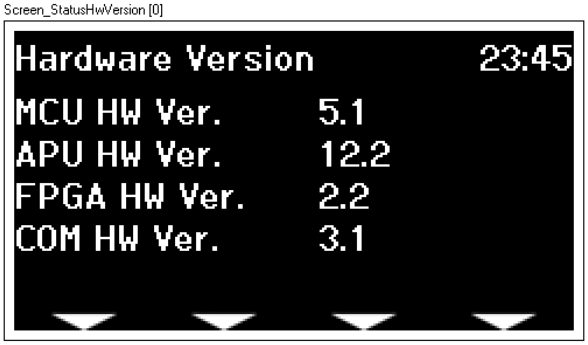
Hitting Enter advances between the different status data.

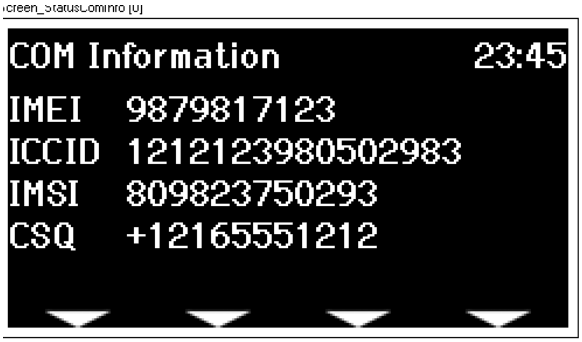
Screen_StatusDeviceIdent [0]

Screen_StatusFwVersion [0]



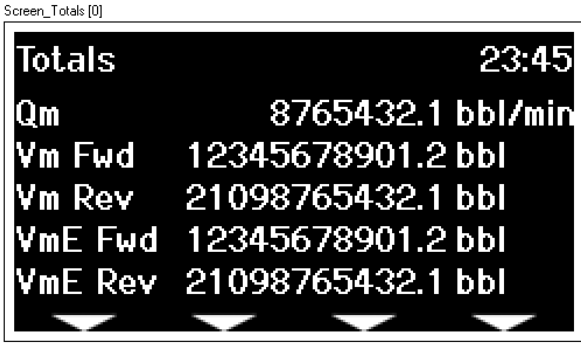
Screen_StatusHwVersion [0]





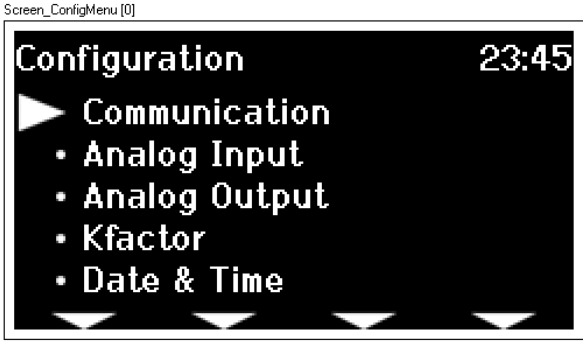
Totals Screen

Screen_Totals [0]



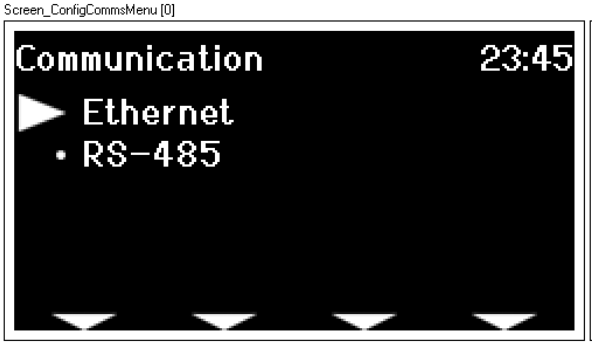
Configuration Menu

Screen_ConfigMenu [0]



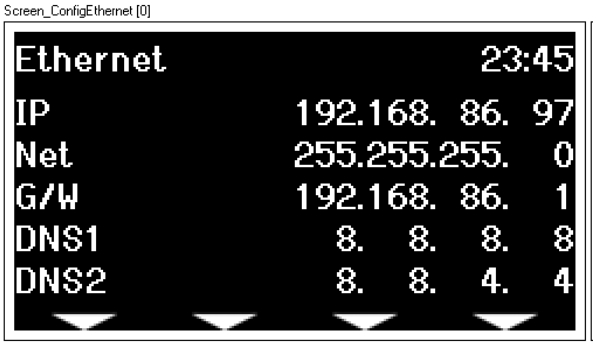
Communication Menu

Screen_ConfigCommsMenu [0]



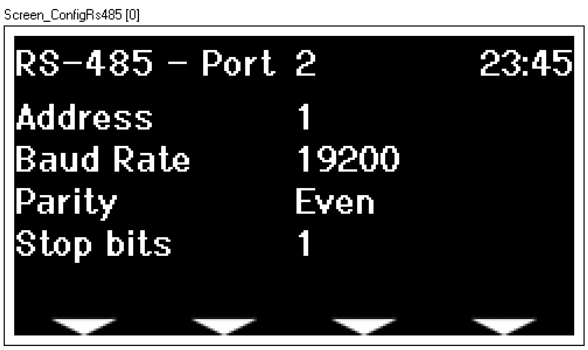
Ethernet Configuration

Screen_ConfigEthernet [0]



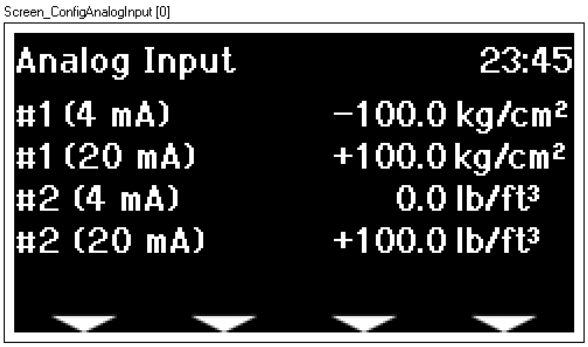
RS-485 Configuration

Screen_ConfigRs485 [0]



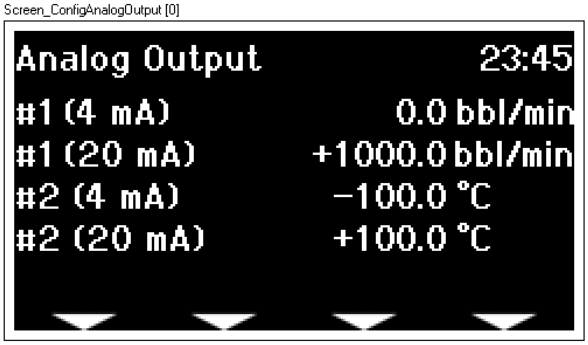
Toggle through the different COM ports by hitting enter.

Analog Input Configuration



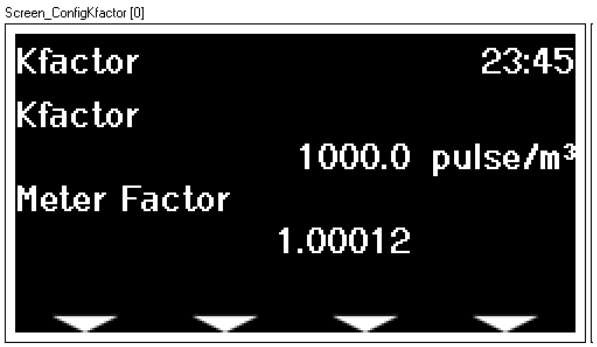
Toggle through the different analog inputs by hitting enter.

Analog Output Configuration



Toggle through the different analog outputs by hitting enter.

KFactor Configuration (and Active Meter Factor)

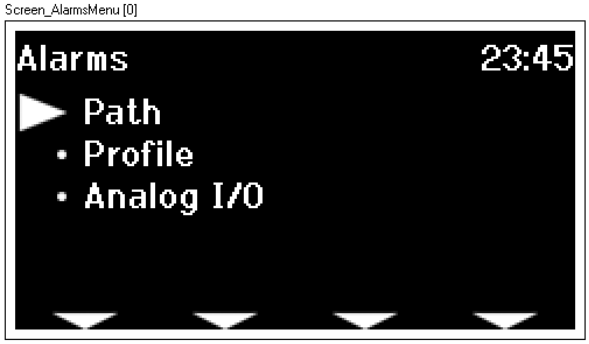


Date and Time

Screen_ConfigDateTime [0]

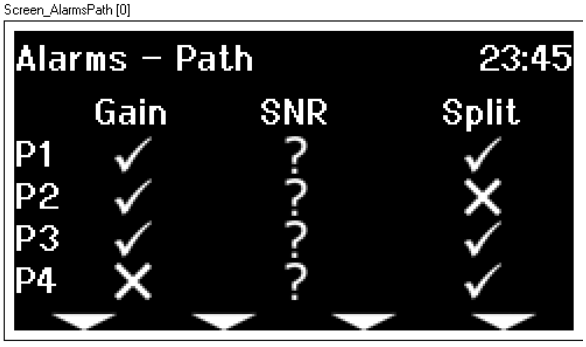
Alarms Menu

Screen_AlarmsMenu [0]



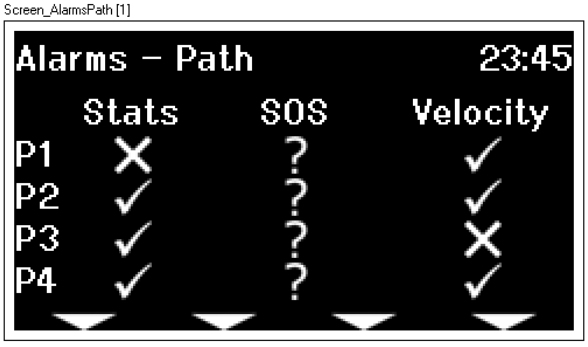
Path Alarms

Screen_AlarmsPath [0]



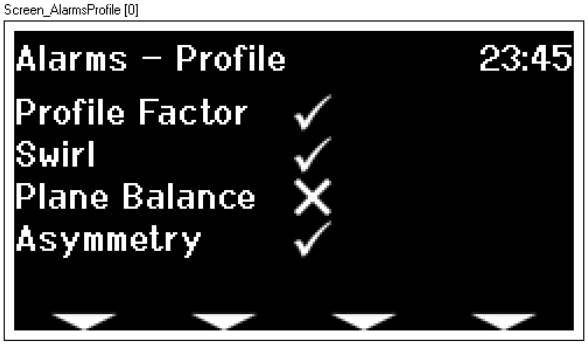
Toggle through paths by hitting Up/Down buttons
Advance through path alarm types by hitting enter.

Screen_AlarmsPath [1]



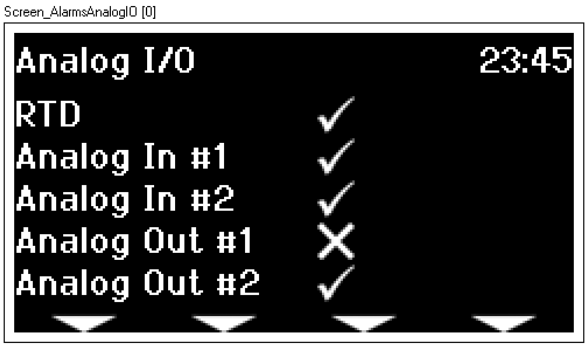
Profile Alarms

Screen_AlarmsProfile [0]



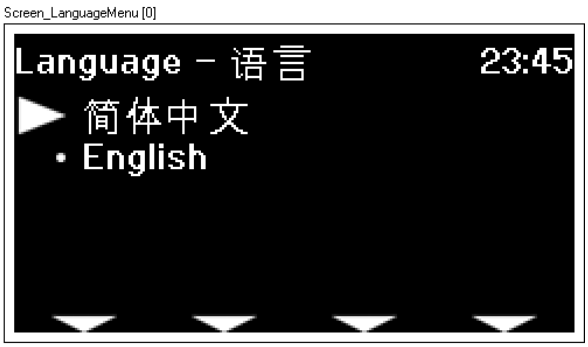
Analog Alarms

Screen_AlarmsAnalogIO [0]



Language Choice

Screen_LanguageMenu [0]



This screen can change the language of ALL screens.

Section 5 Maintenance

WARNING

Service should be performed on the iSonic 8X/8L only by qualified personnel.

Introduction

The troubleshooting and maintenance procedures in this section may be incorporated into the customer's standard maintenance program. The procedures should be performed only by a trained maintenance technician.

Note: Detailed troubleshooting is explained with the SmartLink User's manual.

General Inspections - Preventative Maintenance Procedures

WARNING

Never open the transmitter or the meter body manifold when the instrument is energized. Before inspecting components, open the power supply circuit breaker. Failure to do so may result in electrical shock and/or an explosion.

CAUTION

Wear an ESD protective wrist strap to avoid damaging any components.

The following procedure covers the inspection of the transmitters, transducers, and metering sections.

Transmitter Enclosure Inspection

Perform the following inspections on each enclosure:

1 Verify that the transmitter enclosure and the meter body have suffered no structural damage. Report any damage to the proper maintenance supervisor.
2 Remove dust, dirt, and other soiling from the enclosure. Use a damp cloth to clean surfaces.
3 Inspect cover O-rings.
   a. Clean O-rings and mating surfaces on the enclosure with water if they are dirty.
   b. Remove any corrosion from mating surfaces.
   c. Verify that gaskets compress when the cover is installed.
   d. Lubricate the cover threads with petroleum jelly.

4 Inspect the enclosure mounting.

Internal Electronics Inspection

1 Put on an ESD (Electrostatic Discharge) protective wrist strap. Connect the ESD protective wrist strap to a known ground.
2 Inspect cable entry points to assure that cable insulation is free from damage.
3 Inspect cable connections for tightness.
4 If connections are fouled or corroded, clean with electronic contact cleaning fluid. Inspect all internal connections and terminals for tightness.
5 If connectors and terminals are fouled or corroded, clean with electronic contact cleaning fluid.
6 Inspect the display for damage.
7 Using a cloth, clean dust and grime from all accessible surfaces of the enclosure.

Transmitter Troubleshooting

Note: Detailed troubleshooting is explained with the SmartLink User's manual.

Perform the following inspections on the transmitter to isolate a problem.

WARNING

Never open the transmitter when the instrument is energized. Before inspecting components, open the power supply circuit breaker. Failure to do so may result in electrical shock and/or an explosion.

CAUTION

Wear an ESD protective wrist strap to avoid damaging any components.

1 With the unit energized, verify that power is being supplied to the meter and that the meter is operating (Figure 5.1).
   a. When the flowmeter is operating normally, the display is illuminated.
   b. See Table 5.1 for help in isolating the causes of the failure.

Figure 5.1: LED Indicators

Table 5.1— 4G, Wi-Fi and Status/Warning Symbol Table

<table>
<tr><th>Symbol</th><th>Significance</th><th>Description</th></tr>
<tr><td>  </td><td>4G</td><td>The signal is always displayed when connected, and the signal is strong.</td></tr>
<tr><td>  </td><td>4G</td><td>The signal is weak.</td></tr>
<tr><td>  </td><td>4G</td><td>The signal is between weak and strong</td></tr>
<tr><td>  </td><td>WI-FI</td><td>Always show WIFI icon when using WIFI function, and the signal is strong. The principle of signal bar display is the same as GPRS.</td></tr>
<tr><td>  </td><td>Malfunction alarm</td><td>Activated per Meter state vector (after mask applied) – below:
<table>
<tr><td>Bit encoded variable describes flow meter diagnostics (for operational issues)</td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Meter Path Failure</td><td>1</td></tr>
<tr><td>Meter SOS vs. AGA SOS</td><td>2</td></tr>
<tr><td>Swirl - High</td><td>3</td></tr>
<tr><td>Swirl - Low</td><td>4</td></tr>
<tr><td>Flatness/Profile Factor - High</td><td>5</td></tr>
<tr><td>Flatness/Profile Factor - Low</td><td>6</td></tr>
<tr><td>Asymmetry - High</td><td>7</td></tr>
<tr><td>Asymmetry - Low</td><td>8</td></tr>
<tr><td>Plane Balance - High</td><td>9</td></tr>
<tr><td>Plane Balance - Low</td><td>10</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Calculation error</td><td>12</td></tr>
<tr><td>SOS path Difference</td><td>13</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Gain Split</td><td>15</td></tr>
<tr><td></td><td></td></tr>
</table></td></tr>
<tr><td>  </td><td>Warning</td><td>Activated per Meter state bits vector (after mask applied) – below:
<table>
<tr><td>Gain too high</td><td>14</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Analog Inputs</td><td>16</td></tr>
<tr><td>MCU Alarm</td><td>17</td></tr>
<tr><td>APU Alarm</td><td>18</td></tr>
<tr><td>Comm Alarm</td><td>19</td></tr>
<tr><td>WiFi Alarm</td><td>20</td></tr>
<tr><td>Analog Input 1</td><td>21</td></tr>
<tr><td>Analog Input 2</td><td>22</td></tr>
<tr><td>Analog Output 1</td><td>23</td></tr>
<tr><td>Analog Output 2</td><td>24</td></tr>
<tr><td>RTD</td><td>25</td></tr>
<tr><td></td><td></td></tr>
</table></td></tr>
</table>

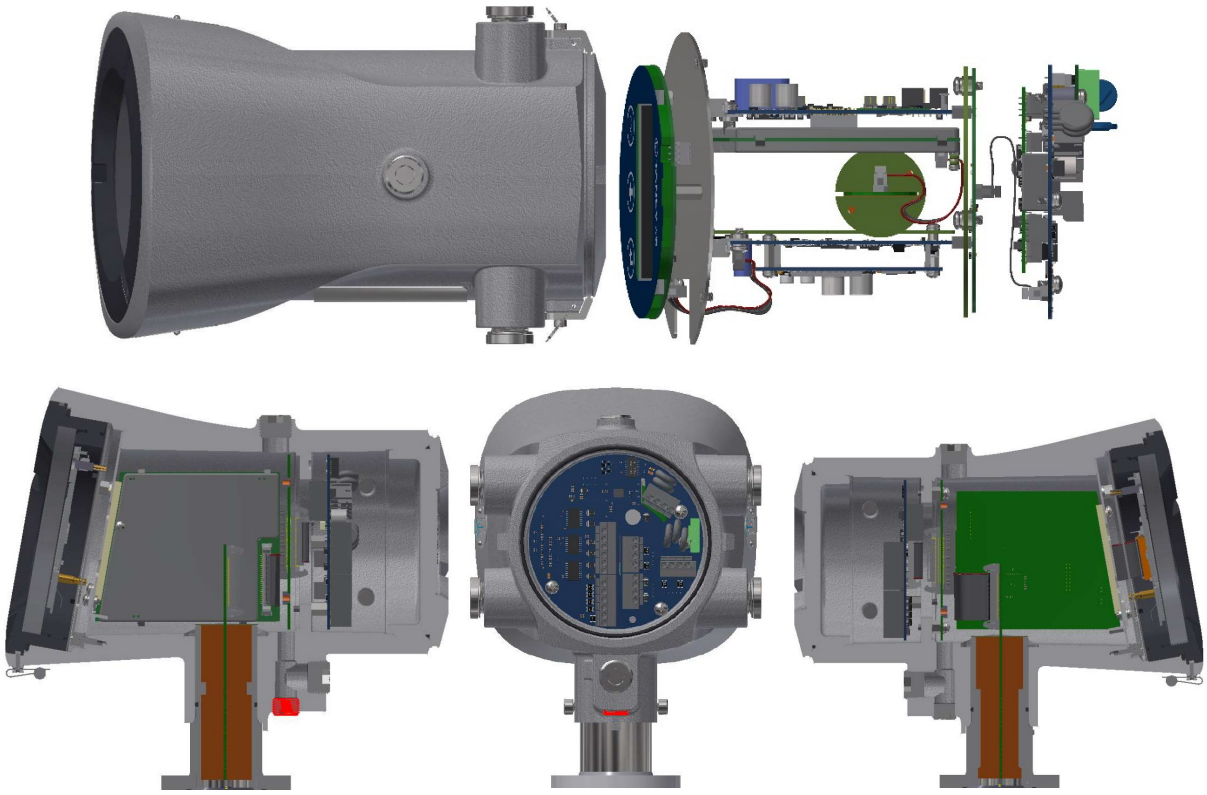
Circuit Board Replacement

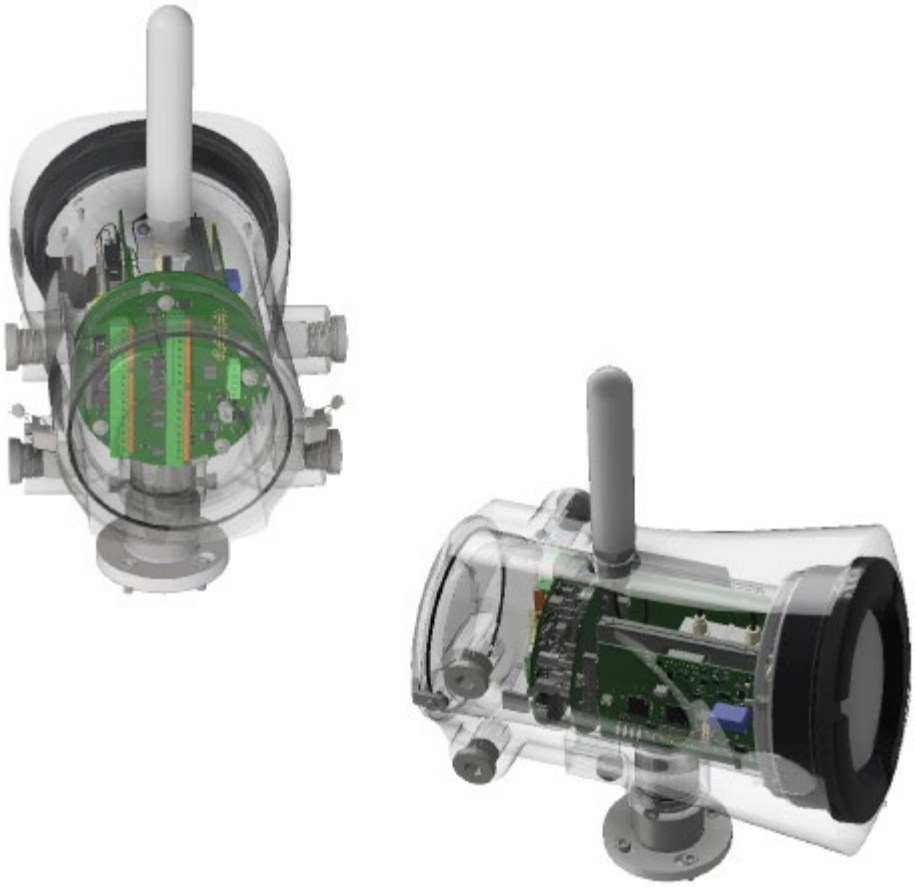
The transmitter comprises two basic subassemblies:

Front section
Display, ISB (Intrinsic Safety Board) MCU (Master Control Unit) APU (Acoustic Processor Unit), COM board (communications), Lightening suppressors and Backplane

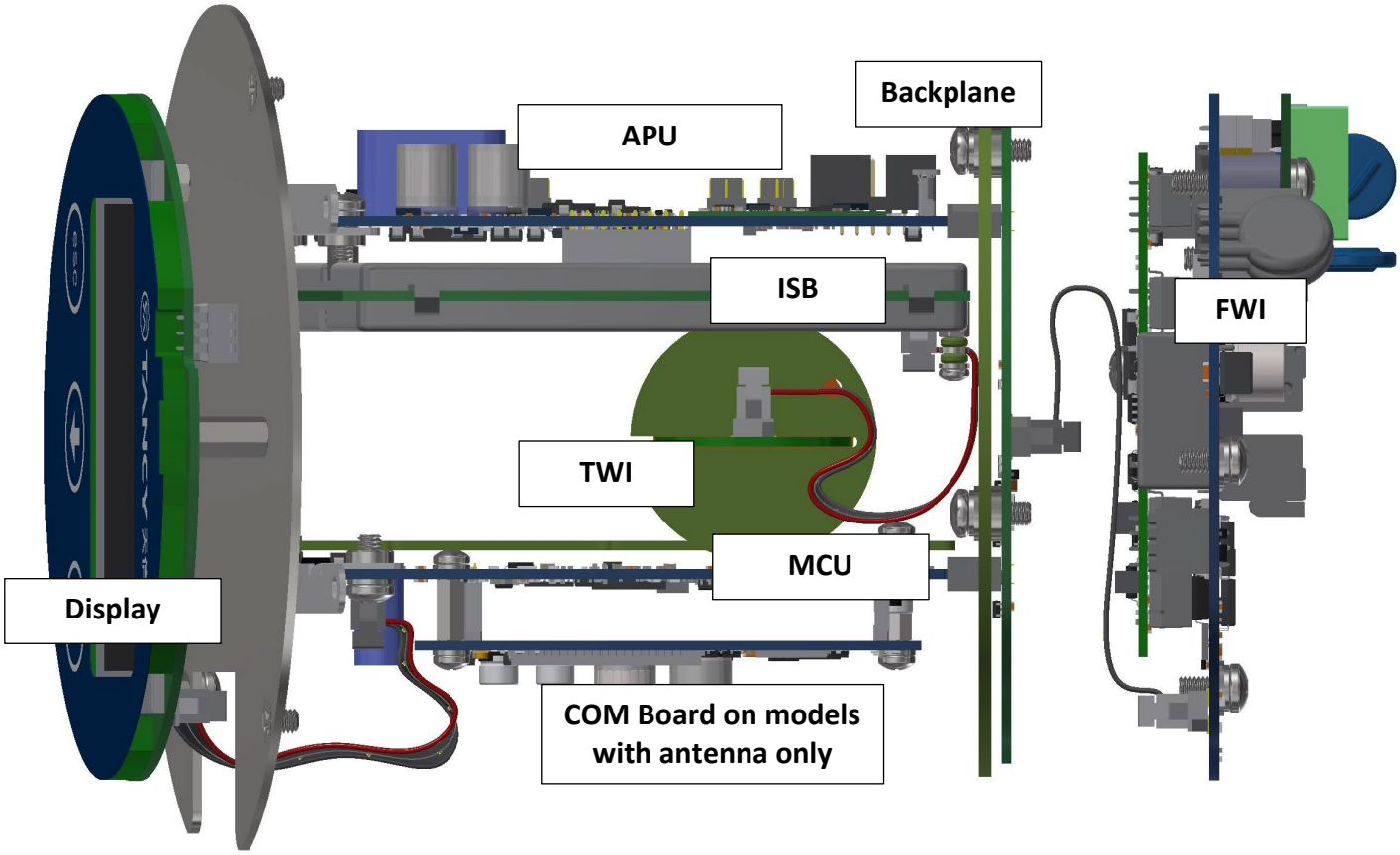
Rear section

Field Wiring Interface board (FWI)





Detailed View



See Tables 5.2 and 5.3 for a description of each subassembly's components.

Table 5.2—Power Supply and Display (Rear section) – Active components only

FWI	Converts 24 VDC power to internal voltages, which are passed to the all the other electronics. Provides galvanically isolated digital outputs, analog output and analog input

Table 5.3—Acoustic Processor (Front Section)

ISB	Intrinsic Safety board limits voltages and currents for hazardous locations
APU	Performs all flowmeter processing
COM	Performs all 4G communications
MCU	Stores data, handles I/O and serial/Ethernet/Wi-Fi communications
Backplane	Routes signals to other boards and FWI – no active components
Antenna Lightening Surge Suppressors	Protects electronics for lightning strikes to the antennas

FWI Replacement

WARNING

Never open the transmitter when the instrument is energized. Before inspecting components, open the power supply circuit breaker. Failure to do so may result in electrical shock and/or an explosion if in a hazardous area.

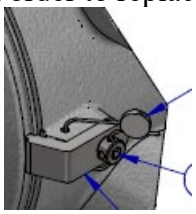
CAUTION

Wear an ESD protective wrist strap to avoid damaging any components.

The printed circuit assemblies consist of several component boards including and the individual component boards are not designed for individual replacement. Rather, if any component on the printed circuit board assembly fails, the entire assembly is to be replaced.

To replace the FWI assembly, perform the following steps:

1 The metrological seal will be broken in order to replace the FWI.



2 Unscrew and remove the lid from the rear end of the enclosure.
3 Remove field wiring from FWI.
4 Unscrew the three standoffs to free the PCB from the transmitter body and lift the assembly from the enclosure this will remove the PCB. Disconnect ribbon cable from the back of the FWI.
5 Remove the new FWI assembly from its packaging.
6 Attach ribbon cable. Align the mounting holes with the standoffs that remain inside the enclosure.
7 Reinstall the three screws into the hex standoffs that were removed.
8 Re-connect field wiring.
9 Replace the lid on the enclosure.

APU, COM, ISB or MCU Replacement

WARNING

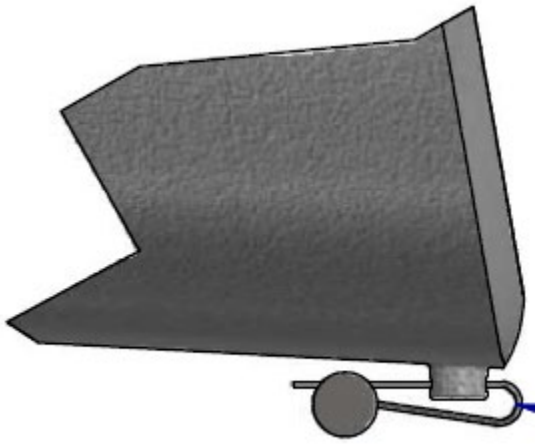
Never open the transmitter when the instrument is energized. Before inspecting components, open the power supply circuit breaker. Failure to do so may result in electrical shock and/or an explosion if in a hazardous area.

CAUTION

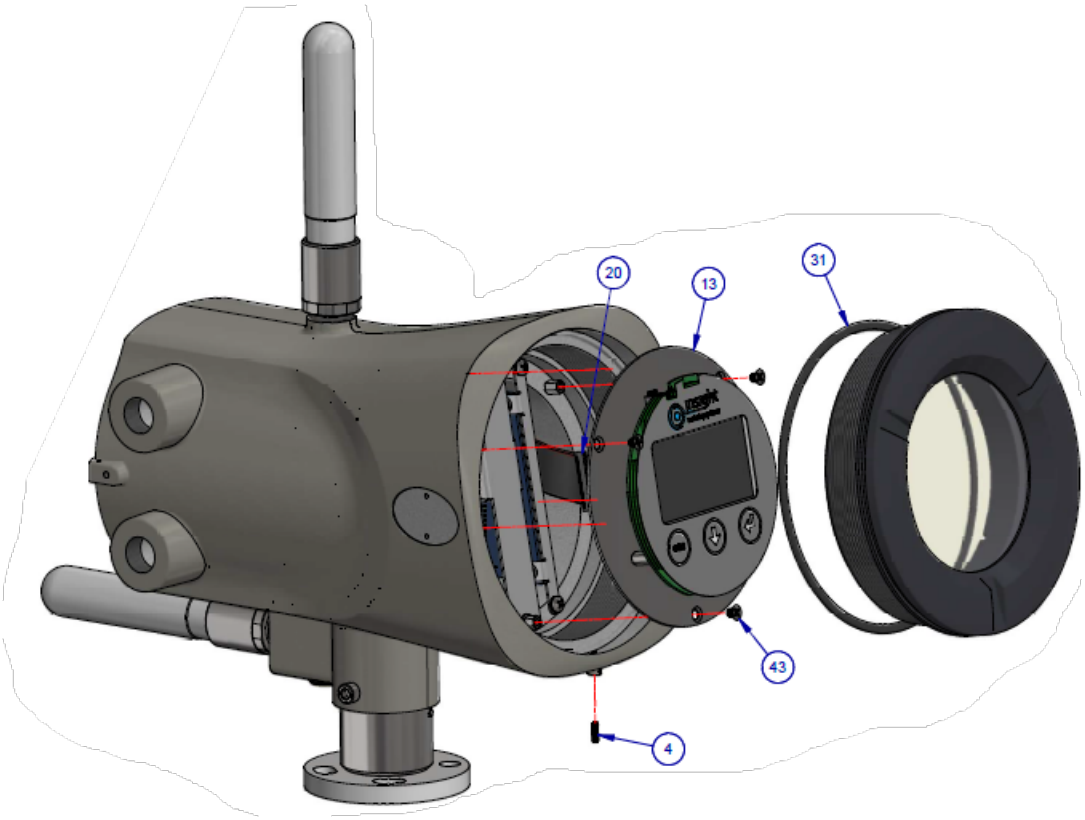
Wear an ESD protective wrist strap to avoid damaging any components. The metrological seal will be broken if any printed circuit boards are to be replaced. Proper programming of any programmable cards must be identical to the replacement cards which include calibration constants.

Below is an exploded front view of the transmitter assembly.

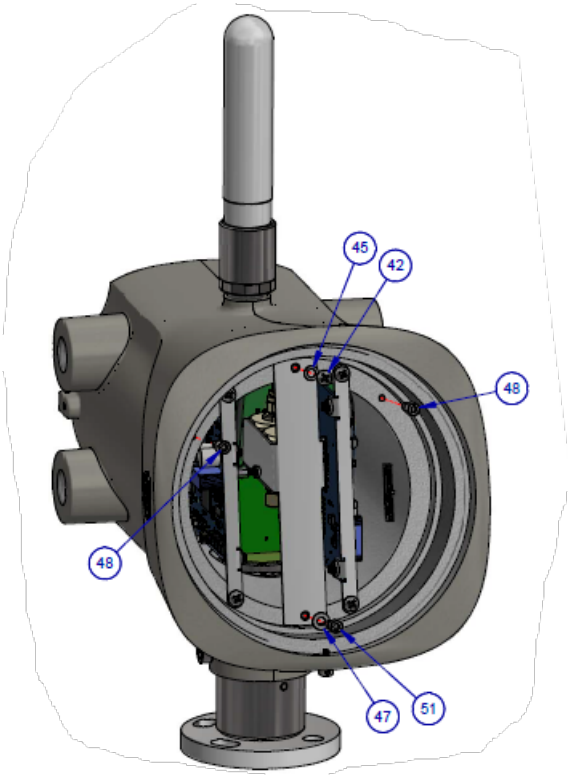
The metrological seal must be broken in order to replace any board in the front section of the pipe.



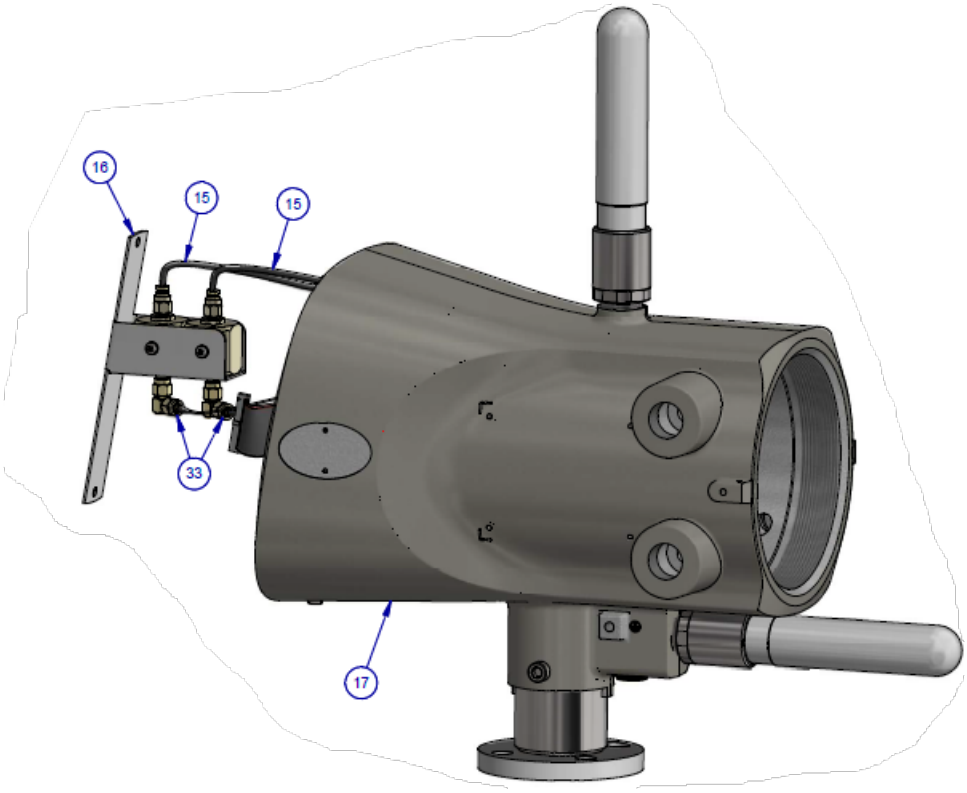
1 Unscrew the front cover from the enclosure.
2 Remove the display board by unscrewing the three M4 fasteners.
3 Carefully remove the ribbon cable from the back of the display.



4 Unscrew the front plate from the transmitter housing by loosening the M4 hardware for the antenna protection hardware (only if device has antennas) – this is the center and largest plate.

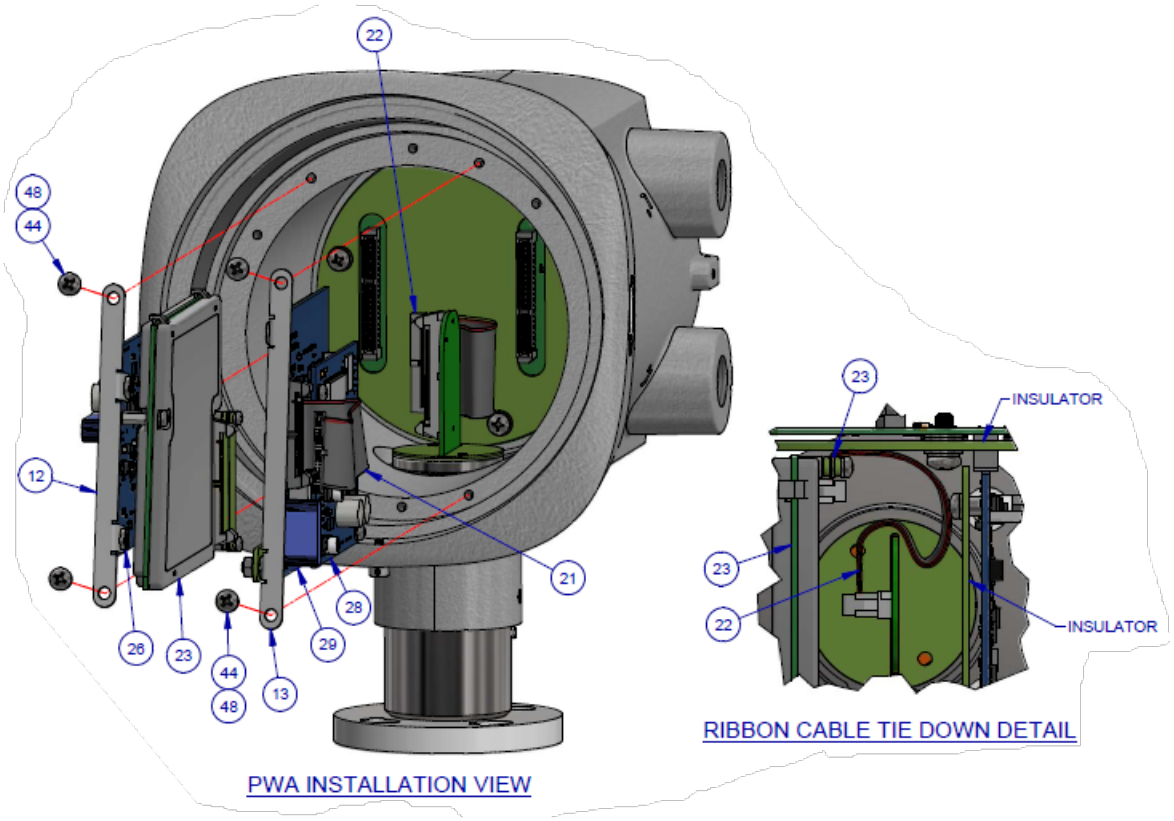


5 Slowly withdraw the front plate from the housing noting that surge suppressors are connected to the antenna cables. Unscrew the upper cables that lead to the antennas and unscrew the lower cables that lead to the COM board.



6 PCB Removal

- (If removing the APU/ISB) – unscrew the plate that holds these boards in the transmitter (on the left hand side). Slowly withdraw the APU and ISB card (if removing these boards). These cards are plugged into each other and can be unplugged from each other for replacement. Disconnect ribbon cable from the ISB and ribbon cable clamp.
- (If removing the APU/ISB) – unscrew the plate that holds these boards in the transmitter (on the right hand side). Slowly withdraw the MCU and Com board (if removing these boards). These cards are plugged into each other and can be unplugged from each other for replacement.



7 Reverse the procedure by re-assembly in the same order.

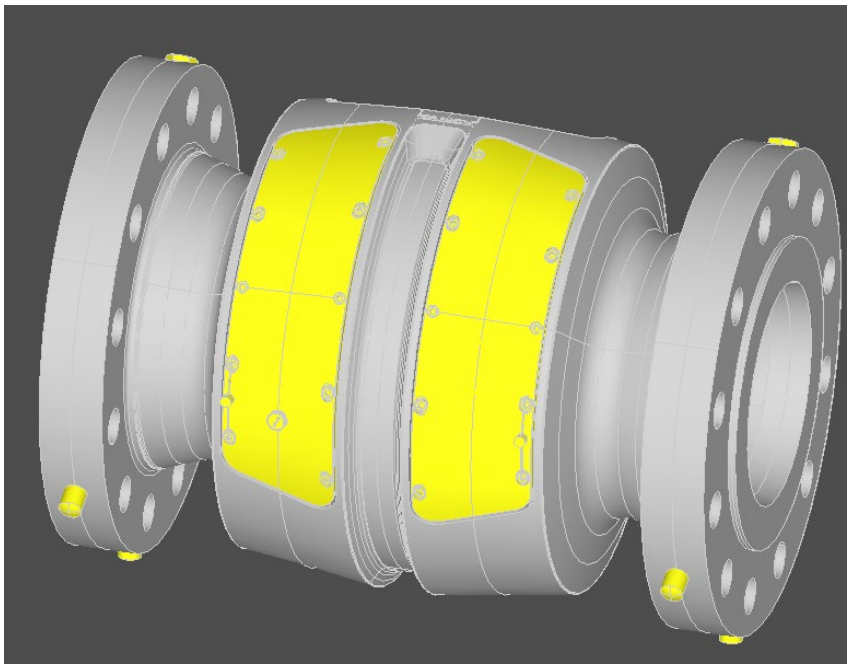
Transducer Replacement/Repair

WARNING

Never open the manifold when the instrument is energized. Before inspecting components, open the power supply circuit breaker. Failure to do so may result in electrical shock and/or an explosion.

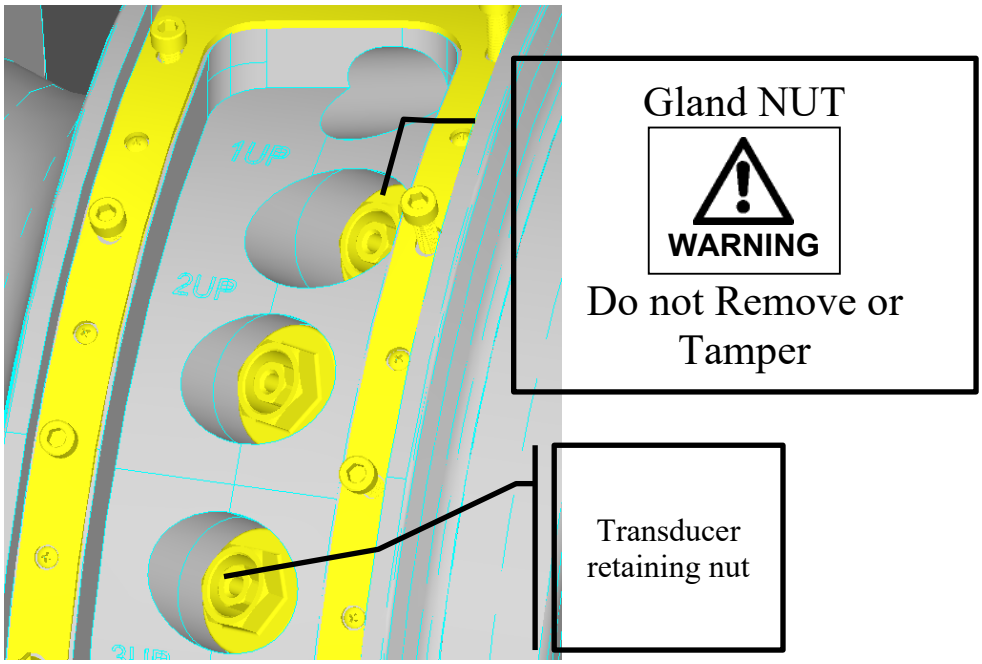
Should a transducer fail, install a replacement using the following procedures:

1 Remove the manifold covers exposing the transducer.



WARNING

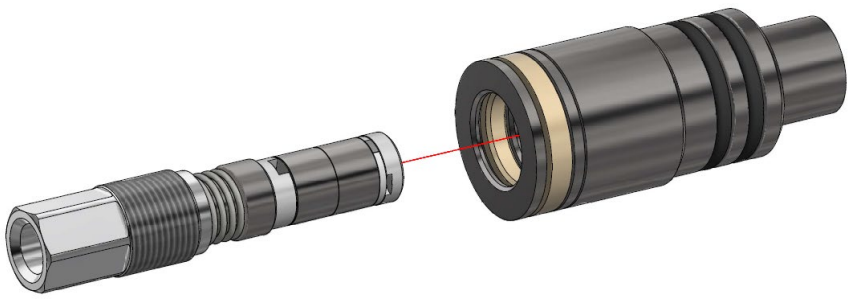
A gland nut holds the transducer housing into the meter. This gland nut has a protective cover to prevent inadvertent loosening. The gland nut must NEVER be removed or tampered with.



2 Slowly loosen the transducer retaining nut and withdraw the transducer using this nut.

3 An exploded view of the transducer withdrawn from the housing is below:

Figure 5.13: Transducer Assembly Construction



4 Add couplant (i.e., silicon grease DC100 or approved petroleum jelly) to the transducer or remove/replace the transducer. If replacing, disconnect the wires from the terminal block and replace the transducer.

5 Install the transducer and tighten hand tight.

6 Connect the new transducer to the terminal block.

7 Re-install the manifold and junction box cover.

8 Torque the socket head screws to 30 in-lbs (3.4 nm).

Note: The iSonic 8X/8L system may require that the acoustic performance is verified when a transducer is replaced or re-coupled.

Analog Input Verification

The iSonic 8X/8L may have an analog input (for example, temperature, pressure, or density). The input signal is conditioned before it is converted to a digital input.

The input is scaled linearly to convert the user input of 4-20 mA to maximum and minimum values. Analog input ranges can only be adjusted via the SmartLink software interface (see the SmartLink manual for instructions).

Failed inputs (are out of range) will produce an alarm and the software will use a default value for that input.

Analog Output and Pulse Output Verification

The digital output channels consist of an analog output and a pulse output. The current output channel has a 4-20 mA range.

Force Output (Analog)

The analog output is scaled linearly between its maximum and minimum values. Use the force output function of SmartLink software to test the scaling of the analog output with input site devices. (See the SmartLink Manual for detailed instructions).

Force Output (Pulse)

Similar to calibrating the analog outputs, a fixed frequency may be forced out of the transmitter pulse output. To verify the pulse output using a forced output, follow the instructions in the SmartLink Manual.

Section 6 Recommended Spare Parts

Transducer Equipment

Qty: 1 Transducer

Electronic Equipment

Qty: 1 FWI
Qty: 1 Display
Qty: 1 APU
Qty: 1 MCU
Qty: 1 COM
Qty: 1 ISB

Contact Information

https://insightmetering.com/contact-us

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