

# General Specifications

Model ISC40G(S)  
Sensors for Inductive Conductivity Measurement

GS 12D07J06-01EN-P

## • General

With Inductive Conductivity (also called Toroidal), the sensing elements (electrode coils) of an inductive sensor do not come in direct contact with the process. These two matched (identical) coils are encapsulated in PEEK (or Teflon) protecting them from the adverse effects of the process.

The accuracy is 0.5% of reading plus 0.5 microS/cm for any conductivity value, whether measured in rinse water or in concentrated acids. The materials of construction ensure a long life under harsh industrial conditions.

The sensor types ISC40G(S) -GG, -GR and -GS are made from erosion/abrasion resistant PEEK (Poly Ether Ether Ketone), which also features excellent chemical resistance in all solutions except fluoric acid or oxidizing concentrated acids. The sensor type ISC40G(S) -TG is made of the ultimate material in terms of chemical resistance, which is PFA (Teflon) for applications in hydrofluoric acid and oxidizing concentrated acids (nitric-, sulfuric-, hydrochloric acid and even Oleum).

The ISC40 sensor is provided with a rugged Stainless Steel mounting thread, nut and gasket combination for ultimate flexibility in installation using bulkhead installation technique. There is also a wide range of holders and options available for reliable in-line or off-line installation with double O-ring seals for long service life of the sensor. Additional models are available for use in Ball-Valve Insertion applications and in Sanitary Flange installations.

The sensors have a large bore for optimal resistance to fouling processes and when properly installed, the flow will keep the sensor clean preventing measuring errors.

## • Features

- Wide range of electrodes to suit all process conditions.
- Colored/ numbered coded wires for easy identification of electrodes
- High degree of standardization for mounting in flow and immersion fittings



## 1. General Specification

### 1.1 Measuring element

Sensing element : Toroids with high permeability magnetic material  
 Temperature element : Pt1000

### 1.2 Materials

#### Wetted parts

Body ISC40\*-G\* : 30% glass filled PEEK, FDA approved  
 Body ISC40\*-T\* : PFA, FDA, PIM regulation 10/2011 approved

#### Non-wetted parts sensor

Sealing gasket : Viton  
 Thread part : AISI 316 SS

#### Options for sensor

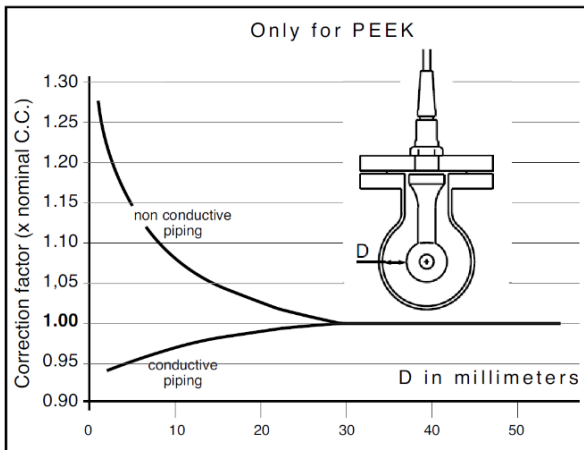
All options except /TFD : AISI 316 SS and O-ring material as wetted part  
 /TFD : AISI 316 SS as non-wetted part, TFM and FFKM as wetted part

### 1.3 Functional specifications (at 25°C)

Temperature element : Pt1000 to IEC 751 30k NTC  
 Installation factor : 1.88 cm-1 nominal for PEEK sensor  
 3.00 cm-1 nominal for PFA sensor

**Note 1:** Actual installation can change this factor. If there is less than 25mm spacing between sensor and holder, in-situ calibration is necessary to meet the specified accuracies (see fig. 1).

**Note 2:** The ISC40 temperature sensor is designed for cell compensation and for indication. It is NOT designed for process temperature control



**Fig 1:** Actual installation factor as function of spacing around the sensor

### 1.4 Dynamic Specifications

Temperature response time :  $t_{90} < 10$  min. for PEEK sensor  
 $t_{90} < 15$  min. for PFA sensor

### 1.5 Operating range

Conductivity : 0 – 2000 mS/cm at actual process temperature.

**Note3:** The sensor has an error (0.5  $\mu$ S/cm for PEEK model, 1.0  $\mu$ S/cm for PFA model) that must be considered when application is chosen.

Temperature : -20°C to 130°C (-4°F to 266°F)

Pressure\*  
 Over pressure : 0 to 20 barg  
 0 to 290 PSIG PEEK  
 0 to 15 barg  
 0 to 217 PSIG PFA

Under pressure : 0 to 0.9 barg  
 0 to 13.1 PSIG for suffix -GG, -GS, -TG  
 0 to 0.5 barg  
 0 to 7.30 PSIG for suffix -GR

\* Unit definition:  
 barg = bar gauge, over pressure against atmosphere-  
 barg = under pressure against atmosphere

Cable length : Functionally, max 50 meter (164 feet), in combination with WF10 extension cable and BA10 junction box

### 1.6 Shipping details

Package size (LxWxH)  
 ISC40\*-\*\*-03 (05) : 350 x 270 x 50 mm (13.8 x 10.6 x 2.0 inch)  
 ISC40\*-\*\*-10 (15, 20) : 320 x 240 x 110 mm (12.6 x 9.5 x 4.3 inch)

Package weight (app.)  
 ISC40\*-\*\*-03 : 1.0 kg (2.2 lbs)  
 ISC40\*-\*\*-05 : 1.3 kg (2.9 lbs)  
 ISC40\*-\*\*-10 : 1.6 kg (3.5 lbs)  
 ISC40\*-\*\*-15 : 2.1 kg (4.6 lbs)  
 ISC40\*-\*\*-20 : 2.5 kg (5.5 lbs)

### 1.7 Environmental conditions

Storage temperature : -30°C to 50°C (-22°F to 122°F)

Waterproof : IP67 (conform IEC 60529), also in combination with the preferred Yokogawa process connections

### 1.8 Process connections

Process connections are made in combination with a variety of adapters and fittings, which are available in AISI 316 SS, PVC or PVDF (see relevant sections in this manual).

**1.9 Cable properties**



The cable used in our ISC40 sensors is a Multicore shielded cable with two low noise coaxes and four insulated wires. This cable is identical to the WU10-V-D. For detailed cable specifications see IM 12B06W02-02EN-P (IM WU10, WF10, WE10).

**1.10 Regulatory standards**

Equipment and systems covered by the intrinsic safety certificates are as follows:

Inductive Conductivity Sensors Model ISC40S-...-... for connection to the certified intrinsically safe Yokogawa Inductive Conductivity Transmitter Model FLXA21 series, Model FLXA202 series or Model ISC202S series.

**Table 1:** Equipment ratings:

Item	Description	Values
Electrical parameters <sup>4)</sup>	Max. input voltage Max. input current Max. input power Max. internal capacitance Max. internal inductance Dielectric strength	U <sub>i</sub> = 14.4 VDC I <sub>i</sub> = 88 mA P <sub>i</sub> = 320 mW C <sub>i</sub> = 150 nF for permanent cable types L <sub>i</sub> = 0.1 mH for permanent cable types 500 Vac against input
Temperature class	T6 T5 T4	-30°C ≤ Ta ≤ +40°C -30°C ≤ Ta ≤ +95°C <sup>5)</sup> -30°C ≤ Ta ≤ +130°C <sup>5)</sup>
Specific conditions of use	Potential electrostatic charging hazard:  Inductive Conductivity sensors containing accessible plastic parts and/or external conductive parts must be installed and used in such a way, that dangers of ignition due to hazardous electrostatic charges cannot occur, especially in the case that the process medium is non-conductive.  Use a damp cloth for cleaning the equipment.	
 WARNING	Electrostatic charges of the sensor enclosure part, and label shall be avoided, especially in the case that the process medium is non-conductive. Use a damp cloth for cleaning the equipment. From the safety point of view the circuits shall be assumed to be connected to earth.	
 WARNING	When the sensor has been connected to non-intrinsically safe equipment which exceeds the restrictions regarding the sensor input circuits, the sensor is not suitable anymore for intrinsically safe use	

**Table 2:** Approvals / certification


Item	Description, Approval, Certification
CE	Decision 768/2008/EC, By applying: EN-ISO 9001
RoHS	EU Directive 2011/65/EU and Commission Delegated Directive (EU) 2015/863 amending Annex II, per EN-IEC 63000
PED <sup>6)</sup>	EU Directive 2011/68/EU applying Article 4.3: Sound Engineering Practice.
WEEE	EU directive 2012/19/EU This sensor is intended to be sold and used only as a part of equipment which is excluded from the WEEE directive, such as large-scale stationary industrial tools, a large-scale fixed installation etc., and therefore it is in principle fully compliant with WEEE directive. The sensor should be disposed in accordance with applicable national legislations/regulations respectively.
ATEX	EU Directive 2014/34/EU

**Note 4:** For EACEx other electrical parameters apply, see details specific certificate

**Note 5:** For FM-US and FM-CAN lower Ta values apply, see regulatory compliance.

**Note 6:** Damaging the screw thread or process connection (e.g. flange) of the sensor might influence the maximum process pressure..

**Table 3:** Certificates

Item	Description, Approval, Certification
ATEX (EU)	ATEX approval: DEKRA 11ATEX0063X <b>CE</b> <small>0344</small> ISC40S:  II 1 G Ex ia IIC T4...T6 Ga Applied standards: <ul style="list-style-type: none"> <li>• EN IEC 60079-0</li> <li>• EN 60079-11</li> </ul> For specific conditions of use see certificate
IECEX	IECEX approval: IECEX DEK 11.0028X ISC40S: Ex ia IIC T4...T6 Ga Applied standards: <ul style="list-style-type: none"> <li>• IEC 60079-0</li> <li>• IEC 60079-11</li> </ul> For specific conditions of use see certificate
FM (Canada)	FM approval Canada: FM22CA0012X IS CL I, DIV1, GP ABCD, T4/T5/T6; CL I, ZN0, Ex ia IIC, T4/T5/T6 Ga Ta = -30 to 85°C/85°C/40°C Control Drawing: FF1-K1244QY Applied standards: <ul style="list-style-type: none"> <li>• CAN/CSA-C22.2 No. 60079-0</li> <li>• CAN/CSA-C22.2 No. 60079-11</li> <li>• CAN/CSA-C22.2 No. 61010-1</li> </ul> For specific conditions of use see certificate Note: When T4 and Ta = 85°C, Process Temperature = 130°C maximum. When T5 and Ta = 85°C, Process Temperature = 95°C maximum.
FM (United States)	FM approval United States: FM21US0083X IS CL I, DIV1, GP ABCD, T4/T5/T6; CL I, ZN0, AEx ia IIC, T4/T5/T6 Ga Ta = -30 to 85°C/85°C/40°C Control Drawing: FF1-K1244QX Applied standards: <ul style="list-style-type: none"> <li>• FM Class 3600</li> <li>• FM Class 3610</li> <li>• FM Class 3810</li> <li>• ANSI/ISA 60079-0</li> <li>• ANSI/ISA 60079-11</li> <li>• ANSI/ISA 61010-1</li> </ul> For specific conditions of use see certificate Note: When T4 and Ta = 85°C, Process Temperature = 130°C maximum. When T5 and Ta = 85°C, Process Temperature = 95°C maximum.
- EACEX	RU C-JP.AA87.B.00229/19 0Ex ia IIC T6...T4 Ga X Applicable standards: <ul style="list-style-type: none"> <li>• GOST 31610.0-2011</li> <li>• GOST 31610.11-2011</li> </ul> For specific conditions of use see certificate Note: For electrical parameters see certificate for details

## ■ 2. Model and Suffix code

**Table 4:** Model & Suffix code

Model	Suffix Code	Option code	Description	
ISC40G			General purpose inductive conductivity sensor	
ISC40S			Intrinsically safe inductive conductivity sensor	
Sensor type	-GG -GR -GS -TG		Glass filled PEEK, general model Glass filled PEEK, retractable model Glass filled PEEK, shaft model PFA, general model	
Temperature Sensor	-T1		Pt1000	
Cable length	-3 -5 -10 -15 -20		03 meter 05 meter 10 meter 15 meter 20 meter	
Options for Sensor Flange adapters -GG, -TG		/SFA /SFD /STW /S2W /TFD /TFN	AISI 316 SS AISI 316 SS AISI 316 SS AISI 316 SS TFM, AISI 316 SS TFM	Proc.Connection 2" ANSI 150 lbs DN50 PN40 3" tri-clamp 2" tri-clamp DN65-PN10 / PN16 For DN65-PN10 / PN16
Flange adapters for -GS		/SFT /STC1 /STC2	AISI 316 SS AISI 316 SS AISI 316 SS	Sanitary Tuchenhagen Sanitary 2" tri clamp Tri-clamp complete
Protection Hose for -TG, -GG		/PH"	03m /05m /10m /15m /20m Same length as the cable	
Certificates		/M	Material certificate	Only for metal parts of flange adapters, except /TFD and /TFN

**Note :** A quality certificate (QIC) is standard included with the product

**Note :** All available models are mentioned in appendix 2

### ■ 3. Spare parts

**Table 5:** Spare parts model codes and description

Part no.	Description	Quantity
K1542FE	2" tri-clover weld-in piece	1
K1542FH	3" tri-clover weld-in piece	1
K1500AW	Flexible conduit, 5 meters	1
K1500AX	Flexible conduit, 10 meters	1
K1500AY	Connection parts conduit	1
K1500CJ	Option /PH05 for immersion fitting	1
K1500DN	/PH03 cable protection ISC40-TG/GG	1 x 3m
K1500DP	/PH05 cable protection ISC40-TG/GG	1 x 5m
K1500DQ	/PH10 cable protection ISC40-TG/GG	1 x 10m
K1500DR	/PH15 cable protection ISC40-TG/GG	1 x 15m
K1500DS	/PH20 cable protection ISC40-TG/GG	1 x 20m
K1500DT	O-ring set Viton ISC40 /PH..	5
K1500BP	Clamp seal ring 2" EPDM	1
K1500AM	Gasket Viton	5
K1500AL	Mounting nut AISI 316 SS	3

**Table 6:** Sensor options and flange adapter model code and description

Options ISC40 sensor, Flange adapters				
Part no.	Description	Process connection	Material	O-ring(s)
K1541ZR	/SFA	2" ANSI 150 lbs	AISI 316 SS	Viton
K1541ZQ	/SFD	DN50	AISI 316 SS	Viton
K1541KB	/STW	3" ANSI tri-clamp	AISI 316 SS	EPDM
K1541KC	/S2W	2" ANSI tri-clamp	AISI 316 SS	EPDM
K1541XF	/TFD	DN65 PN10 / PN16	AISI 316 SS, TFM	FFKM
K1541XG	/TFN	used with DN65 PN10 / PN16	TFM	FFKM
K1541ZP	/SFT	Sanitary Tuchenhagen	AISI 316 SS	EPDM
K1541ZG	/STC1	Sanitary 2" tri-clamp	AISI 316 SS	EPDM
K1541ZF	/STC2	Tri-clamp complete	AISI 316 SS	EPDM
K1500HG		T-piece set DN80, PFA lined	DN80 PN16	
K1500HF		T-piece set DN100, PFA lined	DN100 PN16	

**Note :** Other O-ring materials are available as a spare part

**Table 7:** Sensor O-ring sets and flange adapter model code and description

<b>O-rings ISC40 sensor, Flange adapters</b>				
Part no.	Description	Dimensions	Material	Quantity
<b>O-rings /SFA, /SFD</b>				
K1500CA	O-ring set	40.64 x 5.33; 26.57 x 3.53	EPDM	5 sets
K1500CB	O-ring set	40.64 x 5.33; 26.57 x 3.53	Viton	5 sets
K1500CC	O-ring set	40.64 x 5.33; 26.57 x 3.53	Silicon	5 sets
K1500CD	O-ring	40.64 x 5.33	FFKM	1
K1500CH	O-ring	26.57 x 3.53	FFKM	1
<b>O-rings /STW</b>				
K1541ZK	O-ring set	40.87 x 3.53; 26.65 x 2.62; 3" seal-clamp	EPDM	2 sets
<b>O-rings /S2W</b>				
K1541ZH	O-ring set	40.87 x 3.53; 26.65 x 2.62; 2" seal-clamp	EPDM	2 sets
K1500DJ	O-ring set	40.87 x 3.53; 26.65 x 2.62; 2" seal-clamp	Viton	2 sets
K1500DK	O-ring set	40.87 x 3.53; 26.65 x 2.62; 2" seal-clamp	Silicon	2 sets
<b>O-rings /TFD, /TFN</b>				
K1500AH	O-ring	29.74 x 3.53	FFKM	1
<b>O-rings /SFT</b>				
K1500CM	O-ring set	18.72 x 2.62; 60 x 3	EPDM	5 sets
<b>O-rings /STC1</b>				
K1500CQ	O-ring	18.72 x 2.62	EPDM	5
K1500CP	O-ring	18.72 x 2.62	Viton	5
K1500CR	O-ring	18.72 x 2.62	Silicon	5
<b>O-rings /STC2</b>				
K1500CT	O-ring set	18.72 x 2.72; 2" seal-clamp	EPDM	5 sets
K1500CS	O-ring set	18.72 x 2.72; 2" seal-clamp	Viton	5 sets
K1500CU	O-ring set	18.72 x 2.72; 2" seal-clamp	Silicon	5 sets

### ■ 4. Dimensional drawings

Dimensions in mm [inches].

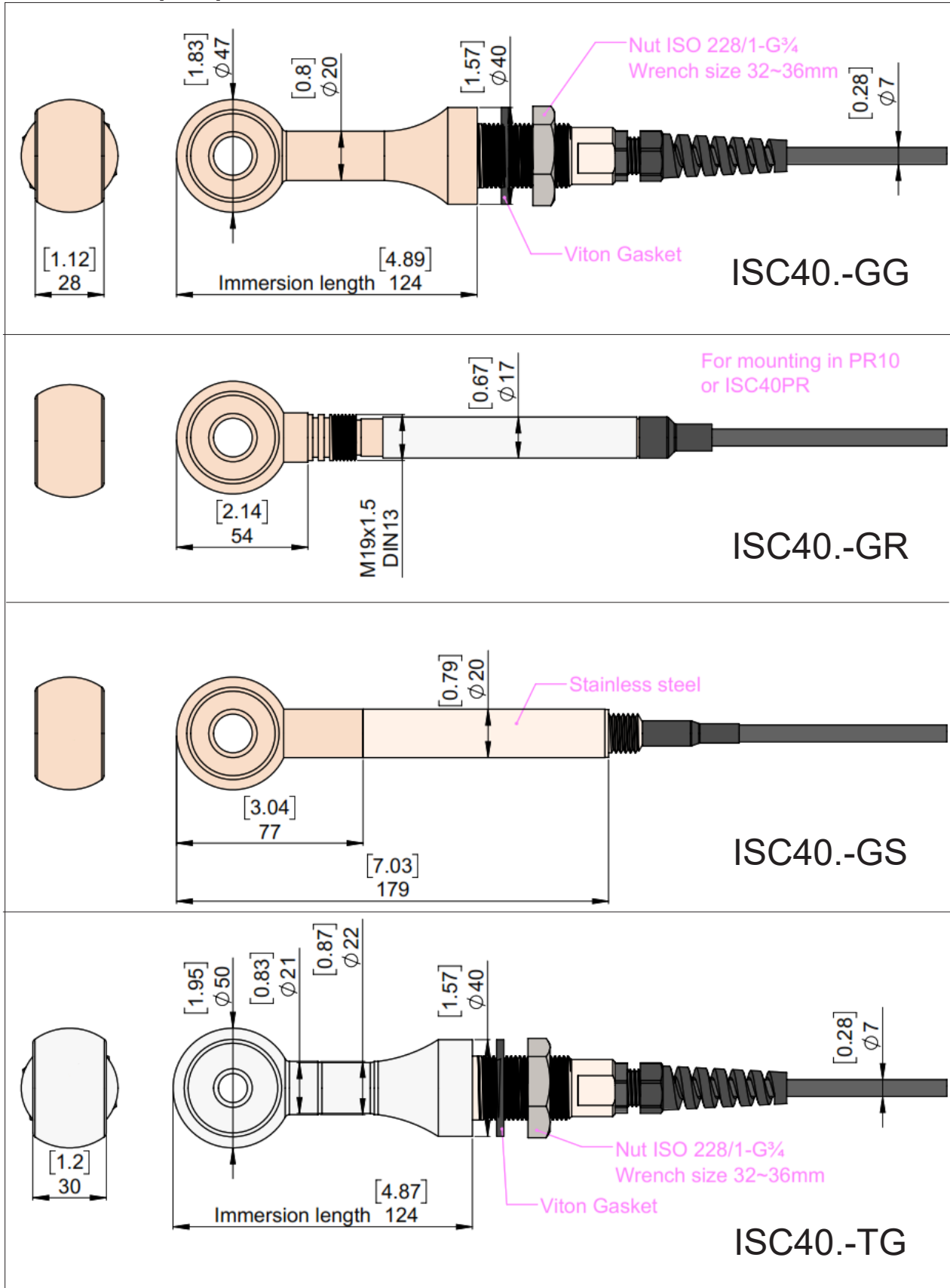


Fig 2: ISC40G(S)-GG -GR -GS -TG



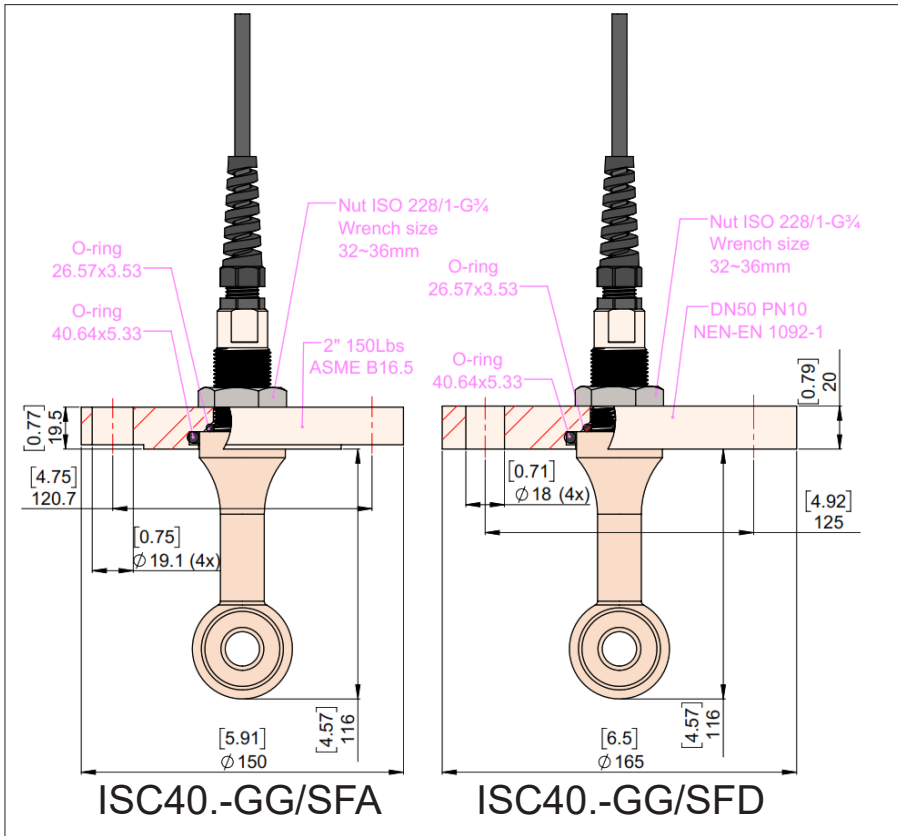


Fig 3: Option /STW, /S2W

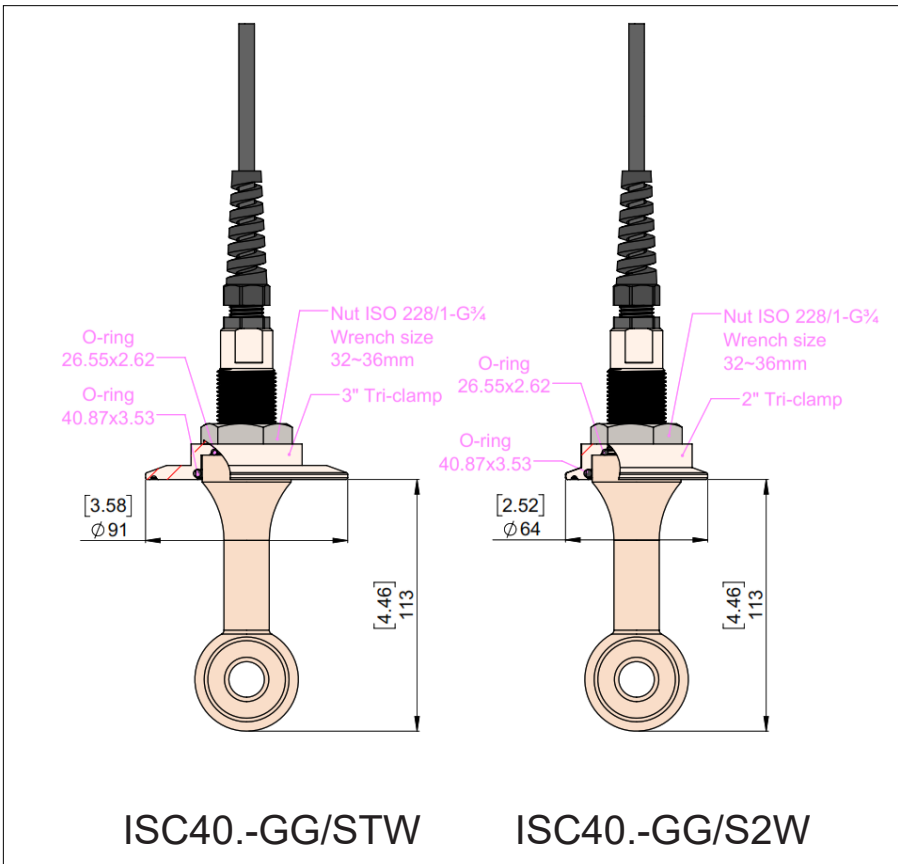
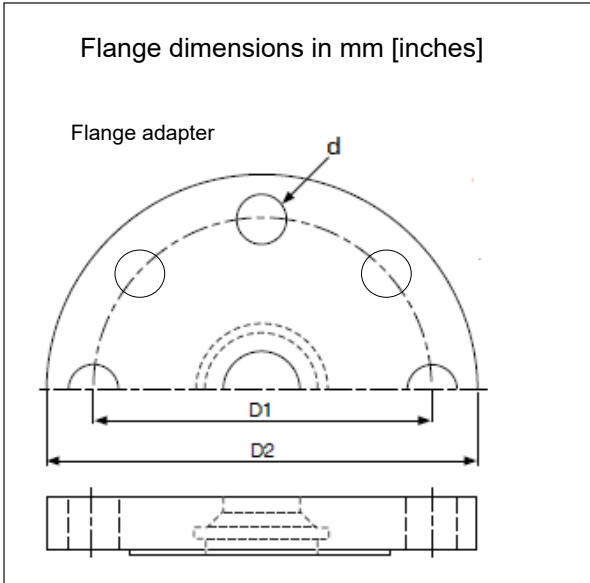


Fig 4: Option /SFA, /SFD

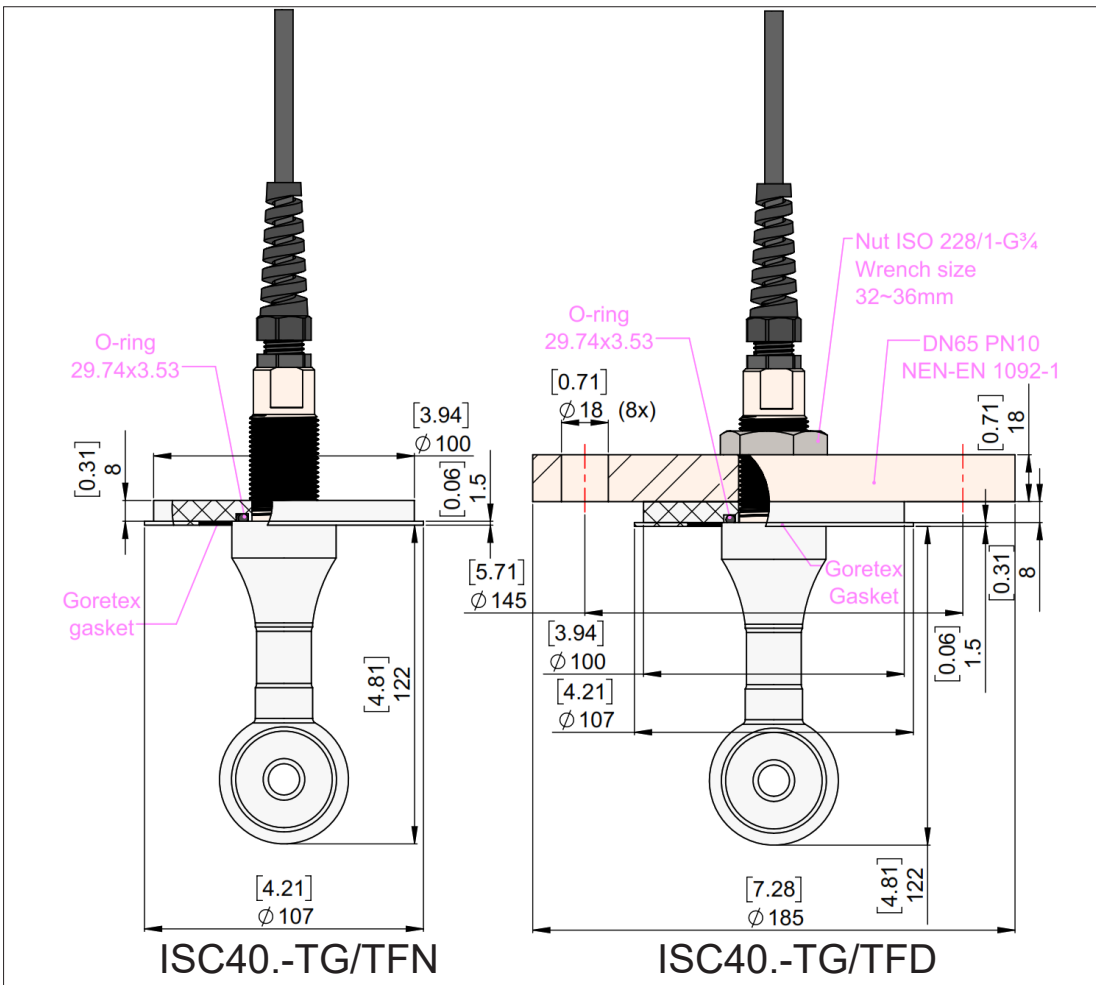


**Table 8:** Flange dimensions

Option	d	D1	D2
/SFA	∅19 [0.75]	121 [4.76]	152 [6.0]
/SFD	∅18 [0.71]	125 [4.92]	165 [6.5]
/TFD	∅18 [0.71]	145 [5.71]	185 [7.3]

**Fig 5:** Flange adapter dimensions Option /SFA, /SFD

**Note 11:** According to EN1092-2 (Cast iron flanges) and EN1092-3 (Copper alloy flanges), the flanges in the DN65 PN10 and DN65 PN16 are supplied 8 holes.



**Fig 6:** Flange adapters (opt. /TFD, /TFN) for –TG sensor in combination with T-piece

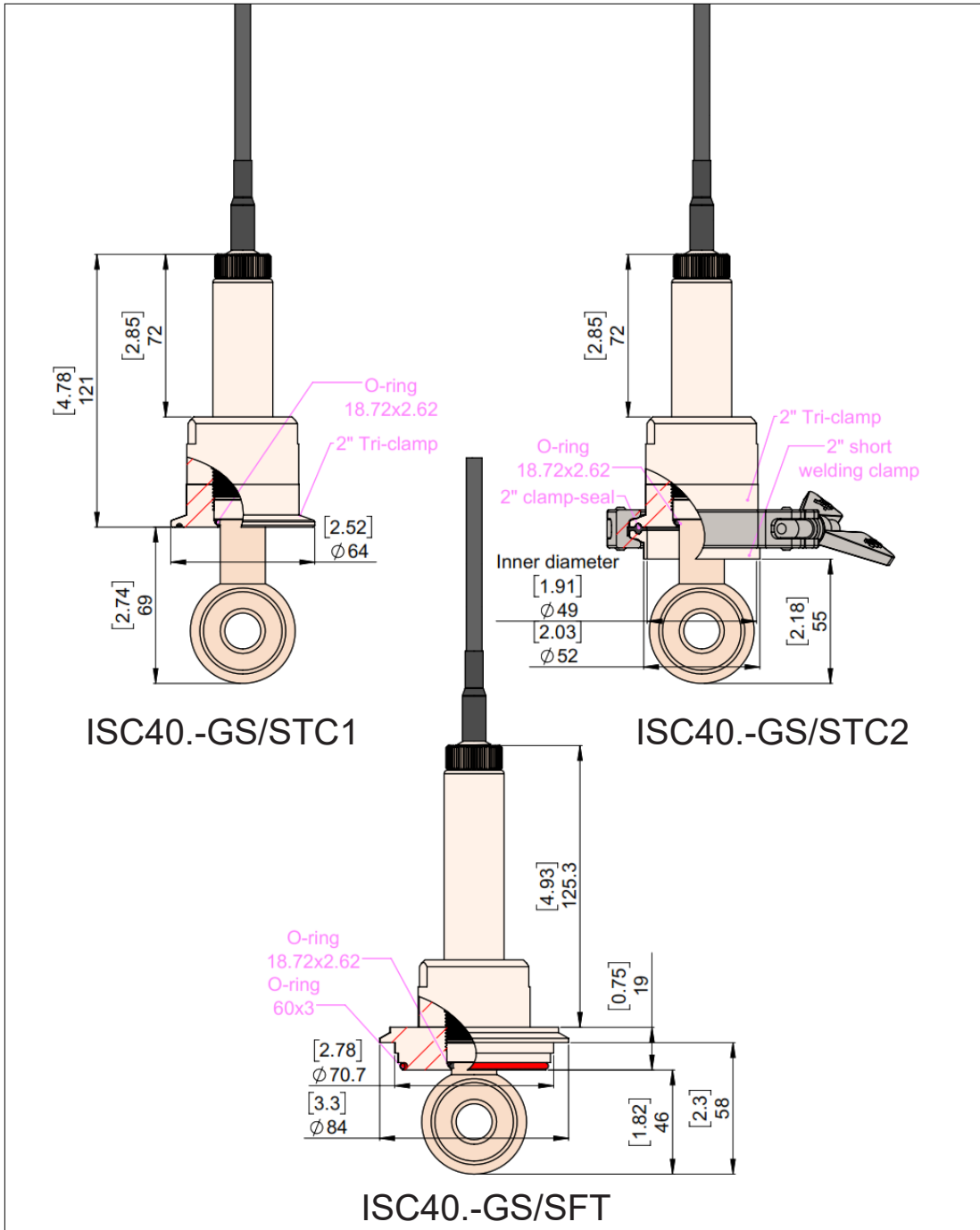
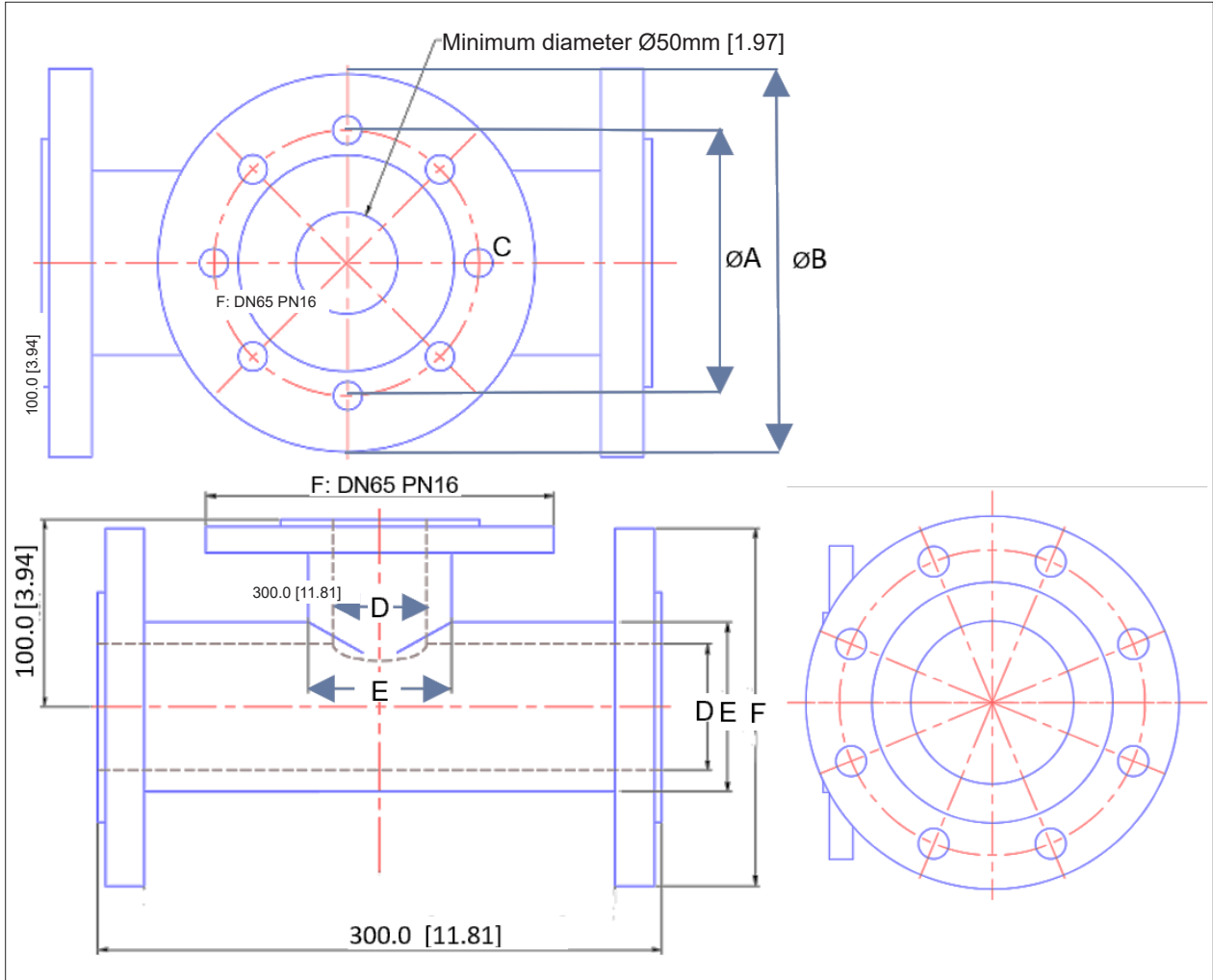


Fig 7: Option /SFT, /STC1, /STC2

**Table 9:** T-piece model codes

Part no.	Flanges	Description
K1500HG	DN80 PN16	T-piece set DN80, PFA lined
K1500HF	DN100 PN16	T-piece set DN100, PFA lined



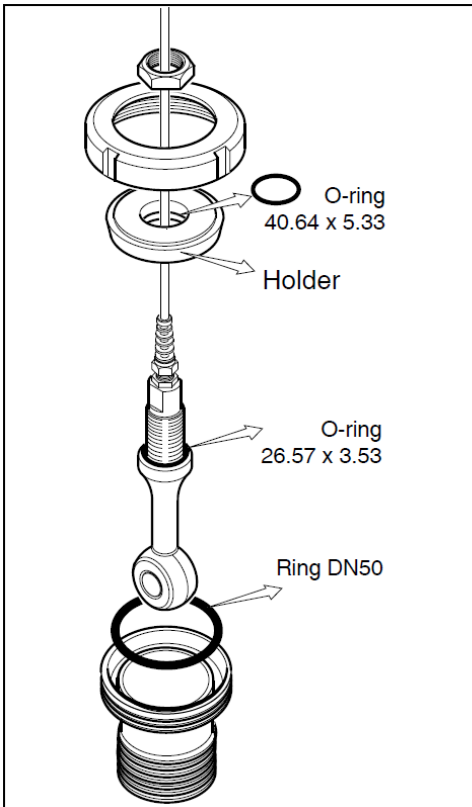
**Fig 8:** T-piece dimension

- Mounting flange and bolts are included
- Innerside of T-piece is lined with PFA
- Thickness : min 3.5 mm [0.14]
- Flange material : SS316

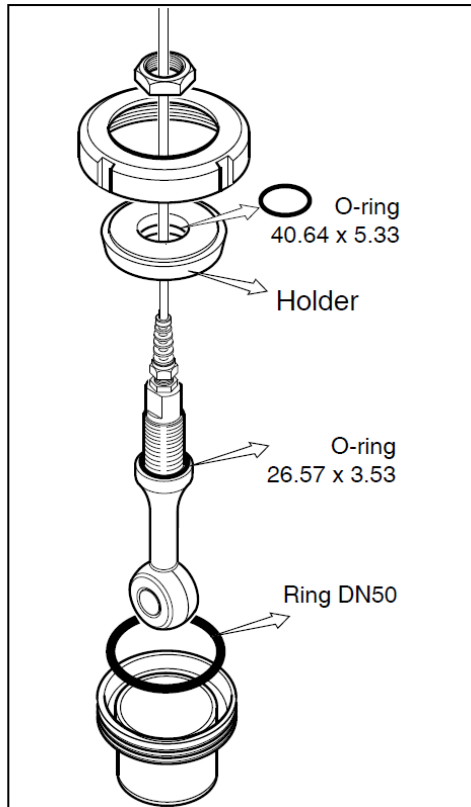
**Table 10:** T-piece dimension

A	B	C	D	E	F
185	145	8 X Ø18	50	76	DN65 PN16
200	160	8 X Ø18	67	90	DN80 PN16
220	180	8 X Ø18	85	114.2	DN100 PN16

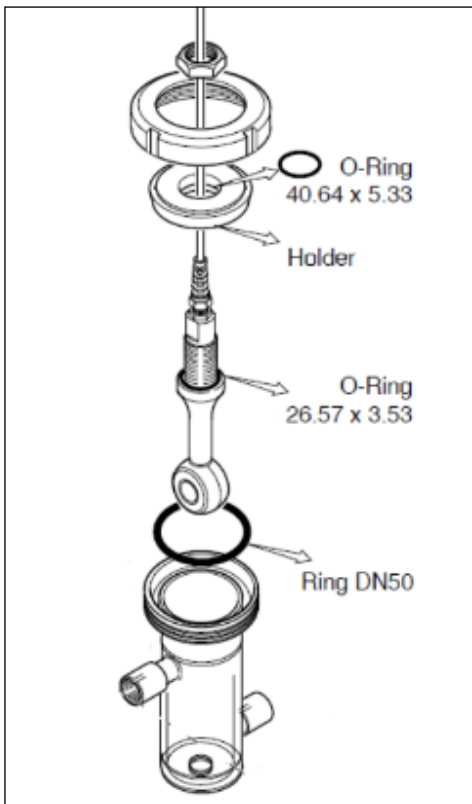
### Addendum 1: Installation examples



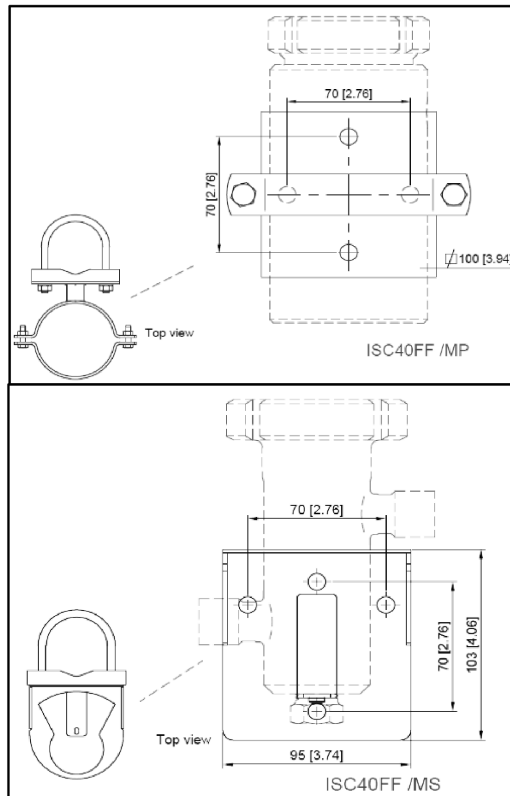
**Fig 9:** ISC40 sensor in screw-in sub-assembly ISC40FS-SCSA



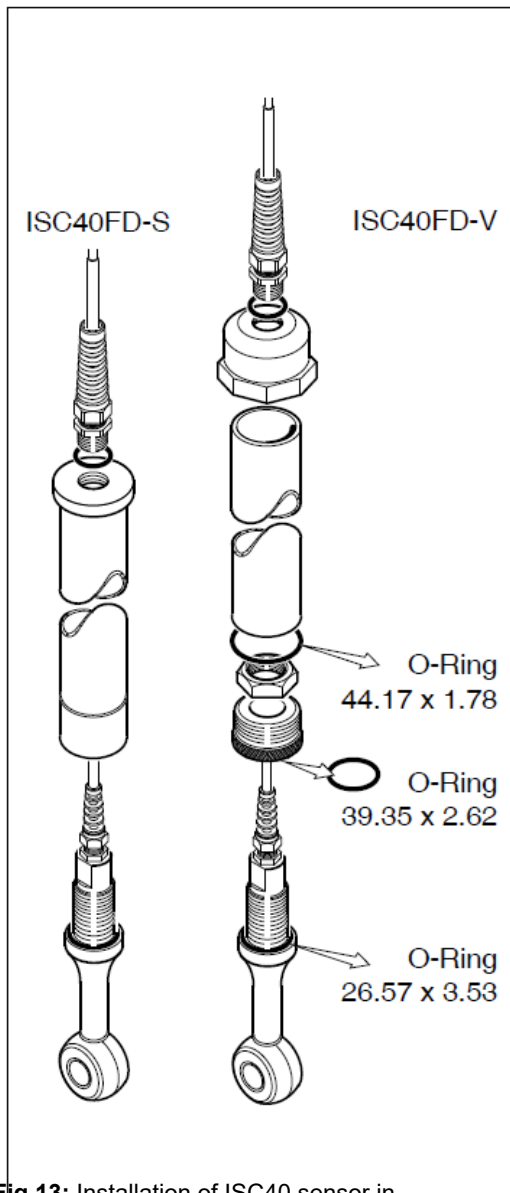
**Fig 10:** ISC40 sensor in weld-in sub-assembly ISC40FS-SCWN



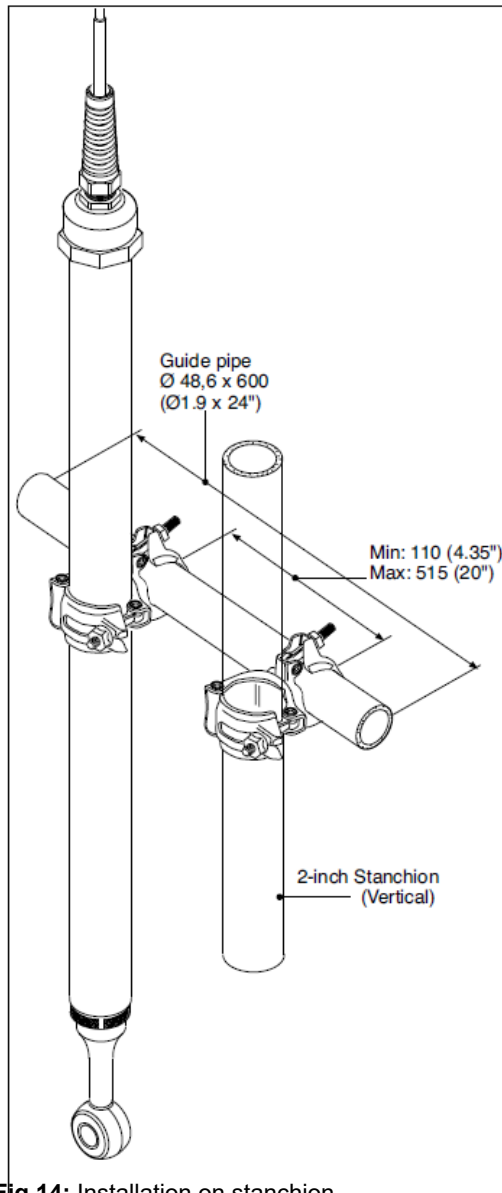
**Fig 11:** Installation of ISC40 sensor in flow fitting



**Fig 12:** Pipe/wall mounting kit ISC40 /MS or /MP  
See IM 12D07K04-01EN-P (ISC40FF) for details



**Fig 13:** Installation of ISC40 sensor in immersion fitting



**Fig 14:** Installation on stanchion with /MS1

## Adendum 2: Available models

**Table 11:** Available sensor model codes and options

MS-code -GG-	MS-code – GS -	MS-code – GR -	MS-code – TG-
ISC40G-GG-T3-03	ISC40G-GS-T3-03	ISC40G-GR-T3-03	ISC40G-TG-T3-03
ISC40G-GG-T3-05	ISC40G-GS-T3-05	ISC40G-GR-T3-05	ISC40G-TG-T3-05
ISC40G-GG-T3-10	ISC40G-GS-T3-10	ISC40G-GR-T3-10	ISC40G-TG-T3-10
ISC40G-GG-T3-15	ISC40G-GS-T3-15	ISC40G-GR-T3-15	ISC40G-TG-T3-15
ISC40G-GG-T3-20	ISC40G-GS-T3-20	ISC40G-GR-T3-20	ISC40G-TG-T3-20
ISC40G-GG-T1-03	ISC40G-GS-T1-03	ISC40G-GR-T1-03	ISC40G-TG-T1-03
ISC40G-GG-T1-05	ISC40G-GS-T1-05	ISC40G-GR-T1-05	ISC40G-TG-T1-05
ISC40G-GG-T1-10	ISC40G-GS-T1-10	ISC40G-GR-T1-10	ISC40G-TG-T1-10
ISC40G-GG-T1-15	ISC40G-GS-T1-15	ISC40G-GR-T1-15	ISC40G-TG-T1-15
ISC40G-GG-T1-20	ISC40G-GS-T1-20	ISC40G-GR-T1-20	ISC40G-TG-T1-20
ISC40S-GG-T1-03	ISC40S-GS-T1-03	ISC40S-GR-T1-03	ISC40S-TG-T1-03
ISC40S-GG-T1-05	ISC40S-GS-T1-05	ISC40S-GR-T1-05	ISC40S-TG-T1-05
ISC40S-GG-T1-10	ISC40S-GS-T1-10	ISC40S-GR-T1-10	ISC40S-TG-T1-10
ISC40S-GG-T1-15	ISC40S-GS-T1-15	ISC40S-GR-T1-15	ISC40S-TG-T1-15
ISC40S-GG-T1-20	ISC40S-GS-T1-20	ISC40S-GR-T1-20	ISC40S-TG-T1-20
/SFD	/STC1	/M	/SFD
/SFA	/STC2		/SFA
/STW	/SFT		/STW
/S2W			/S2W
/PH03			/TFD
/PH05			/TFN
/PH10			/PH03
/PH15			/PH05
/PH20			/PH10
			/PH15
			/PH20

### Adendum 3: Control Drawings

#### Control Drawing FM-Canada

The ISC40S sensor shall be installed with:  
 One of the Yokogawa transmitters model:

- ISC202S
- FLXA202
- FLXA21

with following parameters:

	ISC202S	FLXA202	FLXA21
<b>U<sub>o</sub></b>	14.4 V	11.76 V	11.76 V
<b>I<sub>o</sub></b>	88 mA	60.6 mA	60.6 mA
<b>P<sub>o</sub></b>	317 mW	178 mW	178 mW
<b>L<sub>o</sub></b>	4.5 mH	8 mH	8 mH
<b>C<sub>o</sub></b>	600 nF	100nF	100 nF

or

To a FM approved intrinsically safe apparatus meeting the entity parameters of the ISC40S:

$U_o \leq 14.4V$   
 $I_o \leq 88mA$   
 $P_o \leq 0.32W$   
 $C_o \geq C_i + C(\text{cable})$   
 $L_o \geq L_i + L(\text{cable})$

The effective inductive capacitance  $C_i$  and the effective induced inductance  $L_i$  of the sensor depends only upon the properties and the length of the connected cable (max 100m).

When installing this equipment, follow the manufacturer's control drawing.  
 Installation should be in accordance with Canadian Electrical Code (CEC) CSA22,1 and relevant local codes.

**WARNING:**  
 To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing or read, understand and adhere to the manufacturer's live maintenance procedures.

ISC40S sensor terminals 11-17.  
 Maximum cable length: 100m.

hazardous location

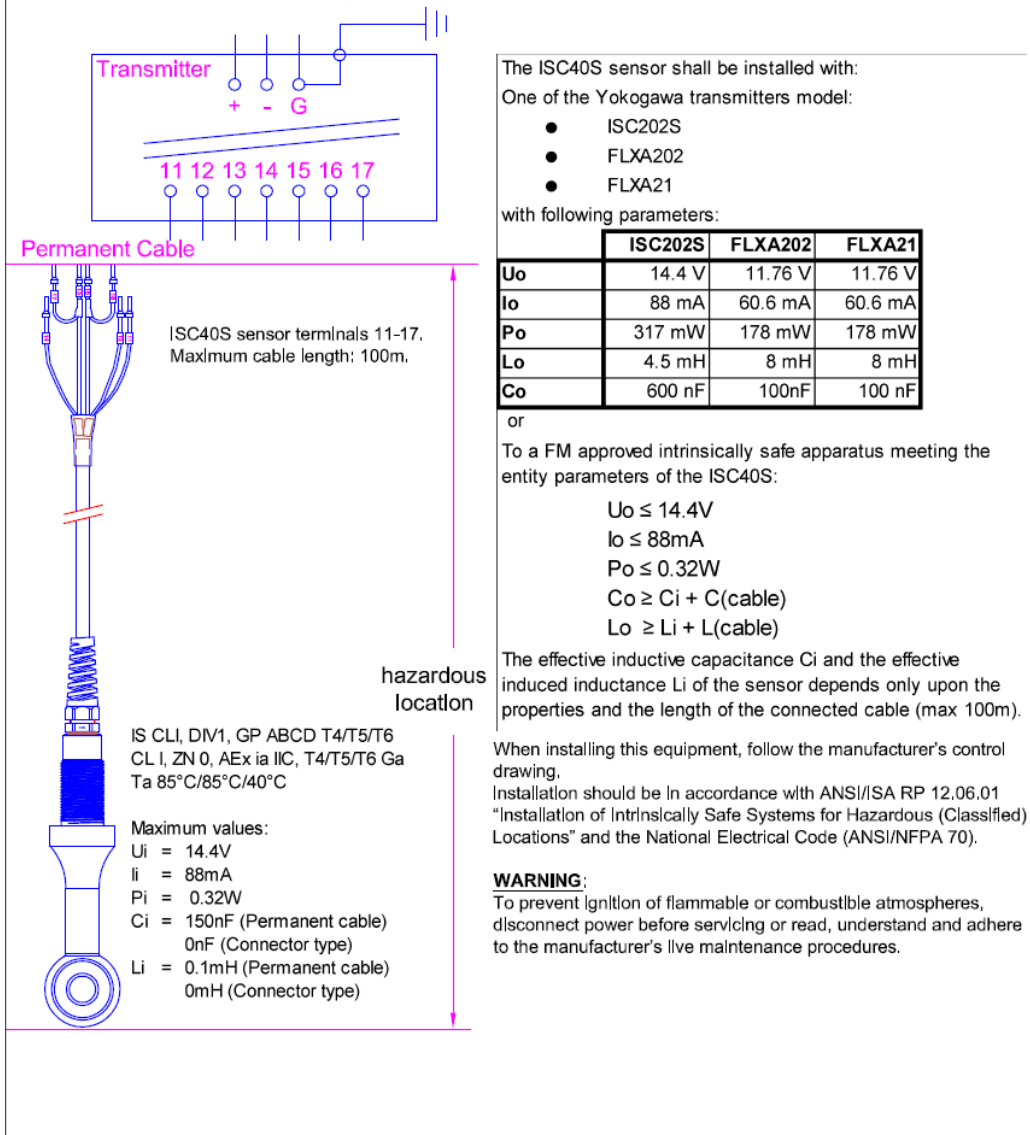
IS CL I, DIV1, GP ABCD T4/T5/T6  
 CL I, ZN 0, Ex ia IIC, T4/T5/T6 Ga  
 Ta 85°C/85°C/40°C

Maximum values:  
 U<sub>I</sub> = 14.4V  
 I<sub>I</sub> = 88mA  
 P<sub>I</sub> = 0.32W  
 C<sub>I</sub> = 150nF (Permanent cable)  
 0nF (Connector type)  
 L<sub>I</sub> = 0.1mH (Permanent cable)  
 0mH (Connector type)


- ISC40S -..... -..... -.....
- Connection type  
 -XX Permanent cable, length in meters (any number 01 - 99)
- Temperature Element  
 T1 PT1000
- Plastic and adaption code
- GG Glass filled PEEK, general model
  - GR Glass filled PEEK, retractable model
  - GS Glass filled PEEK, shaft model
  - TG PFA, general model
  - TR PFA, retractable model
  - TS PFA, shaft model



**Control Drawing FM-United States**



- ISC40S -..... -..... -.....
- Connection type
  - XX Permanent cable, length in meters (any number 01 - 99)
  - Temperature Element
  - T1 PT1000
  - Plastic and adaption code
  - GG Glass filled PEEK, general model
  - GR Glass filled PEEK, retractable model
  - GS Glass filled PEEK, shaft model
  - TG PFA, general model
  - TR PFA, retractable model
  - TS PFA, shaft model

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