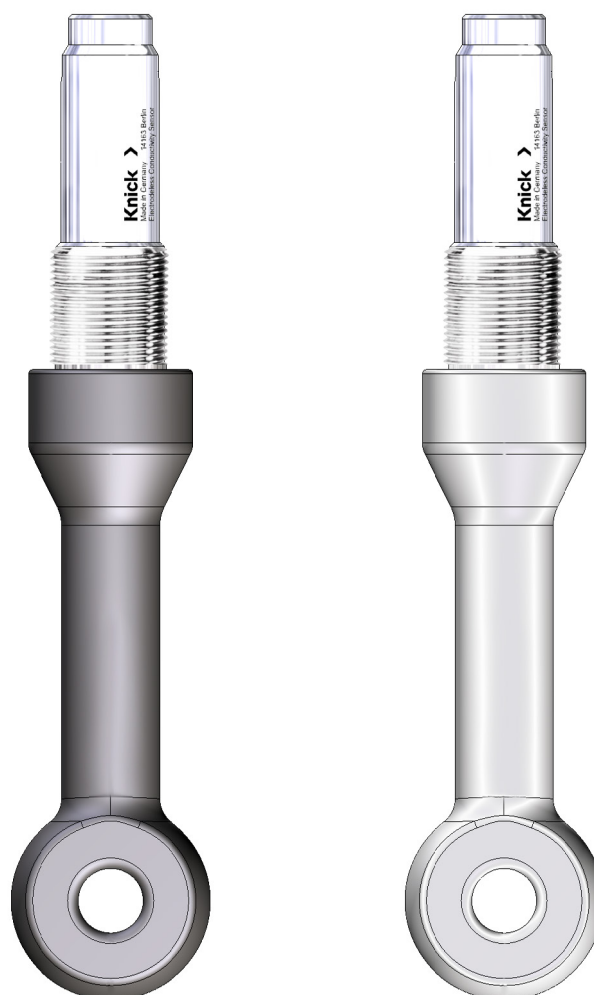


User Manual
English

SE 655(X) / SE 656(X) Toroidal Conductivity Sensors





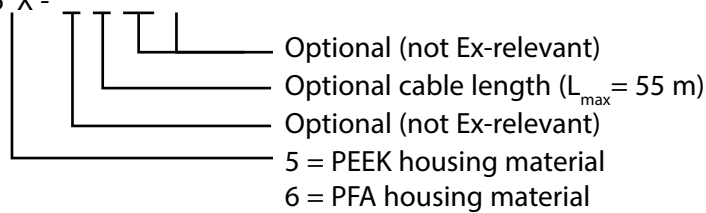
CAUTION! Failure to observe this warning may result in serious injury.

The safety alert symbol on the nameplate means:

Read these instructions for use, observe the specifications, and follow the notes on safety.

Subject and Type

Toroidal conductivity sensor type SE 65*X - ** ** * * *



Safety

- Application in hazardous location (sensor types SE655X and SE656X only): EC Type Examination Certificate Addendum 2 (DMT 01 ATEX E 088 X) and the current EN 60079-14 (Electrical installations in explosive atmospheres) shall apply.
- Manipulations of the equipment other than those described in the user manual are not permitted and are not subject to the manufacturer's product liability.
- Only qualified personnel for automation may carry out installation, operation and maintenance.
- When carrying out such work, personnel must comply with the relevant regulations and the information in the user manual.
- The sensors have been developed in compliance with the applicable European directives and standards. Compliance with the European standards for the use of SE656X and SE655X sensors in explosive atmospheres is confirmed by the EC Declaration of Conformity (attached).
- To safely use the sensors, compliance with the listed ambient and media temperature ranges is required (also see chapter "Special conditions for safe use in explosive atmospheres").
- To maintain the IP 68 protection during installation, use original gaskets and insert the cables in a professional manner.
- Installation tightness. Make sure that the gaskets are securely in place.

⚠ WARNING! Risk of injury from process medium

Do not dismantle the sensors as long as the process medium is under pressure.

NOTICE! For applications in aggressive media such as highly concentrated acids or bases, use the SE 656(X) sensor with sealing kits B or C (ZU 0340 N or ZU 0342 N) made of PTFE.

Special Conditions for Use in Explosive Atmospheres

The toroidal conductivity sensor may be connected to the intrinsically safe output circuits of the following devices (cable length $L_{\text{max}} = 55 \text{ m}$):

- Modular process analysis systems in the Protos series described in KEMA 03ATEX2530 with Protos module type CONDI 3400X-05*
- Process analytics devices in the Stratos series described in KEMA 08ATEX0100 with type MK_CONDI measuring module
- Stratos type 22*2 X Condi transmitter described in TÜV 99 ATEX 1431
- The sensors may only be used in liquid media with a conductivity of $> 10 \text{ nS/cm}$ (risk of electrostatic charging of the sensor).
- The sensors are suitable for use in the following ambient/process temperature range:
Temperature class T4: $-20 \dots +125 \text{ °C}$
Temperature class T6: $-20 \dots +75 \text{ °C}$
- The non-metallic process connector must be protected from electrostatic charging.
- If the connection cable is routed through an area that requires category 1G (EPL Ga) devices, protect the cable against electrostatic charging.
- Metallic process connection parts must be mounted at the installation site so that they are electrostatically conductive ($< 1 \text{ M}\Omega$).

Intended Use


The SE 655(X) and SE 656(X) toroidal conductivity sensors are particularly suited for applications in the chemical industry and for process analysis. Due to their wide measuring range and high chemical resistance of material with media contact, they are ideal for use in many applications.

- Determining the concentration of acids, alkalies, and salt solutions
- Monitoring product quality
- Controlling the phase separation of product mixtures

The SE 655X and SE 656X sensors are approved for operation in hazardous locations.

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General

Cell factor	Approx. 2 (for dependency on installation conditions, see Fig. 11 Influence of wall distance on the installation factor, page 10)
Transfer ratio	120.0
Sensor coding	F003
Measuring range	0 ... 2,000 mS/cm
Resolution	0.001 mS/cm
Measurement error (- 20 ... 100 °C)	± (0.005 mS/cm + 0.5 % meas. value)
Measurement error (> 100 °C)	± (0.010 mS/cm + 0.5 % meas. value)
Material	
SE 655(X)	PEEK
SE 656(X)	PFA
Process temperature	
Safe area	-20 ... 125 °C
Ex temperature class T4	-20 ... 125 °C
Ex temperature class T6	-20 ... 75 °C
Temperature response time t90 (DIN 746-1)	
SE 655(X)	Approx. 7 min
SE 656(X)	Approx. 11 min
	(For measuring processes with rapid temperature changes, use a separate temperature detector with fast response.)
Ambient temperature	-20 ... 70 °C
Storage temperature	-20 ... 80 °C
Process pressure	
SE 655(X)	0 ... 20 bar
SE 656(X)	0 ... 16 bar
Temperature detector	Pt100, Class A (IEC 751)
Assembly	G 3/4
Cable	
Length	5 m (Max. permissible cable length for ex application: 55 m)
Connection	Ferrules
Ingress protection (EN 60529)	IP 68 (sensor mounted, with original gasket)
Explosion protection SE 655X/SE 656X	 II 1G Ex ia IIC T4/T6 Ga
Weight	Approx. 1 kg

Chemical Resistance Depending on the Type, Concentration, and Temperature of the Process Medium

Medium	Concentration	Sensor	Gaskets
		Material: PEEK	Material: FKM (See product line for other materials)
Sodium hydroxide solution NaOH	0 ... 50 %	20 ... 100 °C (68 ... 212 °F)	Not suitable
Nitric acid HNO ₃	0 ... 10 %	20 ... 100 °C (68 ... 212 °F)	0 ... 120 °C (32 ... 248 °F)
	0 ... 40 %	20 °C (68 °F)	0 ... 120 °C (32 ... 248 °F)
Phosphoric acid H ₃ PO ₄	0 ... 80 %	20 ... 100 °C (68 ... 212 °F)	0 ... 120 °C (32 ... 248 °F)
Sulfuric acid H ₂ SO ₄	0 ... 2.5 %	20 ... 80 °C (68 ... 176 °F)	0 ... 120 °C (32 ... 248 °F)
	0 ... 30 %	20 °C (68 °F)	0 ... 120 °C (32 ... 248 °F)
Hydrochloric acid HCl	0 ... 5 %	20 ... 100 °C (68 ... 212 °F)	0 ... 120 °C (32 ... 248 °F)
	0 ... 10 %	20 ... 100 °C (68 ... 212 °F)	0 ... 120 °C (32 ... 248 °F)

Temperature and Pressure Resistance

P/T Diagram (Sensor Version)

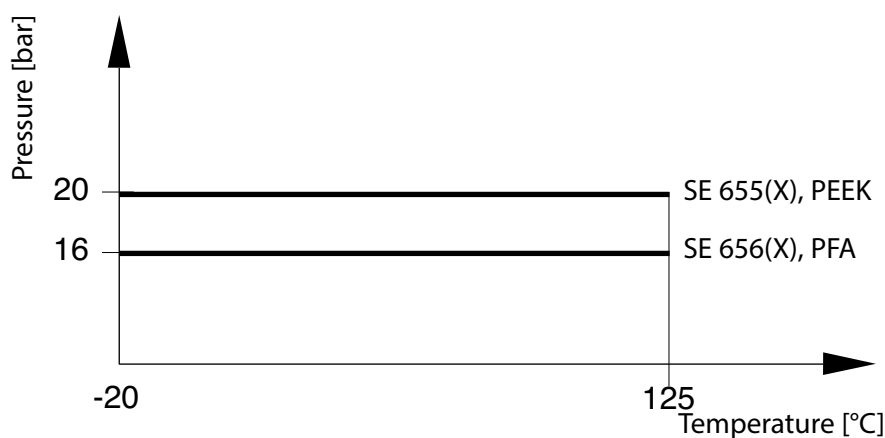


Fig. 1 Pressure/temperature curves for the different sensor materials

P/T Diagram (Flange Version)

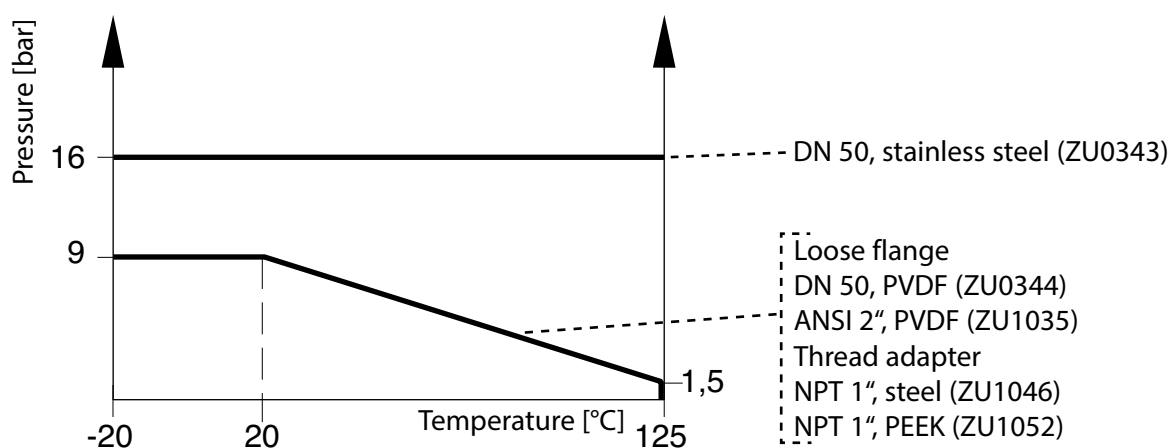


Fig. 2 Pressure/temperature curves for the different flanges

Electrical Connection

Connect the sensor cable to your measuring device.

Refer to the user manual of your measuring device for information on the electrical connection.

For further information, see www.knick.de.

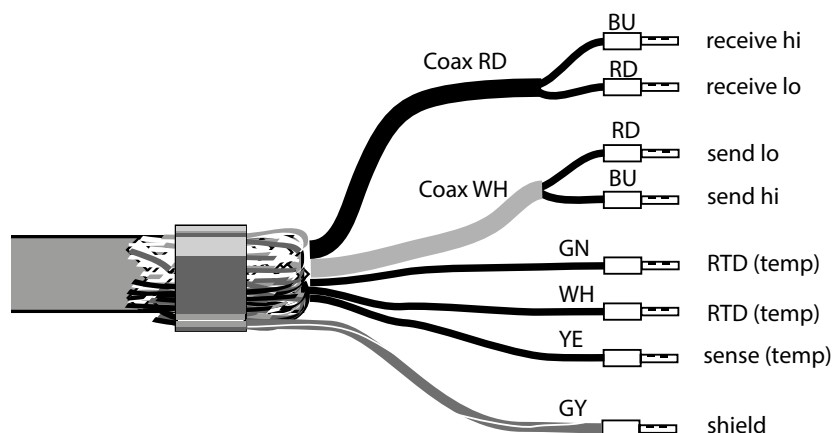


Fig. 3 Wire assignment of measuring cable

Identifying the Sensor

Safe-area model

Knick > SE655
Electrodeless Conductivity Sensor
14163 Berlin Made in Germany

Serial no.: 0123456789012

T=125°C PN=20bar(20°C)K=1,98 /cm

⚠ ⇒ ⓘ

Hazardous-area model

Knick > SE655X
Electrodeless Conductivity Sensor
14163 Berlin Made in Germany

Serial no.: 0123456789012

T=125°C PN=20bar(20°C)K=1,98 /cm

CE 004 Ex ⚠ ⇒ ⓘ

DMT 01 ATEX E 088 X
II 1G Ex ia IIC T4/T6 Ga
-20°C ≤ Ta ≤ 75°C (T6) / ≤ 125°C (T4)

Fig. 4 Model designation / rating plates of **SE 655(X)** sensors

Safe-area model

Knick > SE656
Electrodeless Conductivity Sensor
14163 Berlin Made in Germany

Serial no.: 0123456789012

T=125°C PN=16bar(20°C)K=1,98 /cm

⚠ ⇒ ⓘ

Hazardous-area model

Knick > SE656X
Electrodeless Conductivity Sensor
14163 Berlin Made in Germany

Serial no.: 0123456789012

T=125°C PN=16bar(20°C)K=1,98 /cm

CE 004 Ex ⚠ ⇒ ⓘ

DMT 01 ATEX E 088 X
II 1G Ex ia IIC T4/T6 Ga
-20°C ≤ Ta ≤ 75°C (T6) / ≤ 125°C (T4)

Fig. 5 Model designation / rating plates of **SE 656(X)** sensors

Assembly, with PTFE washer (for flange protection)

Max. torque 20 Nm, 36 mm wrench

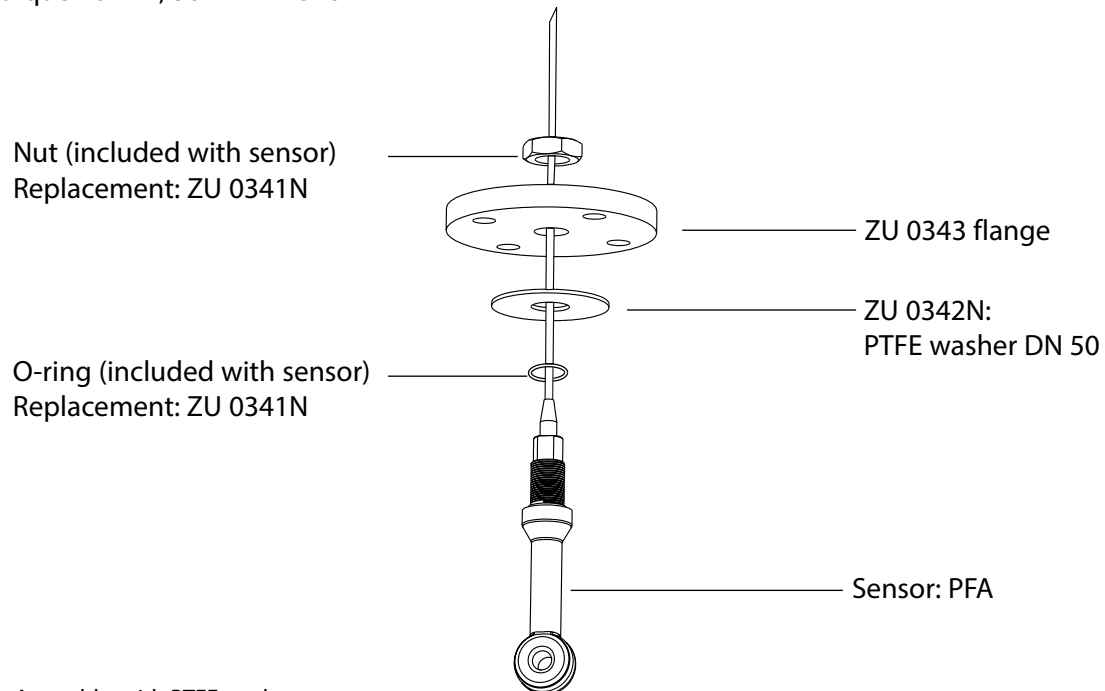


Fig. 6 Assembly, with PTFE washer

Assembly with NPT 1" Adapter

Max. torque 20 Nm, 41 mm wrench

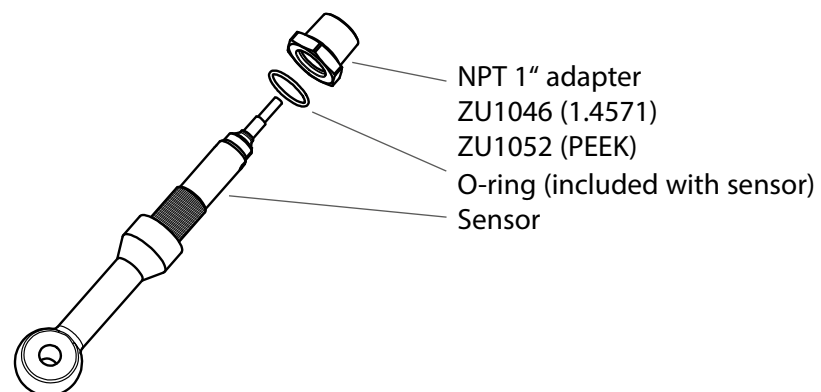


Fig. 7 Assembly with NPT 1" adapter

Assembly, without PTFE washer (flange wetted by process medium)

Max. torque 20 Nm, 36 mm wrench

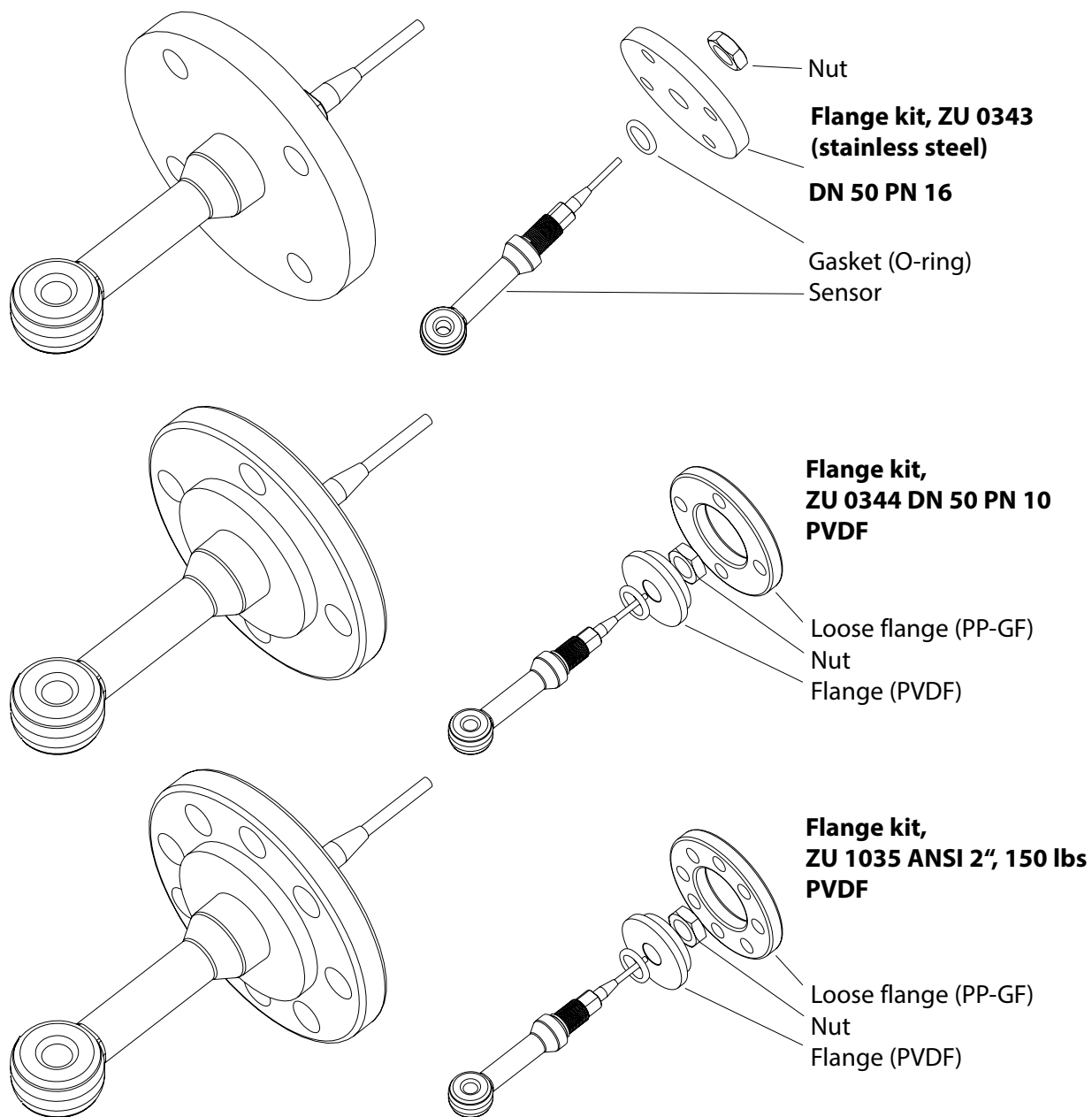


Fig. 8 Assembly with DN 50, ANSI 2" loose flange

Installation Conditions

Min. distance 15 mm (no change of cell factor)

With a distance of less than 15 mm to metallic tank or pipe walls, the cell factor will be reduced.

With insulating walls, the cell factor will increase.

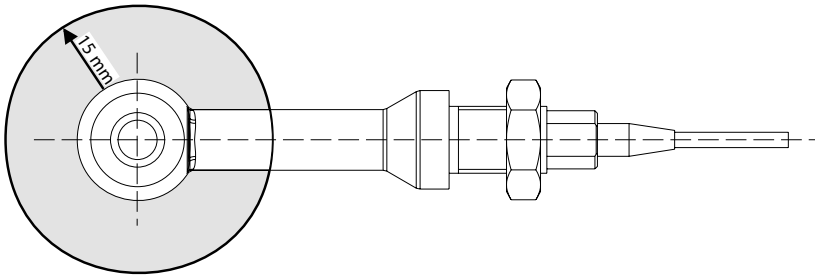


Fig. 9 Minimum extent of the free field without change of the cell factor

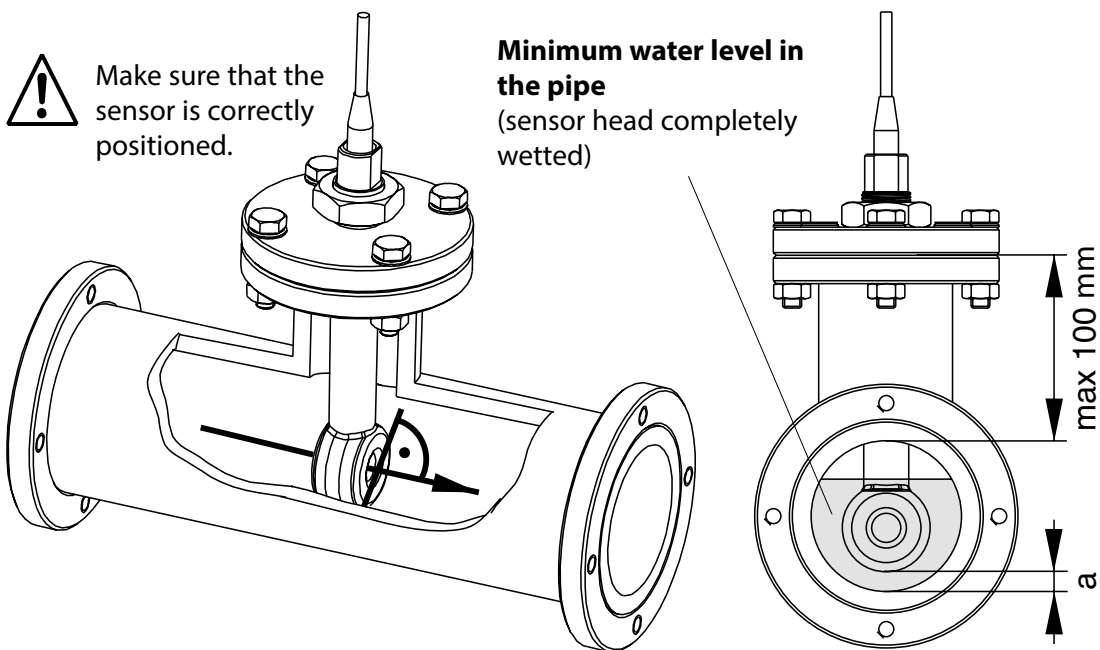


Fig. 10 Typical installation in a pipe

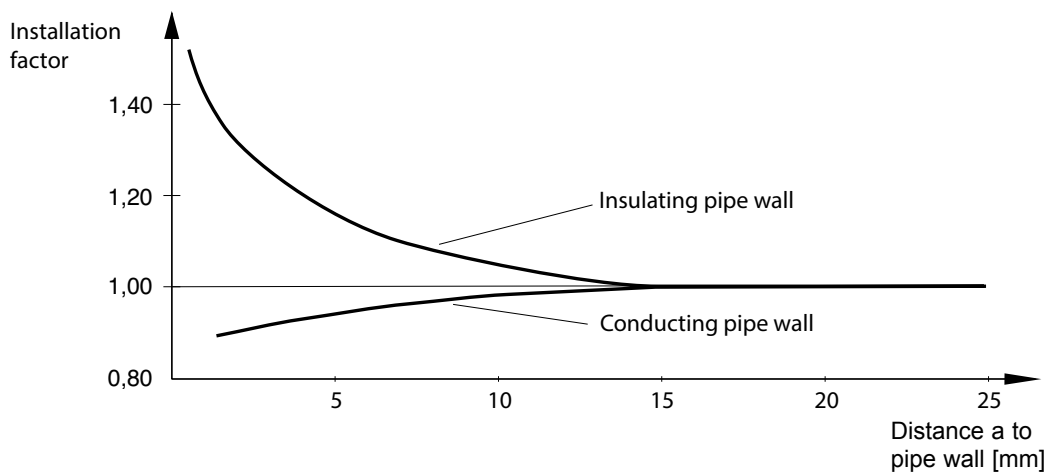
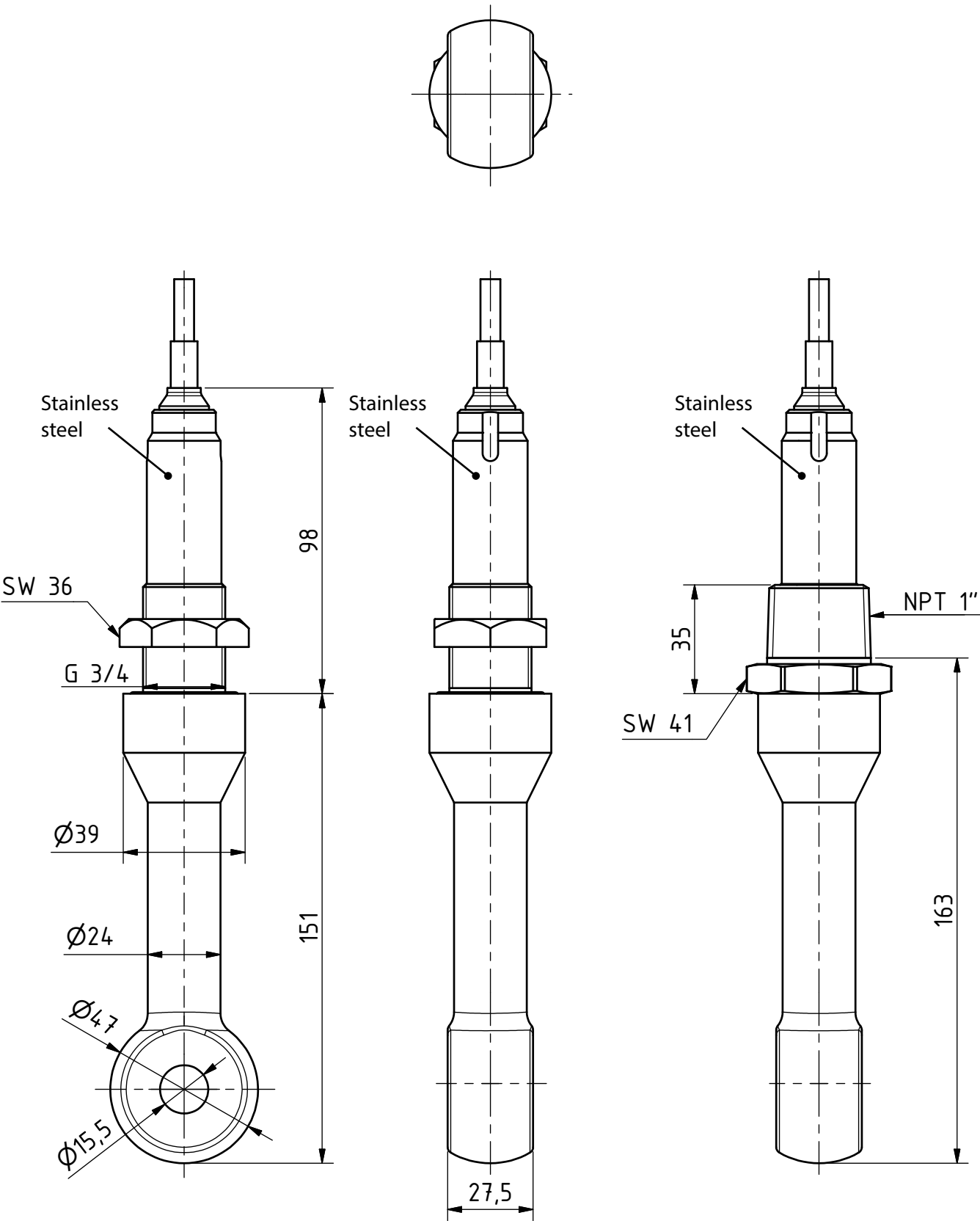


Fig. 11 Influence of wall distance on the installation factor

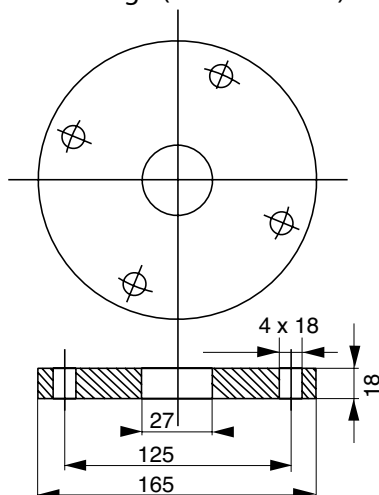


SW: across flats A/F

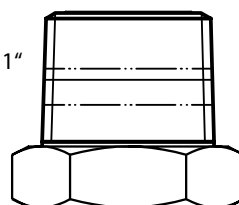
Fig. 12 Dimensions of the sensor in mm

Flange kit DN 50 PN 16, 316L,
ZU 0343

Flange (stainless steel)



NPT 1"

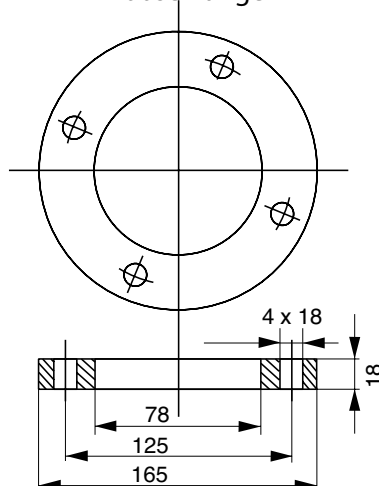


A/F: 41 mm

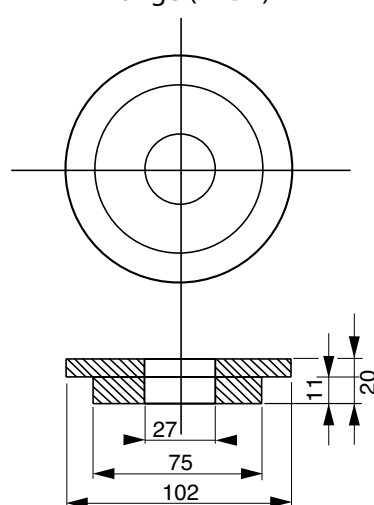
NPT 1" stainless steel **ZU1046**
NPT 1" PEEK **ZU1052**

Flange kit DN 50 PN 10, PVDF,
ZU 0344

Loose flange

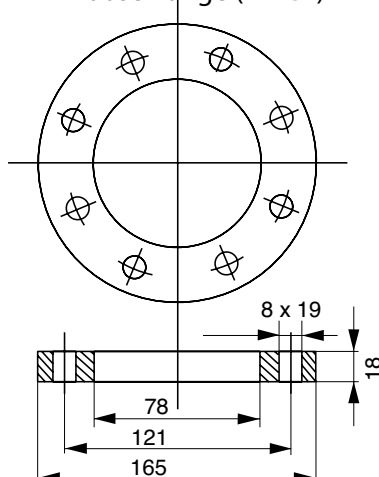


Flange (PVDF)



Flange kit ANSI 2", 150 lbs
ZU 1035

Loose flange (PP-GF)



Flange

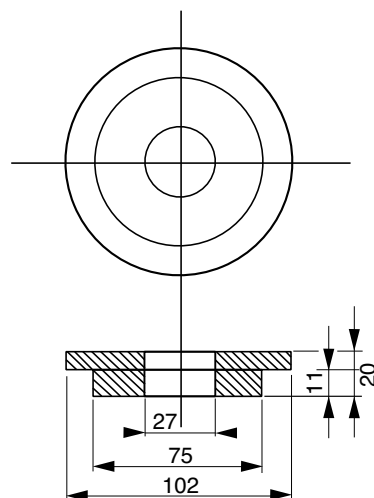


Fig.13 Dimensions of the flanges and adapters in mm

		Order No.
NPT 1" adapter	Material: stainless steel	ZU 1046
NPT 1" adapter	Material: PEEK	ZU 1052
Flange, DN 50 PN 16	Material: 316 L When measuring in aggressive media, you require sealing kit C.	ZU 0343
Flange, DN 50 PN 10	Material: PVDF	ZU 0344
Flange, ANSI 2" 150 lbs	Material: PVDF	ZU 1035
Gasket set A Substitute for SE655N-GEFFT0AM/ GEFTT0AM	Nut + FKM O-ring (3 x)	ZU 0340N
Sealing kit C	PTFE washer DN 50 (protects ZU 0343 flange against aggressive media)	ZU 0342N
O-rings	Material: FKM	O-ring 30x2.5 FKM
	Material: EPDM-FDA	O-ring 30x2.5 EPDM-FDA
	Material: FFKM	O-ring 30x2.5 FFKM
Conductivity standard	KCl 0.1 mol/l 250 ml 12.88 mS/cm \pm 1.5 %	CS-C12880K/500

For more accessories enabling the installation in immersion fittings or flow-through fittings, refer to the Knick "Process Analytics" catalog.

Knick
Elektronische Messgeräte
GmbH & Co. KG

Beuckestr. 22 • 14163 Berlin

Germany

Phone: +49 30 80191-0

Fax: +49 30 80191-200

info@knick.de

www.knick-international.com

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Version: 7

This document was last updated on June 03, 2019

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TA-163.350-KNE07