Technical
Information
TI 182C/07/en
No. 50090385

Conductivity Sensor
InduMax P CLS 50

Highly resistant inductive conductivity measuring cell for standard, Ex and high-temperature applications









With quality certificate

PEEK version

PFA version

The conductivity sensor CLS 50 is specially suitable for use in the chemical industry and in process engineering. The six-decade measuring range and high chemical resistance of the material in contact with the medium (PFA or PEEK) permit this measuring cell to be used in virtually any application conceivable. The wide temperature range of –20 to +180 °C leaves nothing to be desired.

Areas of application
- Chemical industry
  - Concentration measurement of acids and alkalis
  - Product quality monitoring of chemical products in tanks and pipelines
- Phase separation of product/product mixtures in pipe systems in food and pharma industry

Benefits at a glance
- To be used with Mycom CLM 152, MyPro CLM 431, MyPro CLD 431, Liquisys M CLM 223/253 measuring transmitters
- Measuring range from 0 to 2000 mS/cm
- High chemical resistance due to PFA coating
- Ex approval EEx ia IIC T6/T4
- PEEK version for high temperatures up to 180 °C
- Total cable length of up to 55 m
- Dirt-repellent PFA surface
- Integrated, coated Pt 100 temperature sensor, error class A
- Large sensor opening, therefore low risk of soiling
- Can be installed in ≥ DN 80 tees with the outgoing diameter reduced to ≥ DN 50

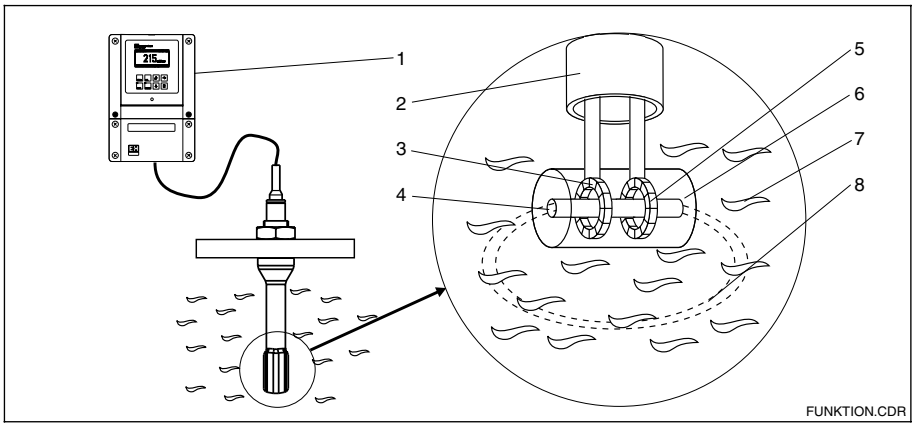
Quality made by
Endress+Hauser

ISO 9001

Endress+Hauser

Nothing beats know-how

Operating principle



Measuring and operating principle

1 Measuring instrument
2 Cable
3 Transmitting coil
4 Sensor opening
5 Receiving coil
6 Sensor housing
7 Medium
8 Induced electric current

Conductivity measurement
In inductive conductivity measurement, a transmitting coil (3) generates a magnetic alternating field that induces an electric voltage in a liquid. The ions present in the liquid enable a current flow which increases with increasing ion concentrations. The ion concentration serves as a measure of conductivity. The current (8) in the liquid generates a magnetic alternating field in the receiving coil (5). The resulting current induced in the receiving coil is measured and used to determine the conductivity value.

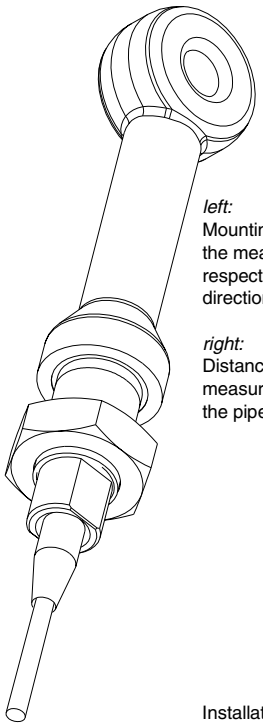
This measuring principle has the following advantages:
- No electrodes, therefore no polarisation
- Error-free measurement in strongly soiled media with a tendency to sediment
- Complete galvanic separation of measurement from medium.

Cell constant and installation factor

The electric conductivity of the liquid primarily depends on the ion concentration. However, installation and sensor geometry are factors that need to be taken into acount. The cell constant describes the geometry of the sensor completely.

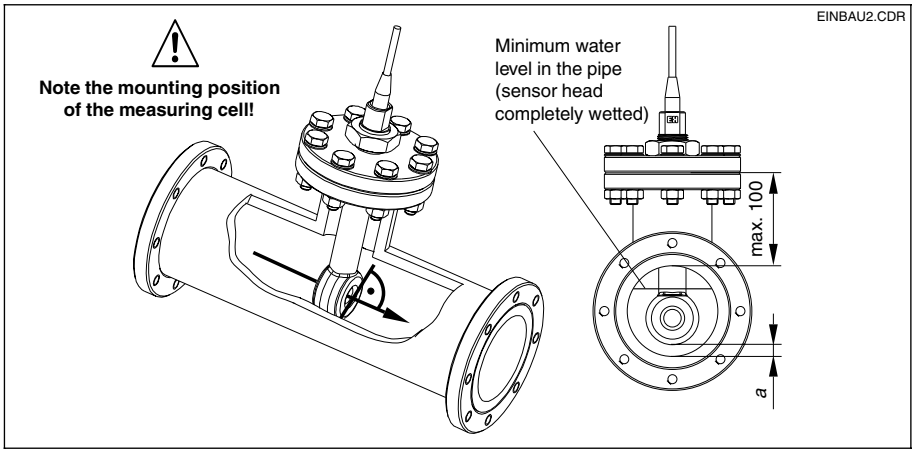
If the distance from the wall is sufficient (a > 30 mm), then it is not necessary to consider the installation factor (f = 1.00). If the distance from the wall is smaller, then the installation factor increases in the case of electrically insulating pipes (f > 1) and decreases in the case of electrically conductive pipes (f < 1).

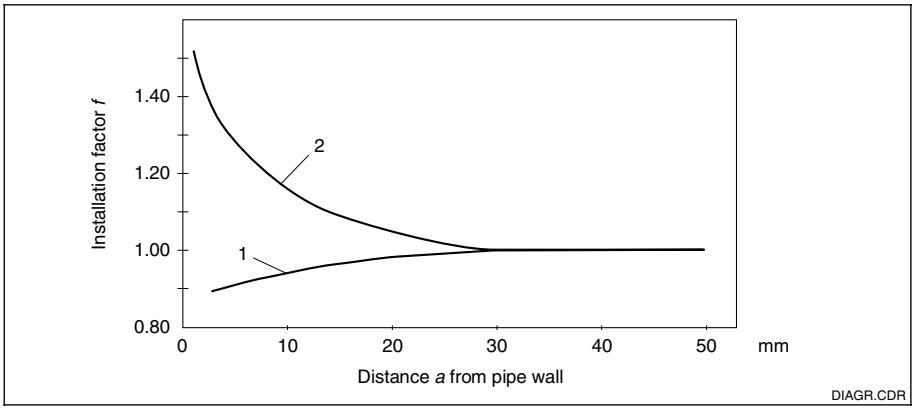
Installation



left:
Mounting position of the measuring cell with respect to the flow direction of the medium

right:
Distance *a* of the measuring cell from the pipe wall

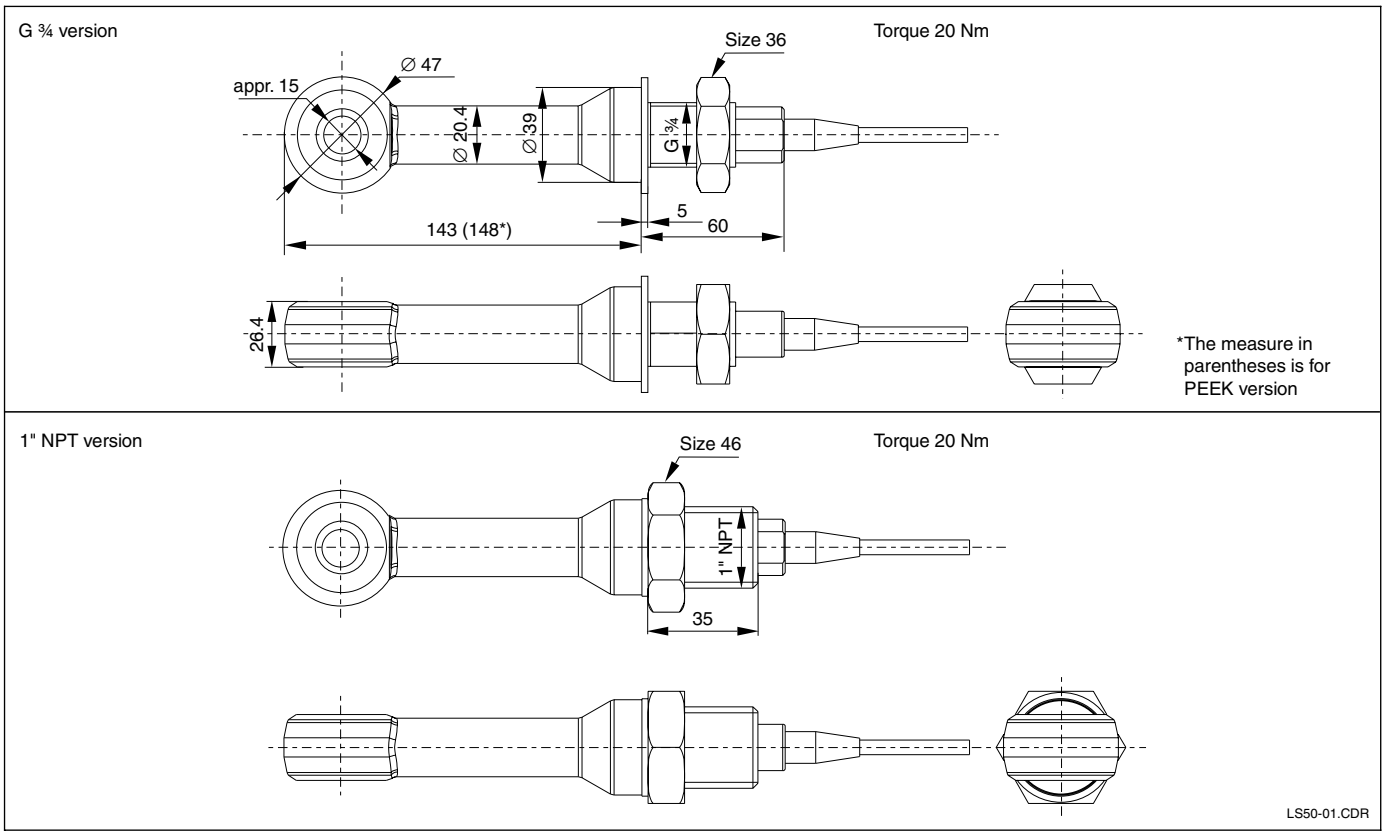




Installation factor *f* in dependence on distance *a* from pipe wall

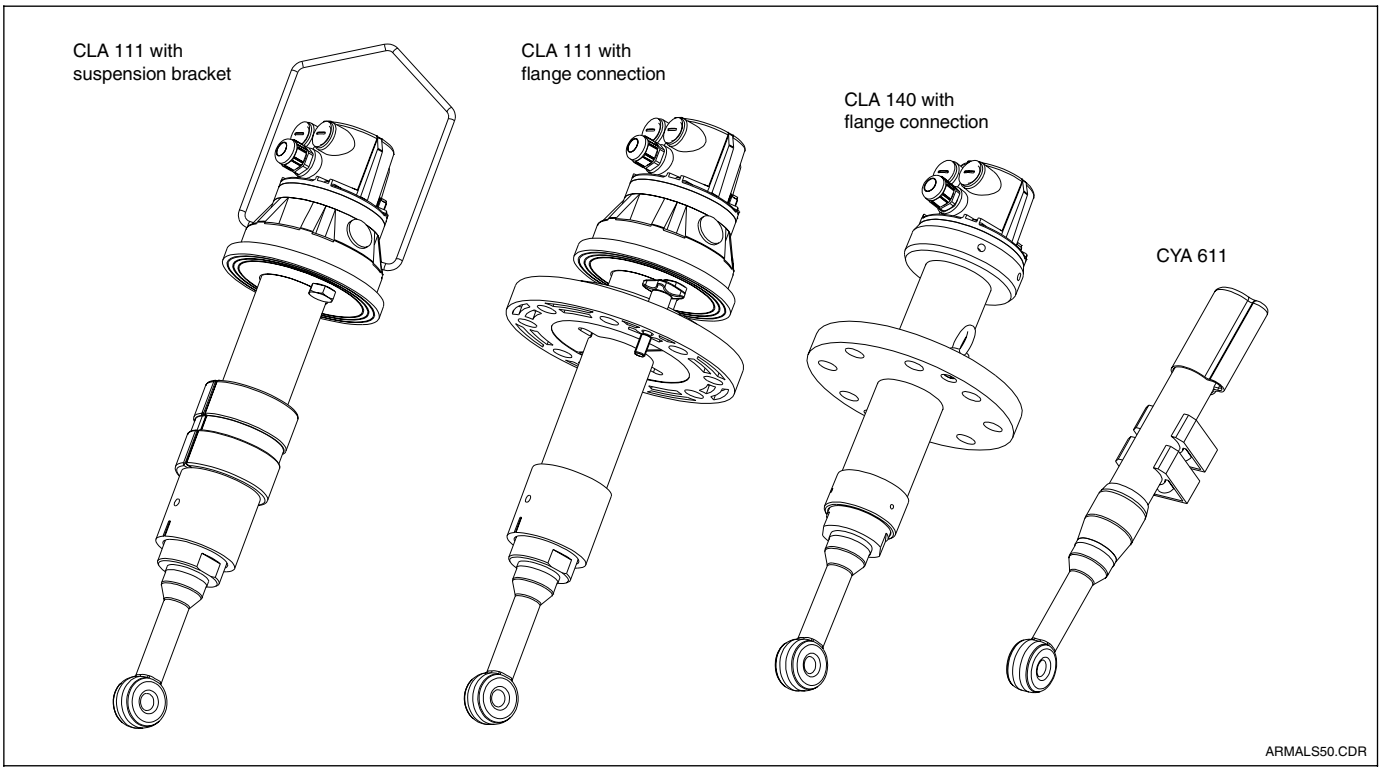
1 Conductive pipe
2 Insulating pipe

Dimensions



Dimensions: Versions with G ¾ thread (top) and 1" NPT thread (bottom)

Mounting of measuring cell with assembly and G ¾ version

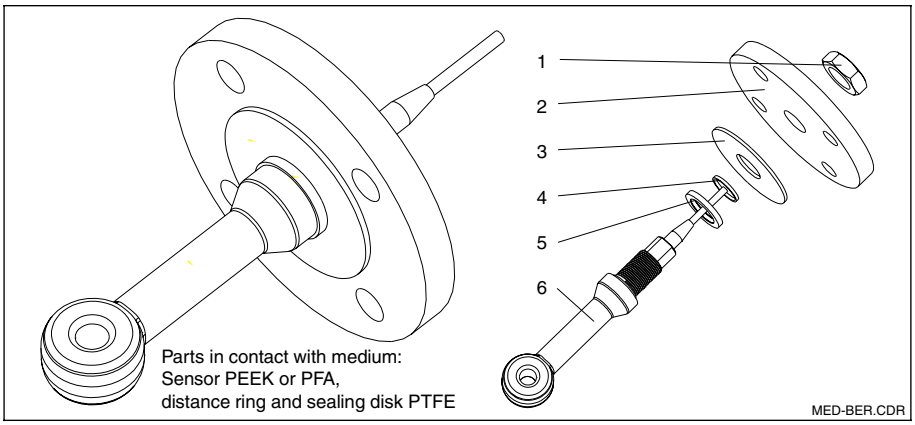


Assembly mounting of measuring cell, G ¾ version

Mounting of measuring cell with flange

Flange not in contact with medium, fixed flange (process connections 5, 6, 7)

1 Nut
2 Flange
3 Sealing disk
4 Distance ring
5 Sealing
6 Sensor

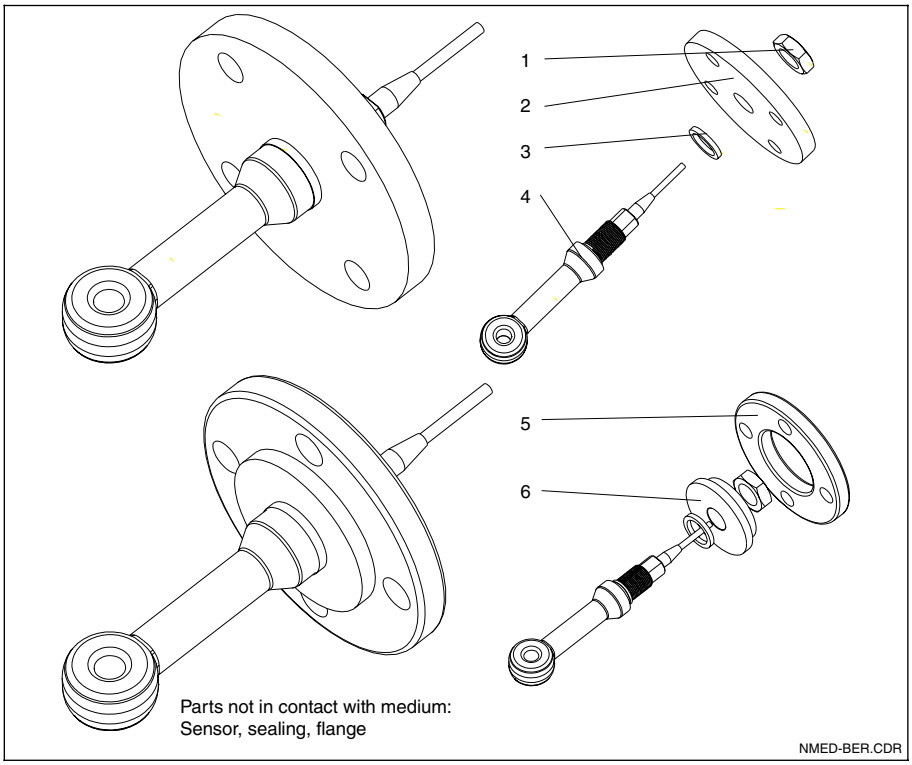


Flange in contact with medium

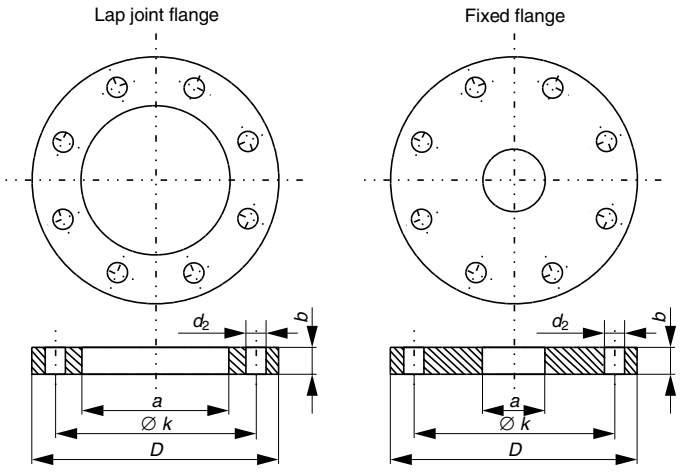
top:
Fixed flange (process connections 3, 4)

bottom:
Lap joint flange (process connections A, B, C)

1 Nut
2 Flange
3 Sealing
4 Sensor
5 Lap joint flange (UP-GF)
6 Flange (PVDF)

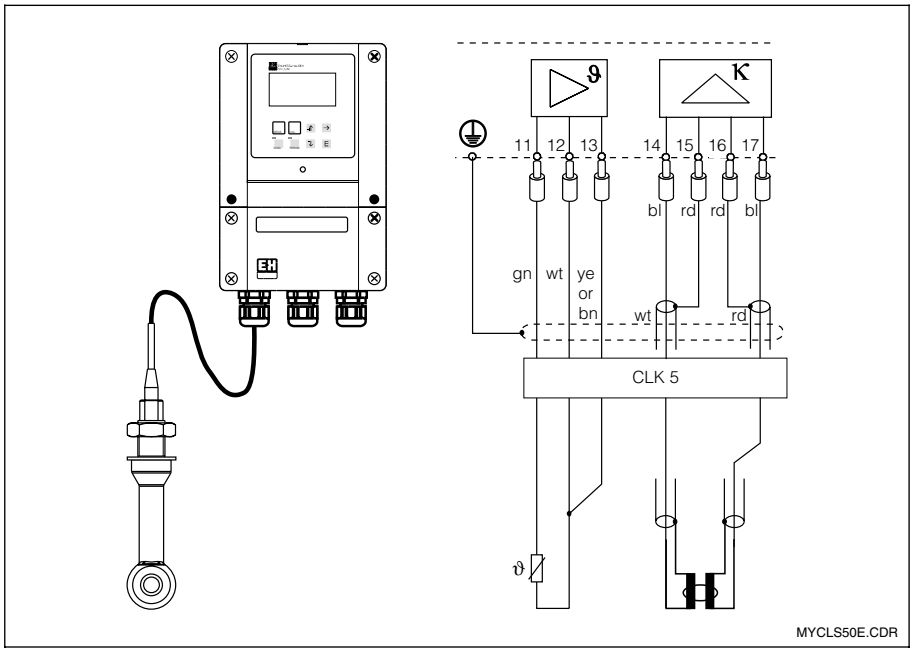


Flange dimensions

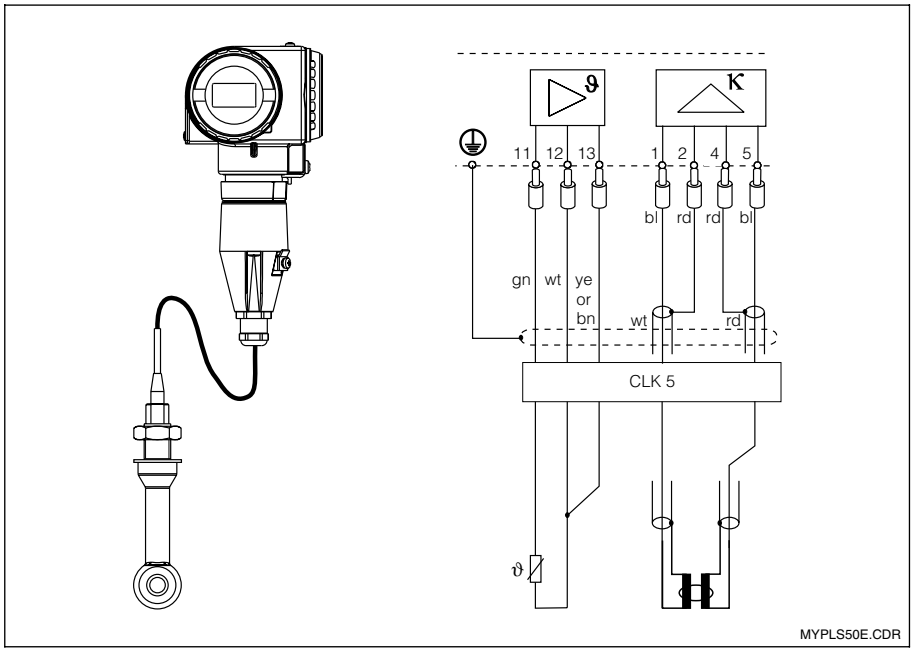


Fixed flange SS 316L	DN 50 PN 16	ANSI 2" 300 lbs	JIS 10K 50A
D	165	165.1	155
Ø k	125	127	120
d_2	4 × 18	8 × 19	4 × 19
b	18	22.2	16
a	27	27	27
Screws	M16	M16	M16
Lap joint flange PVDF	DN 50 PN 10	ANSI 2" 150 lbs	JIS 10K 50A
D	165	165	152
Ø k	125	121	120
d_2	4 × 18	8 × 19	4 × 19
b	18	18	18
a	78	78	78
Screws	M16	M16	M16

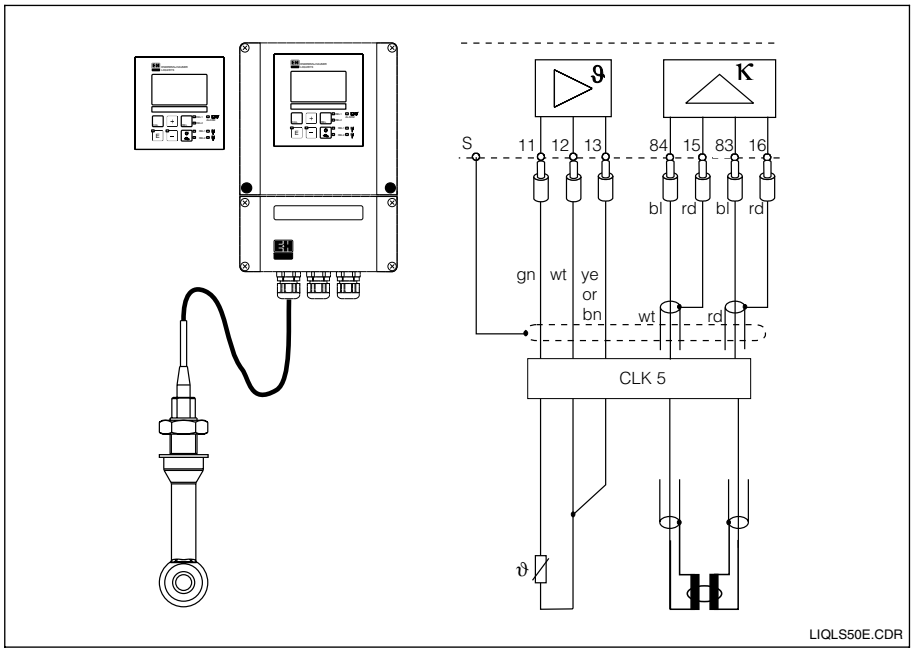
Cable / cable connection



Cable connection at Mycom CLM 152

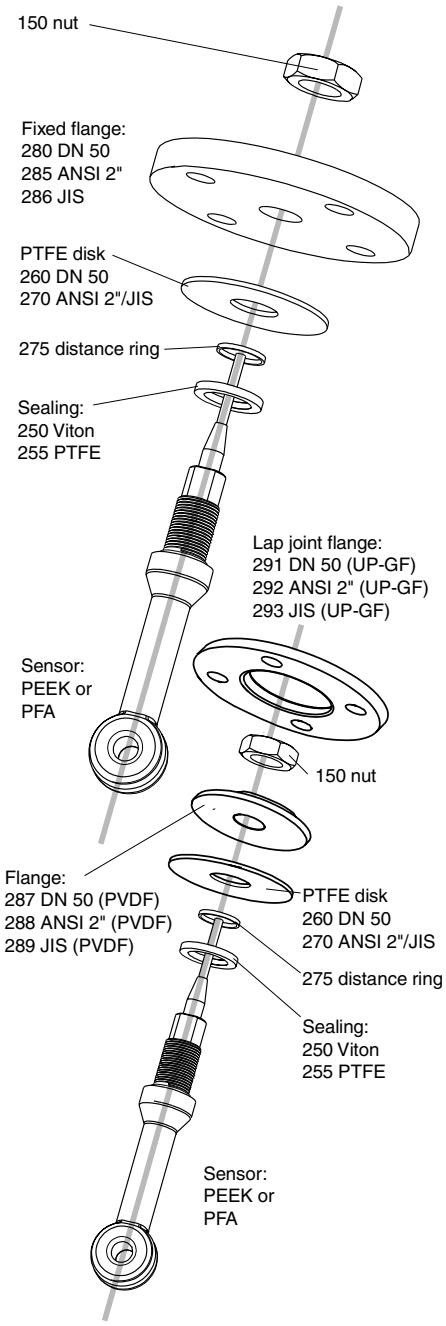


Cable connection at MyPro CLM 431



Cable connection at Liquisys M CLM 223/253

Accessories / service kits



Sealing kits

- ❑ Kit CLS 50 PTFE sealing
  Order no. 51500482
  Pos. 150, nut
  Pos. 255, PTFE sealing (2 pcs.)
- ❑ Kit CLS 50 Viton sealing
  Order no. 51500481
  Pos. 150, nut
  Pos. 250, Viton sealing (3 pcs.)
- ❑ Kit CLS 50 PTFE disk DN 50
  Order no. 51500483
  Pos. 260, PTFE disk DN 50
  Pos. 275, distance ring
- ❑ Kit CLS 50 PTFE disk ANSI 2" and JIS 10K 50A
  Order no. 51500484
  Pos. 270, PTFE disk 2"
  Pos. 275, distance ring

Kits for fixed flanges

- ❑ Kit CLS 50 flange DN 50, SS 316L
  Order no. 51500525
  Pos. 150, nut
  Pos. 280, flange DN 50
  (Kit CLS 50 PTFE disk DN 50 additionally required for retrofitting of PFA sensors or for aggressive media!)
- ❑ Kit CLS 50 flange DN 50, SS 316L
  Order no. 51500527
  Pos. 150, nut
  Pos. 285, flange ANSI 2"
  (Kit CLS 50 PTFE disk ANSI 2" additionally required for retrofitting of PFA sensors or for aggressive media!)
- ❑ Kit CLS 50 flange JIS (SS 316L)
  Order no. 51500934
  Pos. 150, nut
  Pos. 286, flange DN 50

Kits for lap joint flanges

- ❑ Kit CLS 50 flange ANSI 2", PVDF
  Order no. 51500937
  Pos. 288, flange (PVDF) and
  pos. 292, lap joint flange (UP-GF)
- ❑ Kit CLS 50 flange DN 50, PVDF
  Order no. 51500936
  Pos. 150, nut
  Pos. 287, flange DN 50 (PVDF) and
  pos. 291, lap joint flange (UP-GF)
- ❑ Kit CLS 50 flange JIS, PVDF
  Order no. 51500935
  Pos. 150, nut
  Pos. 289, flange JIS (PVDF) and
  pos. 293, lap joint flange (UP-GF)

Accessories

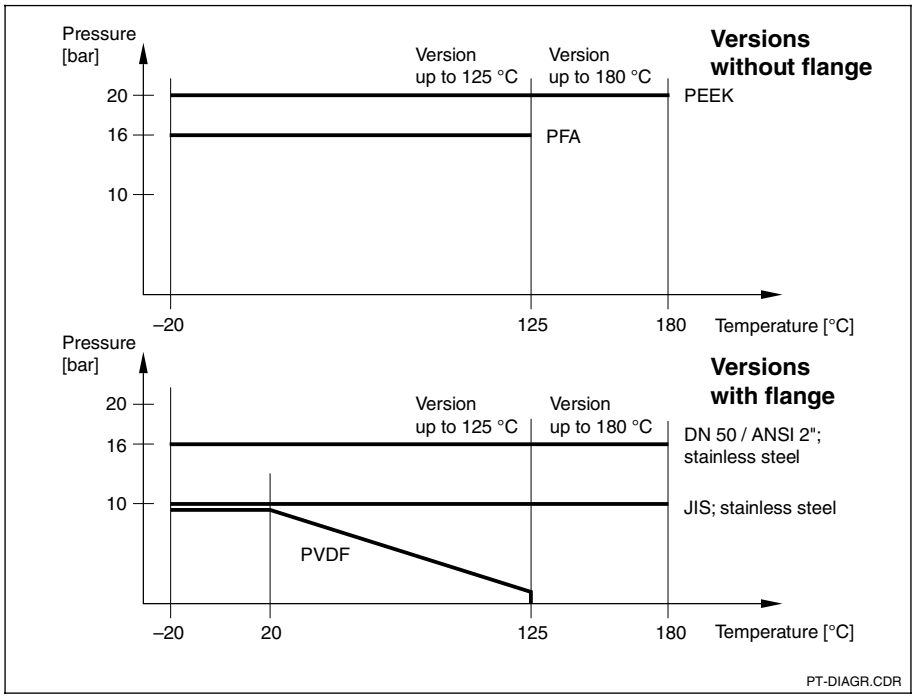
- ❑ Extension cable CLK 5
  Order no. 50085473
- ❑ Junction box VBM
  Order no. 50003987
- ❑ Immersion assembly CLA 140
  See Technical Information CLA 140, order no. 51500081

Resistance table

Chemical attack			Resistance	
Medium	**Concentration [%]**	**Temperature [°C]**	**PFA**	**PEEK**
Nitric acid HNO_3	5	20	+	+
		60	+	+
	up to 40	20	+	+
		60	+	–
Phosphoric acid H_3PO_4	up to 10	20	+	+
		60	+	+
Sodium hydroxide solution NaOH	3	20	+	+
		50	+	+
		80	+	+

Resistances
PEEK and PFA
+ resistant
– not resistant

Pressure-temperature curves



Pressure-temperature curves in dependence on material and flange version

Technical data

General specifications

Manufacturer	Endress+Hauser
Product designation	InduMax P CLS 50

Measuring range	0 ... 2000 mS/cm
Cell constant	appr. 2 cm^{-1}
Storage temperature	–20 ... +80 °C
Protection class (DIN 40050)	IP 67 (sensor in mounted state combined with original sealing)
Meas. value deviation for –20 ... 100 °C	±(5 µS/cm + 0.5 % of measured value)
Meas. value deviation for > 100 °C	±(10 µS/cm + 0.5 % of measured value)

Temperature measurement

Temperature sensor	Pt 100, class A acc. to IEC 751
Temperature response t_{90} – PEEK version – PFA version	90 % of upper temperature display limit (acc. to DIN 746-1): approx. 7 min approx. 26 min

Installation

Required pipe diameter	≥ DN 80 (consider installation factor if pipe diameter < DN 110)
Installation in reduced outgoing line	≥ DN 50

Subject to modifications.

Product structure

Conductivity sensor InduMax P CLS 50

Certificate

A	Version for non-Ex area
G	EC Ex conformity certificate II1G EEx ia IIC T6 / T4
O	FM IS(NI), Cl. I, Div. 1&2, Grp. A, B, C, D (in preparation)
S	CSA IS(NI), Cl. I, Div. 1&2, Grp. A, B, C, D (in preparation)
T	TIIS EEx ia IIC T6 / T4 (in preparation)

Process connection and material

1	G ¾, SS 316Ti
2	1" NPT, PEEK
3	Flange DN 50 PN 16, SS 316L
4	ANSI 2" 300 lbs, SS 316L
5	DN 50 PN 16, SS 316L, PTFE flange sealing
6	ANSI 2" 300 lbs, SS 316L, PTFE flange sealing
7	JIS 10K 50A, SS 316L, PTFE flange sealing
A	DN 50 PN 10, PVDF flange
B	ANSI 2" 150 lbs, PVDF flange
C	JIS 10K 50A, PVDF flange

Materials of probe and sensor sealing

A	PFA with PTFE sensor sealing
B	PEEK with Viton sensor sealing
C	PEEK with PTFE sensor sealing

Temperature range and cable length

1	Max. temperature 125 °C with 5 m cable
2	Max. temperature 125 °C with 10 m cable
5	Max. temperature 180 °C with 5 m cable
6	Max. temperature 180 °C with 10 m cable

CLS 50-					complete order code

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TI 182C/07/en/04.99
Printed in Germany / DT / CV5 (50090385)