Technical Information
Smartec CLD18

Compact inductive conductivity measurement for the food and beverage industry

Application

Compact measuring system for inductive conductivity measurement in liquids with medium to high conductivity. The structure is made from highly durable, food-safe polyetheretherketone (PEEK). The excellent chemical resistance properties of the sensor mean it can also be used in applications outside the food industry. The measuring system is perfectly suited for:

- Phase separation of product/water mixtures in the beverage industry
- Control of cleaning-in-place facilities (CIP), concentration control, separation in the cleaning return line
- Industrial water monitoring
- Rinsing processes in pickling plants

Your benefits

- Hygienic sensor design in accordance with EHEDG and 3-A requirements, no risk of recontamination
- Stainless steel or plastic transmitter housing, IP 69K, can be cleaned with high-pressure steam
- High level of repeatability, 0.5 % of reading, always guarantees same separation or monitoring

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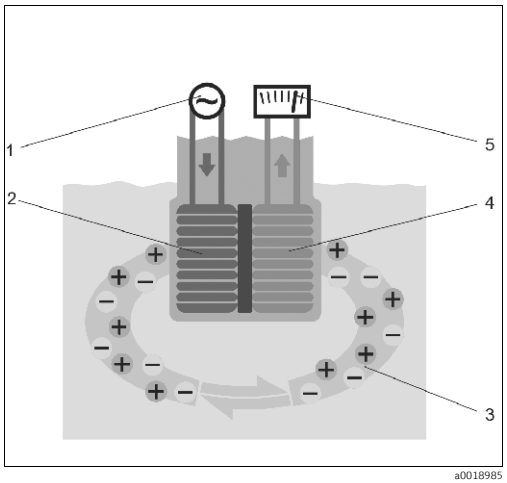
Function and system design

Measuring principle

Inductive conductivity measurement

An oscillator (1) produces an alternating magnetic field in the primary coil (2). This induces current flow (3) in the medium. The strength of the current depends on the conductivity and therefore the concentration of ions in the medium. The current flow in the medium, in turn, generates a magnetic field in the secondary coil (4). The induction current this causes is measured by the receiver (5) and the result is used to determine the conductivity.



Inductive conductivity measurement
1 Oscillator
2 Primary coil
3 Current flow in the medium
4 Secondary coil
5 Receiver

Advantages of inductive conductivity measurement:
- No electrodes and therefore no polarization effects
- Accurate measurement in media with a high degree of pollution and the tendency to form buildup
- Complete galvanic isolation of the measurement from the medium

Key properties

- **Hygiene**
  The PEEK sensor (polyetheretherketone) has excellent chemical, mechanical and thermal resistance properties, is entirely seamless and gap-free and is therefore safe to use in hygienic applications. The sensor has 3A approval which is required for the hygiene sector. All wetted materials are FDA-listed. The sensor is designed in accordance with the current guidelines of the American Society of Mechanical Engineers - Bioprocessing Equipment (ASME BPE) and meets the requirements of EC Regulation No. 1935/2004 of the European Parliament on materials and articles intended to come into contact with food.
- **Process connections**
  The measuring system is available with all the process connections commonly used in the hygiene sector. The measuring system is also available with a G1½ process adapter and 2½" coupling nut for use in non-hygienic areas.
- **Process temperature, process pressure**
  The sensor is suitable for continuous operating temperatures up to 110 °C (230 °F). It can be operated up to 130 °C (266 °F) for short periods (max. 60 min) for sterilization phases. Its pressure resistance rating is 12 bar (174 psi) up to 50 °C (122 °F) and at higher temperatures is always above the specific vapor pressure.
  If the PVC process adapter is used, the maximum pressure resistance drops to 8 bar (116 psi) at 25 °C (77 °F) and the maximum process temperature to 60 °C (140 °F).
- **Temperature measurement**
  A Pt 1000 temperature sensor is integrated in the sensor. This ensures efficient phase separation at different and quickly changing process temperatures. The temperature sensor is embedded in the PEEK body.
- **Temperature compensation**
  Linear temperature compensation with user-configurable temperature coefficients α is implemented in the measuring system.

Input

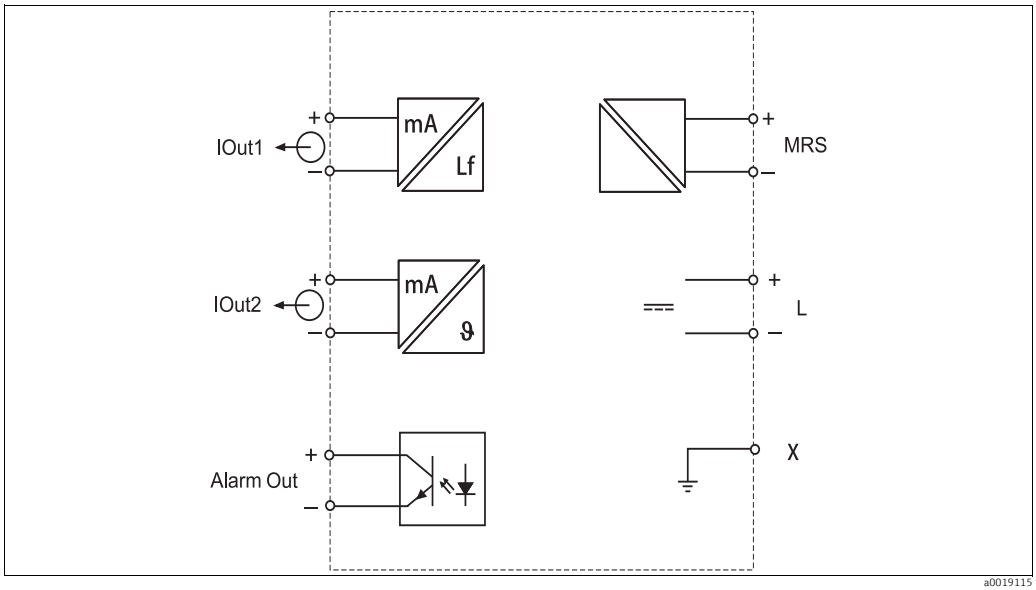
Measured variables	Conductivity Temperature	
Measuring range	Conductivity	Recommended range: 200 µS/cm to 1000 mS/cm (uncompensated)
	Temperature	−10 to +130 °C (+14 to +266 °F)
Temperature measurement	Pt 1000	
Binary input	The binary input is used for measuring range switching.	
	Voltage range	0 V to 30 V
	Voltage HIGH min.	12 V
	Voltage LOW max.	9.0 V
	Current consumption at 24 V	30 mA
	Undefined voltage range	9.0 to 12 V

Output

Output signal	Conductivity	0/4 to 20 mA, galvanically isolated
	Temperature	0/4 to 20 mA, galvanically isolated
Load	Max. 500 Ω	
Characteristic	Linear	
Signal resolution	Resolution	> 13 bit
	Accuracy	± 20 µA

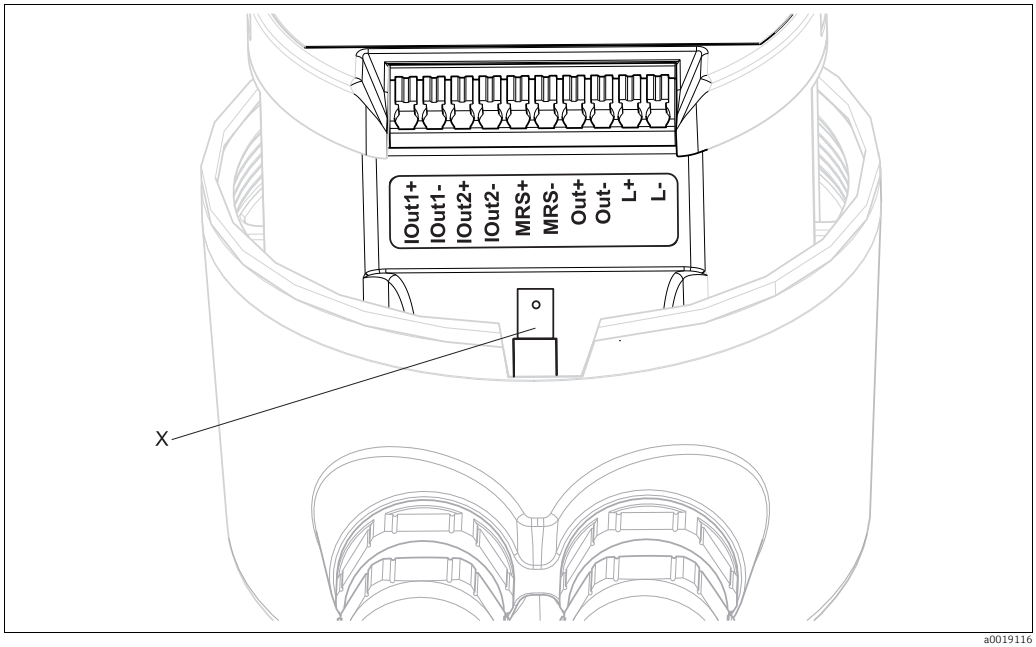
Power supply

Connection



Electrical connection

Terminal assignment



Terminal assignment

IOut1	*Current output conductivity*
IOut2	*Current output temperature*
MRS	*Binary input (measuring range switch)*
Out	*Alarm output (open-collector)*
L+/L-	*Power supply*
X	*Grounding pin (flat male tab 4.8 mm)*

Supply voltage

24 V DC ±20 %, protected against reverse polarity

Power consumption

3 W

Cable specification

Recommended	0.5 mm^2
Max.	1.0 mm^2

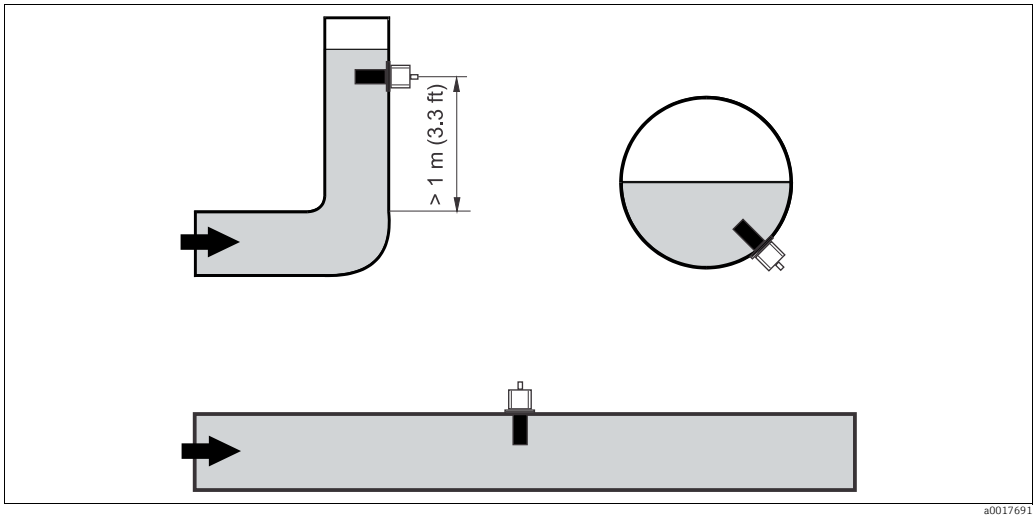
Performance characteristics

Response time	Conductivity Temperature	t_{95} < 1.5 s t_{90} < 50 s
Measured error	Conductivity Temperature Signal outputs	± (2.0 % of measured value + 20 µS/cm) ± 1.5 K ± 50 µA
Repeatability	Conductivity	Max. 0.5 % of measured value ± 5 µS/cm ± 2 digits
Cell constant	11.0 cm^{-1}	
Temperature compensation	Range Types of compensation	-10 to +130 °C (+14 to +266 °F) - none - linear with freely configurable temperature coefficients
Reference temperature	25 °C (77 °F)	

Installation

Installation instructions

The sensor must be fully immersed in the liquid. No air bubbles should occur in the area of the sensor.

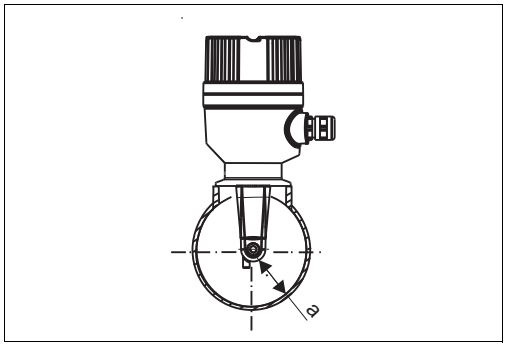


Orientation of conductivity sensors

If there is a change in the direction of flow (after a pipe bend), this can cause turbulence in the medium. Install the sensor at a distance of at least 1 m (3.3 ft) from a pipe bend.

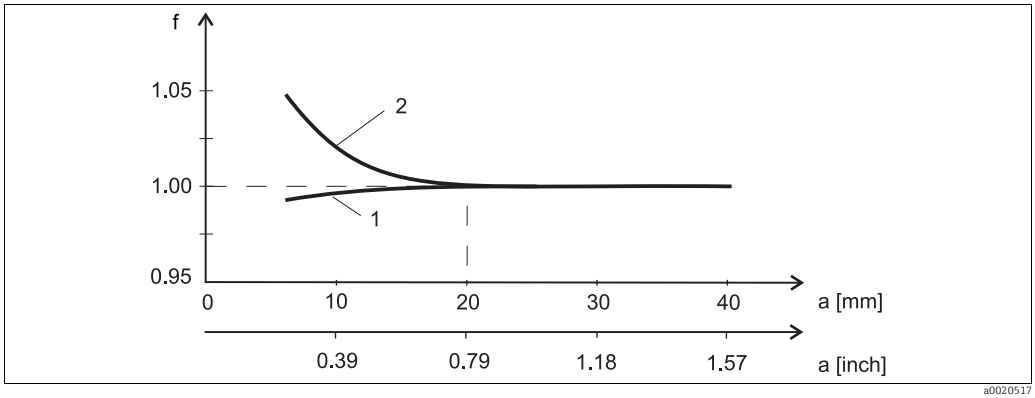
The product should flow along the hole of the sensor (see the arrows on the housing). Product can flow in both directions through the symmetrical measuring channel.

In confined installation conditions, the walls affect the ionic current in the liquid.
The installation factor compensates for this effect. The installation factor can be entered in the device for the measurement, or the cell constant is corrected by multiplying by the installation factor.
The value for the installation factor depends on the diameter and the conductivity of the pipe nozzle, as well as the distance "a" between the wall and the sensor.
If there is a sufficient distance between the wall and the sensor (a > 20 mm, from DN 60) the installation factor f does not need to be taken into consideration (f = 1.00).
If the distance from the wall is smaller, the installation factor for electrically insulating pipes is larger
(f > 1), and smaller (f < 1) in the case of electrically conductive pipes.
It can be measured using calibration solutions, or a close approximation can be determined from the following diagram.



CLD18 installation

a *Distance from wall*



Relationship between the installation factor "f" and the distance from wall "a"

1 Electrically conductive pipe wall
2 Electrically insulating pipe wall

Install the measuring system in such a way that the housing is not exposed to direct sunshine.

Environment

Ambient temperature range	Stainless steel process connection:	-20 to +60 °C (-4 to +140 °F)
	PVC process connection:	-10 to +60 °C (14 to 140 °F)
Storage temperature	Stainless steel process connection:	–25 to +80 °C (-13 to +176 °F)
	PVC process connection:	-10 to +60 °C (14 to 140 °F)
Relative humidity	≤ 100%, condensating	
Climate class	Climate class 4K4H as per EN 60721-3-4	
Degree of protection	IP 69K as per EN 40050:1993 Degree of protection NEMA TYPE 6P as per NEMA 250-2008	
Shock resistance	Complies with IEC 61298-3, certified up to 5 g	
Vibration resistance	Complies with IEC 61298-3, certified up to 5 g	
Electromagnetic compatibility	Interference emission as per EN 61000-6-3:2007 + A1:2011 and EN 55011:2009 + A1:2010 Interference immunity as per EN 61326-1:2006	

Process

Process temperature range

Stainless steel process connection:
-10 to +110 °C (14 to 230 °F)
Max.130 °C (266 °F) up to 60 minutes

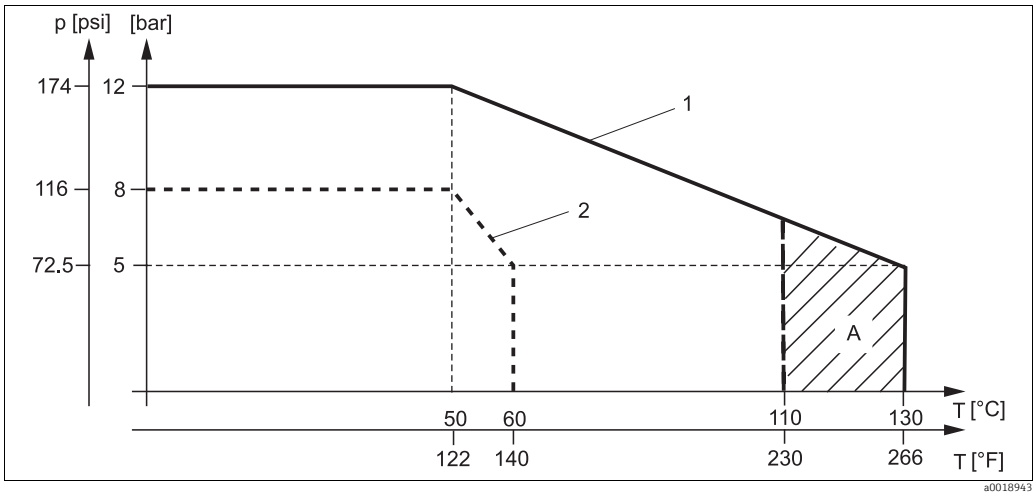
PVC process connection:
-10 to +60 °C (14 to 140 °F)

Process pressure

Stainless steel process connection:
12 bar (174 psi) up to 50 °C (122 °F)
6.75 bar (98 psi) at 110 °C (230 °F)
5.0 bar (72.5 psi) at 130 °C (266 °F) max. 60 minutes

PVC process connection:
8 bar (116 psi) up to 50 °C (122 °F)
5.0 bar (72.5 psi) at 60 °C (140 °F)

Pressure-temperature ratings



Pressure-temperature ratings

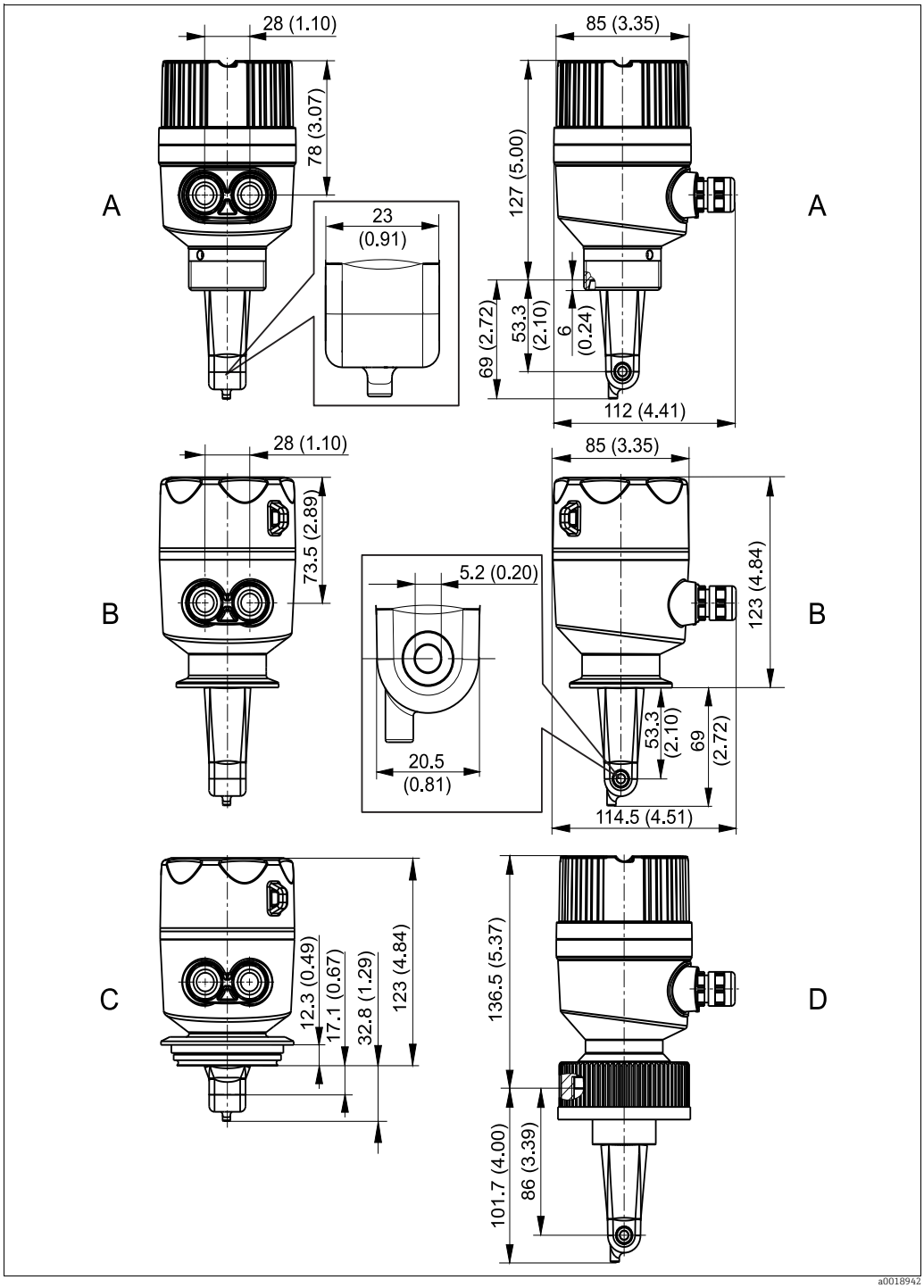
1 Stainless steel process connection
2 PVC process connection
A Process temperature increased briefly (max. 60 minutes)

Flow velocity

Max. 5 m/s (16.4 ft/s) for low-viscosity media in pipe DN 50

Mechanical construction

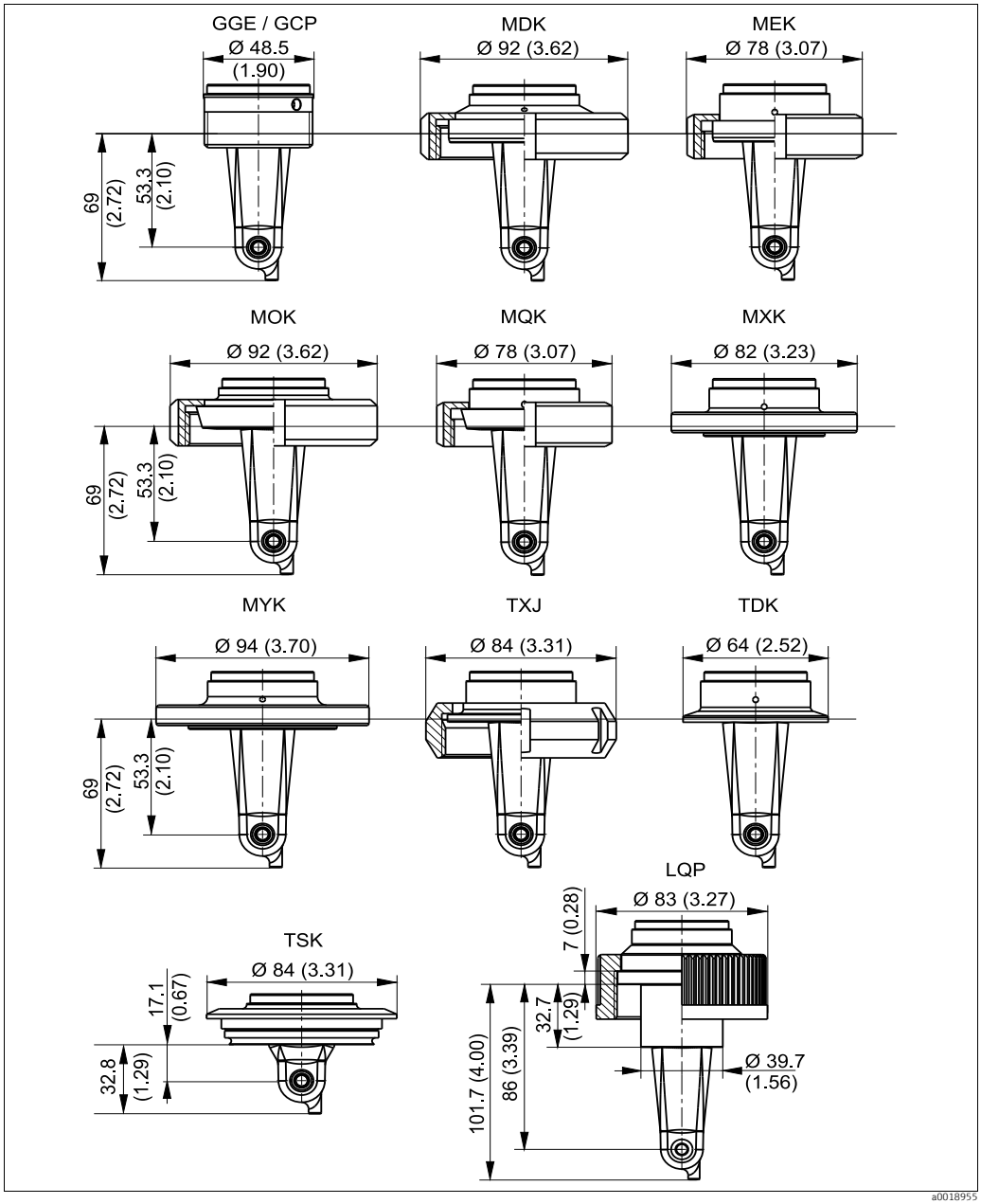
Design and dimensions



Dimensions in mm (inch) and versions (examples)

A Plastic housing with thread G 1½
B Stainless steel housing with ISO 2852 Clamp 2"
C Stainless steel housing with Varivent DN 40 to 125
D Plastic housing with coupling nut 2½" PVC

Process connections



Process connections, dimensions in mm (inch)

GGE Thread G1½
GCP Thread G1½ PVC
MDK Aseptic DIN 11864-1-A DN 50
MEK Aseptic DIN 11864-1-A DN 40
MOK Dairy fitting DIN 11851 DN 50
MQK Dairy fitting DIN 11851 DN 40
MXK Dairy fitting DIN 11853-2 DN 40
MYK Dairy fitting DIN 11853-2 DN 50
TXJ SMS 2"
TDK Tri-Clamp ISO 2852 2"
TSK Varivent N DN 40 to 125
LQP Coupling nut 2½" PVC

Weight

Stainless steel housing:	up to 1.870 kg (4.12 lbs)
Plastic housing:	up to 1.070 kg (2.36 lbs)

Material

In contact with medium

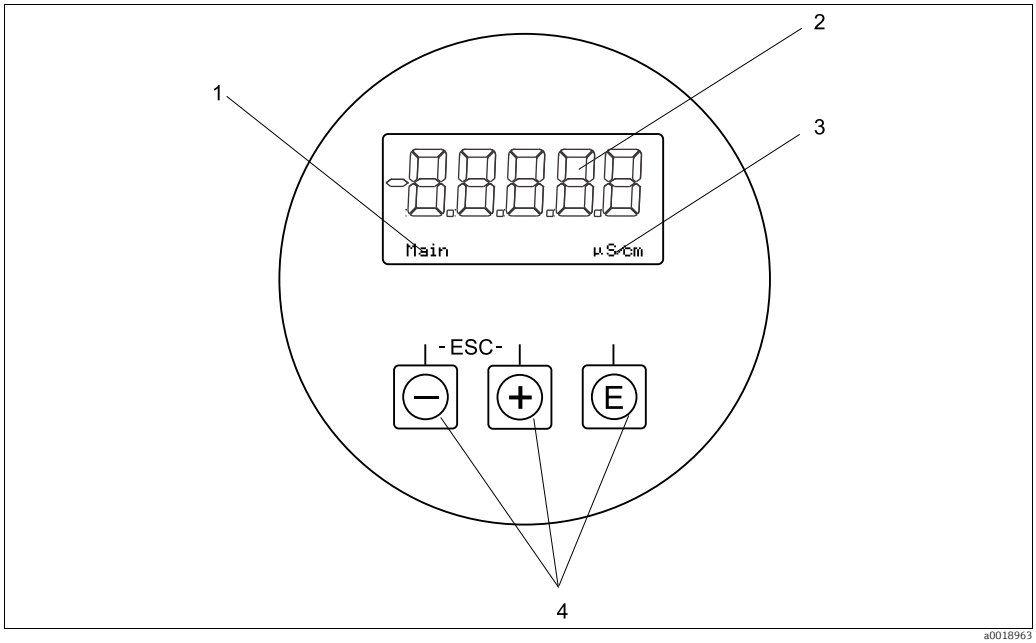
Sensor:	PEEK (polyetheretherketone)
Process connection:	Stainless steel 1.4435 (AISI 316 L), PVC-U
Seal:	EPDM

Not in contact with medium

Stainless steel housing:	Stainless steel 1.4308 (ASTM CF-8, AISI 304)
Plastic housing:	PBT GF20
Seals:	EPDM
Window:	PC
Cable glands:	PA, TPE

Operability

Display and operating elements



Display and keys of the CLD18

1 Parameter
2 Measured value
3 Unit
4 Operating keys

Certificates and approvals

Hygiene

FDA
All materials in contact with the product are FDA-listed materials (apart from the PVC process connections).

3-A
Certification in accordance with the 3-A Standard 74-06 ("3-A Sanitary Standards for Sensor and Sensor Fittings and Connections Used on Milk and Milk Products Equipment").

CE mark

Declaration of Conformity
The product meets the requirements of the harmonized European standards.
As such, it meets the legal regulations of the EC directives.
The manufacturer confirms successful testing of the product by affixing to it the CE mark.

Ordering information

Product page

You can create a valid and complete order code online using the Configurator.

Enter the following address in the browser to launch the product page:
www.endress.com/cld18

Product Configurator

The navigation area is located on the right of the product page.

1. Under "Device support" click "Configure your selected product".
   ↳ The Configurator opens in a separate window.
2. Select all the options to configure the device in line with your requirements.
   ↳ In this way, you receive a valid and complete order code for the device.
3. Export the order code as a PDF or Excel file. To do so, click the appropriate button at the top of the screen.

Scope of delivery

The delivery comprises:
- A Smartec CLD18 measuring system in the version ordered
- Operating Instructions BA01149C/07/EN

Accessories

The most important accessories available at the time this document went to print are listed below. Contact your local Service Center or Sales Center for accessories that are not listed here.

Standard solutions

Precision solutions referenced to the NIST standard reference material (SRM) for the qualified calibration of conductivity measuring systems as per ISO 9000, with temperature table

- CLY11-B
  149.6 µS/cm (reference temperature 25 °C (77 °F)), 500 ml (16.9 fl.oz)
  Order No. 50081903
- CLY11-C
  1.406 mS/cm (reference temperature 25 °C (77 °F)), 500 ml (16.9 fl.oz)
  Order No. 50081904
- CLY11-D
  12.64 mS/cm (reference temperature 25 °C (77 °F)), 500 ml (16.9 fl.oz)
  Order No. 50081905
- CLY11-E
  107.0 mS/cm (reference temperature 25 °C (77 °F)), 500 ml (16.9 fl.oz)
  Order No. 50081906

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