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Operating Instructions
Smartec CLD18

Conductivity measuring system
IO-Link

IO-Link

Endress+Hauser
People for Process Automation

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1 Document information

1.1 Warnings

Structure of information	Meaning
DANGER **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation **will** result in a fatal or serious injury.
WARNING **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation **can** result in a fatal or serious injury.
CAUTION **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.
NOTICE **Cause/situation** If necessary, Consequences of non-compliance (if applicable) ▶ Action/note	This symbol alerts you to situations which may result in damage to property.

1.2 Symbols

- Additional information, tips
- Permitted or recommended
- Not permitted or not recommended
- Reference to device documentation
- Reference to page
- Reference to graphic
- Result of a step

1.3 Symbols on the device

- Reference to device documentation

1.4 Documentation

The following manuals, which complement these Operating Instructions, can be found on the product pages on the Internet:

Technical Information Smartec CLD18, TI01080C

Special Documentation for hygienic applications, SD02751C

2 Basic safety instructions

2.1 Requirements for personnel

- Installation, commissioning, operation and maintenance of the measuring system may be carried out only by specially trained technical personnel.
- The technical personnel must be authorized by the plant operator to carry out the specified activities.
- The electrical connection may be performed only by an electrical technician.
- The technical personnel must have read and understood these Operating Instructions and must follow the instructions contained therein.
- Faults at the measuring point may only be rectified by authorized and specially trained personnel.

Repairs not described in the Operating Instructions provided must be carried out only directly at the manufacturer's site or by the service organization.

2.2 Intended use

The compact measuring system is used for inductive conductivity measurement in liquids with medium to high conductivity.

Use of the device for any purpose other than that described, poses a threat to the safety of people and of the entire measuring system and is therefore not permitted.

The manufacturer is not liable for damage caused by improper or non-designated use.

NOTICE

Applications outside specifications!

Incorrect measurements, malfunctions and even measuring point failure could result

- ▶ Use the product only in accordance with the specifications.
- ▶ Pay attention to the technical data on the nameplate.

2.3 Occupational safety

As the user, you are responsible for complying with the following safety conditions:

- Installation guidelines
- Local standards and regulations

Electromagnetic compatibility

- The product has been tested for electromagnetic compatibility in accordance with the applicable international standards for industrial applications.
- The electromagnetic compatibility indicated applies only to a product that has been connected in accordance with these Operating Instructions.

2.4 Operational safety

Before commissioning the entire measuring point:

1. Verify that all connections are correct.
2. Ensure that electrical cables and hose connections are undamaged.
3. Do not operate damaged products, and protect them against unintentional operation.
4. Label damaged products as defective.

During operation:

- If faults cannot be rectified:
  products must be taken out of service and protected against unintentional operation.

2.5 Product safety

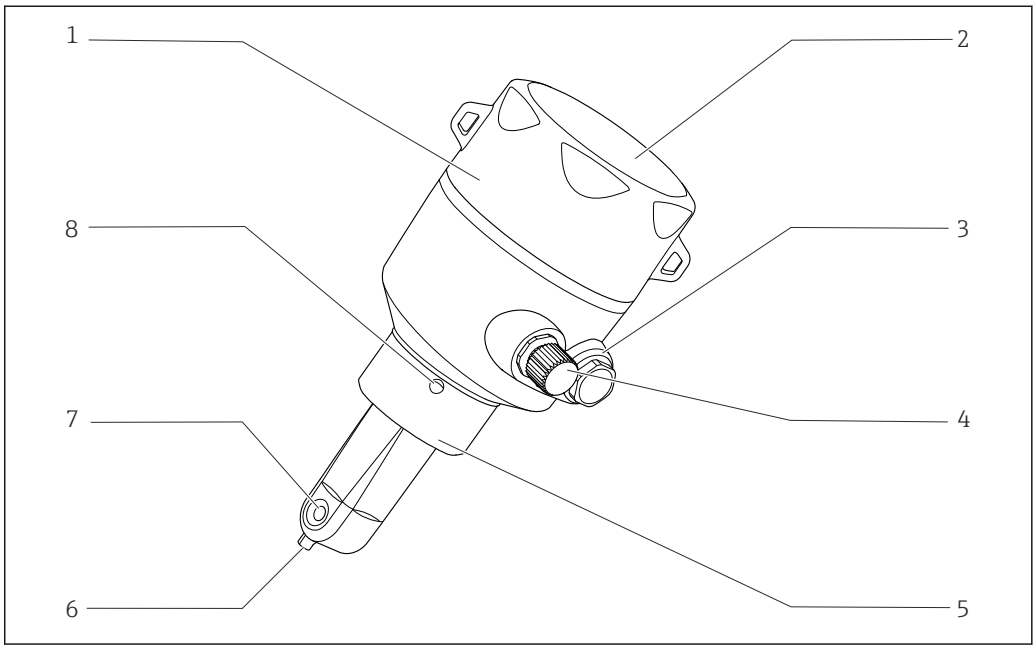
The product is designed to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. The relevant regulations and international standards have been observed.

2.6 IT security

We only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

3 Product description



1 Product description

1	*Removable housing cover*	*5*	*Process connection, e.g. DN50*
2	*Window for display*	*6*	*Temperature sensor*
3	*Dummy plug*	*7*	*Flow opening of sensor*
4	*IO-Link connection (M12 socket)*	*8*	*Leakage hole*

4 Incoming acceptance and product identification

4.1 Incoming acceptance

1. Verify that the packaging is undamaged.
   ↳ Notify the supplier of any damage to the packaging.
   Keep the damaged packaging until the issue has been resolved.
2. Verify that the contents are undamaged.
   ↳ Notify the supplier of any damage to the delivery contents.
   Keep the damaged goods until the issue has been resolved.
3. Check that the delivery is complete and nothing is missing.
   ↳ Compare the shipping documents with your order.
4. Pack the product for storage and transportation in such a way that it is protected against impact and moisture.
   ↳ The original packaging offers the best protection.
   Make sure to comply with the permitted ambient conditions.

If you have any questions, please contact your supplier or your local Sales Center.

4.2 Product identification

4.2.1 Nameplate

The nameplate provides you with the following information on your device:
- Manufacturer identification
- Order code
- Extended order code
- Serial number
- Firmware version
- Ambient and process conditions
- Input and output values
- Measuring range
- Safety information and warnings
- Protection class

▶ Compare the information on the nameplate with the order.

4.2.2 Product identification

Product page

www.endress.com/CLD18

Interpreting the order code

The order code and serial number of your product can be found in the following locations:
- On the nameplate
- In the delivery papers

Obtaining information on the product

1. Open www.endress.com.
2. Call up the site search (magnifying glass).
3. Enter a valid serial number.
4. Search.
   ↳ The product structure is displayed in a popup window.
5. Click on the product image in the popup window.
   ↳ A new window (**Device Viewer**) opens. All of the information relating to your device is displayed in this window as well as the product documentation.

Manufacturer's address

Endress+Hauser Conducta GmbH+Co. KG
Dieselstraße 24
D-70839 Gerlingen

4.3 Scope of delivery

The scope of delivery comprises:
- Smartec CLD18 measuring system in the version ordered
- Operating Instructions BA02097C

5 Installation

5.1 Installation conditions

5.1.1 Installation instructions

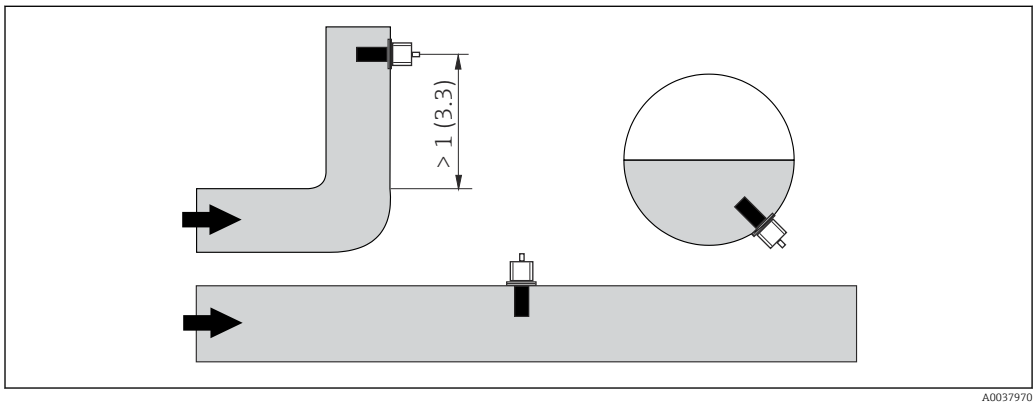
Hygienic requirements

- Easily cleanable installation of equipment according to the criteria of the EHEDG must be free of dead legs.
- If a dead leg is unavoidable, it shall be kept as short as possible. Under no circumstances shall the length of a dead leg L exceed the pipe's inner diameter D minus the equipment's enveloping diameter d. The condition $L \leq D - d$ applies.
- Furthermore, the dead leg must be self-draining, so neither product nor process fluids are retained therein.
- Within tank installations, the cleaning device must be located so that it directly flushes the dead leg.
- For further reference, see the recommendations concerning hygienic seals and installations in EHEDG Doc. 10 and the Position Paper: "Easy cleanable Pipe couplings and Process connections".

For 3-A-compliant installation, please observe the following:
- After the device has been mounted, hygienic integrity must be guaranteed.
- The leakage hole must be located at the lowest point on the device.
- 3-A-compliant process connections must be used.

Orientations

The sensor must be completely immersed in the medium. Avoid air bubbles in the area of the sensor.



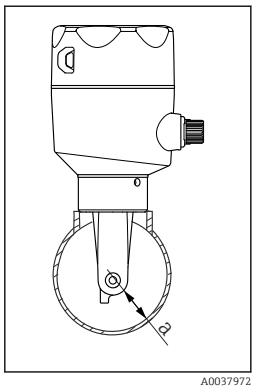
2 *Orientation of conductivity sensors. Engineering unit: m (ft)*

Changes in the flow direction (after pipe bends) can cause turbulence in the medium.

1. Install the sensor at a distance of at least 1 m (3.3 ft) downstream from a pipe bend.
2. When installing, align the sensor in such a way that the medium flows through the flow opening of the sensor in the direction of medium flow. The sensor head must be completely immersed in the medium.

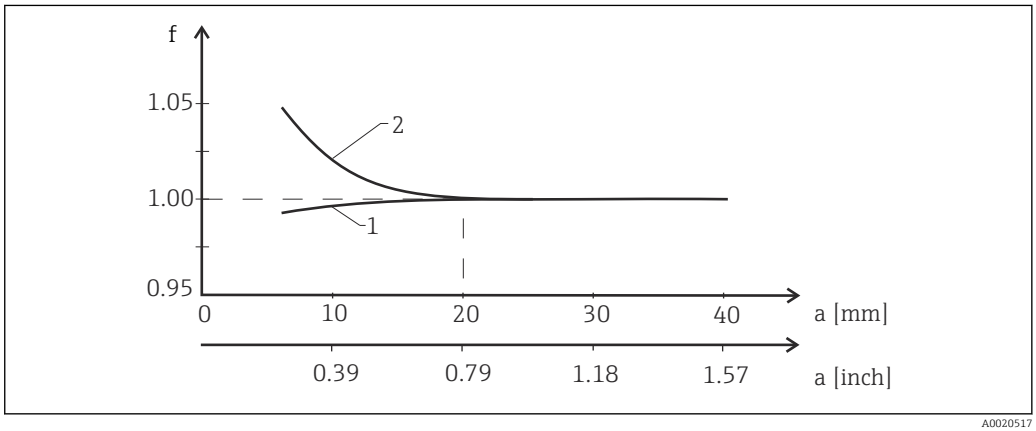
Installation factor

In confined installation conditions, the walls affect the ionic current in the liquid. This effect is offset by what is referred to as the installation factor. The installation factor can be entered in the transmitter for the measurement or the cell constant is corrected by multiplying by the installation factor.
The value of the installation factor depends on the diameter and the conductivity of the pipe nozzle as well as the distance a between the sensor and the wall.
The installation factor can be disregarded (f = 1.00) if the distance to the wall is sufficient (a > 20 mm, from DN 60).
If the distance to the wall is shorter, the installation factor increases for electrically insulating pipes (f > 1) and decreases for electrically conductive pipes (f < 1).
It can be measured using calibration solutions, or a close approximation can be determined from the following diagram.



3 CLD18 installation

a Wall distance

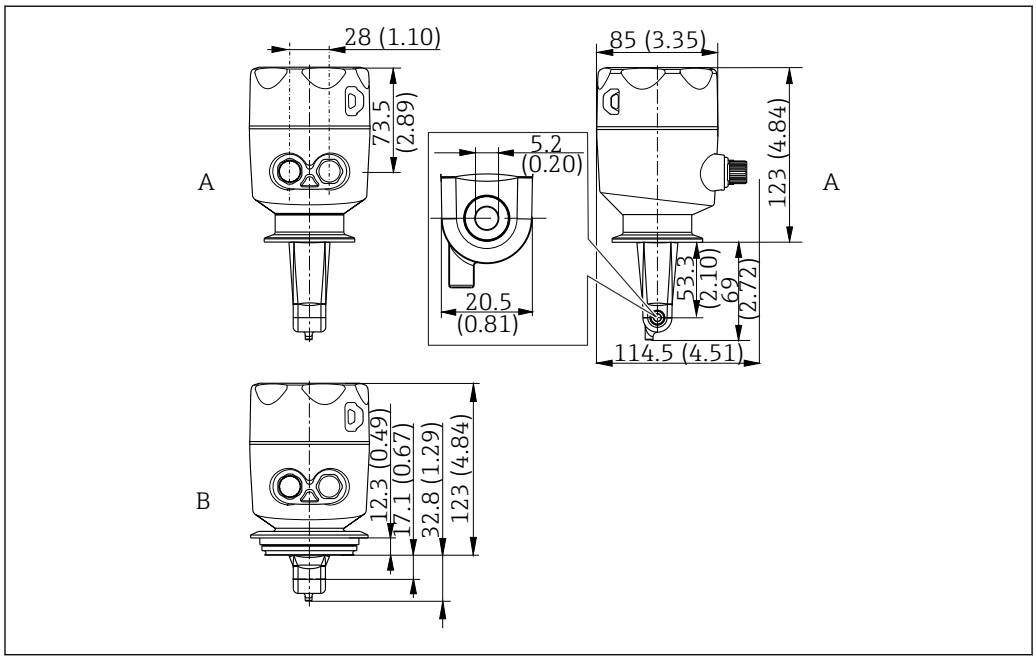


4 Relationship between installation factor f and wall distance a

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 sunlight.

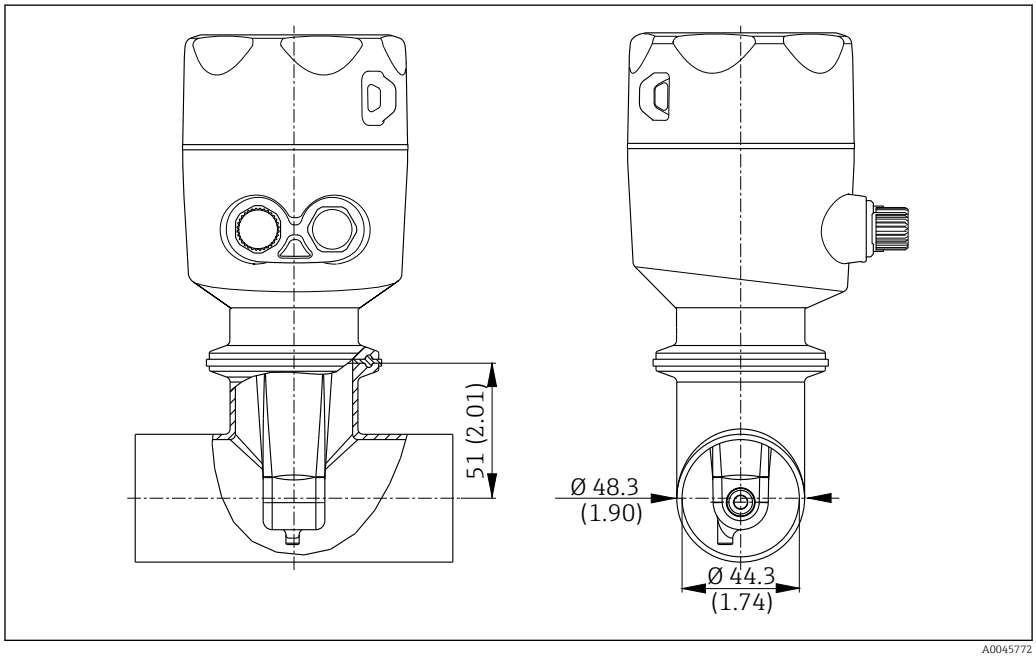
Dimensions



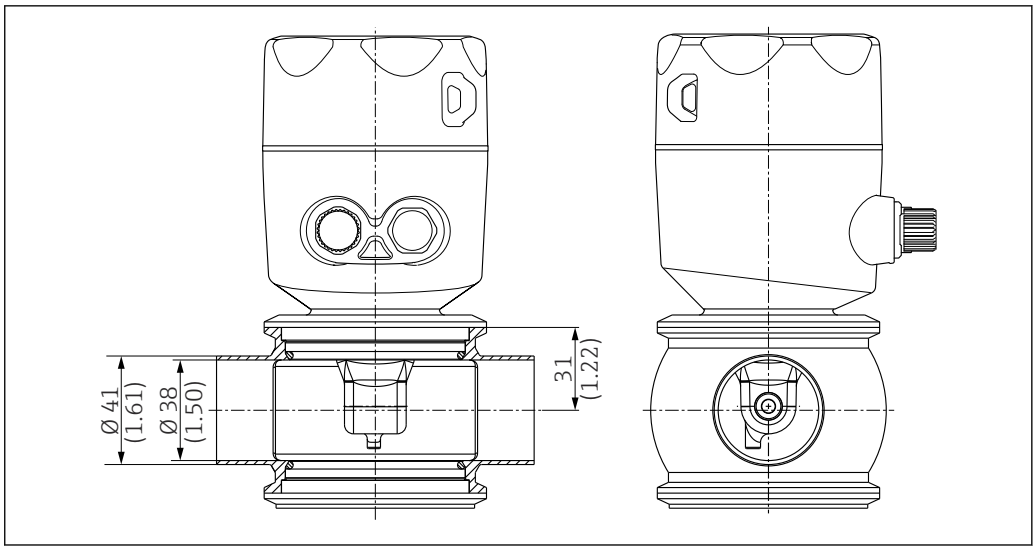
5 Dimensions and versions (examples). Engineering unit: mm (in)

A Stainless steel housing with ISO 2852 clamp 2"
B Stainless steel housing with Varivent DN 40 to 125

5.1.2 Mounting examples



6 Installation in DN 40 pipe with Tri-Clamp 2" process connection. Engineering unit: mm (in)



7 *Installation in DN 40 pipe with Varivent process connection. Engineering unit: mm (in)*

5.2 Mounting the compact device

1. Choose the installation depth of the sensor in the medium such that the coil body is completely immersed in the medium.
2. Pay attention to the distance from the wall. (→ 4, 11)
3. Mount the compact device directly on a pipe nozzle or tank nozzle via the process connection.
4. For the 1½" threaded connection, use Teflon tape to seal the connection and an adjustable pin wrench (DIN 1810, flat face, size 45 to 50 mm (1.77 to 1.97 in)) to tighten it.
5. When installing, align the compact device in such a way that the medium flows through the flow opening of the sensor in the direction of medium flow. Use the arrow on the nameplate to help you align the device.
6. Tighten the flange.

5.3 Post-installation check

1. Following installation, check the compact device for damage.
2. Ensure that the compact device is protected against direct sunlight.

6 Electrical connection

⚠ WARNING

Device is live!

Incorrect connection may result in injury or death!

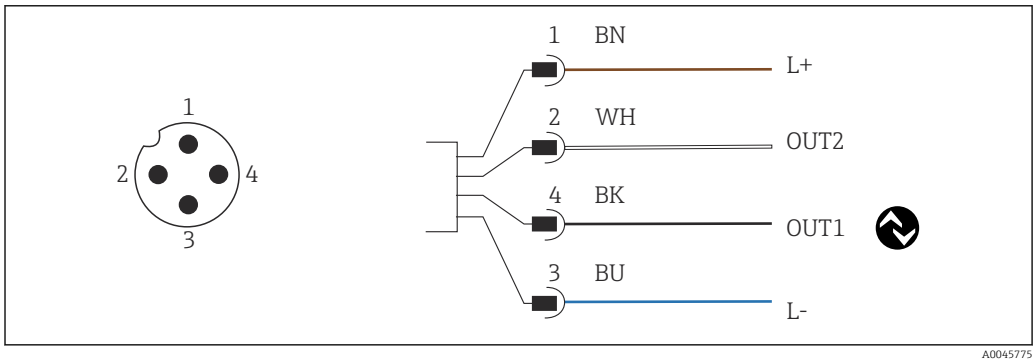
- The electrical connection may be performed only by an electrical technician.
- The electrical technician must have read and understood these Operating Instructions and must follow the instructions contained therein.
- **Prior** to commencing connection work, ensure that no voltage is present on any cable.

6.1 Connecting the transmitter

⚠ WARNING

Risk of electric shock!

- At the supply point, the power supply must be isolated from dangerous live cables by double or reinforced insulation in the case of devices with a 24 V power supply.



8 Connection via M12 connector (A-coded)

1 L+
2 OUT2, current output 0/4 to 20 mA
3 L-
4 OUT1, IO-Link communication / SIO input for measuring range switching

For interference-free use of the current output (OUT2), we recommend switching off the IO-Link communication.

6.2 Ensuring the degree of protection

Only the mechanical and electrical connections that are described in these instructions and are necessary for the required, intended application, may be established on the device supplied.

- Tighten the M12 cable to the stop.

Individual types of protection approved for this product (impermeability (IP), electrical safety, EMC interference immunity) can no longer be guaranteed if for example:
- Covers are left off
- The M12 cable is not fully screwed on

6.3 Post-connection check

Once you have performed the electrical connections, carry out the following checks :

Device health and specifications	Notes
Are the transmitter and cables free from damage on the outside?	Visual inspection

Electrical connection	Notes
Are the installed cables strain-relieved and not twisted?	Visual inspection

7 Operating options

7.1 Structure and function of the operating menu

This section applies only to local operation.

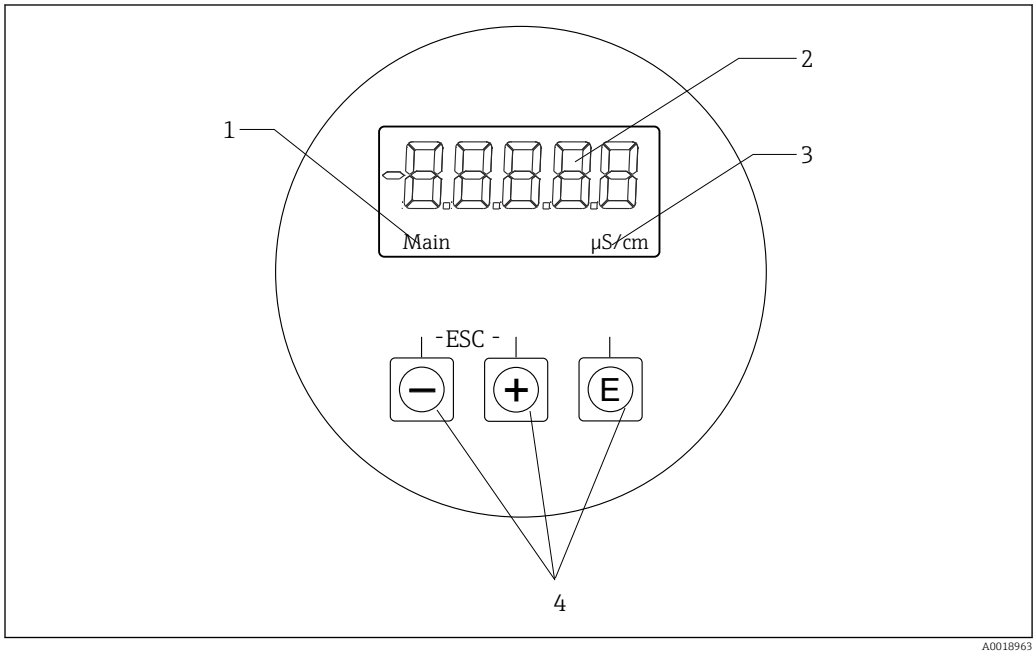
The operating functions of the compact measuring device are divided into the following menus:

Display	Configure the device display: Contrast, brightness, alternating time for display of measured values
Setup	Device settings
Calibration	Calibrate the sensor [1)]
Diagnostics	Device information, diagnostics logbook, sensor information, simulation

1) The air set and the correct cell constant have already been configured at the factory for the Smartec CLD18. A sensor calibration is not necessary during commissioning.

7.2 Access to the operating menu via the local display

Local operation can be locked and unlocked via IO-Link.



9 *Local display and buttons*

1 Parameter
2 Measured value
3 Unit
4 Operating keys

In the event of an error the device automatically alternates between displaying the error and the measured value.
The operating language is English.

E	▪ Open the Configuration menu ▪ Confirm the entry ▪ Select a parameter or submenu
+ −	Within the Configuration menu: ▪ Gradually scroll through the menu items / characters shown for the parameter ▪ Change the selected parameter Outside the Configuration menu: Display enabled and calculated channels, as well as minimum and maximum values for all the active channels.

Exiting the menu or canceling

1. Always exit menu items / submenus at the bottom of the menu via **Back**.
2. Press the plus and minus buttons simultaneously (< 3 s) to exit the setup without saving any changes.

Symbols in the editing mode:

↵	Accept entry If this symbol is selected, the entry is applied at the position specified by the user, and you exit the editing mode.
✕	Reject entry If this symbol is selected, the entry is rejected and you exit the editing mode. The previously set text remains.
←	Jump one position to the left. If this symbol is selected, the cursor jumps one position to the left.
⌫	Delete backwards If this symbol is selected, the character to the left of the cursor position is deleted.
C	Delete all If this symbol is selected, the entire entry is deleted.

7.3 Access to the operating menu via the operating tool

The IO-Link interface allows direct access to process and diagnostic data and enables the user to configure the measuring device on the fly.→ 20

More information on IO-Link is available at: www.io-link.com

8 System integration

8.1 Overview of device description files

In order to integrate field devices into a digital communication system, the IO-Link system needs a description of the device parameters, such as output data, input data, data format, data volume and supported transfer rate. This data is available in the IODD (IO Device Description) which is provided to the IO-Link master via generic modules when the communication system is commissioned.

Download via endress.com

1. endress.com/download
2. Select **Device Driver** from the search options shown.
3. For **Type** select "IO Device Description (IODD)".
4. Select the **Product Code** or enter it as text.
   ↳ A list of search results is displayed.
5. Download the appropriate version.

Download via ioddfinder

1. ioddfinder.io-link.com
2. For **Manufacturer** select "Endress+Hauser".
3. Enter the **Product Name**.
   ↳ A list of search results is displayed.
4. Download the appropriate version.

8.2 Integrating the measuring device into the system

Device ID	0x020101 (131329)
Vendor Id	0x0011 (17)

8.2.1 Process data

Designation	Description	Bit offset	Data type	Access	Value range	Unit
Process Data Input.Conductivity	Actual conductivity	48	float32	r	0.0 to 200.0	S/m
Process Data Input .Temperature	Actual temperature	16	float32	r	-50.0 to 250.0	°C
Process Data Input.Condensed status	Condensed status in compliance with PI specification: PA Profile 4.0 Condensed Status	8	uint8	r	36 = Failure 60 = Functional check 120 = Out of specification 128 = Good 129 = Simulation 164 = Maintenance required	
Process Data Input.Active parameter set	Active parameter set for measuring range switching	4	boolean	r	0 = Set 1 1 = Set 2	
Process Data Input.Switching Signal Channel 2.2 Temperature	Switching signal status SSC 2.2	3	boolean	r	0 = False 1 = True	
Process Data Input.Switching Signal Channel 2.1 Temperature	Switching signal status SSC 2.1	2	boolean	r	0 = False 1 = True	

Designation	Description	Bit offset	Data type	Access	Value range	Unit
Process Data Input.Switching Signal Channel 1.2 Conductivity	Switching signal status SSC 1.2	1	boolean	r	0 = False 1 = True	
Process Data Input.Switching Signal Channel 1.1 Conductivity	Switching signal status SSC 1.1	0	boolean	r	0 = False 1 = True	

8.2.2 Identification

Designation	Description	Index (hex)	Sub (dec)	Size (Byte)	Data type	Access	Value range	Factory setting	Unit
Serial number	Serial number	0x0015	0	11	string	r			
Firmware version	Firmware version	0x0017	0	8	string	r			
Extended ordercode	Extended order code	0x0103	0	18	string	r			
Order Ident	Order code	0x0106	0	20	string	r			
Product name	Product name	0x0012	0	64	string	r		Smartec	
Product text	Product description	0x0014	0	16	string	r		Conductivity	
Vendor name	Manufacturer name	0x0010	0	16	string	r		Endress+Hauser	
Hardware revision	Hardware revision	0x0016	0	64	string	r			
ENP version	Version of the electronic nameplate	0x0101	0	8	string	r		02.03.00	
Application specific tag	Application-specific device ID	0x0018	0	16	string	r/w			
Function tag	Function ID	0x0019	0	32	string	r/w		***	
Location tag	Location ID	0x001a	0	32	string	r/w		***	
Device type	Device type	0x0100	0	2	uint16	r		0x95FF	
Sensor hardware version	Hardware version of sensor	0x0068	0	8	string	r			

8.2.3 Observation

Designation	Description	Index (hex)	Sub (dec)	Size (Byte)	Data type	Access	Value range	Factory setting	Unit
Process Data Input.Conductivity	Actual conductivity	0x0028	1	4	float32	r	0.0 to 200.0		S/m
Process Data Input .Temperature	Actual temperature	0x0028	2	4	float32	r	-50.0 to 250.0		℃
Process Data Input.Condensed status	Summary of status as per PI specification	0x0028	3	1	uint8	r	36 = Failure 60 = Functional check 120 = Out of specification 128 = Good 129 = Simulation 164 = Maintenance required		
Process Data Input.Active parameter set	Active parameter set for measuring range switching	0x0028	4	1	boolean	r	0 = set 1 1 = set 2		

Designation	Description	Index (hex)	Sub (dec)	Size (Byte)	Data type	Access	Value range	Factory setting	Unit
Process Data Input.Switching Signal Channel 2.2 Temperature	Switching signal status SSC 2.2	0x0028	5	1	boolean	r	0 = False 1 = True		
Process Data Input.Switching Signal Channel 2.1 Temperature	Switching signal status SSC 2.1	0x0028	6	1	boolean	r	0 = False 1 = True		
Process Data Input.Switching Signal Channel 1.2 Conductivity	Switching signal status SSC 1.2	0x0028	7	1	boolean	r	0 = False 1 = True		
Process Data Input.Switching Signal Channel 1.1 Conductivity	Switching signal status SSC 1.1	0x0028	8	1	boolean	r	0 = False 1 = True		

8.2.4 Parameters

Application

Designation	Description	Index (hex)	Sub (dec)	Size (Byte)	Data type	Access	Value range	Factory setting	Unit
Active parameter set	Select active parameter set (measuring range switching).	0x0070	0	1	uint8	r/w	0 = Set 1 1 = Set 2	0	
Sensor input									
Temperature unit	Configure the temperature unit. Note: The actual value unit is always the SI unit °C.	0x0049	0	2	uint16	r/w	0 = °C 1 = °F	0	
Cell constant	Cell constant of sensor	0x0046	0	4	float32	r/w	0.0025 to 99.99	11.0	1/cm
Installation factor	Installation factor, in accordance with installation position	0x0047	0	4	float32	r/w	0.1 to 5.0	1.0	
Damping main value	Damping of main measured value, parameter set 1	0x0050	0	2	uint16	r/w	0 to 60	0	s
Temperature compensation	Switch on/off temperature compensation	0x004a	0	2	uint16	r/w	0 = Off 1 = On	1	
Alpha coefficient	Alpha coefficient of sensor, parameter set 1	0x004b	0	4	float32	r/w	1.0 to 20.0	2.1	%/K
Reference temperature	Reference temperature for alpha coefficient. Unit depends on temperature unit.	0x004c	0	4	float32	r/w	10.0 to 50.0	25.0	°C
Hold release time	Time delay for releasing a hold	0x0051	0	2	uint16	r/w	0 to 600	0	s
Current output									
Current range	Current output range	0x004d	0	2	uint16	r/w	0 = Off 1 = 4-20 mA 2 = 0-20 mA	1	
Output 0/4 mA	Lower range limit, parameter set 1	0x004e	0	4	float32	r/w	0.0 to 2000000.0	0.0	µS/cm
Output 20 mA	Upper range limit, parameter set 1	0x004f	0	4	float32	r/w	0.0 to 2000000.0	2000000.0	µS/cm

Designation	Description	Index (hex)	Sub (dec)	Size (Byte)	Data type	Access	Value range	Factory setting	Unit
MRS parameter set 2									
Output 0/4 mA	Lower range limit, parameter set 2	0x005a	0	4	float32	r/w	0.0 to 2000000.0	0.0	µS/cm
Output 20 mA	Upper range limit, parameter set 2	0x005b	0	4	float32	r/w	0.0 to 2000000.0	2000000.0	µS/cm
Damping main	Damping of main measured value, parameter set 2	0x005c	0	2	uint16	r/w	0 to 60	0	s
Alpha coefficient	Alpha coefficient of sensor, parameter set 2	0x005d	0	4	float32	r/w	1.0 to 20.0	2.1	%/K
Teach - Single Value									
Teach Select	Selection of switching signal to be taught	0x003a	0	1	uint8	r/w	1 = SSC1.1 2 = SSC1.2 11 = SSC2.1 12 = SSC2.2	1	
Teach SP1	System command (value 65) "Teach switch point 1"	0x0002	0	1	uint8	w			
Teach SP2	System command (value 66) "Teach switch point 2"	0x0002	0	1	uint8	w			
Teach Result.State	Results of the triggered system command	0x003b	1	1	uint8	r		0	
Switching Signal Channel 1.1 Conductivity									
SSC1.1 Param.SP1	Switch point 1 of switching signal SSC1.1 for conductivity	0x003c	1	4	float32	r/w	0.0 to 2000000.0	1000000.0	µS/cm
SSC1.1 Param.SP2	Switch point 2 of switching signal SSC1.1 for conductivity	0x003c	2	4	float32	r/w	0.0 to 2000000.0	200.0	µS/cm
SSC1.1 Config.Logic	Logic for inverting switching signal SSC1.1 for conductivity	0x003d	1	1	uint8	r/w	0 = High active 1 = Low active	0	
SSC1.1 Config.Mode	Mode of switching signal SSC1.1 for conductivity	0x003d	2	1	uint8	r/w	0 = Deactivated 1 = Single point 2 = Window 3 = Two-point	0	
SSC1.1 Config.Hyst	Hysteresis of switching signal SSC1.1 for conductivity	0x003d	3	4	float32	r/w	0.0 to 2000000.0	10.0	

Designation	Description	Index (hex)	Sub (dec)	Size (Byte)	Data type	Access	Value range	Factory setting	Unit
Switching Signal Channel 1.2 Conductivity									
SSC1.2 Param.SP1	Switch point 1 of switching signal SSC1.2 for conductivity	0x003e	1	4	float32	r/w	0.0 to 2000000.0	1000000.0	µS/cm
SSC1.2 Param.SP2	Switch point 2 of switching signal SSC1.2 for conductivity	0x003e	2	4	float32	r/w	0.0 to 2000000.0	200.0	µS/cm
SSC1.2 Config.Logic	Logic for inverting switching signal SSC1.2 for conductivity	0x003f	1	1	uint8	r/w	0 = High active 1 = Low active	0	
SSC1.2 Config.Mode	Mode of switching signal SSC1.2 for conductivity	0x003f	2	1	uint8	r/w	0 = Deactivated 1 = Single point 2 = Window 3 = Two-point	0	
SSC1.2 Config.Hyst	Hysteresis of switching signal SSC1.2 for conductivity	0x003f	3	4	float32	r/w	0.0 to 2000000.0	10.0	
Switching Signal Channel 2.1 Temperature									
SSC2.1 Param.SP1	Switch point 1 of switching signal SSC2.1 for temperature	0x400c	1	4	float32	r/w	-50.0 to 250.0	130.0	°C
SSC2.1 Param.SP2	Switch point 2 of switching signal SSC2.1 for temperature	0x400c	2	4	float32	r/w	-50.0 to 250.0	-10.0	°C
SSC2.1 Config.Logic	Logic for inverting switching signal SSC2.1 for temperature	0x400d	1	1	uint8	r/w	0 = High active 1 = Low active	0	
SSC2.1 Config.Mode	Mode of switching signal SSC2.1 for temperature	0x400d	2	1	uint8	r/w	0 = Deactivated 1 = Single point 2 = Window 3 = Two-point	0	
SSC2.1 Config.Hyst	Hysteresis of switching signal SSC2.1 for temperature	0x400d	3	4	float32	r/w	0.0 to 300.0	0.5	
Switching Signal Channel 2.2 Temperature									
SSC2.2 Param.SP1	Switch point 1 of switching signal SSC2.2 for temperature	0x400e	1	4	float32	r/w	-50.0 to 250.0	130.0	°C
SSC2.2 Param.SP2	Switch point 2 of switching signal SSC2.2 for temperature	0x400e	2	4	float32	r/w	-50.0 to 250.0	-10.0	°C
SSC2.2 Config.Logic	Logic for inverting switching signal SSC2.2 for temperature	0x400f	1	1	uint8	r/w	0 = High active 1 = Low active	0	
SSC2.2 Config.Mode	Mode of switching signal SSC2.2 for temperature	0x400f	2	1	uint8	r/w	0 = Deactivated 1 = Single point 2 = Window 3 = Two-point	0	
SSC2.2 Config.Hyst	Hysteresis of switching signal SSC2.2 for temperature	0x400f	3	4	float32	r/w	0.0 to 300.0	0.5	

Designation	Description	Index (hex)	Sub (dec)	Size (Byte)	Data type	Access	Value range	Factory setting	Unit
Process check									
Function	Configure the process control function. This function checks the measuring signal for stagnation. Duration and observation width are configurable.	0x0057	0	2	uint16	r/w	0 = Off 1 = On	0	
Duration	Configure the duration.	0x0058	0	2	uint16	r/w	1 to 240	60	min
Observation width	Configure the observation width.	0x0059	0	4	float32	r/w	0.01 to 2.0	0.5	%
Manual hold									
Hold active	Set the manual hold. This function can be used to keep the outputs stable during calibration or cleaning.	0x0056	0	2	uint16	r/w	0 = Off 1 = On	0	

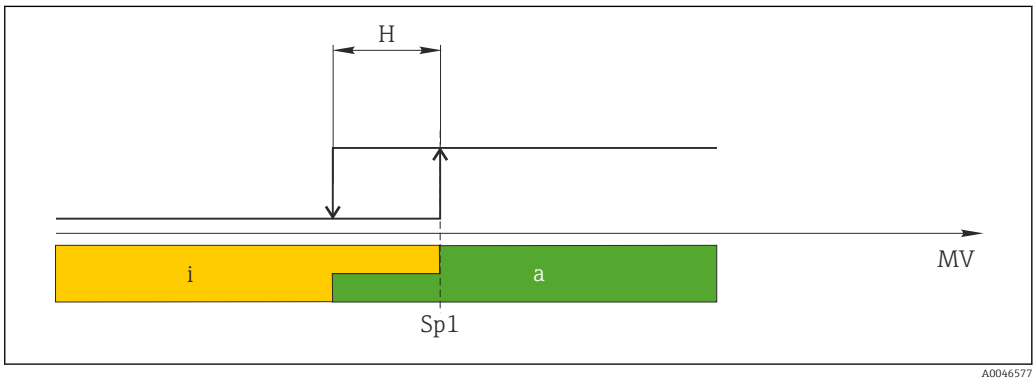
Switching signals

The switching signals provide a simple way of monitoring the measured values for limit violations.

Each switching signal is clearly assigned to a process value and provides a status. This status is transmitted with the process data (process data link). The switching behavior of this status is to be configured using the configuration parameters of a "Switching Signal Channel" (SSC). In addition to manual configuration for switch points SP1 and SP2, a teach mechanism is available in the "Teach" menu. This is used to write the respective current process value into the selected SSC via a system command. The following describes the different behaviors of the modes that can be selected. The "Logic" parameter is always "High active". If the logic is to be inverted, the "Logic" parameter can be set to "Low active".

Mode Single Point

SP2 is not used in this mode.

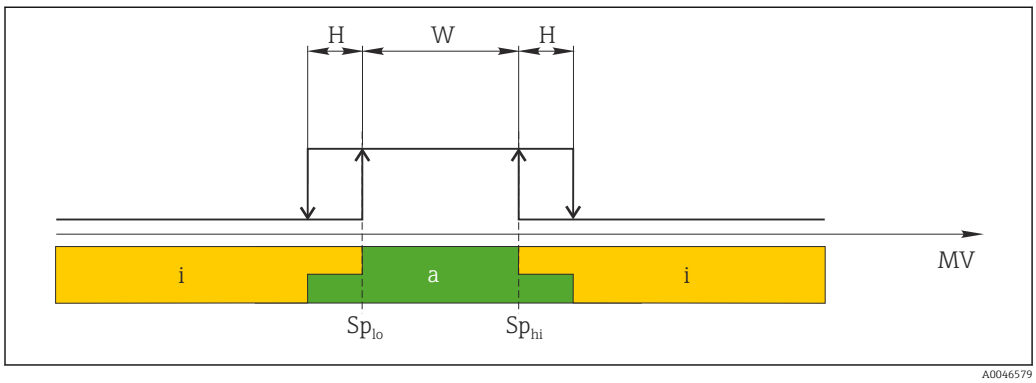


10 SSC, Single Point

H Hysteresis
Sp1 Switch point 1
MV Measured value
i inactive (orange)
a active (green)

Mode Window

SP_{hi} always corresponds to whichever value is higher, SP1 or SP2, and SP_{lo} always corresponds to whichever value is lower.

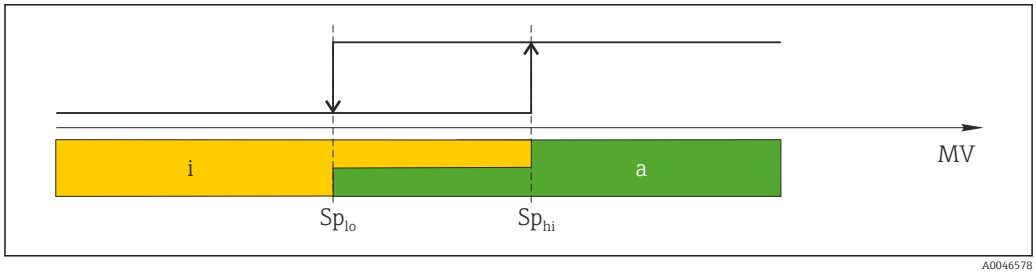


11 *SSC, Window*

H *Hysteresis*
W *Window*
Sp_{lo} *Switch point with lower measured value*
Sp_{hi} *Switch point with higher measured value*
MV *Measured value*
i *inactive (orange)*
a *active (green)*

Mode Two-point

SP_{hi} always corresponds to whichever value is higher, SP1 or SP2, and SP_{lo} always corresponds to whichever value is lower.
Hysteresis is not used.



12 *SSC, Two-Point*

Sp_{lo} *Switch point with lower measured value*
Sp_{hi} *Switch point with higher measured value*
MV *Measured value*
i *inactive (orange)*
a *active (green)*

System

Designation	Description	Index (hex)	Sub (dec)	Size (Byte)	Data type	Access	Value range	Factory setting	Unit
Operating time	Operating time, resolution: 0.5 h	0x0069	0	4	float32	r			h
Display									
Local operation	Activate/deactivate local operation.	0x000c	0	2	uint16	r/w	0 = On 8 = Off	0	
Contrast	Display contrast: 0 = low, 6 = high	0x0053	0	2	uint16	r/w	0 = 1 1 = 2 2 = 3 3 = 4 4 = 5 5 = 6 6 = 7	3	
Brightness	Display brightness: 0 = low, 6 = high	0x0054	0	2	uint16	r/w		5	
Alternating time	Time that elapses before switching between the conductivity and temperature value on the display. 0 means that the values on the display are not displayed in alternation.	0x0055	0	2	uint16	r/w	0 = 0 s 1 = 3 s 2 = 5 s 3 = 10 s	2	s
Restart device									
Please confirm	System command (value 128)	0x0002	0	2		w			
Application Reset	Set application-specific device configuration to default values (without restarting the device).								
Please confirm	System command (value 129)	0x0002	0	2		w			
Factory default	Set device configuration to default values. The device restarts automatically.								
Please confirm	System command (value 130)	0x0002	0	2		w			
Back to Box	Set device configuration to default values. Device is waiting for current cycle. This means that any DataStorage Backup present in the master is not overwritten.								
Please confirm	System command (value 131)	0x0002	0	1		w			

8.2.5 Diagnostics

Diagnostic settings

Designation	Description	Index (hex)	Sub (dec)	Size (Byte)	Data type	Access	Value range	Factory setting	Unit
Device status	Device health	0x0024	0	1	uint8	r	0 = Device is OK 1 = Maintenance required 2 = Out of specification 3 = Function test 4 = Error	0	
Detailed device status	Events currently pending (→ 🖹 27)	0x0025	0	15	uint8	r		0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00	
Current diagnostic	Diagnostic code of currently prioritized diagnostic message	0x0104	0	2	uint16	r		0	
Last diagnostic	Diagnostic code of last diagnostic message to be displayed	0x0105	0	2	uint16	r			

Diagnostics logbook

Designation	Description	Index (hex)	Sub (dec)	Size (Byte)	Data type	Access	Value range	Factory setting	Unit
Diagnostic 1	Logbook entry 1	0x005e	0	20	string	r			
Diagnostic 2	Logbook entry 2	0x005f	0	20	string	r			
Diagnostic 3	Logbook entry 3	0x0060	0	20	string	r			
Diagnostic 4	Logbook entry 4	0x0061	0	20	string	r			
Diagnostic 5	Logbook entry 5	0x0062	0	20	string	r			
Diagnostic 6	Logbook entry 6	0x0063	0	20	string	r			

Sensor

Designation	Description	Index (hex)	Sub (dec)	Size (Byte)	Data type	Access	Value range	Factory setting	Unit
Operation time > 80 °C	Operating hours > 80 °C	0x006a	0	4	float32	r			h
Operation time > 120 °C	Operating hours > 120 °C	0x006b	0	4	float32	r			h
Maximal conductivity	Maximum conductivity	0x006c	0	4	float32	r			µS/cm
Maximal temperature	Maximum temperature	0x006d	0	4	float32	r			°C
Calibration counter	Calibration counter	0x006e	0	4	uint32	r			
Cell constant	Specified cell constant	0x006f	0	4	float32	r			1/cm

Simulation

Designation	Description	Index (hex)	Sub (dec)	Size (Byte)	Data type	Access	Value range	Factory setting	Unit
Current output	Selector switch for current output simulation	0x0064	0	2	uint16	r/w	0 = Off 1 = 0 mA 2 = 3.6 mA 3 = 4 mA 4 = 10 mA 5 = 12 mA 6 = 20 mA 7 = 21.5 mA	0	
IO-Link process value simulation	Configure the IO-Link process value simulation	0x0065	0	2	uint16	r/w	0 = Off, 1 = On	0	
IO-Link conductivity value	Simulated conductivity value via IO-Link	0x0066	0	4	float32	r/w	0.0 to 2500000.0	1000.0	µS/cm
IO-Link temperature value	Simulated temperature value via IO-Link	0x0067	0	4	float32	r/w	-100.0 to 300.0	25.0	°C

Smart Sensor Descriptor

Designation	Description	Index (hex)	Sub (dec)	Size (Byte)	Data type	Access	Value range	Factory setting	Unit
Conductivity									
Conductivity Descr.Lower limit	Process data lower limit	0x4080	1	4	float32	r		0.0	S/m
Conductivity Descr.Upper limit	Process data upper limit	0x4080	2	4	float32	r		200.0	S/m
Conductivity Descr.Unit	Process data unit 1299 = S/m	0x4080	3	2	int16	r		1299	
Conductivity Descr.Scale	Process data scaling factor	0x4080	4	1	int8	r		0	
Temperature									
Temperature Descr.Lower limit	Process data lower limit	0x4081	1	4	float32	r		-50.0	°C
Temperature Descr.Upper limit	Process data upper limit	0x4081	2	4	float32	r		250.0	°C
Temperature Descr.Unit	Process data unit 1001 = °C	0x4081	3	2	int16	r		1001	
Temperature Descr.Scale	Process data scaling factor	0x4081	4	1	int8	r		0	

Diagnostic messages

Namur class	No.	Event Code	Condensed status	PV status	Device status	Designation	Remedial action	Display text
F	22	0x1820	0b00100100	false	4	Temperature sensor broken	▸ Contact the Service Team.	Temp. sensor
F	61	0x1821	0b00100100	false	4	Sensor electronics defective	▸ Contact the Service Team.	Sens.el.
F	100	0x1822	0b00100100	false	4	Sensor not communicating	1. Check sensor connection. 2. Contact the Service Team.	Sens.com

Namur class	No.	Event Code	Condensed status	PV status	Device status	Designation	Remedial action	Display text
F	130	0x1823	0b00100100	false	4	No conductivity	Sensor in air or defective 1. Check sensor installation. 2. Contact the Service Team.	Sensor supply
F	152	0x1824	0b00100100	false	4	No calibration data available	▶ Calibrate air set.	No airset
F	241	0x1825	0b00100100	false	4	Unspecific software failure	1. Restart the device. 2. Run "back-to-box" command or restore factory settings. 3. Contact the Service Team.	Int.SW
F	243	0x1826	0b00100100	false	4	Unspecific hardware failure	1. Restart the device. 2. Run "back-to-box" command or restore factory settings. 3. Contact the Service Team.	Int.HW
F	419	0x1856	0b00100100	false	4	The Back-To-Box command is executed	1. Wait. 2. Restart the device.	Back to Box
F	904	0x1827	0b00100100	false	4	Process check system	Measuring signal has not changed over a longer period of time. 1. Check sensor installation. 2. Verify that sensor is immersed in the medium. 3. Restart the device.	Process check
C	107	0x1828	0b10000001	true	3	Sensor calibration active	▶ Wait.	Calib. active
C	216	0x1829	0b10000001	true	3	Hold function active	▶ Disable hold.	Hold active
C	848	0x8c01	0b10000001	true	3	Simulation active	▶ Check mode of operation.	Simulate
S	144	0x182A	0b01111000	true	2	Conductivity out of range	1. Check cell constant. 2. Check installation factor.	PV range
S	146	0x182B	0b01111000	true	2	Temperature out of range	▶ Check process temperature.	TmpRange
S	460	0x182C	0b01111000	true	2	Measured value below limit	▶ Check output settings.	Output low
S	461	0x182D	0b01111000	true	2	Measured value above limit	▶ Check output settings.	Output high
M	500	0x182E	0b10100100	true	1	Sensor calibration aborted	Main measured value fluctuating ▶ Check sensor installation.	Not stable

9 Commissioning

9.1 Switching on the measuring device

1. Familiarize yourself with the operation of the transmitter before switching it on for the first time.
   ↳ After power-up, the device performs a self-test and then switches to the measuring mode.
2. **Setup**: When commissioning the device for the first time, program the device in accordance with the following instructions.

9.2 Configuring the measuring device

This section applies only to local operation. Operation via the IO-Link: → 18.

9.2.1 Display settings (Display menu)

1. E: Call up the main menu.
   ↳ The submenus are displayed.
2. ⊞ or ⊟: Navigate through the available submenus.
3. Select **Display** and open (E).
4. Use the **Back** option, which can be found at the bottom of each menu, to move up a level in the menu structure.

Parameter	Possible settings	Description
Contrast	1 to 7 Default: **4**	Setting for display contrast
Brightness	1 to 7 Default: **6**	Setting for brightness of display
Alternating time	0, 3, 5, 10 s Default: **5**	Alternating time between the two measured values 0 means that the values do not alternate on the display

9.2.2 Main menu

1. E: Call up the main menu.
   ↳ The submenus are displayed.
2. ⊞ or ⊟: Navigate through the available submenus.
3. Select **Setup** and open (E).
4. Use the **Back** option, which can be found at the bottom of each menu, to move up a level in the menu structure.

Default settings are in bold.

Parameter	Possible settings	Description
Current range	**4-20 mA** 0-20 mA Off	▶ Select the current range.
Out 0/4 mA	0 to 2000000 µS/cm **0 µS/cm**	▶ Enter the measured value at which the min. current value (0/4 mA) is present at the transmitter output.
Out 20 mA	0 to 2000000 µS/cm **2000000 µS/cm**	▶ Enter the measured value at which the max. current value (20 mA) is present at the transmitter output.

Parameter	Possible settings	Description
Damping main	0 to 60 s **0 s**	Damping value for the conductivity measured value
Extended setup		Advanced settings → 30
Manual hold	**Off** On	Function for freezing the current output

9.2.3 Advanced settings

1. E: Call up the main menu.
   ↳ The submenus are displayed.
2. ⊞ or ⊟: Navigate through the available submenus.
3. Select **Extended setup** and open (E).
4. Use the **Back** option, which can be found at the bottom of each menu, to move up a level in the menu structure.

Default settings are in bold.

Parameter	Possible settings	Description
System		General settings
Device tag	User-defined text Max. 16 characters	Enter the device designation
Temp. unit	**°C** °F	Setting for the temperature unit
Hold release	0 to 600 s **0 s**	Prolongs the device hold when the hold condition no longer applies
Sensor input		Input settings
Cell const.	0.0025 to 99.99 **11.0**	Configure the cell constant
Inst. factor	0.1 to 5.0 **1.0**	The effects of the distance from the wall can be corrected with the installation factor (→ 4, 11)
Damping main	0 to 60 s **0 s**	Setting for damping
Temp. comp.	Off **Linear**	Setting for temperature compensation
Alpha coeff.	1.0 to 20.0 %/K **2.1 %/K**	Coefficient for linear temperature compensation
Ref. temp.	+10 to +50 °C **25 °C**	Enter the reference temperature
Process check		The process check checks the measuring signal for stagnation. An alarm is triggered if the measuring signal does not change over a specific period (several measured values).
Function	On **Off**	▶ Switch the process check on or off.
Duration	1 to 240 min **60 min**	The measured value must change within this time as otherwise an error message is triggered.
Observation width	0.01 to 20 % **0.5 %**	Bandwidth for the process check
MRS		Setting for measuring range switching → 31
Out 0/4 mA	0 to 2000000 µS/cm **0 µS/cm**	▶ Enter the measured value at which the min. current value (0/4 mA) is present at the transmitter output.

Parameter	Possible settings	Description
Out 20 mA	0 to 2000000 µS/cm **2000000 µS/cm**	▶ Enter the measured value at which the max. current value (20 mA) is present at the transmitter output.
Damping main	0 to 60 s **0 s**	Setting for damping
Alpha coeff.	1.0 to 20 %/K **2.1 %/K**	Coefficient for linear temperature compensation
Factory default		Factory settings
Please confirm	No **No**, **Yes**	

Temperature compensation

The conductivity of a liquid depends heavily on the temperature, as the mobility of the ions and the number of dissociated molecules are temperature-dependent. In order to compare measured values, they must be referenced to a defined temperature. The reference temperature is 25 °C (77 °F).

The temperature is always specified when the conductivity is specified. $k(T_0)$ represents the conductivity measured at 25 °C (77 °F) or referenced back to 25 °C (77 °F).

The temperature coefficient α represents the percentage change in the conductivity per degree of temperature change. The conductivity k at the process temperature is calculated as follows:
$\kappa(T) = \kappa(T_0) \cdot (1 + \alpha \cdot (T - T_0))$
$\kappa(T)$ = conductivity at process temperature T
$k(T_0)$ = conductivity at process temperature T_0

The temperature coefficient depends on both the chemical composition of the solution and on the temperature, and is between 1 and 5 % per °C. The electrical conductivity of the majority of diluted saline solutions and natural waters changes in a close-to-linear fashion.

Typical values for the temperature coefficient α:

Natural waters	approx. 2 %/K
Salts (e.g. NaCl)	approx. 2.1 %/K
Alkalis (e.g. NaOH)	approx. 1.9 %/K
Acids (e.g. HNO_3)	approx. 1.3 %/K

Measuring range switching (MRS)

Measuring range switching involves a parameter set changeover for two substances:
- in order to cover a large measuring range
- in order to adjust temperature compensation in the event of a product change

The analog output can be configured with two parameter sets each.
- Parameter set 1:
  - The parameters for the current output and the damping can be set in the **Setup** menu.
  - The alpha coefficient for the temperature compensation can be set in the **Setup**/**Extended setup**/**Sensor input** menu..
  - Parameter set 1 is active if the **MRS** binary input in SIO is **Low**.
- Parameter set 2:
  - The damping, the alpha coefficient and the parameters of the current outputs can be set in the **Setup**/**Extended setup**/**MRS** menu.
  - Parameter set 2 is active if the **MRS** binary input in SIO is **High**.

9.2.4 Calibration (Calibration menu)

In the case of the Smartec CLD 18, the air set and the correct cell constant have already been configured at the factory. A sensor calibration is not necessary during commissioning.

Types of calibration

The following types of calibration are possible:
- Cell constant with calibration solution
- Air set (residual coupling)

Cell constant

General

When calibrating a conductivity measuring system, the cell constant is determined or checked using suitable calibration solutions. This process is described in the standards EN 7888 and ASTM D 1125, for example, and the method for producing a number of calibration solutions is explained.

Calibrating the cell constant

▶ With this type of calibration, enter a reference value for the conductivity.
  ↳ In the result, the device calculates a new cell constant for the sensor.

First switch off the temperature compensation:

1. Select the **Setup/Extended setup/Sensor input/Temp. comp.** menu.
2. Select **Off**.
3. Return to the **Setup** menu.

Perform the calculation of the cell constant as follows:

1. Select the **Calibration/Cell const.** menu.
2. Select **Cond. ref.** and enter the value of the standard solution.
3. Place the sensor in the medium.
4. Start the calibration.
   ↳ **Wait cal. %**: Wait for calibration to finish. The new value is displayed after the calibration.
5. Press the Plus key.
   ↳ Save cal. data?
6. Select **Yes**.
   ↳ Cal. successful
7. Switch the temperature compensation back on.

Air set (residual coupling)

When working with inductive sensors, the residual coupling between the primary coil (transmitter coil) and secondary coil (receiver coil) must be taken into account or compensated for. The residual coupling is not only caused by the direct magnetic coupling of the coils but also by crosstalk in the supply cables.

The cell constant is determined using precise calibration solutions, as is the case with the sensors.

To perform an air set, the sensor must be dry.

Perform an air set as follows:

1. Select **Calibration/Airset**.
   ↳ The current value is displayed.
2. Press the Plus key.
   ↳ Keep sensor in air

3. Keep the dried sensor in air and press the Plus key.
   ↳ **Wait cal. %**: Wait for calibration to finish. The new value is displayed after the calibration.
4. Press the Plus key.
   ↳ Save cal. data?
5. Select **Yes**.
   ↳ Cal. successful
6. Press the Plus key.
   ↳ The device switches back to the measuring mode.

10 Operation

Icons on the display alert you to special device states.

Icon	Description
F	Diagnostic message "Failure"
M	Diagnostic message "Maintenance request"
C	Diagnostic message "Check"
S	Diagnostic message "Out of specification"
⇆	Fieldbus communication is active
⧗	Hold active
🔒	Keypad lock is active (triggered by IO-Link)

11 Diagnostics and troubleshooting

11.1 General troubleshooting

Display	Reason	Remedial action
No measured value displayed	No power supply connected	▶ Check power supply of the device.
	Power is supplied, device is defective	▶ Replace device.
	Voltage polarity reversed or voltage too low	▶ Check voltage and polarity
Diagnostic message is displayed	Diagnostic messages: ▪ Device display → 🖹 35 ▪ IO-Link → 🖹 27	

11.2 Troubleshooting instructions

This following sections apply only to local operation. Troubleshooting via the IO-Link: → 🖹 27.

1. Ⓔ: Call up the main menu.
   ↳ The submenus are displayed.
2. ⊞ or ⊟: Navigate through the available submenus.
3. Select and open **Diagnostics** (Ⓔ).
4. Use the **Back** option, which can be found at the bottom of each menu, to move up a level in the menu structure.

Parameter	Possible settings	Description
Current diag.	Read only	Displays the current diagnostic message
Last diag.	Read only	Displays the last diagnostic message
Diag. logbook	Read only	Displays the last diagnostic messages
Device info	Read only	Displays device information
Sensor info	Read only	Displays sensor information
Simulation		
Current output	Off 0 mA, 3.6 mA, 4 mA, 10 mA, 12 mA, 20 mA, 21.5 mA	Outputs a corresponding value at the **Current output** output.
Restart device		

11.3 Pending diagnostic messages

The diagnostic message consists of a diagnostic code and a message text. The diagnostic code is made up of the error category as per Namur NE 107 and the message number.

▶ If you need to contact the Service Team:
Quote the message number (ID).

Error category (letter in front of the message number):
- F = **Failure**, a malfunction has been detected
  The measured value of the affected channel is no longer reliable. Look for the cause in the measuring point. If a control system is connected, it must be switched to manual mode.
- M = **Maintenance required**, action should be taken as soon as possible
  The device still measures correctly. Immediate measures are not necessary. Proper maintenance efforts may prevent a possible malfunction in the future.
- C = **Function check**, waiting (no error)
  Maintenance work is being performed on the device. Wait until the work has been completed.
- S = **Out of specification**, the measuring point is being operated outside your specification
  Operation is still possible. However, you run the risk of increased wear, shorter operating life or reduced measurement accuracy. Look for the cause in the measuring point.

Code	Message text	Description	Remedial action
F22	Temp. sensor	Temperature sensor is defective	▶ Contact the Service Team.
F61	Sens.el. (IDxxx)	Sensor electronics defective	▶ Contact the Service Team.
F100	Sens.com (IDxxx)	Sensor not communicating, sensor not connected	1. Check sensor connection. 2. Contact the Service Team.
F130	Sensor supply	Sensor check, no conductivity displayed	Sensor in air or defective 1. Check sensor installation. 2. Contact the Service Team.
F152	No airset	Sensor data No calibration data available	▶ Calibrate air set.
F241	Int.SW (IDxxx)	Unspecific software error	▶ Contact the Service Team.
F243	Int.HW (IDxxx)	Unspecific hardware error	▶ Contact the Service Team.
F419	Back to Box	Back to box command is executed	▶ Wait for restart.
F904	Process check	Process check system alarm Measuring signal has not changed for a long time Possible reasons: ▪ Contaminated sensor, or sensor in air ▪ No flow to sensor ▪ Sensor defective ▪ Software error	1. Check sensor installation. 2. Verify that sensor is immersed in the medium. 3. Restart the device.

Code	Message text	Description	Remedial action
C107	Calib. active	Sensor calibration is active	▶ Wait.
C216	Hold active	Hold function is active	▶ Disable hold function.
C848	Simulate (IDxxx)	Simulation active ▪ ID852 Current output simulation ▪ ID849 Measured value simulation	▶ Deactivate simulation.

Code	Message text	Description	Remedial action
S144	PV range (IDxxx)	Conductivity outside measuring range	▶ Check cell constant.
S146	TmpRange (IDxxx)	Temperature outside measuring range	1. Check process temperature. 2. Check device.
S460	Output low	Output limit value undershot	▶ Check settings.
S461	Output high	Output limit value overshot	▶ Check settings.

Code	Message text	Description	Remedial action
M500	Not stable	Sensor calibration aborted Main measured value fluctuating Possible reasons: ▪ Sensor in air ▪ Sensor fouled ▪ Incorrect flow to sensor ▪ Sensor defective	▶ Check sensor installation.

12 Maintenance

⚠ WARNING

Risk of injury if medium escapes!

- ▶ Before each maintenance task, ensure that the process pipe is unpressurized, empty and rinsed.

The electronics box does not contain any parts that the user must maintain.
- The cover on the electronics box may be opened only by the Endress+Hauser Service Department.
- The electronics box may only be removed by the Endress+Hauser Service Department.

12.1 Maintenance tasks

12.1.1 Cleaning the housing

- ▶ Clean the front of the housing using commercially available cleaning agents only.

The front of the housing is resistant to the following in accordance with DIN 42 115:
- Ethanol (for a short time)
- Diluted acids (max. 2% HCl)
- Diluted bases (max. 3% NaOH)
- Soap-based household cleaning agents

- ▶ When performing any work on the device, bear in mind any potential impact this may have on the process control system or on the process itself.

NOTICE

Prohibited cleaning agents!

Damage to the housing surface or housing seal

- ▶ Never use concentrated mineral acids or alkaline solutions for cleaning.
- ▶ Never use organic cleaners such as benzyl alcohol, methanol, methylene chloride, xylene or concentrated glycerol cleaner.
- ▶ Never use high-pressure steam for cleaning.

13 Repair

The O-ring is defective if medium escapes from the leakage hole.

- Contact the E+H Service Department to replace the O-ring.

13.1 General information

- Only use spare parts from Endress + Hauser to guarantee the safe and stable functioning of the device.

Detailed information on the spare parts is available at:
www.endress.com/device-viewer

13.2 Return

The product must be returned if repairs or a factory calibration are required, or if the wrong product was ordered or delivered. As an ISO-certified company and also due to legal regulations, Endress+Hauser is obliged to follow certain procedures when handling any returned products that have been in contact with medium.

To ensure the swift, safe and professional return of the device:

- Refer to the website www.endress.com/support/return-material for information on the procedure and conditions for returning devices.

13.3 Disposal

If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to Endress+Hauser for disposal under the applicable conditions.

14 Accessories

The following are the most important accessories available at the time this documentation was issued.

▶ For accessories not listed here, please contact your Service or Sales Center.

Conductivity calibration solutions CLY11
Precision solutions referenced to SRM (Standard Reference Material) by NIST for qualified calibration of conductivity measuring systems in accordance with ISO 9000:
- 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, 107.00 mS/cm (reference temperature 25 °C (77 °F)), 500 ml (16.9 fl.oz)
  Order No. 50081906

 For further information on "Calibration solutions", see the Technical Information

15 Technical data

15.1 Input

Measured variable	▪ Conductivity ▪ Temperature	
Measuring range	Conductivity:	Recommended range: 200 µS/cm to 1000 mS/cm (uncompensated)
	Temperature:	−10 to 130 °C (14 to 266 °F)
Binary input	The binary input is used in the SIO [1] (without IO-Link communication) for measuring range switching.	
	Voltage range	0 V to 30 V
	High voltage min.	13.0 V
	Low voltage max.	8.0 V
	Current consumption at 24 V	5.0 mA
	Undefined voltage range	8.0 to 13.0 V

15.2 Output

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

Protocol-specific data

IO-Link specification	Version 1.1.3
Device ID	0x020101 (131329)
Manufacturer ID	0x0011 (17)
IO-Link Smart Sensor Profile 2nd Edition	Identification, diagnosis, DMSS (digital measuring and switching sensors)
SIO mode	Yes
Velocity	COM2 (38.4 kBd)
Minimum cycle time	10 ms
Process data width:	80 bit

1) SIO = standard input output

IO-Link data storage	Yes
Block configuration	Yes

15.3 Power supply

Supply voltage	18 to 30 V DC (SELV, PELV, Class 2), protected against reverse polarity
Power consumption	1 W
Overvoltage protection	Overvoltage category I

15.4 Performance characteristics

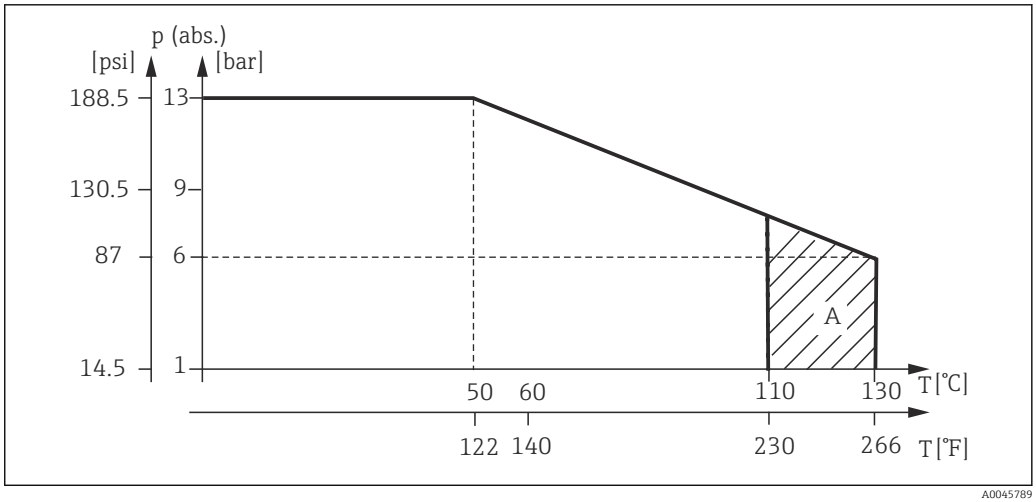
Response time	Conductivity: Temperature:	t_{95} < 1.5 s t_{90} < 20 s
Maximum measured error	Conductivity: Temperature: Signal output	± (2.0 % of measured value + 20 µS/cm) ± 1.5 K ± 50 µA
Repeatability	Conductivity:	max. 0.5 % of measured value ± 5 µS/cm ± 2 digits
Cell constant	11.0 cm^{-1}	
Temperature compensation	Range Types of compensation	−10 to 130 °C (14 to 266 °F) ▪ None ▪ Linear with user-configurable temperature coefficient
Reference temperature	25 °C (77 °F)	

15.5 Environment

Atmospheric temperature	−20 to 60 °C (−4 to 140 °F)
Storage temperature	−25 to 80 °C (−13 to 176 °F)
Humidity	≤ 100 %, condensating
Climate class	Climate class 4K4H as per EN 60721-3-4
Degree of protection	IP 69 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 50 g
Vibration resistance	Complies with IEC 61298-3, certified up to 50 g
Electromagnetic compatibility	Interference emission according to EN 61326-1:2013, Class A Interference immunity according to EN 61326-1:2013, Class A and IEC 61131-9:2013 (at least: Annex G1)
Pollution degree	Pollution level 2
Altitude	<2000 m (6500 ft)

15.6 Process

Process temperature	−10 to 110 °C (14 to 230 °F) Max.130 °C (266 °F) up to 60 minutes
Absolute process pressure	13 bar (188.5 psi), abs to up to 50 °C (122 °F) 7.75 bar (112 psi), abs at 110 °C (230 °F) 6.0 bar (87 psi), abs at 130 °C (266 °F) max. 60 minutes 1 to 6 bar (14.5 to 87 psi), abs in CRN environment tested with 50 bar (725 psi)
Pressure/temperature ratings	
Flow velocity	max. 10 m/s (32.8 ft/s) for low-viscosity media in pipe DN 50

13 Pressure/temperature ratings

A Process temperature increased briefly (max. 60 minutes)

15.7 Mechanical construction

Dimensions	→ 12

Weight	max. 1.870 kg (4.12 lbs)

Materials

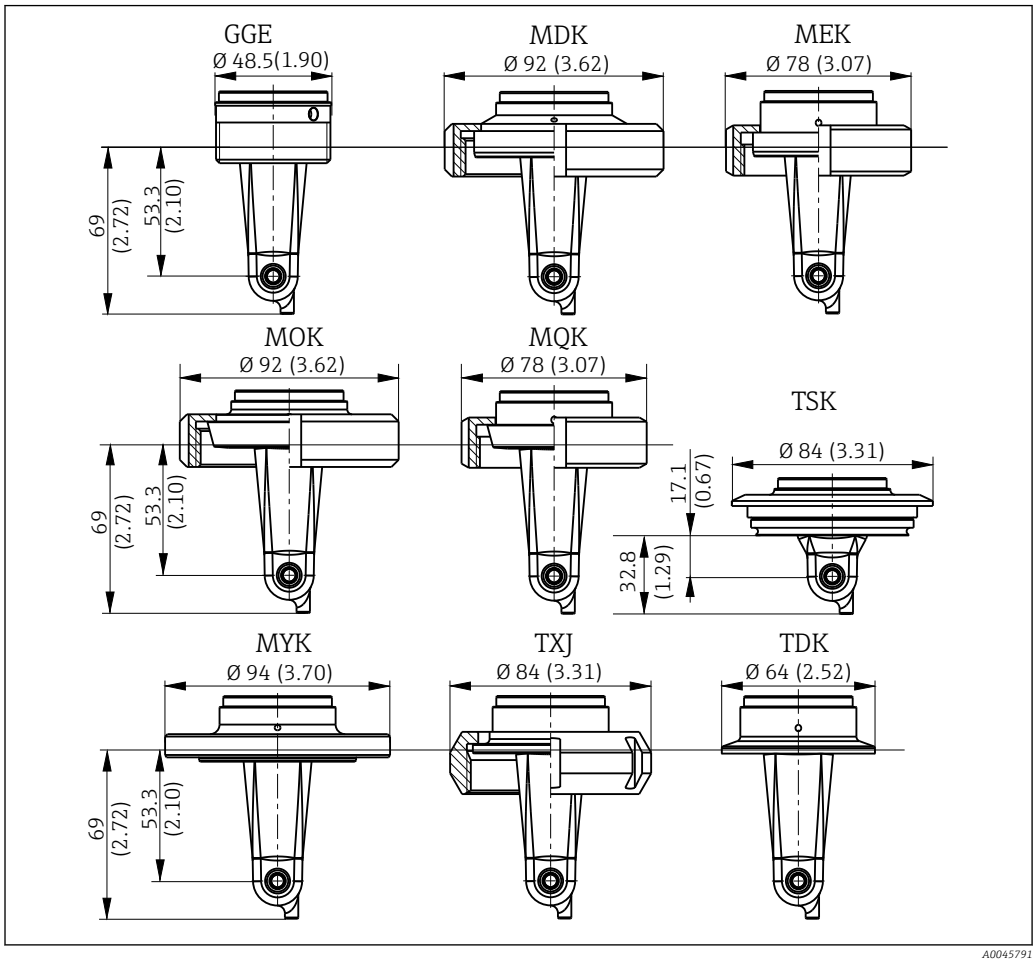
In contact with medium

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)
Seals:	EPDM
Window:	PC

Process connections



14 Process connections, dimensions in mm (inch)

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

Temperature sensor	Pt1000

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www.addresses.endress.com

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