

# Technical Information

## Condumax CLS13

Conductivity sensor for high-temperature applications



2-electrode sensors with cell constant  $k = 0.01 \text{ cm}^{-1}$  or  $k = 0.1 \text{ cm}^{-1}$

### Application

The sensor measures conductivity in water or steam circuits, such as in the power plant and energy industry:

- Condensate monitoring
- Boiler feedwater monitoring
- Boiler blowdown monitoring

The sensor can be used in all applications with a low conductivity and very high temperatures and pressures.

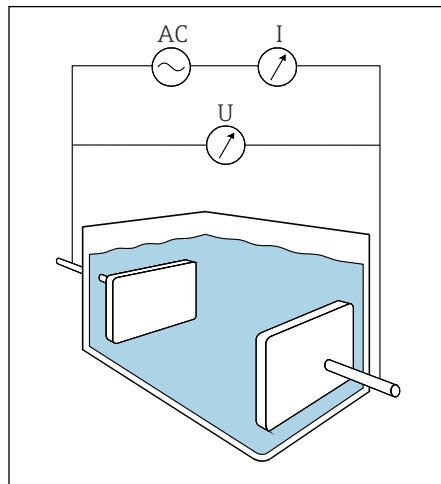
Sensor versions with explosion protection approval according to ATEX, FM or CSA are suitable for use in hazardous areas.

### Your benefits

- Reliable and accurate measured values at low conductivities
- Optimized for high pressures and temperatures up to 250 °C (482 °F)
- Easy to clean thanks to stainless steel body and removable outer electrode
- Robust design for maximum durability
- Quality certificate with information on individual cell constants

## Function and system design

### Measuring principle



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1 Conductive measurement of conductivity

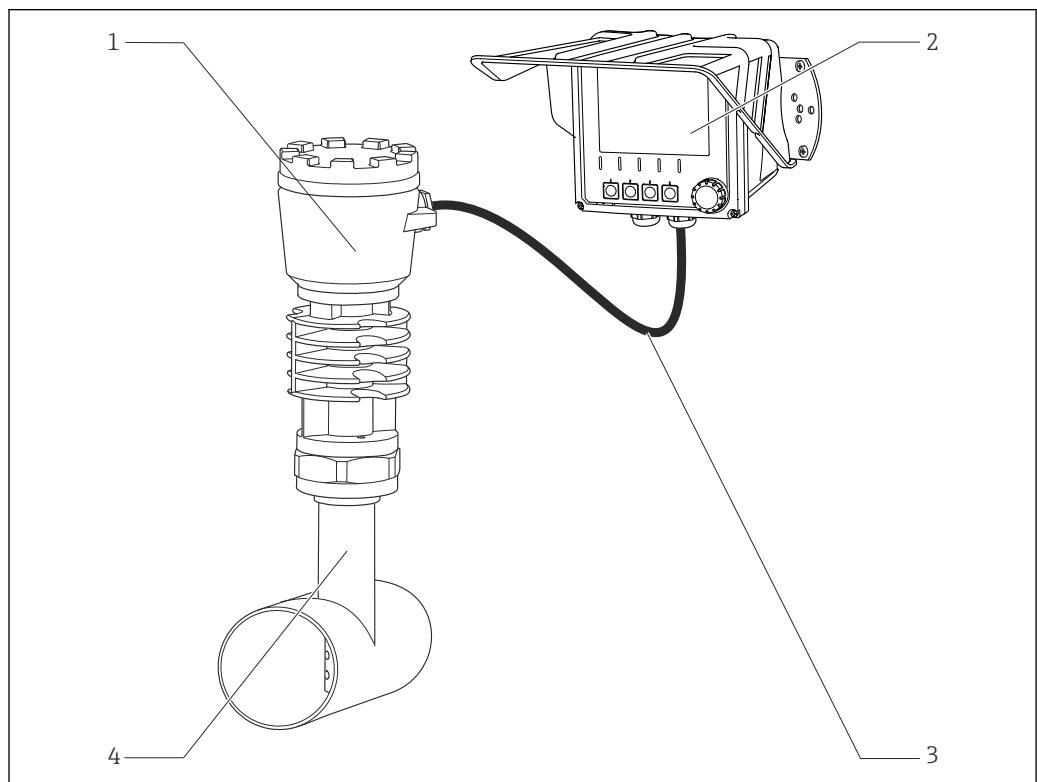
- AC Alternating voltage source  
 I Current intensity measurement  
 U Voltage measurement

Conductivity of liquids is determined with a measuring arrangement where two electrodes are located in the medium. An alternating voltage that causes a current to flow through the medium is applied at these electrodes. The electrical resistance, or its reciprocal value - conductance  $G$  - is calculated based on Ohm's law. The specific conductance  $\kappa$  is determined from the conductance value using the cell constant  $k$ , which depends on the sensor geometry.

### Measuring system

A complete measuring system consists of the following components at least:

- The contacting conductivity sensor CLS13
- A transmitter, e.g. Liquiline M CM42
- A measuring cable, e.g. CYK71 for analog sensors



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2 Example of a measuring system

- 1 Sensor CLS13  
 2 Transmitter CM42  
 3 Sensor cable  
 4 Pipe nozzle, process connection

## Dependability

### Reliability

#### Electrodes

The sensor has particularly large coaxial measuring electrodes. This enables fast medium throughput and a high level of measuring accuracy.

#### Temperature compensation

In addition, a Pt 100 temperature sensor is integrated in the inner electrode. The high thermal conductivity of the sensor means that the temperature adjusts quickly to the fluid temperature. This enables precise temperature compensation using the connected transmitter.

#### Robustness

The sensor is characterized by excellent thermal, chemical and mechanical resistance properties.

#### Use in superheated steam and ultrapure water

Special materials are available for these applications. A nominal operating life cannot be indicated for the FFKM standard material in these cases.

## Input

### Measured variables

- Conductivity
- Temperature

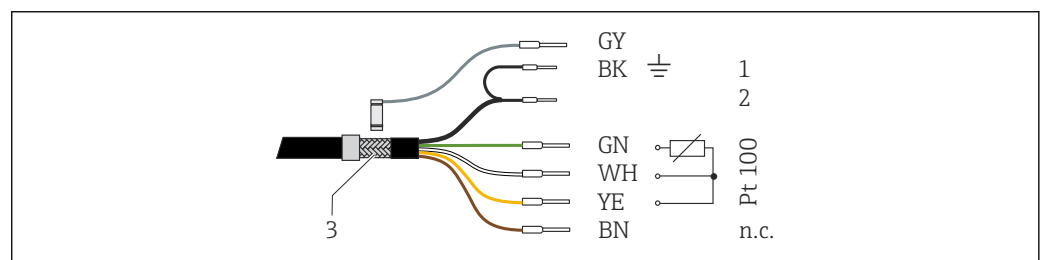
### Measuring ranges

<b>Conductivity</b>	(in relation to water at 25 °C (77 °F))
CLS13 -A	0.04 to 20 µS/cm
CLS13 -B	0.10 to 200 µS/cm
<b>Temperature</b>	
CLS13	-20 to 250 °C (-4 to 480 °F)

## Power supply

### Electrical connection

The sensor is connected via the fixed cable or via the measuring cable CYK71 with a shield. The wiring diagram is provided in the Operating Instructions of the transmitter used.



- 3 Measuring cable CYK71
- 1 Coax BK, shield (outer electrode)
- 2 Coax, inner, conductivity (inner electrode)
- Pt100 Temperature
- 3 Outer shield, pay attention to the wiring diagram of the transmitter
- n.c. Do not connect

A VMB junction box and another CYK71 cable are required for the cable extension.

## Installation

### Installation instructions

1. Mount the sensor directly on a process connection that matches the version or alternatively install it in a CLA751 flow assembly.
2. Ensure that the electrodes are fully immersed in the medium during measurement.
  - ↳ The insertion depth must be at least 50 mm (1.97 in).
3. If using the sensor in the ultrapure water range:
  - Work under air-evacuated conditions.
  - ↳ This prevents CO<sub>2</sub> in the air from dissolving in the water and increasing the conductivity by up to 3 µS/cm as a result of (weak) dissociation.

## Environment

**Ambient temperature range** -20 to 60 °C (-4 to 140 °F)

**Storage temperature** -25 to +80 °C (-10 to +180 °F)

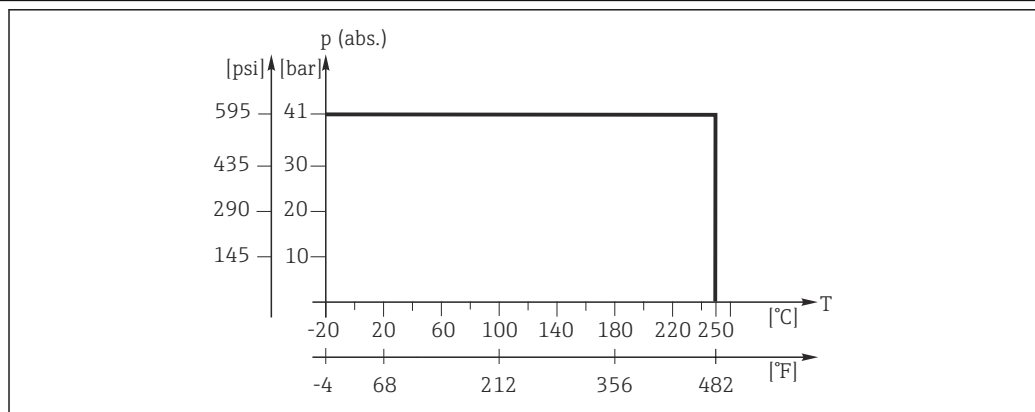
**Degree of protection** IP67

## Process

**Process temperature range** -20 to 250 °C (-4 to 480 °F)

**Process pressure** 1 to 41 bar (15 to 595 psi), absolute

### Temperature/pressure ratings

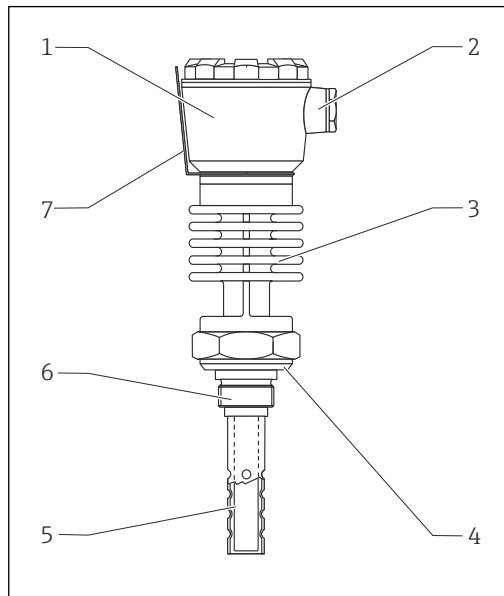


4 Mechanical pressure-temperature resistance

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## Mechanical construction

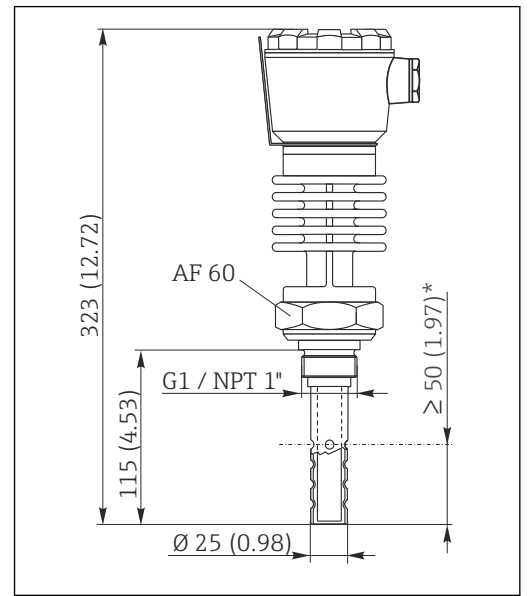
### Design, dimensions



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5 Design

- 1 Terminal head
- 2 Cable connection
- 3 Dissipator
- 4 Sealing surface as per DIN 3852 BI 2, Form A
- 5 Electrodes (coaxially arranged)
- 6 Threaded connection
- 7 Nameplate



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6 Dimensions in mm (in)

\* Minimum immersion depth

**Weight**                      Approx. 1.7 kg (3.75 lbs) depending on version

<b>Materials (in contact with medium)</b>	Electrodes	Stainless steel 1.4571 (AISI 316Ti)
	Process connection	Stainless steel 1.4571 (AISI 316Ti)
	Terminal head	Die-cast aluminum
	Dissipator	Die-cast aluminum
	Seals	FFKM
	Insulator body	Ceramic

**Process connections**              Thread G1  
NPT 1" thread

<b>Cell constant</b>	CLS13 -A	$k = 0.01 \text{ cm}^{-1}$
	CLS13 -B	$k = 0.1 \text{ cm}^{-1}$

**Temperature sensor**              Pt 100 (class B as per IEC 60751)

## Ordering information

**Product page**                      [www.endress.com/cls13](http://www.endress.com/cls13)

**Product Configurator**

1. **Configure:** Click this button on the product page.
2. Select **Extended selection**.  
↳ The Configurator opens in a separate window.

3. Configure the device according to your requirements by selecting the desired option for each feature.
  - ↳ In this way, you receive a valid and complete order code for the device.
4. **Apply:** Add the configured product to the shopping cart.
- i** For many products, you also have the option of downloading CAD or 2D drawings of the selected product version.
5. **Show details:** Open this tab for the product in the shopping cart.
  - ↳ The link to the CAD drawing is displayed. If selected, the 3D display format is displayed along with the option to download various formats.

**Scope of delivery**

- The scope of delivery includes:
- Sensor in the version ordered
  - Operating Instructions

## Accessory

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

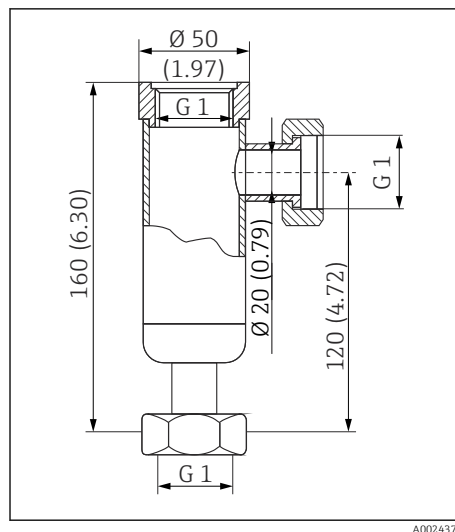
- ▶ For accessories not listed here, please contact your Service or Sales Center.

**Device-specific accessories**

**Assemblies**

**Flow assembly CLA751**

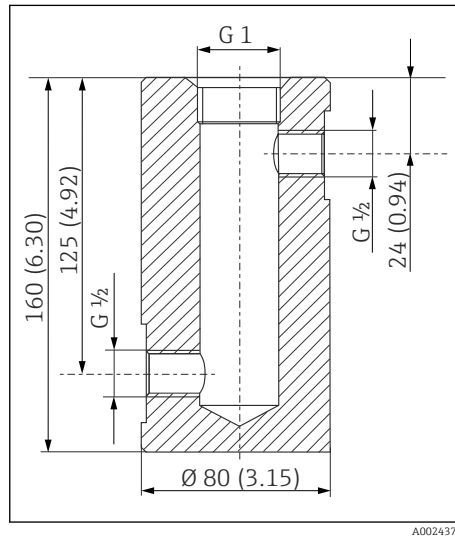
- For installing conductivity sensors with G1 thread (CLS12, CLS13, CLS21, CLS30)
- Inlet (below) and outlet (lateral) DN 20 with G1 thread adapter nut
- Stainless steel 1.4571 (AISI 316Ti)
- Max. temperature 160 °C (320 °F), max. pressure 12 bar (174 psi)
- Order No. 50004201



**7** Dimensions in mm (inch)

**Flow assembly CLA752**

- For installing conductivity sensors with G1 thread (CLS12, CLS13, CLS21, CLS30)
- Inlet (lateral) and outlet (lateral) DN 20 with G½ internal thread
- Polypropylene (PP)
- Max. temperature 90 °C (194 °F), max. pressure 6 bar (87 psi)
- Order No. 50033772



8 Dimensions in mm (inch)

**Measuring cable**

**Measuring cable CYK71**

- Unterminated cable for connecting analog sensors and for extending sensor cables
- Sold by the meter, order numbers:
  - Non-Ex version, black: 50085333
  - Ex-version, blue: 50085673

**Junction boxes**

**VBM**

- Junction box for cable extension
- 10 terminal strips
- Cable entries: 2 x Pg 13.5 or 2 x NPT ½"
- Material: aluminum
- Degree of protection: IP 65
- Order numbers
  - Cable entries Pg 13.5 : 50003987
  - Cable entries NPT ½": 51500177

**VBM-Ex**

- Junction box for cable extension in hazardous area
- 10 terminal strips (blue)
- Cable entries: 2 x Pg 13.5
- Material: aluminum
- Degree of protection: IP 65 (≅ NEMA 4X)
- Order number: 50003991

**Service-specific accessories**

**Calibration solutions**

**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-A, 74 µS/cm (reference temperature 25 °C (77 °F)), 500 ml (16.9 fl.oz)  
Order No. 50081902
- CLY11-B, 149.6 µS/cm (reference temperature 25 °C (77 °F)), 500 ml (16.9 fl.oz)  
Order No. 50081903



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**Calibration set**

**Conducal CLY421**

- Conductivity calibration set (case) for ultrapure water applications
- Complete, factory-calibrated measuring system with certificate, traceable to SRM by NIST and PTB, for comparison measurement in ultrapure water up to max. 20  $\mu\text{S}/\text{cm}$
- Product Configurator on the product page: [www.endress.com/cly421](http://www.endress.com/cly421)



Technical Information TI00496C/07/EN



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[www.addresses.endress.com](http://www.addresses.endress.com)

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