



Technical Information

Condumax CLS16B

Analog conductivity sensor



Cell constant $k = 0.1 \text{ cm}^{-1}$

Application

Measurement in pure and ultrapure water range

- Monitoring of ion exchangers
- Reverse osmosis
- Distillation
- Electrodeionization
- WFI (water for injection) in the pharmaceutical industry

Sensors with temperature probes are used in conjunction with conductivity measuring devices that support automatic temperature compensation:

- Liquiline CM42
- Lquisys CLM223/253

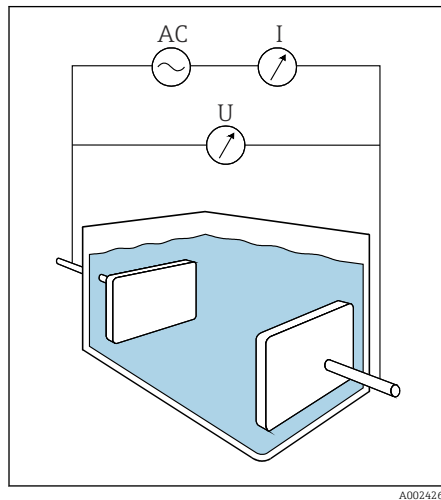
These transmitters can also be used to measure the resistivity.

Your benefits

- High measurement accuracy as cell constant is individually measured
- Hygienic process connections for installation in pipes or flow vessel
- With plug-in head (IP68) or fixed cable (IP67)
- Easy to clean thanks to electropolished surfaces
- Sterilizable up to 150 °C (302 °F)
- Final inspection report stating the individual cell constant
- Certified according to EHEDG Document 8, EL Class I
- Declaration according to USP<87> and USP<88> Class VI (optional)
- Inspection certificate EN 10204 3.1 (optional)
- Ex approval (optional)

Function and system design

Measuring principle



1 Conductive measurement of conductivity

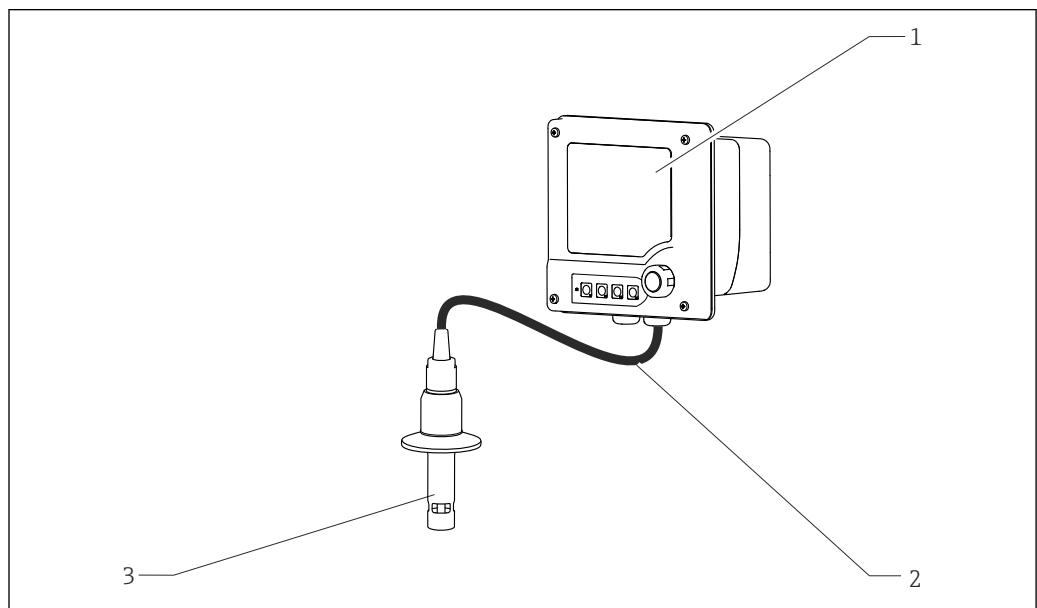
AC Alternating voltage source
I Current intensity measurement
U Voltage measurement

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 κ is determined from the conductance value using the cell constant k , which depends on the sensor geometry.

Measuring system

A complete measuring system comprises at least:

- the contacting conductivity sensor
- a transmitter, e.g. Liquiline M CM42
- a measuring cable, e.g. sensor fixed cable or CPK9



2 Example of a measuring system

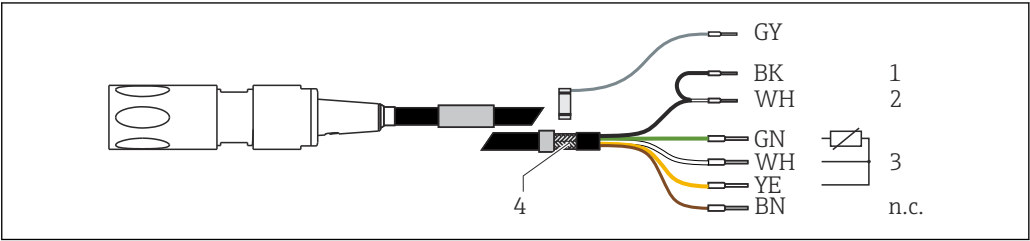
1 Transmitter CM42
2 Sensor cable
3 CLS16B sensor

Input

Measured variables	Conductivity Temperature
Measuring ranges	Conductivity in relation to water at 25 °C (77 °F) 0.04 to 500 µS/cm Temperature -5 to 150 °C (23 to 300 °F)
Cell constant	k = 0.1 cm ⁻¹
Temperature compensation	Depending on version: Pt100 (Class A according to IEC 60751) Pt1000 (Class A according to IEC 60751)

Power supply

Electrical connection	The sensor is electrically connected via the CPK9 measuring cable (plug-in head versions) or the sensor's fixed cable. The wiring diagram is provided in the Operating Instructions of the transmitter used.
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- 3 Measuring cable CPK9
- 1 Coax BK, shield (outer electrode)
 - 2 Coax WH, conductivity (inner electrode)
 - 3 Temperature
 - 4 Outer shield, pay attention to the wiring diagram of the transmitter
 - n.c. Do not connect

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

Performance characteristics

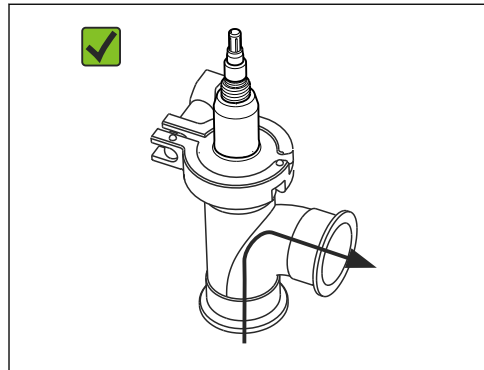
Measurement uncertainty	Each individual sensor is factory-measured in a solution with approx. 5 µS/cm using a reference measuring system traceable to NIST or PTB. The exact cell constant is entered in the final inspection report supplied. The measurement uncertainty in determining the cell constant is 1.0 %.
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Mounting procedure

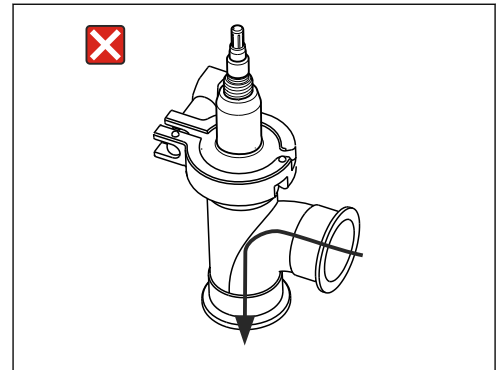
Installation instructions

The sensors are installed directly via the process connection.

- When installing in pipes, pay attention to the flow direction.



4 Permitted flow direction



5 Inadmissible flow direction

Environment

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

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

Relative humidity 5 to 95 %

Degree of protection	Fixed cable version	IP 67 / NEMA 6
	TOP68 plug-in system	IP 68 / NEMA 6

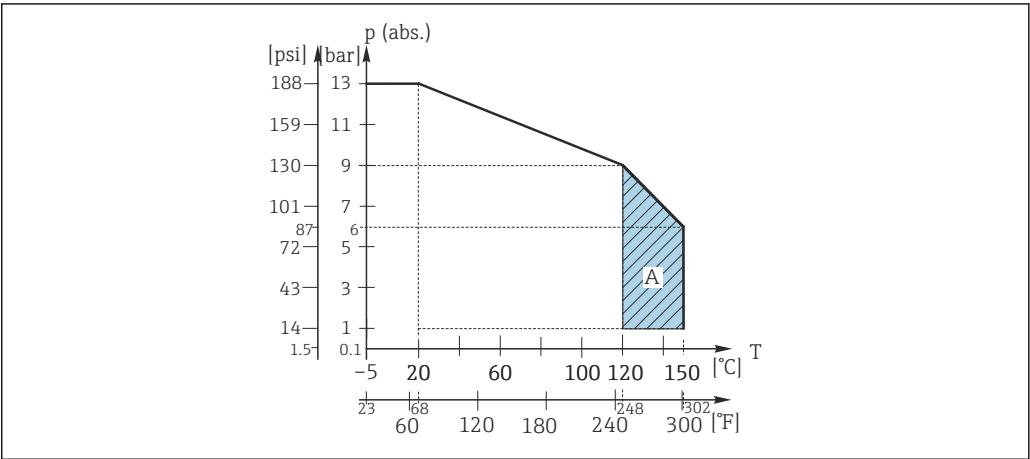
Process

Process temperature	Normal operation	-5 to 120 °C (23 to 248 °F)
	Sterilization (max. 45 min)	Max. 150 °C (302 °F) at 6 bar (87 psi) absolute

Pressure (absolute)

- 13 bar (188 psi) absolute, at 20 °C (68 °F)
- 9 bar (130 psi) absolute, at 120 °C (248 °F)
- 0.1 bar (1.5 psi) absolute (vacuum), at 20 °C (68 °F)

Temperature/pressure rating

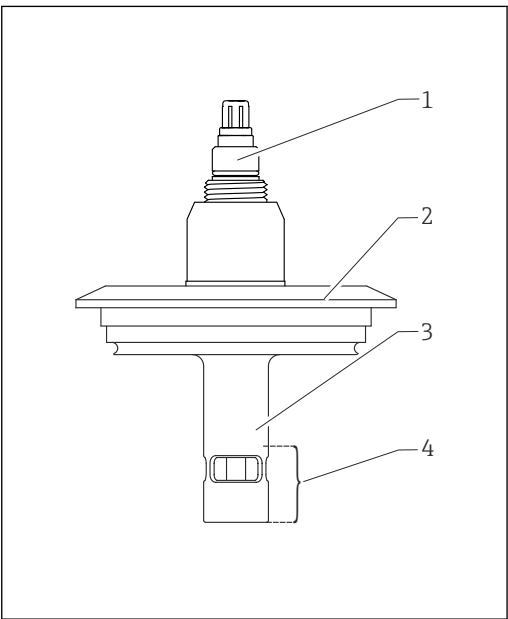


6 Mechanical pressure-temperature resistance

A Can be sterilized for a short time (45 min.)

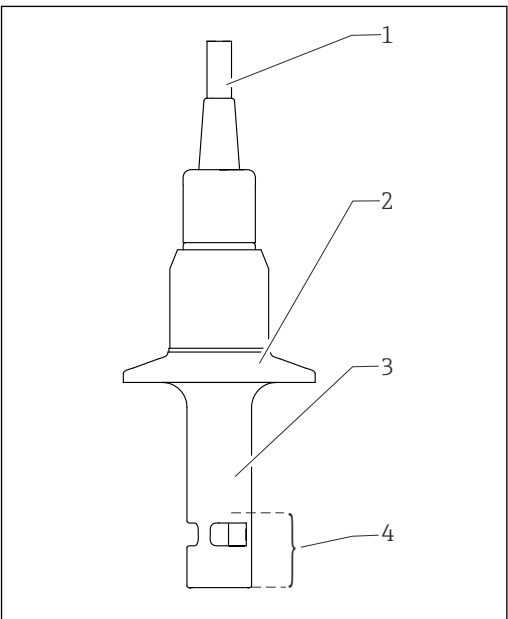
Mechanical construction

Design



7 Design with plug-in head

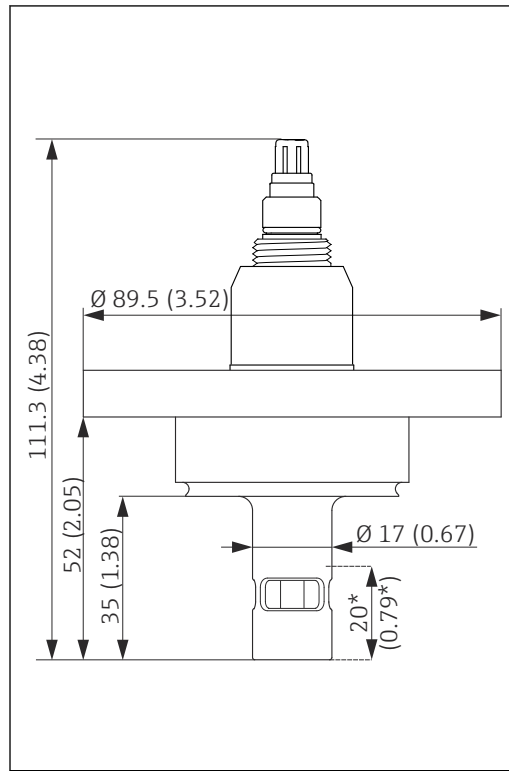
- 1 Plug-in head
- 2 Process connection (Clamp, Varivent, BioControl)
- 3 Coaxial measuring electrode
- 4 Minimum immersion depth



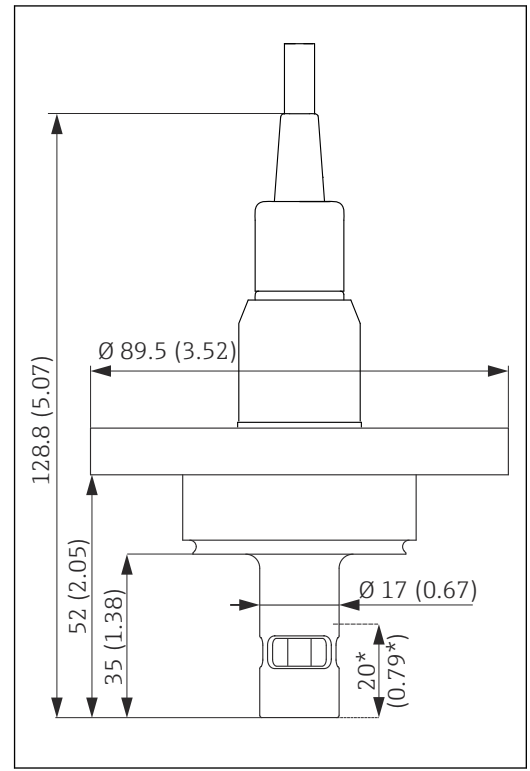
8 Design with fixed cable

- 1 fixed cable
- 2 Process connection (Clamp, Varivent, BioControl)
- 3 Coaxial measuring electrode
- 4 Minimum immersion depth

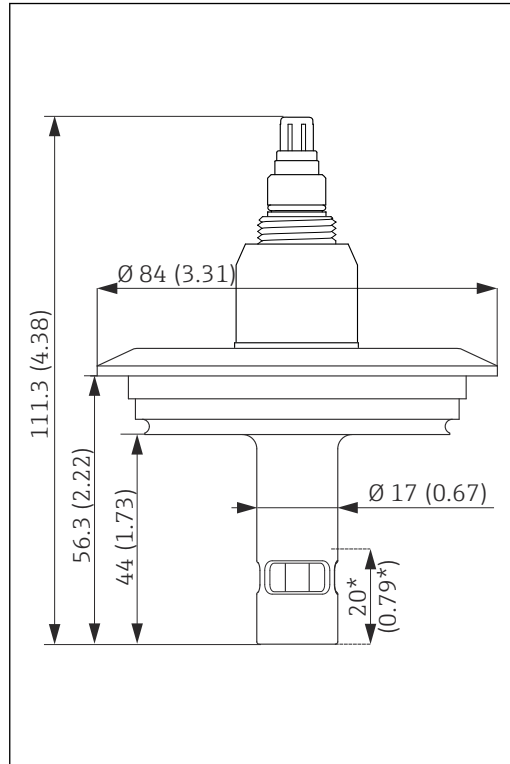
Dimensions



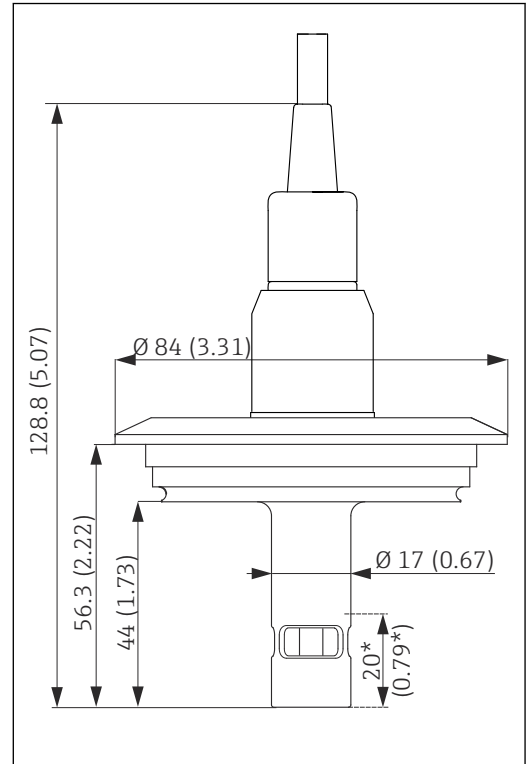
9 Plug-in head version with BioControl. Unit of measurement mm (in)



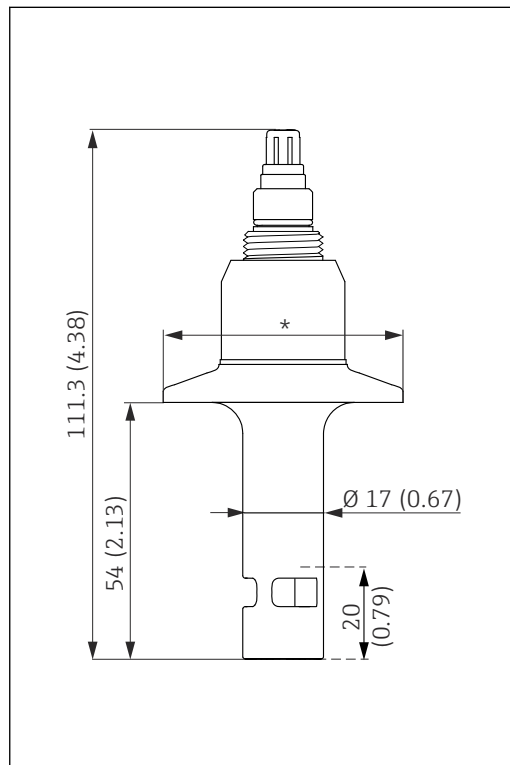
10 Fixed cable version with BioControl. Unit of measurement mm (in)



11 Plug-in head version with Varivent. Unit of measurement mm (in)

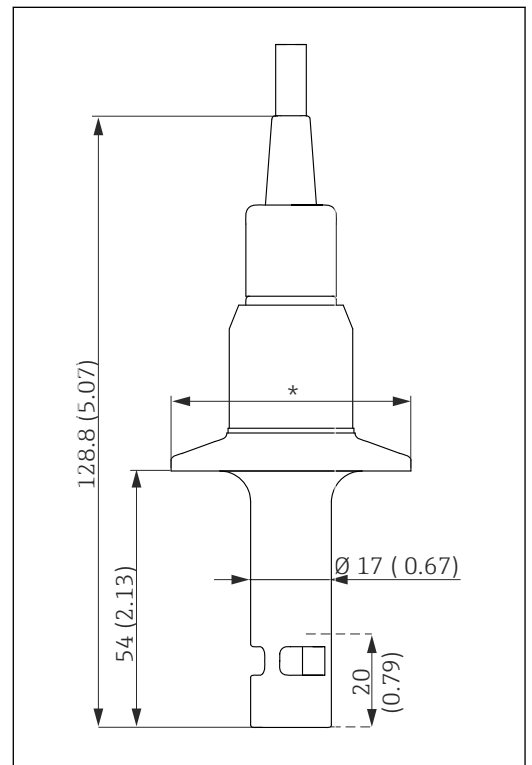


12 Fixed cable version with Varivent. Unit of measurement mm (in)



13 Plug-in head version with Clamp. Unit of measurement mm (in)

* CLS16B-**CA: 50.5 mm
CLS16B-**CB: 64 mm
CLS16B-**CC: 50.5 mm



14 Fixed cable version with Clamp. Unit of measurement mm (in)

* CLS16B-**CA: 50.5 mm
CLS16B-**CB: 64 mm
CLS16B-**CC: 50.5 mm

Weight

Depending on the version, 0.13 to 0.75 kg (0.29 to 1.65 lbs)

Materials (in contact with medium)	Sensor	Depending on the order version: ■ Electropolished, stainless steel 1.4435 (AISI 316L) ■ PEEK
	Sealing	Depending on the order version: ■ Form seal FFKM ■ Form seal EPDM
Process connections	■ Clamp 1", 1½", 2" as per ISO 2852 (also suitable for TRI-CLAMP, DIN 32676) ■ Tuchenhausen VARIVENT N DN 50 to 125 ■ NEUMO BioControl D50	
Surface roughness	R _a ≤ 0.38 µm, electropolished	

Certificates and approvals

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.



Certificates and approvals are optional, i.e. they depend on the product version.

Ex approvals	CLS16B-BA ATEX II 1G Ex ia IIC T3/T4/T6 Ga CLS16B-CI CSA C/US IS Cl. I Div. 1 GP A-D T3/T4/T6 + CSA C/US IS Cl. I Zone 0 AEx ia IIC T3/T4/T6 CLS16B-MA INMETRO Ex ia IIC T3/T4/T6 Ga CLS16B-NA NEPSI Ex ia IIC T3/T4/T6 Ga CLS16B-UA UK Ex II 1G Ex ia IIC T6...T3 Ga
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Hygienic compatibility	EHEDG Certified according to EL Class I, only for process connections: ■ Clamp 1 1/2" ■ Clamp 2" ■ Varivent Regulation (EC) No. 1935/2004 Meets the requirements of Regulation (EC) No. 1935/2004 The product therefore meets the requirements for materials that come into contact with food. FDA All materials in contact with the medium meet the requirements of the FDA. Chinese standard for food contact materials Meets the requirements of the GB4806.1-2016 Standard.
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Pharmaceutical compatibility	Compliance with requirements derived from cGMP Certificate of conformity for pharmaceutical requirements, confirms conformity with biological reactivity test USP 87, USP 88 Class VI, FDA material conformity, TSE-/BSE-free, surface roughness
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ASME BPE

Produced according to the criteria of the ASME BPE that is currently valid.

CRN approval	As the sensor can be operated with a nominal pressure greater than 15 psi (approx. 1 bar), it has been registered according to CSA B51 ("Boiler, pressure vessel, and pressure piping code"; category F) with a CRN (Canadian Registration Number) in all Canadian provinces. The CRN can be found on the nameplate.
Final inspection report	Stating the individual cell constant
Surface roughness test	Stainless steel surfaces in contact with medium tested to $\leq R_a 0.38 \mu\text{m}$.
Inspection certificate in accordance with EN 10204 3.1	Depending on the version, a test certificate 3.1 in accordance with EN 10204 is supplied.

Ordering information

Product page	www.endress.com/cls16b
Product Configurator	1. Configure: Click this button on the product page. - Select Extended selection. - The Configurator opens in a separate window. - 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. Accept: Add the configured product to the shopping cart.  For many products, you also have the option of downloading CAD or 2D drawings of the selected product version. 5. CAD: Open this tab. - The drawing window is displayed. You have a choice between different views. You can download these in selectable formats.
Scope of delivery	The scope of delivery includes: ■ Sensor (version as ordered) ■ Operating instructions ■ XA, Safety instructions for electrical equipment in hazardous areas (optional) ■ Final inspection report

Accessories

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

Listed accessories are technically compatible with the product in the instructions.

- 1.** Application-specific restrictions of the product combination are possible. Ensure conformity of the measuring point to the application. This is the responsibility of the operator of the measuring point.
- 2.** Pay attention to the information in the instructions for all products, particularly the technical data.
- 3.** For accessories not listed here, please contact your Service or Sales Center.

Measuring cable	Measuring cable CPK9 ■ Terminated measuring cable for connecting analog sensors with TOP68 plug-in head ■ Selection in accordance with product structure ■ Product Configurator on the product page: www.endress.com/cpk9  Technical Information TI00118C
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
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  Technical Information TI00162C
Calibration set	Conductal CLY421 ■ Conductivity calibration set (case) for ultrapure water applications ■ Complete, factory-calibrated measuring system with certificate, for comparative measurement in ultrapure water up to max. 20 µS/cm ■ Product Configurator on the product page: www.endress.com/cly421  Technical Information TI00496C/07/EN



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