

Operating Instructions

Condumax CLS16B

Analog conductivity sensor







Table of contents









1	About this document	3
1.1	Safety information	3
1.2	Symbols	3
1.3	Documentation	3
2	Basic safety instructions	4
2.1	Requirements for the personnel	4
2.2	Intended use	4
2.3	Workplace safety	4
2.4	Operational safety	5
2.5	Product safety	5
3	Incoming acceptance and product identification	5
3.1	Incoming acceptance	5
3.2	Product identification	6
3.3	Scope of delivery	6
4	Mounting	7
4.1	Mounting requirements	7
4.2	Mounting the sensor	7
4.3	Post-mounting check	7
5	Electrical connection	8
5.1	Connecting the sensor	8
5.2	Ensuring the degree of protection	8
5.3	Post-connection check	9
6	Commissioning	9
7	Maintenance	10
8	Repair	11
8.1	General notes	11
8.2	Spare parts	11
8.3	Endress+Hauser services	11
8.4	Return	12
8.5	Disposal	12
9	Technical data	13
9.1	Input	13
9.2	Performance characteristics	13
9.3	Process	13
9.4	Mechanical construction	14
	Index	15

1 About this document

1.1 Safety information

Structure of information	Meaning
<p> DANGER</p> <p>Causes (/consequences) If necessary, Consequences of non-compliance (if applicable)</p> <ul style="list-style-type: none"> ▶ Corrective action 	<p>This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation will result in a fatal or serious injury.</p>
<p> WARNING</p> <p>Causes (/consequences) If necessary, Consequences of non-compliance (if applicable)</p> <ul style="list-style-type: none"> ▶ Corrective action 	<p>This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation can result in a fatal or serious injury.</p>
<p> CAUTION</p> <p>Causes (/consequences) If necessary, Consequences of non-compliance (if applicable)</p> <ul style="list-style-type: none"> ▶ Corrective action 	<p>This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.</p>
<p> NOTICE</p> <p>Cause/situation If necessary, Consequences of non-compliance (if applicable)</p> <ul style="list-style-type: none"> ▶ Action/note 	<p>This symbol alerts you to situations which may result in damage to property.</p>

1.2 Symbols

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

1.3 Documentation

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



Technical Information Condumax CLS16B, TI01772C



Special Documentation for hygienic applications, SD02751C

In addition to the Operating Instructions and depending on the relevant approval, XA "Safety instructions" are supplied with sensors for the hazardous area.

- ▶ Please follow the XA instructions when using the device in the hazardous area.

2 Basic safety instructions

2.1 Requirements for the 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 conductivity sensor is designed for the conductive measurement of the conductivity of liquids. The main areas of application are:

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

Any use other than that intended puts the safety of people and the measuring system at risk. Therefore, any other use is not permitted.

The manufacturer is not liable for harm caused by improper or unintended use.

2.3 Workplace safety

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

- Installation guidelines
- Local standards and regulations
- Regulations for explosion protection

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, take products out of service and protect them 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.

3 Incoming acceptance and product identification

3.1 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.

3.2 Product identification

3.2.1 Nameplate

The nameplate provides you with the following information on your device:

- Manufacturer identification
- Extended order code
- Serial number
- Safety information and warnings

► Compare the information on the nameplate with the order.

3.2.2 Identifying the product

Product page

www.endress.com/cls16b

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. Go to www.endress.com.
2. Page search (magnifying glass symbol): Enter valid serial number.
3. Search (magnifying glass).
 - ↳ The product structure is displayed in a popup window.
4. Click the product overview.
 - ↳ A new window opens. Here you fill information pertaining to your device, including the product documentation.

Manufacturer address

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

3.3 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

4 Mounting

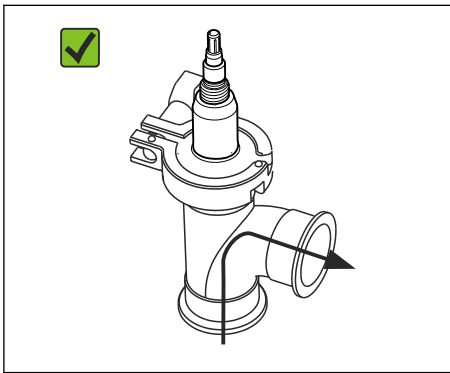
4.1 Mounting requirements

- ▶ 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".

4.2 Mounting the sensor

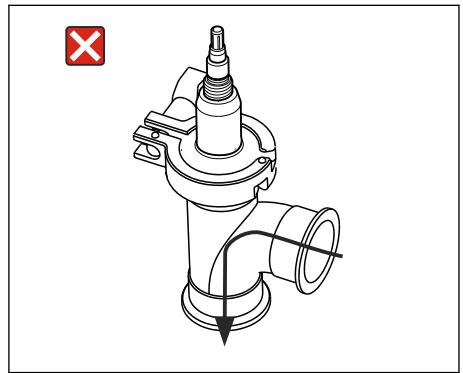
The sensors are installed directly via the process connection.

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



A0024198

1 Permitted flow direction



A0024197

2 Inadmissible flow direction

1. Ensure that the electrodes are fully immersed in the medium during measurement.
2. If using the sensor in the ultrapure water range, you must work under air-evacuated conditions.
 - ↳ Otherwise the CO_2 in the air can dissolve in the water and its (weak) dissociation can increase the conductivity by up to $3 \mu\text{S}/\text{cm}$.

4.3 Post-mounting check

1. Are the sensor and cable undamaged?

2. Is the sensor installed in the process connection and is not suspended from the cable?

5 Electrical connection

⚠ WARNING

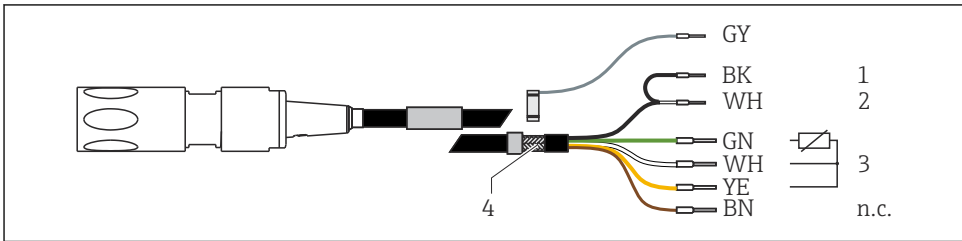
Device is live!

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.

5.1 Connecting the sensor

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.



A0044784

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.

5.2 Ensuring the degree of protection

Only the mechanical and electrical connections which are described in these instructions, and which are necessary for the required intended use, may be established on the device delivered.

- ▶ Exercise care when carrying out the work.

Otherwise, the individual types of protection (Ingress Protection (IP), electrical safety, EMC interference immunity) agreed for this product can no longer be guaranteed due, for example, to covers being left off or cable (ends) that are loose or insufficiently secured.

5.3 Post-connection check

Device health and specifications	Action
Is the outside of the sensor, assembly or cable free from damage?	▶ Perform a visual inspection.
Electrical connection	Action
Are the mounted cables strain-relieved and not twisted?	▶ Perform a visual inspection. ▶ Untwist the cables.
Is a sufficient length of the cable cores stripped, and are the cores positioned in the terminal correctly?	▶ Perform a visual inspection. ▶ Pull gently to check they are seated correctly.
Are the power supply and signal lines correctly connected?	▶ Refer to the wiring diagram for the transmitter.
Are all screw terminals tightened?	▶ Tighten the screw terminals.
Are all the cable entries installed, tightened and leak-tight?	▶ Perform a visual inspection. In the case of lateral cable entries:
Are all cable entries mounted on the side or pointing downwards?	▶ Point cable loops downward so that water can drip off.

6 Commissioning

Prior to initial commissioning, ensure that:

- The sensor is correctly installed
- The electrical connection is correct

1. Check the temperature compensation and damping settings on the transmitter.

⚠ WARNING

Escaping process medium

Risk of injury from high pressure, high temperatures or chemical hazards!

- ▶ Before applying pressure to an assembly with cleaning system, ensure that the system has been connected correctly.
- ▶ If you cannot reliably establish the correct connection, do not install the assembly in the process.

If using an assembly with automatic cleaning function:

2. Check that the cleaning medium (water or air, for example) is connected correctly.
3. Following commissioning:
Maintain the sensor at regular intervals.
↳ This is the only way to ensure reliable measurements.

7 Maintenance

⚠ CAUTION

Corrosive chemicals

Risk of chemical burns to the eyes and skin and risk of damage to clothing and equipment!

- ▶ It is absolutely essential to protect the eyes and hands properly when working with acids, alkalis and organic solvents!
- ▶ Wear protective goggles and safety gloves.
- ▶ Clean away splashes on clothes and other objects to prevent any damage.
- ▶ Comply with instructions in the safety data sheets for the chemicals used.

⚠ WARNING

Thiocarbamide

Harmful if swallowed! Limited evidence of carcinogenicity! Possible risk of harm to the unborn child! Dangerous for the environment with long-term effects!

- ▶ Wear protective goggles, protective gloves and appropriate protective clothing.
- ▶ Avoid all contact with the eyes, mouth and skin.
- ▶ Avoid discharge into the environment.

⚠ CAUTION

Corrosive chemicals

Risk of chemical burns to the eyes and skin and risk of damage to clothing and equipment!

- ▶ It is absolutely essential to protect the eyes and hands properly when working with acids, alkalis and organic solvents!
- ▶ Wear protective goggles and safety gloves.
- ▶ Clean away splashes on clothes and other objects to prevent any damage.
- ▶ Comply with instructions in the safety data sheets for the chemicals used.

Clean away fouling on the sensor as follows depending on the type of fouling:

1. Oily and greasy films:
Clean with grease remover, e.g. alcohol, or hot water with an alkaline agent.
2. Lime and metal hydroxide buildup and low solubility (lyophobic) organic buildup:
Dissolve buildup with diluted hydrochloric acid (3 %) and then rinse thoroughly with plenty of clear water.
3. Sulfidic buildup (from flue gas desulfurization or wastewater treatment plants):
Use a mixture of hydrochloric acid (3 %) and thiocarbamide (commercially available) and then rinse thoroughly with plenty of clear water.
4. Buildup containing protein (e.g. in the food industry):
Use a mixture of hydrochloric acid (0.5 %) and pepsin (commercially available) and then rinse thoroughly with plenty of clear water.
5. Readily soluble biological buildup:
Rinse with pressurized water.

After cleaning, rinse the sensor thoroughly with plenty of water.

8 Repair

8.1 General notes

The repair and conversion concept provides for the following:

- The product has a modular design
- Spare parts are grouped into kits which include the associated kit instructions
- Only use original spare parts from the manufacturer
- Repairs are carried out by the manufacturer's Service Department or by trained users
- Certified devices can only be converted to other certified device versions by the manufacturer's Service Department or at the factory
- Observe applicable standards, national regulations, Ex documentation (XA) and certificates

1. Carry out the repair according to the kit instructions.
2. Document the repair and conversion and enter, or have entered, in the Life Cycle Management tool (W@M).

8.2 Spare parts

Device spare parts that are currently available for delivery can be found on the website:

<https://portal.endress.com/webapp/SparePartFinder>

- ▶ Quote the serial number of the device when ordering spare parts.

8.3 Endress+Hauser services

Intact seals are a prerequisite for safe and reliable measurements. The seal should be replaced at regular intervals to guarantee maximum sensor operational safety and hygiene.

Practical repair intervals can only be determined by the user as they depend greatly on the operating conditions, such as:

- Type and temperature of the product
- Type and temperature of the cleaning agent
- Number of cleanings
- Number of sterilizations
- Operating environment

Recommended intervals for seal replacement (reference values)

Application	Window
Media with temperatures from 50 to 100 °C (122 to 212 °F)	Approx. 18 months
Media with temperatures < 50 °C (122 °F)	Approx. 36 months
Sterilization cycles, max. 150 °C (302 °F), 45 min.	Approx. 400 cycles

To ensure your sensor is operational again after being exposed to very high loads, you can have it regenerated in the factory. In the factory, the sensor is fitted with new seals and recalibrated.

Please contact your sales office for information on replacing the seal and recalibration in the factory.

8.4 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:

- ▶ Check the website www.endress.com/support/return-material for information on the procedure and general conditions.

8.5 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 the manufacturer for disposal under the applicable conditions.

9 Technical data

9.1 Input

9.1.1 Measured variables

- Conductivity
- Temperature

9.1.2 Measuring ranges

Conductivity

in relation to water at 25 °C (77 °F)

0.04 to 500 $\mu\text{S}/\text{cm}$

Temperature

-5 to 150 °C (23 to 300 °F)

9.1.3 Cell constant

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

9.1.4 Temperature compensation

Depending on version:

- Pt100 (Class A according to IEC 60751)
- Pt1000 (Class A according to IEC 60751)

9.2 Performance characteristics

9.2.1 Measurement uncertainty

Each individual sensor is factory-measured in a solution with approx. 5 $\mu\text{S}/\text{cm}$ 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 %.

9.3 Process

9.3.1 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

9.3.2 Process 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)

Index

C

Cell constant 13

Check

- Connection 9
- Mounting 7

Connection

- Check 9
- Ensuring the degree of protection 8

D

Degree of protection

- Ensuring 8

Disposal 12

E

Electrical connection 8

I

Identifying the product 6

Incoming acceptance 5

Intended use 4

M

Materials 14

Measured variables 13

Measurement uncertainty 13

Measuring ranges 13

Mounting

- Check 7
- Sensor 7

N

Nameplate 6

O

Operational safety 5

P

Performance characteristics 13

Process 13

Process connection 14

Process pressure 13

Process temperature 13

Product safety 5

R

Recalibration 11

Repair 11

Return 12

S

Safety

- Operation 5
- Product 5
- Workplace safety 4

Safety information 3

Safety instructions 4

Scope of delivery 6

Sealing ring replacement 11

Sensor

- Cleaning 10
- Connecting 8
- Installing 7

Spare parts 11

Surface roughness 14

Symbols 3

T

Technical data

- Input 13
- Mechanical construction 14
- Performance characteristics 13
- Process 13

Temperature compensation 13

U

Use 4

W

Weight 14

Workplace safety 4



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