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Operating Instructions
Liquiline Compact CM72

Compact single-parameter transmitter for Memosens sensors

Endress+Hauser
People for Process Automation

Table of contents

1 About this document

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
- Recommended
- Forbidden 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
- Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

1.4 Documentation

The following instructions complement these Operating Instructions and are available on the product pages on the Internet:
Operating Instructions Memosens, BA01245C
- Software description for Memosens inputs
- Calibration of Memosens sensors
- Sensor-specific diagnostics and troubleshooting

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 Liquiline CM72 is a transmitter for connecting digital sensors with Memosens technology, permanently preset to sensor parameters and turn down with 4 to 20mA communication.

The device is designed for use in the following industries:
- Life science
- Chemical industry
- Water and wastewater
- Food and beverages
- Power stations
- Other industrial applications

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:
  products must be taken out of service and protected against unintentional operation.

⚠ CAUTION

Programs not switched off during maintenance activities.
Risk of injury due to medium or cleaning agent!

- Quit any programs that are active.
- Switch to the service mode.
- If testing the cleaning function while cleaning is in progress, wear protective clothing, goggles and gloves or take other suitable measures to protect yourself.

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.

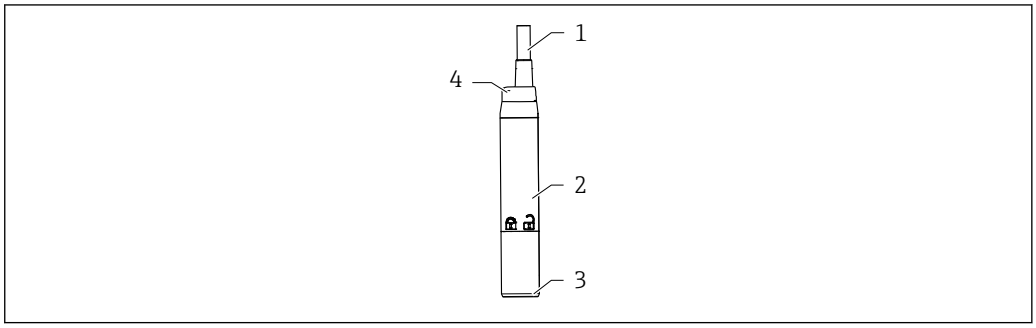
2.6 IT security

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

3.1 Product design



1 Transmitter design

1 Cable
2 Housing
3 Memosens connection
4 LED, for optical signaling of operating statuses of measuring point

3.1.1 Measuring parameters

The transmitter is designed for digital Memosens sensors with an inductive plug-in head:
- pH
- ORP
- Conductive conductivity
- Dissolved oxygen

Depending on the order version, the measuring range is configured to suit the sensor type:
- pH sensor: 0 to 14 pH
- ORP: -1500 mV to +1500 mV
- Conductivity: 0 to 20 µS/cm
- Conductivity: 0 to 500 µS/cm
- Conductivity: 0 to 20 mS/cm
- Conductivity: 0 to 500 mS/cm
- Oxygen: 0 to 200 µg/l
- Oxygen: 0 to 20 mg/l

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
- Safety information and warnings
- Certificate information
- Approvals as per version ordered

▶ Compare the data on the nameplate with your order.

4.2.2 Product identification

Manufacturer address

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

Product page

www.endress.com/CM72

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.

4.3 Scope of delivery

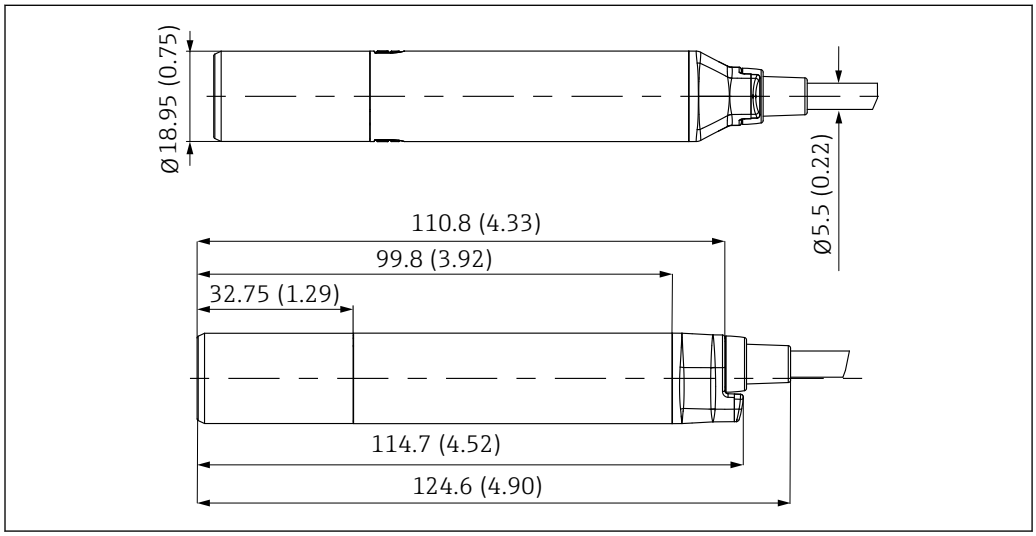
The scope of delivery includes:
- CM72
- Brief Operating Instructions

▶ If you have any queries:
Please contact your supplier or local sales center.

5 Mounting

5.1 Mounting requirements

5.1.1 Dimensions



2 Dimensions in mm (inch)

6 Electrical connection

⚠ WARNING

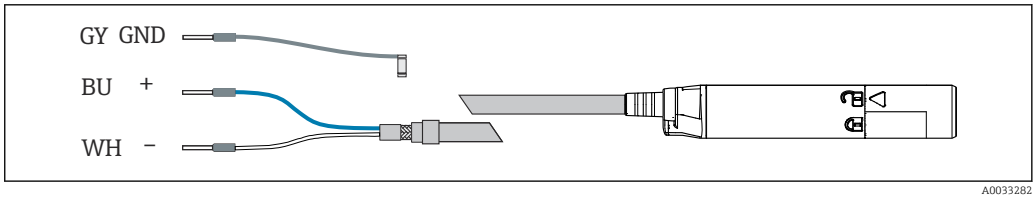
Device is live!

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 requirements

Supply voltage:	12.6 to 30 VDC (when error current > 20 mA) 14 to 30 VDC (if the error current is set to 3.6 mA.)
Cable length:	3 m (10 ft) 7 m (23 ft) 15 m (46 ft)
Signal output:	4 to 20 mA
Signal on alarm:	3.6 or 23 mA depending on order version



3 Electrical connection

- ▶ Connect ferrules as specified in the table:

Cable	Function
Gray (GY)	Grounding, GND
BU (blue)	4 to 20 mA +
White (WH)	4 to 20 mA -

The ground cable must be provided by the customer.

6.1.1 With RIA15

The RIA15 process indicator is loop-powered and does not require any external power supply.

Further information is available in the RIA15 Operating Instructions BA01170K.

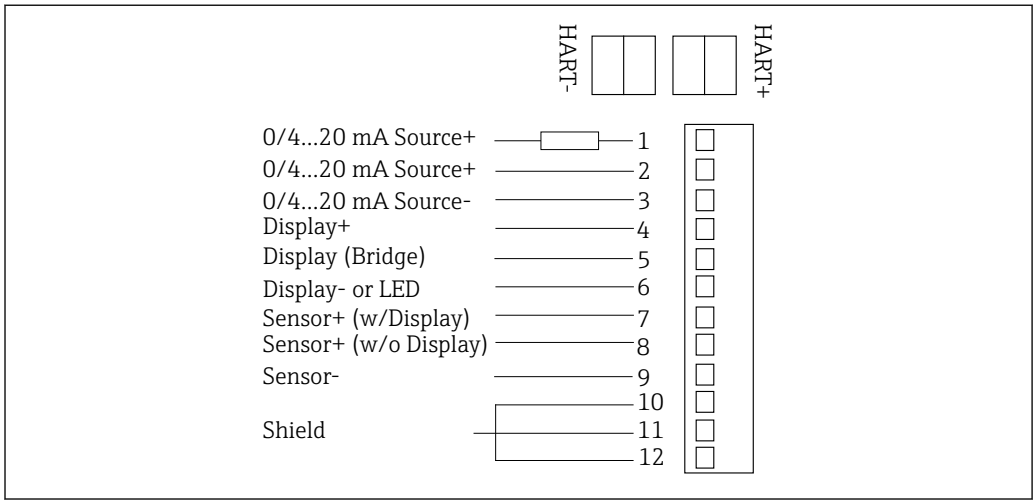
6.1.2 With junction box

Max. operating voltage:	30 V
Max. operating current	30 mA

Wiring

1. Unscrew cover and remove.
   ↳ The terminal assignment is indicated in the box.

2. Guide the cable cores through the M16 cable gland.
3. Connect cores in accordance with the assignment provided.



4 *Terminal diagram*

Further information is available in the Operating Instructions BA01802C.

6.2 Post-connection check

WARNING

Connection errors

The safety of people and of the measuring point is under threat. The manufacturer does not accept any responsibility for errors that result from failure to comply with the instructions in this manual.

- Put the device into operation only if you can answer **yes** to **all** the following questions.

Electrical connection

- Is the device or cable undamaged (visual inspection)?
- Do the mounted cables have adequate strain relief?
- Are the cables routed without loops and cross-overs?
- Does the supply voltage match the specifications on the nameplate?
- No reverse polarity, is terminal assignment correct?

7 System integration

7.1 Integrating the measuring device into the system

Interface for measured value transmission:
4 to 20 mA

For configuration with the measured value and the current output turndown, select the option in the order structure when ordering. This cannot be changed at a later stage.

8 Commissioning

8.1 Preliminaries

- Connect the device.
  - The device starts up and transmits the measured value as a current value.

8.2 Function check

WARNING

Incorrect connection, incorrect supply voltage
Safety risks for staff and device malfunctions!
- Check that all connections have been established correctly in accordance with the wiring diagram.
- Ensure that the supply voltage matches the voltage indicated on the nameplate.

Familiarize yourself with the operation of the device before it is first switched on. In particular, please read the "Basic safety instructions" sections. After power-up, the device performs a self-test and then goes to the measuring mode.

8.2.1 LED indicators

LED indicators signal the device status and sensor status.

LED behavior	Status
Green Flashes quickly	Everything OK Device starting up
Green Flashes twice	Everything OK Read out Memosens sensor information from sensor to transmitter (sensor type, calibration data, etc.)
Green Flashes slowly	Everything OK Sensor and device OK and functioning correctly.
Green Flashes quickly three times	Everything OK Measured value at PLC in automatic HOLD. If the "Sensor replacement alarm delay" is exceeded, the device transmits a signal on alarm. The automatic hold is set to 30 seconds.
Red Flashes quickly	Failure of device or sensor Fault state as per NAMUR NE107

9 Operation

9.1 Reading measured values

The measured value is output at the current output in accordance with the order code.

The LED indicates the status of the measuring point (→ 13).

The data relating to the measuring point can be found on the nameplate. → 8

10 Diagnostics and troubleshooting

10.1 Diagnostic information via LED

See LED display in Commissioning section. (→ 13)

11 Maintenance

The maintenance of the measuring point comprises:
- Calibration
- Cleaning the controller, assembly and sensor
- Checking the cables and connections.

⚠ WARNING

Process pressure and temperature, contamination
Risk of serious or fatal injury
- ▶ If the sensor has to be removed during maintenance work, avoid hazards posed by pressure, temperature and contamination.

NOTICE

Electrostatic discharge (ESD)
Risk of damaging the electronic components
- ▶ Take personal protective measures to avoid ESD, such as discharging beforehand at PE or permanent grounding with a wrist strap.

11.1 Maintenance tasks

11.1.1 Cleaning

NOTICE

Cleaning agents not permitted
Damage to housing surface and optical waveguide
- ▶ Never use concentrated mineral acids or alkaline solutions for cleaning.
- ▶ Never use organic cleaners such as acetone, benzyl alcohol, methanol, methylene chloride, tetrahydrofuran, xylene or concentrated glycerol cleaner.

The device is resistant to:
- Ethanol (for a short time)
- Diluted acids (max. 2% HCl)
- Diluted bases (max. 3% NaOH)
- Soap-based household cleaning agents
- Washing-up liquid

12 Repair

12.1 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

12.2 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.

12.3 Disposal

The device contains electronic components. The product must be disposed of as electronic waste.

- Observe the local regulations.

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.

13 Accessories

13.1 Device-specific accessories

13.1.1 Sensors

pH glass electrodes

Memosens CPS11E
- pH sensor for standard applications in process and environmental engineering
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: www.endress.com/cps11e

Technical Information TI01493C

Memosens CPS31E
- pH sensor for standard applications in drinking water and swimming pool water
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: www.endress.com/cps31e

Technical Information TI01574C

Memosens CPS41E
- pH sensor for process technology
- With ceramic junction and KCl liquid electrolyte
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: www.endress.com/cps41e

Technical Information TI01495C

Memosens CPS71E
- pH sensor for chemical process applications
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: www.endress.com/cps71e

Technical Information TI01496C

Memosens CPS171D
- pH electrode for bio-fermenters with digital Memosens technology
- Product Configurator on the product page: www.endress.com/cps171d

Technical Information TI01254C

Memosens CPS91E
- pH sensor for heavily polluted media
- With open aperture
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: www.endress.com/cps91e

Technical Information TI01497C

Memosens CPF81E
- pH sensor for mining operations, industrial water and wastewater treatment
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: www.endress.com/cpf81e

Technical Information TI01594C

Enamel pH electrodes

Ceramax CPS341D
- pH electrode with pH-sensitive enamel
- Meets highest demands of measuring accuracy, pressure, temperature, sterility and durability
- Product Configurator on the product page: www.endress.com/cps341d

Technical Information TI00468C

ORP sensors

Memosens CPS12E
- ORP sensor for standard applications in process and environmental engineering
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: www.endress.com/cps12e

Technical Information TI01494C

Memosens CPS42E
- ORP sensor for process technology
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: www.endress.com/cps42e

Technical Information TI01575C

Ceragel CPS72D
- ORP electrode with reference system including ion trap
- Product Configurator on the product page: www.endress.com/cps72d

Technical Information TI00374C

Memosens CPF82E
- ORP sensor for mining operations, industrial water and wastewater treatment
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: www.endress.com/cpf82e

Technical Information TI01595C

Orbipore CPS92D
- ORP electrode with open aperture for media with high dirt load
- Product Configurator on the product page: www.endress.com/cps92d

Technical Information TI00435C

pH-ISFET sensors

Tophit CPS441D
- Sterilizable ISFET sensor for low-conductivity media
- Liquid KCl electrolyte
- Product Configurator on the product page: www.endress.com/cps441d

Technical Information TI00352C

Tophit CPS471D
- Sterilizable and autoclavable ISFET sensor for food and pharmaceutics, process engineering
- Water treatment and biotechnology
- Product Configurator on the product page: www.endress.com/cps471d

Technical Information TI00283C

Tophit CPS491D
- ISFET sensor with open aperture for media with high dirt load
- Product Configurator on the product page: www.endress.com/cps491d

Technical Information TI00377C

Conductivity sensors with conductive measurement of conductivity

Memosens CLS15E
- Digital conductivity sensor for measurements in pure and ultrapure water
- Conductive measurement
- With Memosens 2.0
- Product Configurator on the product page: www.endress.com/cls15e

Technical Information TI01526C

Memosens CLS16E
- Digital conductivity sensor for measurements in pure and ultrapure water
- Conductive measurement
- With Memosens 2.0
- Product Configurator on the product page: www.endress.com/cls16e

Technical Information TI01527C

Memosens CLS21E
- Digital conductivity sensor for media with medium or high conductivity
- Conductive measurement
- With Memosens 2.0
- Product Configurator on the product page: www.endress.com/cls21e

Technical Information TI01528C

Memosens CLS82E
- Hygienic conductivity sensor
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: www.endress.com/cls82e

Technical Information TI01529C

Oxygen sensors

Memosens COS22E
- Hygienic amperometric oxygen sensor with maximum measurement stability over multiple sterilization cycles
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: www.endress.com/cos22e

Technical Information TI01619C

Memosens COS51E
- Amperometric oxygen sensor for water, wastewater and utilities
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: www.endress.com/cos51e

Technical Information TI01620C

Memosens COS81E
- Hygienic optical oxygen sensor with maximum measurement stability over multiple sterilization cycles
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: www.endress.com/cos81e

Technical Information TI01558C

13.1.2 Software

Memobase Plus CYZ71D
- PC software to support laboratory calibration
- Visualization and documentation of sensor management
- Sensor calibrations stored in database
- Product Configurator on the product page: www.endress.com/cyz71d

Technical Information TI00502C

DeviceCare SFE100
Configuration tool for HART, PROFIBUS and FOUNDATION Fieldbus field devices
DeviceCare is available for download at www.software-products.endress.com. You need to register in the Endress+Hauser software portal to download the application.

Technical Information TI01134S

13.1.3 Cable junction with Velcro strip

Cable junction with Velcro strip
- 4 pieces, for sensor cable
- Order No. 71092051

13.2 Communication-specific accessories

Commubox FXA195
Intrinsically safe HART communication with FieldCare via the USB port

Technical Information TI00404F

Wireless HART adapter SWA70
- Wireless device connection
- Easily integrated, offers data protection and transmission safety, can be operated in parallel with other wireless networks, minimum cabling complexity

Technical Information TI00061S

13.3 System components

RIA15
- Process display unit, Digital display unit for integration into 4-20 mA circuits
- Panel mounting
- With optional HART communication

Technical Information TI01043K

14 Technical data

14.1 Input

Measured variables	▪ pH ▪ ORP ▪ Oxygen ▪ Conductivity
Measuring ranges	→ Documentation of the connected sensor The measuring range for oxygen sensors depends on the order specification.
Types of input	Digital sensor inputs for Memosens-sensors
Cable specification	**Cable length:** ▪ Max. 3 m (10 ft) ▪ Max. 7 m (23 ft) ▪ Max. 15 m (49 ft)

14.2 Output

Output signal	4 … 20 mA, galvanically isolated from the sensor circuits
Linearization/transmission behavior	Linear

14.3 Performance characteristics

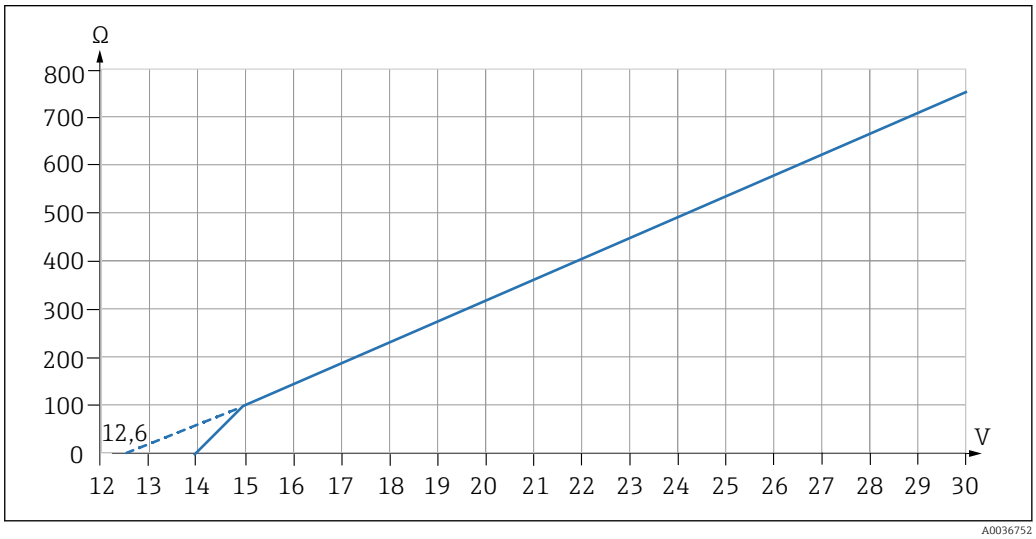
Response time of current output	t_{90} = max. 500 ms for an increase from 0 to 20 mA
Tolerance of current output	**Typical measuring tolerances:** < ±20 µA (if current value = 4 mA) < ±50 µA (for current values 4 to 20 mA) at 25 °C (77 °F) each **additional tolerance depending on the temperature:** < 1.5 µA/K
Resolution of current output	< 5 µA
Repeatability	→ Documentation of the connected sensor

14.4 Power supply

Supply voltage

12.6 to 30 VDC (when failure current setting > 20 mA)

14 to 30 VDC (when failure current setting < 4 mA)



5 *Supply voltage and load*

The lower voltage value in each case applies only to a load resistance of 0 Ohm.

NOTICE

The device does not have a power switch

- 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.

Overvoltage protection

IEC 61 000-4-4 and IEC 61 000-4-5 with +/- 1 kV

Sensor connection

Sensors with Memosens protocol

Sensor types	Sensors
Digital sensors with inductive Memosens plug-in head	▪ pH sensors ▪ ORP sensors ▪ Oxygen sensors ▪ Conductivity sensors

14.5 Environment

Ambient temperature

−20 to 85 °C (−4 to 185 °F)

The maximum ambient temperature depends on the process temperature and the transmitter's installation position.

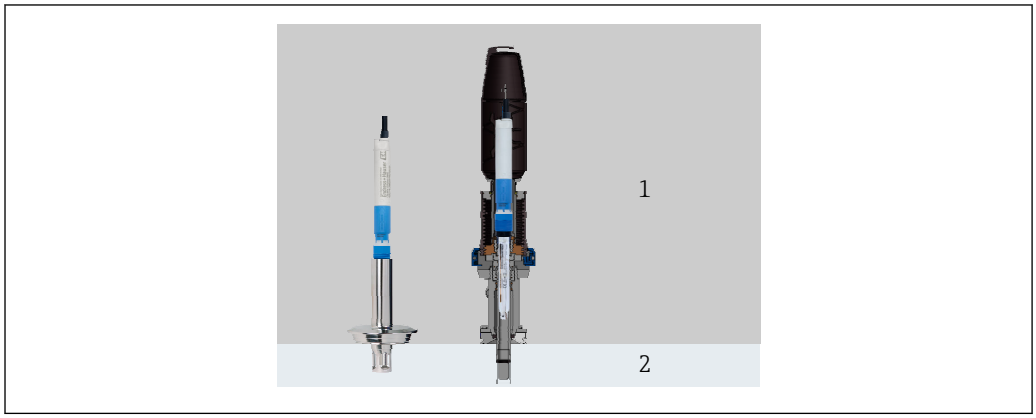
- Make sure that the ambient temperature at the transmitter does not exceed 85 °C (185 °F).

Example for ambient conditions in Endress+Hauser assemblies:
- for open installation (without protective cover, i.e. free convection at the transmitter), e.g. CPA442, CPA842
- for enclosed installation (with protective cover), e.g. CPA871, CPA875, CPA842

$T_{ambient}$ = max. 60 °C (140 °F)

$T_{process}$ = max. 100 °C (212 °F), in continuous operation

$T_{process}$ = max. 140 °C (284 °F), < 2h (for sterilization)



6 Installation position of transmitter with or without protective cover

1 Ambient temperature $T_{ambient}$
2 Process temperature $T_{process}$

Storage temperature	-40 to +85 °C (-40 to 185 °F)
Relative humidity	5 to 95 %
Degree of protection	IP67 IP 68 (10 m (33 ft) head of water at 25 °C (77 °F) over 45 days, 1 mol/l KCl) NEMA Type 6
Electromagnetic compatibility	▪ EN 61326-1 ▪ EN 61326-2-3 ▪ NAMUR NE 21
Electrical safety	EN 61010-1
Max. altitude above MSL	< 2000 m (< 6562 ft) above MSL

Pollution degree

Complete device:	Pollution level 4
Internal:	Pollution level 2

14.6 Mechanical construction

Materials

Components	Material
Housing, cover	Peek 151
Strain relief	EPDM (peroxide crosslinked)
Axial ring	Peek 450 G
Optical waveguide	PC transparent

Impact loads

The product is designed for mechanical impact loads of 1 J (IK06) as per the requirements of EN 61010-1.

Weight

without cable	Approx. 42 g (1.5 oz)
3 m (9 f) cable	Approx. 190 g (7 oz)
7 m (23 f) cable	Approx. 380 g (13 oz)
15 m (49 f) cable	Approx. 760 g (27 oz)
For every 1 m (3 f) of cable	Approx. 48 g (2 oz)

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