TI01527C/07/EN/03.24-00
71649265
2024-03-31

Technical Information
Memosens CLS16E

Digital conductivity sensor with Memosens technology

Cell constant k = 0.1 cm^{-1}

Application

Measurements in pure and ultrapure water

Typical applications include:
- 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 CM442/CM444/CM448
- Liquiline CM42
- Liquiline CM14

The resistivity in MΩ · cm can also be measured using these transmitters.

Your benefits

- High measuring accuracy as cell constant is individually measured
- Manufacturer inspection certificate stating the individual cell constant
- Hygienic process connections for installation in pipes or flow vessel
- Easy to clean thanks to electropolished surfaces
- Can be sterilized up to 150 °C (302 °F)
- Stainless steel 1.4435 (AISI 316L) meets the highest demands of the pharmaceutical industry
- Certified according to EHEDG, Document 8
- Certificate according to United States Pharmacopeia 87, USP 88 Class VI (optional)
- Inspection certificate EN 10204 3.1 (optional)

Other advantages of Memosens technology

- Maximum process safety
- Data security thanks to digital data transmission
- Very easy to use as sensor data saved in the sensor
- Recording of sensor load data in the sensor enables predictive maintenance

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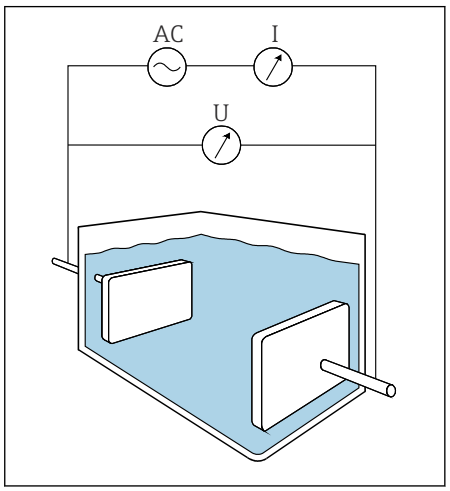


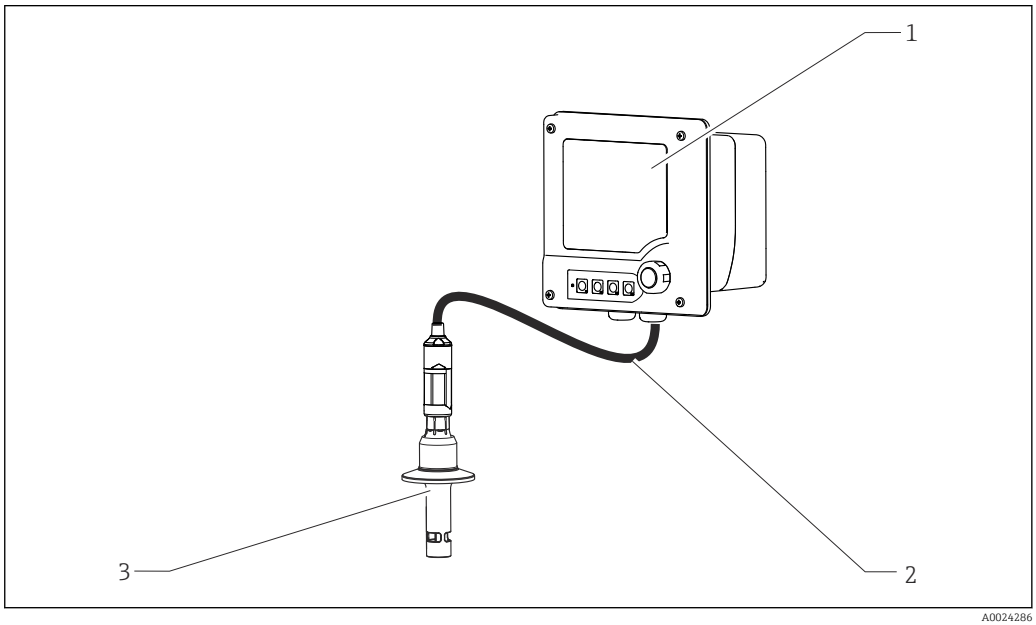
1 Conductive measurement of conductivity

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 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:
- Conductivity sensor Memosens CLS16E
- Transmitter, e.g. Liquiline M CM42
- Measuring cable, e.g. Memosens data cable CYK10



2 Example of a measuring system (with Memosens sensor)

1 Liquiline M CM42 transmitter
2 Memosens data cable
3 Memosens CLS16E

Communication and data processing

Communication with the transmitter

Always connect digital sensors with Memosens technology to a transmitter with Memosens technology. Data transmission to a transmitter for analog sensors is not possible.

Digital sensors can store measuring system data in the sensor. These include the following:
- Manufacturer data
  - Serial number
  - Order code
  - Date of manufacture
- Calibration data
  - Calibration date
  - Cell constant
  - Delta cell constant
  - Number of calibrations
  - Serial number of the transmitter used to perform the last calibration or adjustment
- Operating data
  - Temperature application range
  - Conductivity application range
  - Date of initial commissioning
  - Maximum temperature value
  - Hours of operation at high temperatures

Reliability

Dependability

Memosens technology digitizes the measured values in the sensor and transmits the data to the transmitter via a . The result:
- If the sensor fails or there is an interruption in the connection between the sensor and transmitter, this is reliably detected and reported.
- The availability of the measuring point is reliably detected and reported.

Maintainability

Easy handling
Sensors with Memosens technology have integrated electronics that store calibration data and other information (e.g. total operating hours or operating hours under extreme measuring conditions). Once the sensor has been connected, the sensor data are transferred automatically to the transmitter and used to calculate the current measured value. As the calibration data are stored in the sensor, the sensor can be calibrated and adjusted independently of the measuring point. The result:
- Easy calibration in the measuring lab under optimum external conditions increases the quality of the calibration.
- Pre-calibrated sensors can be replaced quickly and easily, resulting in a dramatic increase in the availability of the measuring point.
- The availability of sensor data means that maintenance intervals can be accurately defined and predictive maintenance is possible.
- The sensor history can be documented with external storage media and evaluation programs.
- The application range of the sensor can be determined based on its previous history.

Interference immunity

With inductive transmission of the measured value using a non-contact connection, Memosens guarantees maximum process safety and offers the following benefits:
- All problems caused by moisture are eliminated.
  - Plug-in connection remains free from corrosion
  - Measured value distortion from moisture is not possible.
  - The plug-in system can even be connected under water.
- The transmitter is galvanically decoupled from the medium.
- EMC safety is guaranteed by screening measures for the digital transmission of measured values.

Input

Measured variables

- Conductivity
- Temperature

Measuring ranges

Conductivity [1]	40 nS/cm to 500 µS/cm
Temperature	-5 to 150 °C (23 to 302 °F)

1) In relation to water at 25 °C (77 °F)

Cell constant

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

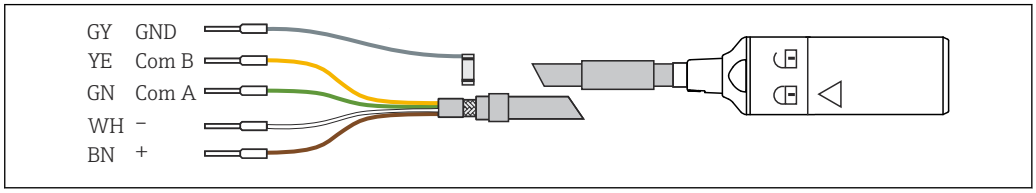
Temperature compensation

Pt1000 (Class A according to IEC 60751)

Power supply

Electrical connection

The electrical connection of the sensor to the transmitter is established using measuring cable CYK10.



3 Measuring cable CYK10

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 into the manufacturer's certificate supplied. The measurement uncertainty in determining the cell constant is 1.0 %.

Response time

Conductivity	$t_{95} \leq 2$ s
Temperature [1]	$t_{90} \leq 9$ s

1) DIN VDI/VDE 3522-2 (0.3 m/s laminar)

Measurement error

Conductivity	≤ 2 % of reading, in specified measuring range
Temperature	≤ 0.5 K, in measuring range -5 to 120 °C (23 to 248 °F) ≤ 1.0 K, in measuring range 120 to 150 °C (248 to 302 °F)

Repeatability

Conductivity	≤ 0.2 % of reading, in specified measuring range
Temperature	≤ 0.05 K

Mounting

Installation instructions

The sensors are installed directly via the process connection.

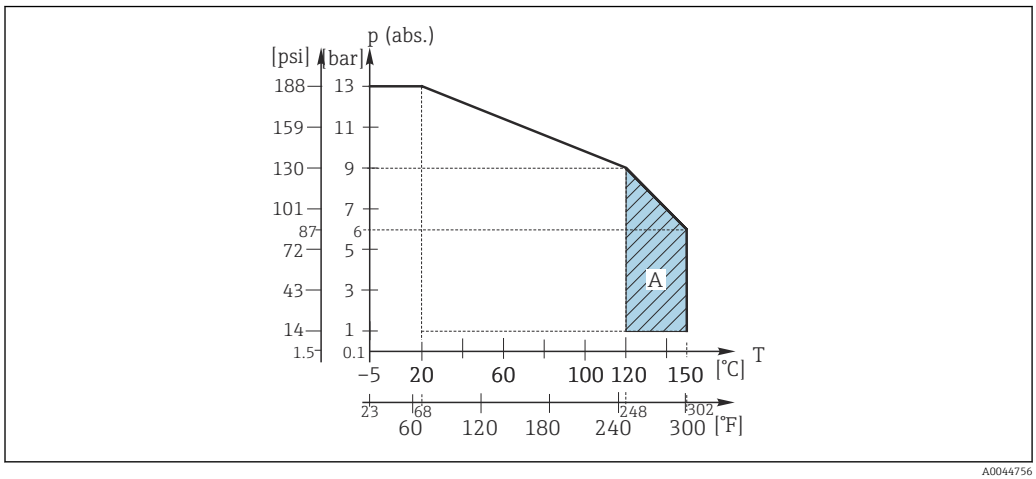
Environment

Ambient temperature	−20 to 60 °C (−4 to 140 °F)
Storage temperature	-25 to +80 °C (-10 to +180 °F)
Degree of protection	IP 68 / NEMA type 6P (1 m water column, 25 °C, 24 h)

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	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

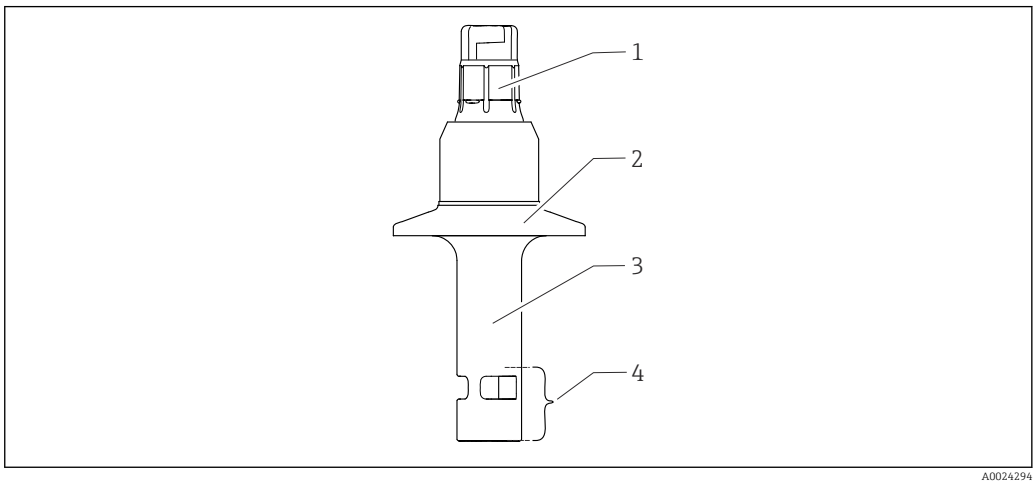


4 *Mechanical pressure-temperature resistance*

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

Mechanical construction

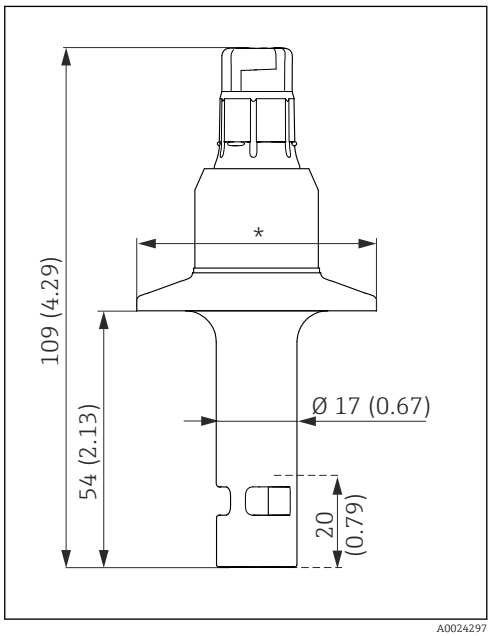
Design



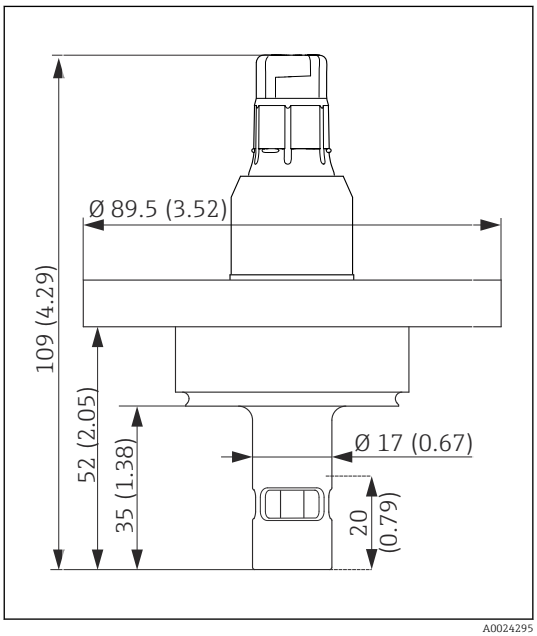
5 *Sensor*

1 Memosens plug-in head
2 Process connection made of electropolished stainless steel 1.4435 (AISI 316 L) (Clamp, Varivent, BioControl)
3 Coaxial measuring electrode made of electropolished stainless steel 1.4435 (AISI 316 L)
4 Minimum immersion depth

Dimensions

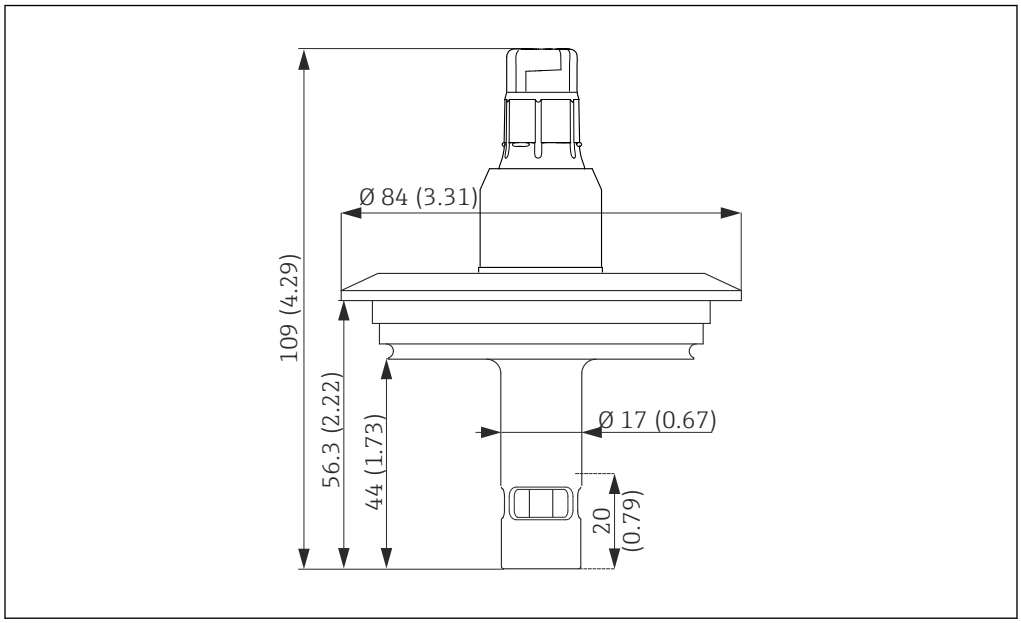


6 *Version with Clamp ISO2852. Unit of measurement mm (in)*



7 *Version with BioControl. Unit of measurement mm (in)*

* *CLS16E-**CA**: 1 ½" = 50.5 mm*
*CLS16E-**CB**: 2" = 64 mm*



8 Version with Varivent. Unit of measurement mm (in)

Weight	Approx. 0.13 to 0.75 kg (0.29 to 1.65 lbs) depending on version	
Materials (in contact with medium)	Sensor	Depending on the order version: ▪ Electropolished, stainless steel 1.4435 (AISI 316L) ▪ PEEK
	Seal	Depending on the order version: ▪ Molded seal FFKM ▪ Molded seal EPDM
Process connection	1½", 2" as per ISO 2852 (also suitable for TRI-CLAMP, DIN 32676) Tuchenhagen VARIVENT N DN 50 to 125 NEUMO BioControl D50	
Surface roughness	$R_a \leq 0.38$ 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

CLS16E-BA
II 1 G Ex ia IIC T3/T4/T6 Ga

CLS16E-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

CLS16E-GA
EAC Ex, 0Ex ia IIC T3/T4/T6 Ga X

CLS16E-IA
Ex ia IIC T3/T4/T6 Ga

CLS16E-NA
NEPSI Ex ia IIC T3/T4/T6 Ga

Hygienic compatibility

EHEDG

The hygienic process connections are certified in accordance with EHEDG Type EL Class I.

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.

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

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.

Test reports

Manufacturer's certificate

Stating the individual cell constant

Surface roughness test

Stainless steel surfaces in contact with medium tested to ≤ R_a 0.38 µm.

Additional certification

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.

External standards and guidelines

EAC

The product has been certified according to guidelines TP TC 004/2011 and TP TC 020/2011 which apply in the European Economic Area (EEA). The EAC conformity mark is affixed to the product.

Order information

Product page

www.endress.com/cls16e

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. **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

Memosens data cable CYK10
- For digital sensors with Memosens technology
- Product Configurator on the product page: www.endress.com/cyk10

Technical Information TI00118C

Memosens data cable CYK11
- Extension cable for digital sensors with Memosens protocol
- Product Configurator on the product page: www.endress.com/cyk11

Technical Information TI00118C

Sensor regeneration

Replacement of seals and recalibration in the factory
Order No. 51505585

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

Conducal 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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