

Technical Information

Memosens CLS82E

Hygienic conductivity sensor
Digital with Memosens technology

Cell constant $k = 0.57 \text{ cm}^{-1}$



Application

For measurements where very diverse conductivities must be measured in one measuring system.

Typical applications include:

- Phase separations
- Chromatography
- Fermentations
- CIP monitoring in small pipes
- Ultrafiltration
- Cleaning of ballast water on ships
- Cleaning of water in a ship's wake

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

- Liquiline CM442/CM444/CM448
- Liquiline CM42

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 140 °C (284 °F)
- Stainless steel 1.4435 (AISI 316L) meets the highest demands of the pharmaceutical industry
- IP68 protection
- The entire sensor is certified according to EHEDG and 3-A
- FDA conformity

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

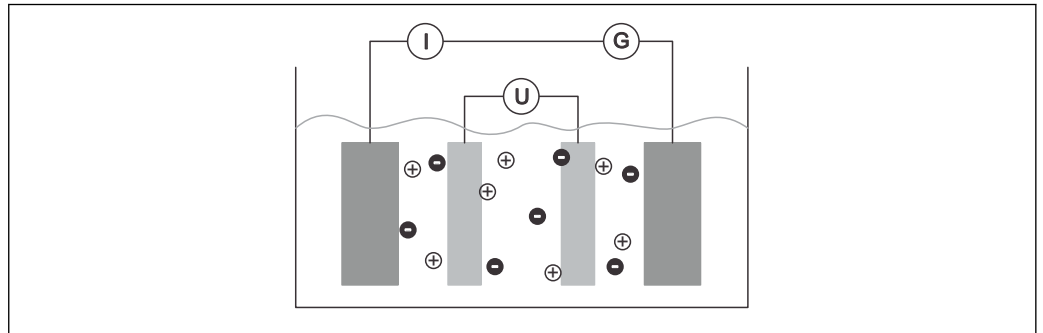
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Function and system design

Measuring principle

The measuring cell has four electrodes. An alternating current is applied via the outer electrode pair. At the same time, the voltage applied is measured at the two inner electrodes. The electrolytic conductivity between the electrodes can be reliably established based on the measured voltage and the current flow caused by the liquid's resistance. The advantage of this technology compared to traditional two-electrode sensors is that electrochemical effects at the live electrodes are suppressed by the two additional voltage measuring electrodes.



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1 Conductivity measurement

I Current intensity measurement

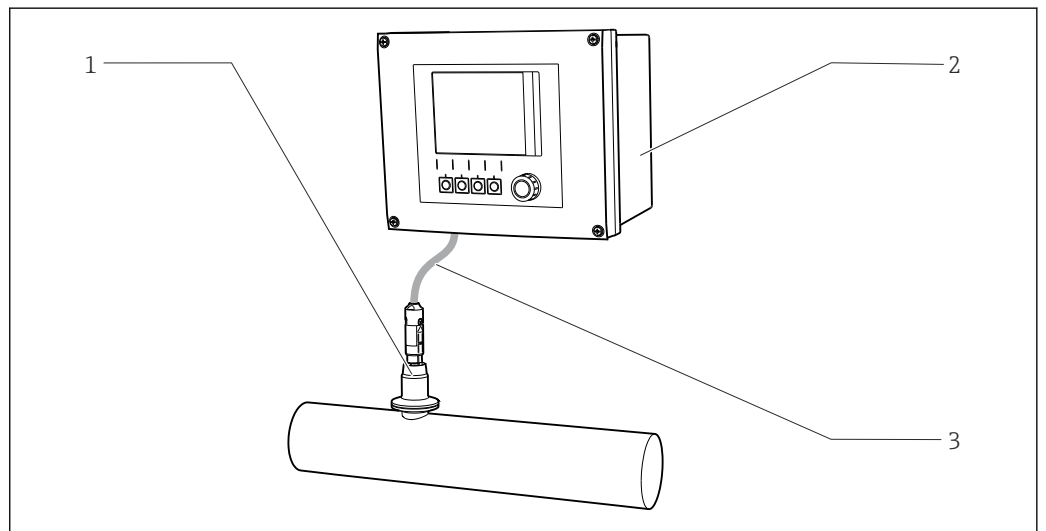
U Voltage measurement

G Generator

Measuring system

A complete measuring system comprises at least:

- Conductivity sensor Memosens CLS82E
- Transmitter, e.g. Liquiline M CM42
- Measuring cable, e.g. Memosens data cable CYK10



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2 Example of a measuring system


1 Memosens CLS82E

2 Transmitter Liquiline CM44x

3 Measuring cable

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

Dependability

Reliability

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 hours of operation or hours of operating 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.
- Precalibrated sensors can be replaced quickly and easily, resulting in a noticeable increase in the availability of the measuring point.
- Thanks to the availability of the sensor data, maintenance intervals can be accurately defined and predictive maintenance is possible.
- The sensor history can be documented on external data carriers and evaluation programs.
- Thus, the current application of the sensor can be determined depending on its previous history.

Integrity

With inductive transmission of the measured value using a non-contact connection, Memosens guarantees maximum process safety and offers the following benefits:

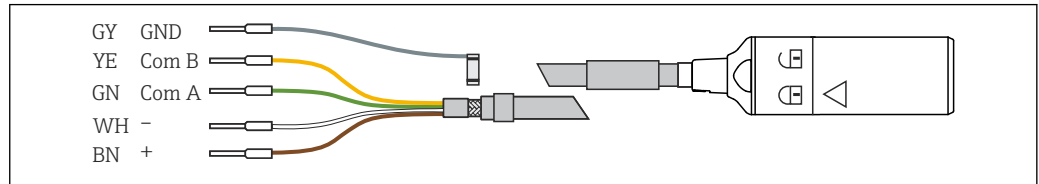
- All problems caused by moisture are eliminated.
 - Plug-in connection remains free from corrosion
 - Measured value distortion from moisture is not possible.
 - The plug-in system can even be connected under water.
- The transmitter is galvanically decoupled from the medium.
- EMC safety is guaranteed by screening measures for the digital transmission of measured values.

Input

Measured variables	<ul style="list-style-type: none"> ■ Conductivity ■ Temperature 				
Measuring ranges	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Conductivity¹⁾</td> <td>1 µS/cm to 500 mS/cm</td> </tr> <tr> <td>Temperature</td> <td>-5 to 140 °C (23 to 284 °F)</td> </tr> </table> <p>1) In relation to water at 25 °C (77 °F)</p>	Conductivity ¹⁾	1 µS/cm to 500 mS/cm	Temperature	-5 to 140 °C (23 to 284 °F)
Conductivity ¹⁾	1 µS/cm to 500 mS/cm				
Temperature	-5 to 140 °C (23 to 284 °F)				
Cell constant	k = 0.57 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

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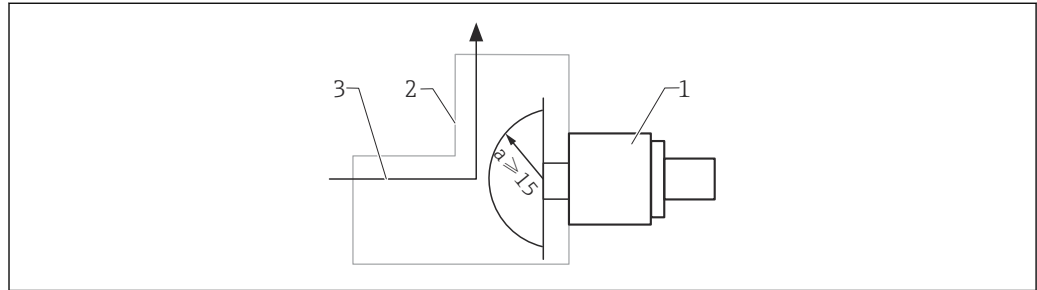
Performance characteristics

Measurement uncertainty	Each individual sensor is factory-measured in a solution with approx. 50 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	<table style="width: 100%; border-collapse: collapse;"> <tr> <td>Conductivity</td> <td>$t_{95} \leq 2 \text{ s}$</td> </tr> <tr> <td>Temperature¹⁾</td> <td></td> </tr> <tr> <td style="padding-left: 20px;">With Pg 13.5 or Clamp</td> <td>$t_{90} \leq 16 \text{ s}^{2)}$</td> </tr> <tr> <td style="padding-left: 20px;">With other process connection</td> <td>$t_{90} \leq 28 \text{ s}^{2)}$</td> </tr> </table> <p>1) DIN VDI/VDE 3522-2 (0.3 m/s laminar) 2) With temperature prediction activated as standard</p>	Conductivity	$t_{95} \leq 2 \text{ s}$	Temperature ¹⁾		With Pg 13.5 or Clamp	$t_{90} \leq 16 \text{ s}^{2)}$	With other process connection	$t_{90} \leq 28 \text{ s}^{2)}$				
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In the range 1 µS/cm to 1 mS/cm ¹⁾	$\leq 2 \%$ of reading												
In the range 1 mS/cm to 500 mS/cm ¹⁾	$\leq 4 \%$ of reading												
Temperature													
With Pg 13.5 or Clamp	$\leq 0.5 \text{ K}$, in measuring range -5 to 100 °C (23 to 212 °F) $\leq 1.0 \text{ K}$, in measuring range 100 to 140 °C (212 to 284 °F)												
With other process connection	$\leq 1.0 \text{ K}$, in measuring range -5 to 140 °C (23 to 284 °F)												
Repeatability	<table style="width: 100%; border-collapse: collapse;"> <tr> <td>Conductivity</td> <td>$\leq 0.2 \%$ of reading, in specified measuring range</td> </tr> <tr> <td>Temperature</td> <td>$\leq 0.05 \text{ K}$</td> </tr> </table>	Conductivity	$\leq 0.2 \%$ of reading, in specified measuring range	Temperature	$\leq 0.05 \text{ K}$								
Conductivity	$\leq 0.2 \%$ of reading, in specified measuring range												
Temperature	$\leq 0.05 \text{ K}$												

Mounting

Installation instructions

Symmetrical installation is recommended in order to guarantee linearity. The distance to the side walls and opposite walls must be at least 15 mm.

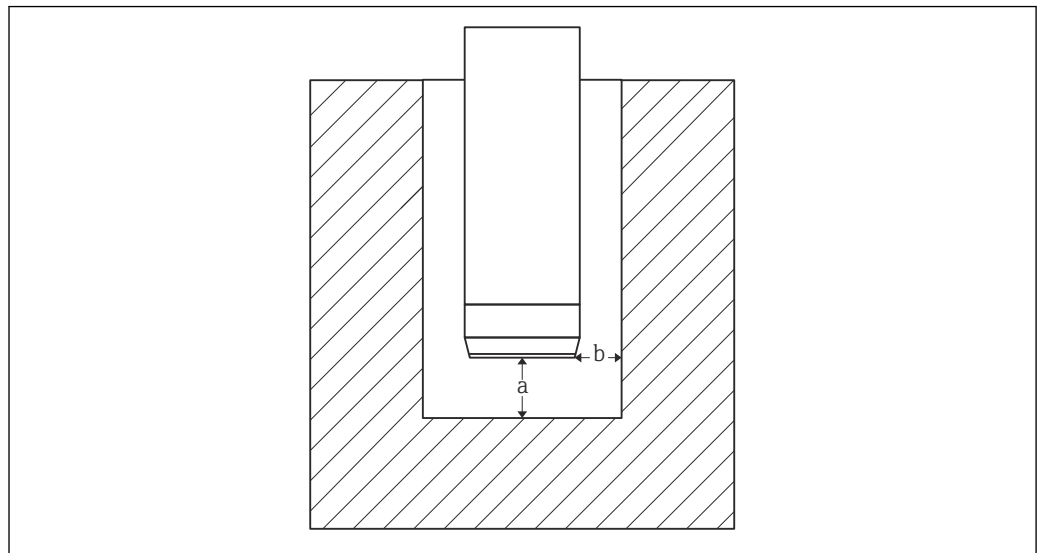



 4 Minimum distance between pipe and end of the measuring cell

- 1 Sensor
- 2 Pipe
- 3 Direction of flow

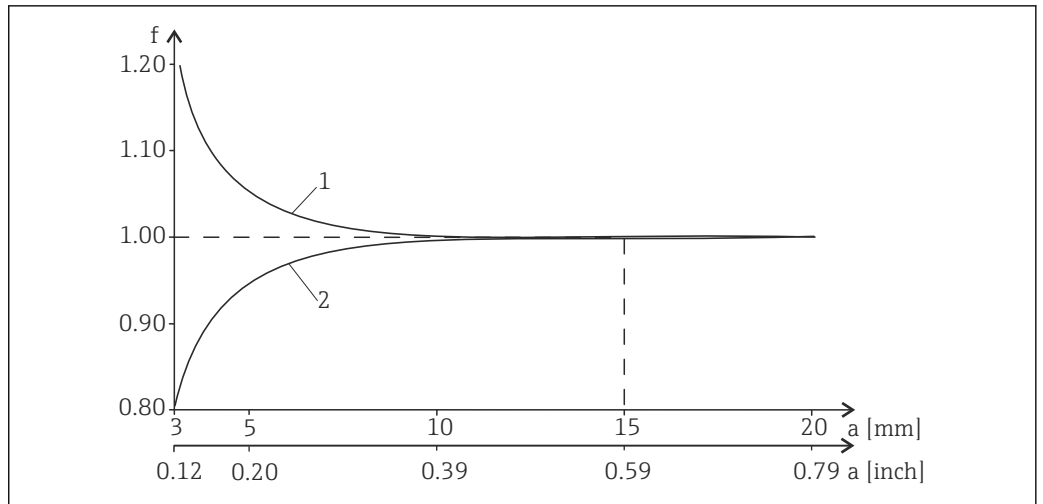
The ionic current in the liquid is affected by the walls in confined installation conditions. This effect is compensated by what is referred to as the installation factor. The installation factor can be entered in the transmitter for the measurement or the cell constant is corrected by multiplying by the installation factor.

The value of the installation factor depends on the diameter and the conductivity of the pipe nozzle as well as the sensor's distance to the wall. The installation factor can be disregarded ($f = 1.00$) if the distance to the wall is sufficient ($a > 15$ mm). If the distance to the wall is smaller, the installation factor increases for electrically insulating pipes ($f > 1$) and decreases for electrically conductive pipes ($f < 1$). The installation factor can be determined using calibration solutions.



 5 Schematic drawing of the sensor in confined installation conditions

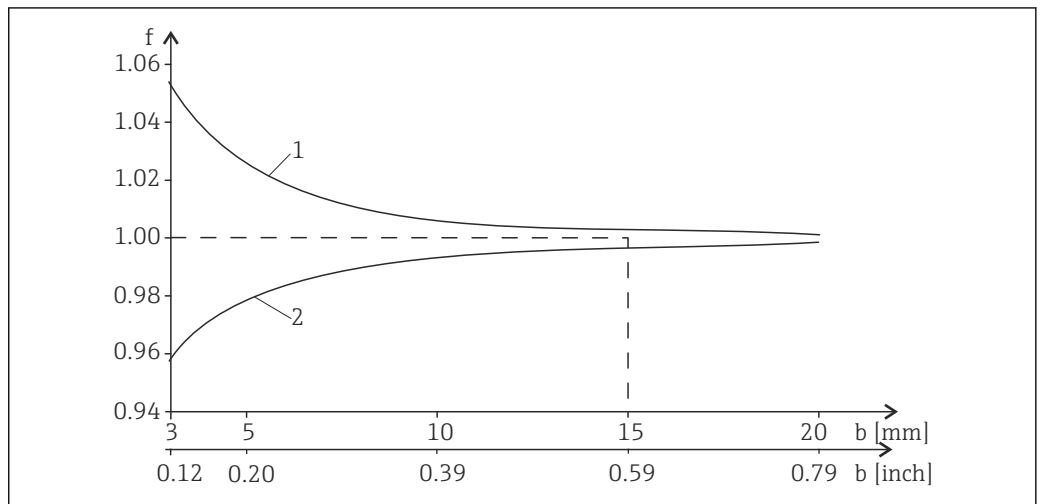
- a Wall distance
- b Gap width



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6 Relationship between installation factor f and wall distance a

- 1 Electrically insulating pipe wall
- 2 Electrically conductive pipe wall



A0024616

7 Relationship between installation factor f and gap width b


- 1 Electrically insulating pipe wall
- 2 Electrically conductive pipe wall

Hygienic properties

For 3-A-compliant installation, please observe the following:

- ▶ After the device has been mounted, hygienic integrity must be guaranteed.
- ▶ 3-A-compliant process connections must be used.

Installation factors for assemblies

-  For flow assemblies or assemblies with a basket protector where it is not possible to maintain a distance $a > 15$ mm (\rightarrow 4, 6) to the sensor element, it is advisable to determine the installation factor by calibrating in the assembly used in order to guarantee the specified sensor measured error.

Environment

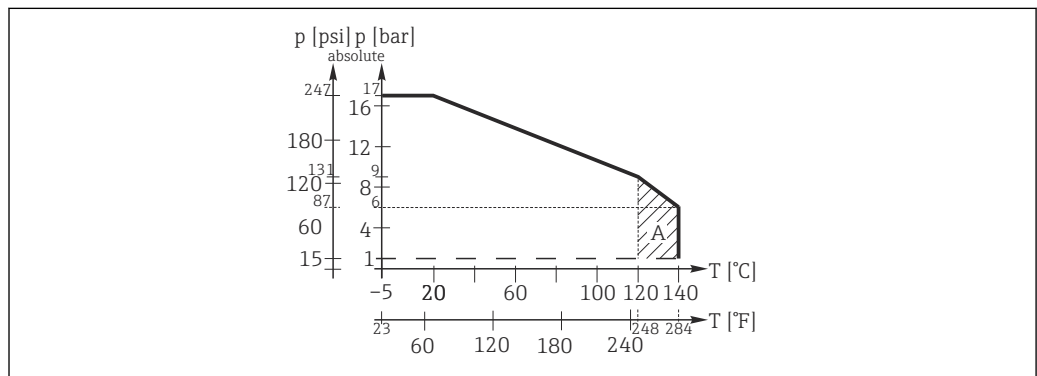
Ambient temperature -20 to 60 °C (-4 to 140 °F)

Storage temperature	-25 to +80 °C (-10 to +180 °F)
Relative humidity	5 to 95 %
Degree of protection	IP 68 / NEMA type 6P (1.9 m water column, 20 °C, 24 h)

Process

Process temperature	Normal operation:	-5 to 120 °C (23 to 248 °F)
	Sterilization (max. 45 min.):	Max. 140 °C (284 °F) at 6 bar (87 psi)
Process pressure	17 bar (247 psi) at 20 °C (68 °F)	
	9 bar (131 psi) at 120 °C (248 °F)	

Temperature/pressure ratings



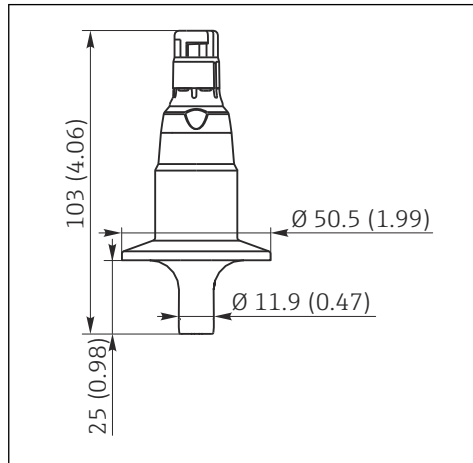
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8 Pressure/temperature rating

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

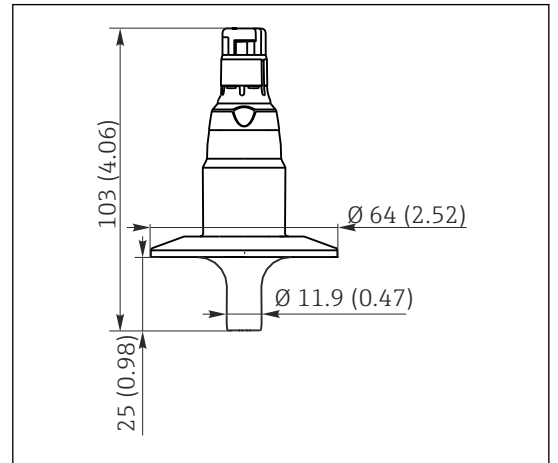
Mechanical construction

Dimensions



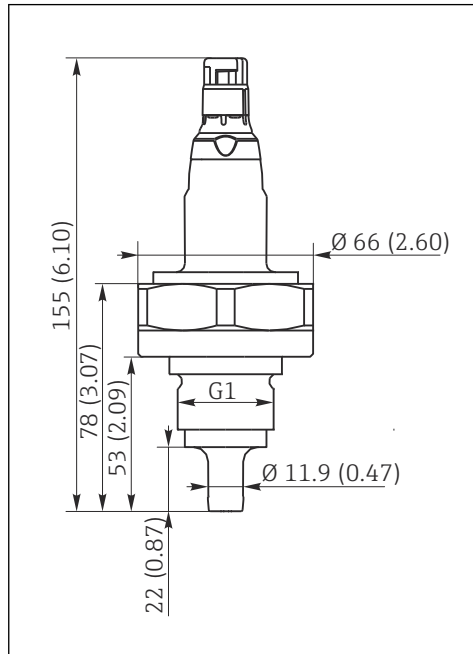
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9 Clamp 1 1/2"



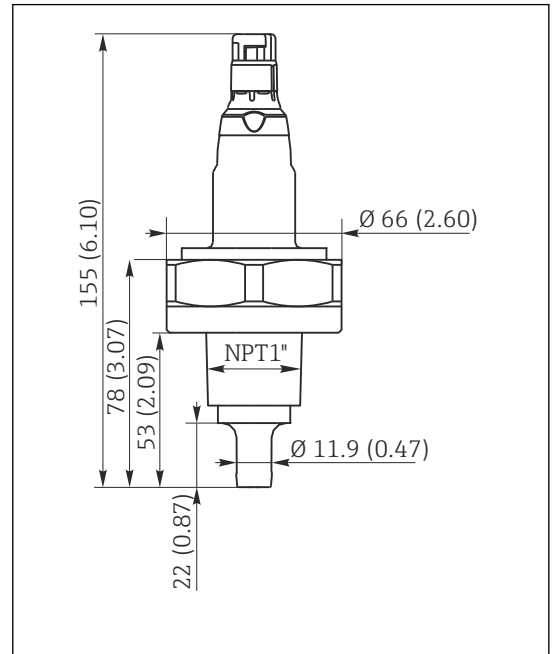
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10 Clamp 2"



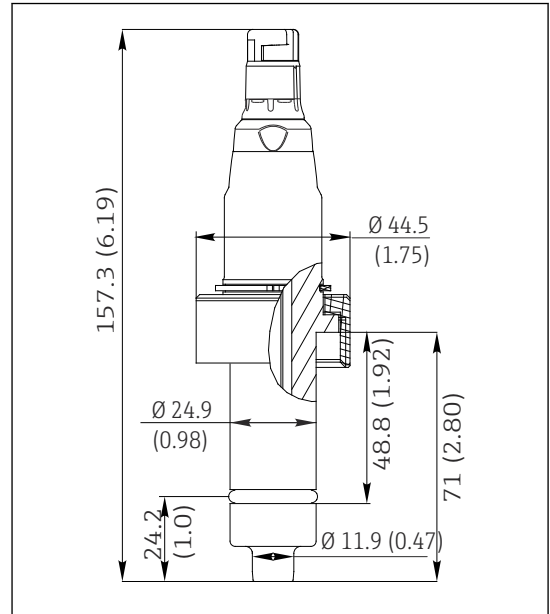
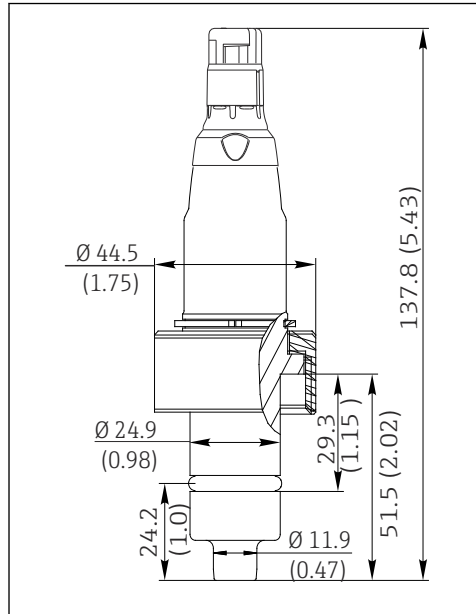
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11 G1



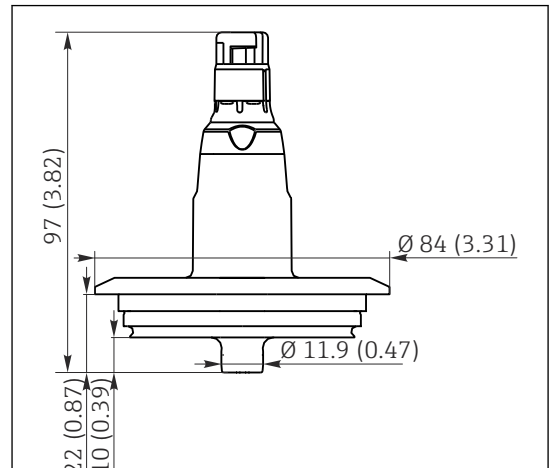
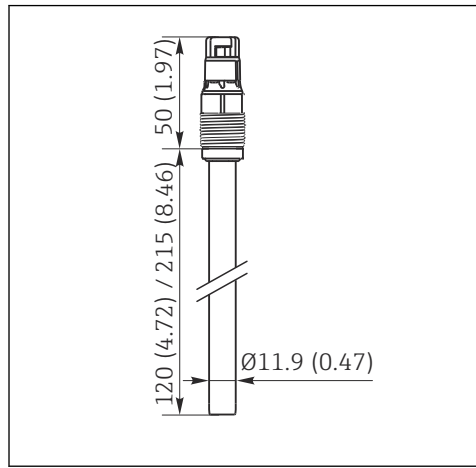
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12 NPT1"



13 DN 25 standard

14 DN 25 B. Braun



15 Pg 13.5

16 Varivent N DN 40 - DN 125

All designs are supplied without a process seal.

Weight

Depending on version, e.g.
 ■ Process connection Pg 13.5: 0.06 to 0.09 kg (0.13 to 0.20 lbs)
 ■ Process connection G1 or NPT: approx. 0.9 kg (1.98 lbs)

Materials (in contact with medium)

Sensor element: Platinum and ceramic (zirconium oxide)
 Process connection: Stainless steel 1.4435 (AISI 316L)

Only for CLS82E-**NA¹⁾ and CLS82E-**NB²⁾:

Seal: EPDM

- 1) Connection DN25 standard
- 2) *Connection DN25 B. Braun

Surface roughness

R_a < 0.38 µm

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

CLS82E-BA

II 1 G Ex ia IIC T3/T4/T6 Ga

CLS82E-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

CLS82E-GA

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

CLS82E-IA

Ex ia IIC T3/T4/T6 Ga

CLS82E-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.

3-A

Meets the requirements of the current 3-A Sanitary Standard 74-xx.

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.

Test reports

Manufacturer inspection certificate

Stating the individual cell constant

Surface roughness test

Stainless steel surfaces in contact with medium tested to $\leq R_a$ 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.

Ordering information

Product page

www.endress.com/cls82e

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

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 $\mu\text{S}/\text{cm}$ (reference temperature 25 °C (77 °F)), 500 ml (16.9 fl.oz)
Order No. 50081902
- CLY11-B, 149.6 $\mu\text{S}/\text{cm}$ (reference temperature 25 °C (77 °F)), 500 ml (16.9 fl.oz)
Order No. 50081903
- CLY11-C, 1.406 mS/cm (reference temperature 25 °C (77 °F)), 500 ml (16.9 fl.oz)
Order No. 50081904
- CLY11-D, 12.64 mS/cm (reference temperature 25 °C (77 °F)), 500 ml (16.9 fl.oz)
Order No. 50081905
- CLY11-E, 107.00 mS/cm (reference temperature 25 °C (77 °F)), 500 ml (16.9 fl.oz)
Order No. 50081906



Technical Information TI00162C



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