LENNTECH
WATER TREATMENT SOLUTIONS

Technical Information
Condumax CLS16D/CLS16

Hygienic conductivity sensors, analog or digital with Memosens technology



Cell constant k = 0.1 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 CM442/CM444/CM448 (only CLS16D)
- Liquiline CM42
- Liquiline CM14 (only CLS16D)
- Liquisys CLM223/253 (only CLS16)
- Mycom CLM153 (only CLS16)

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

Your benefits

- High measuring 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)
- Quality certificate stating the individual cell constant
- Certified according to EHEDG, Document 8
- Certificate according to United States Pharmacopeia Class VI Part 87 and 88 (optional)
- Inspection certificate EN 10204 3.1 (optional)

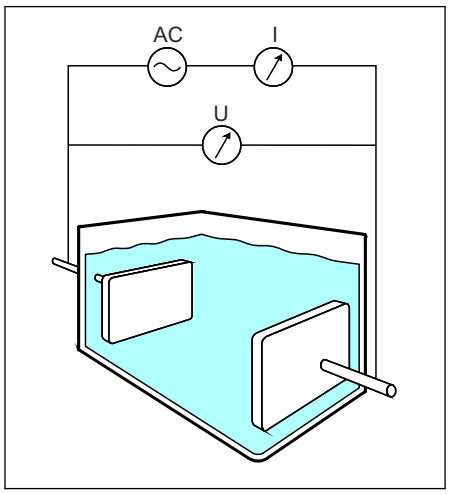
Other advantages of Memosens technology

- Maximum process safety owing to non-contact, inductive signal transmission
- Data security thanks to digital data transmission
- Very easy to use as sensor data saved in the sensor
- Predictive maintenance possible as sensor load data logged in the sensor

Endress+Hauser
People for Process Automation

Function and system design

Measuring principle



A0024260

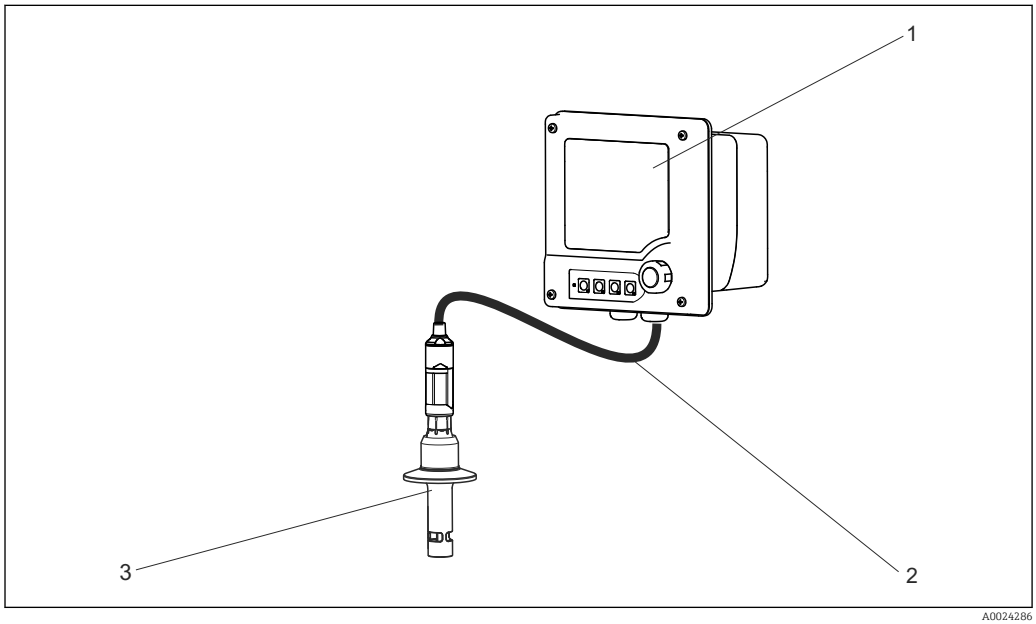
1 Conductive measurement of conductivity

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 the following components at least:
- The conductively measuring conductivity sensor CLS16D or CLS16
- A transmitter, e.g. Liquiline M CM42
- A measuring cable, e.g. Memosens data cable CYK10 or CPK9 for analog sensors



A0024286

2 Example of a measuring system (with Memosens sensor)

1 Liquiline M CM42 transmitter
2 Memosens data cable
3 Condumax CLS16D

Communication and data processing (only CLS16D)

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 are able to store the following system data in the sensor

- Manufacturing 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 for the last calibration
- Application data
  - Temperature application range
  - Conductivity application range
  - Date of first commissioning
  - Maximum temperature value
  - Hours of operation at high temperatures

Dependability (only CLS16D)

Reliability

Memosens technology digitizes the measured values in the sensor and transmits the data to the transmitter using a non-contact connection that is free from potential interference. The result:

- Automatic error message if sensor fails or connection between sensor and transmitter is interrupted
- Immediate error detection increases measuring point availability

Maintainability

Easy handling

Sensors with Memosens technology have integrated electronics that allow for saving calibration data and further information such as total hours of operation and 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 .
- Maintenance intervals can be defined based on all stored sensor load and calibration data and predictive maintenance is possible.
- The sensor history can be documented on external data carriers and evaluation programs at any time. Thus, the current application of the sensors can be made to depend on their 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 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	(in relation to water at 25 °C (77 °F))
CLS16D/CLS16	0.04 to 500 µS/cm
Temperature	
CLS16D	-5 to 100 °C (23 to 212 °F)
CLS16	-5 to 150 °C (23 to 300 °F)

Cell constant

CLS16D/CLS16: $k = 0.1\ cm^{-1}$

Temperature compensation

NTC 30K (CLS16D)

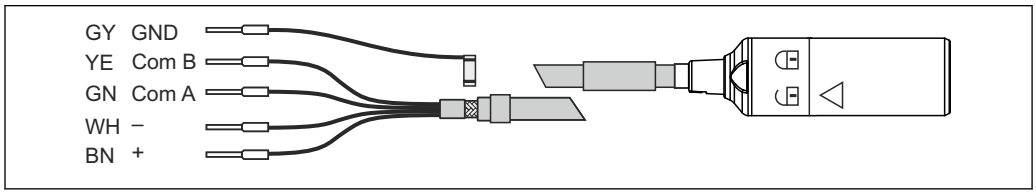
Pt 100 (class A as per IEC 60751) (CLS16)
Pt 1000 (class A as per IEC 60751)(CLS16, optional)

Power supply

Electrical connection

CLS16D

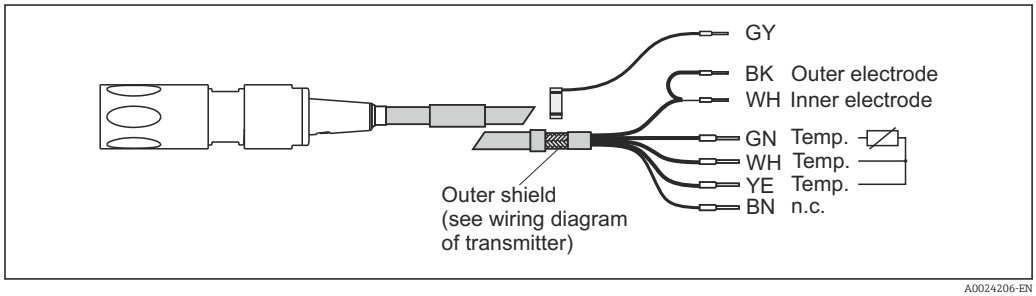
The sensor is electrically connected to the transmitter via the CYK10 measuring cable.



3 Measuring cable CYK10

CLS16

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.



4 Measuring cable CPK9

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

Performance characteristics, general

Uncertainty of measurement

Each individual sensor is factory-measured in a solution of approx. 5 µS/cm using a reference measuring system traceable to NIST or PTB. The exact cell constant is entered into the quality certificate supplied. The uncertainty of measurement in determining the cell constant is 1.0 %.

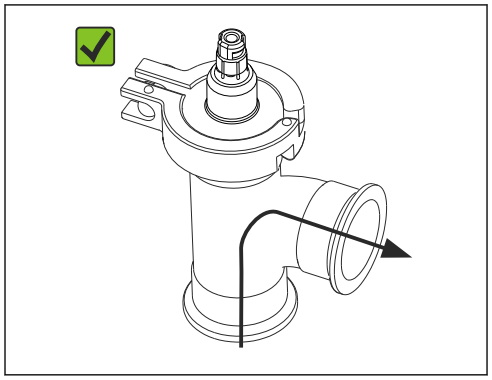
Performance characteristics (only CLS16D)

Response time	Conductivity	$t_{95} \leq 3$ s
	Temperature	$t_{90} \leq 13$ s
Maximum measured error	2 % of reading up to 200 µS/cm 3 % of reading from 200 to 500 µS/cm	
Repeatability	0.2% of reading	

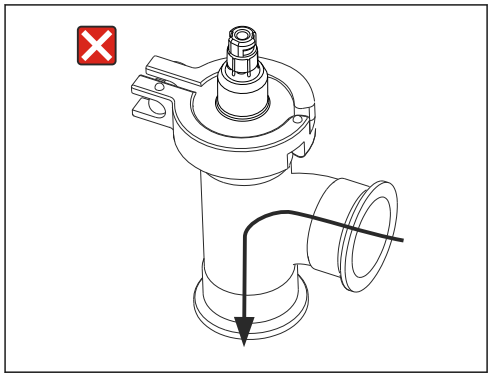
Installation

Installation instructions

The sensors are installed directly via the process connection. Take the flow direction into consideration when installing in pipes.



5 Permitted flow direction



6 Inadmissible flow direction

Environment

Ambient temperature range	-20 to +60 °C (0 to 140 °F)	
Storage temperature	-25 to +80 °C (-10 to +180 °F)	
Humidity	5 to 95 %	
Degree of protection	CLS16D	IP 68 / NEMA type 6P (1 m water column, 25 °C, 24 h)
	CLS16	
	Fixed cable version	IP 67 / NEMA 6
	TOP68 plug-in system	IP 68 / NEMA 6

Process

Process temperature

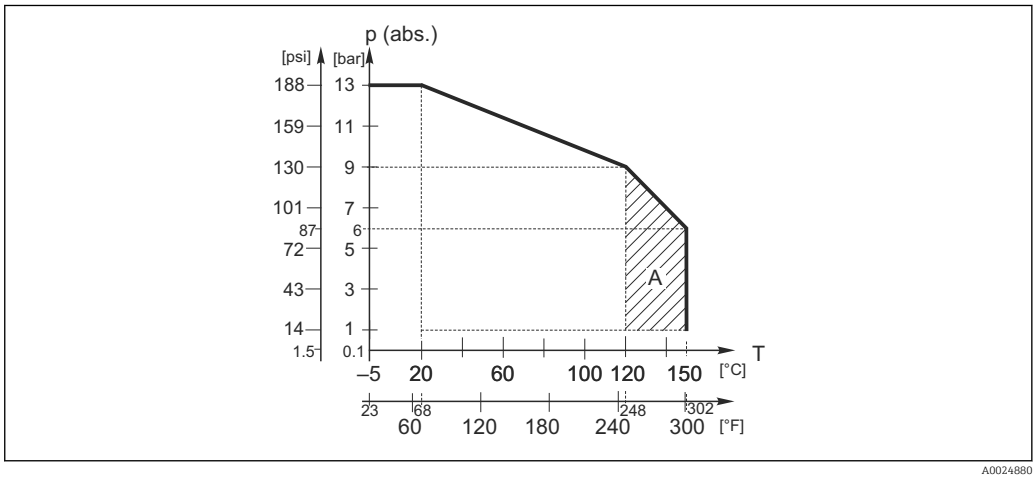
Normal operation	-5 to 120 °C (23 to 248 °F)
Sterilization (max. 45 min.)	max. 150 °C (302 °F) at 5 bar (73 psi)

The maximum temperature for communication with the transmitter is 130 °C (266°F) for the Memosens versions.

Process pressure (absolute)

CLS16D/CLS16	13 bar (188 psi) at 20 °C (68 °F) 9 bar (130 psi) at 120 °C (248 °F) 0.1 bar (1.5 psi (negative pressure)) at 20 °C (68 °F)

Temperature-pressure ratings

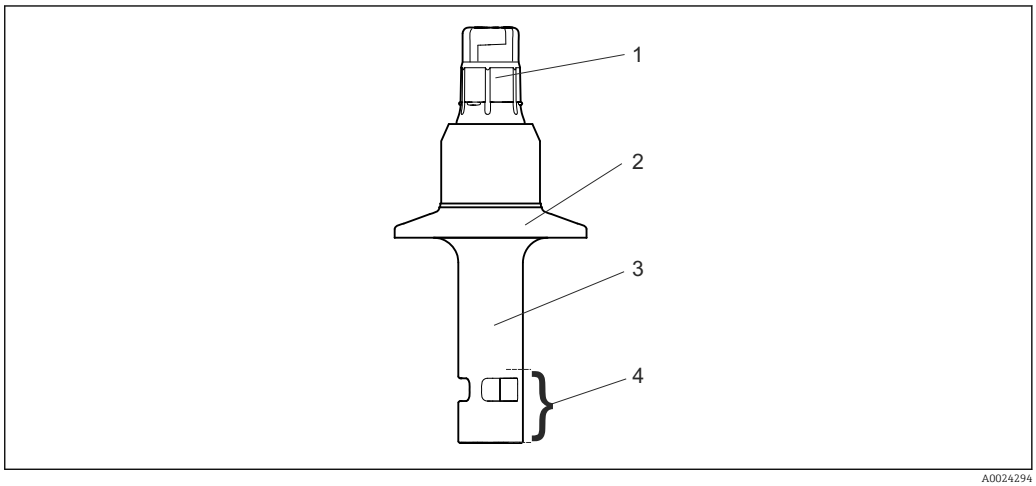


7 *Mechanical pressure-temperature resistance*

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

Mechanical construction

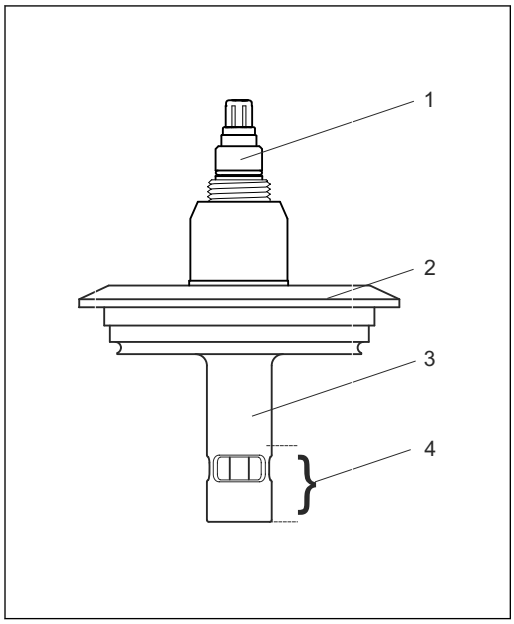
Design CLS16D



8 *CLS16D*

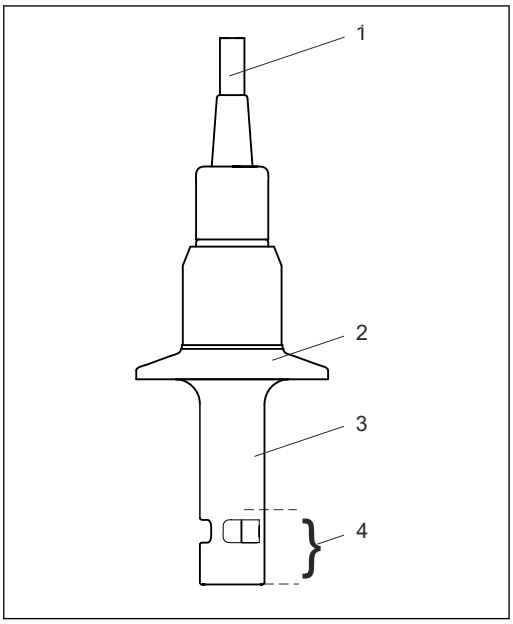
1 *Memosens plug-in head*
2 *Process connection made of electropolished stainless steel 1.4435 (AISI 316 L) (Clamp, Varivent, BioControl)*
3 *Coaxial measuring electrode made of electropolished stainless steel 1.4435 (AISI 316 L)*
4 *Minimum immersion depth*

Design CLS16



9 *Design with plug-in head*

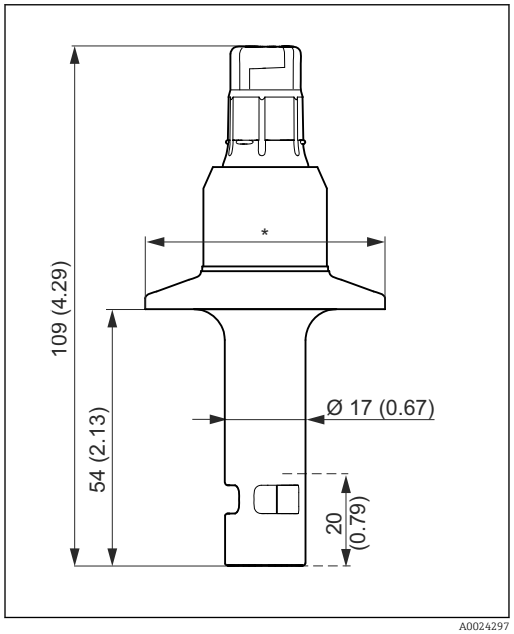
1 *Plug-in head*
2 *Process connection (Clamp, Varivent, BioControl)*
3 *Coaxial measuring electrode*
4 *Minimum immersion depth*



10 *Design with fixed cable*

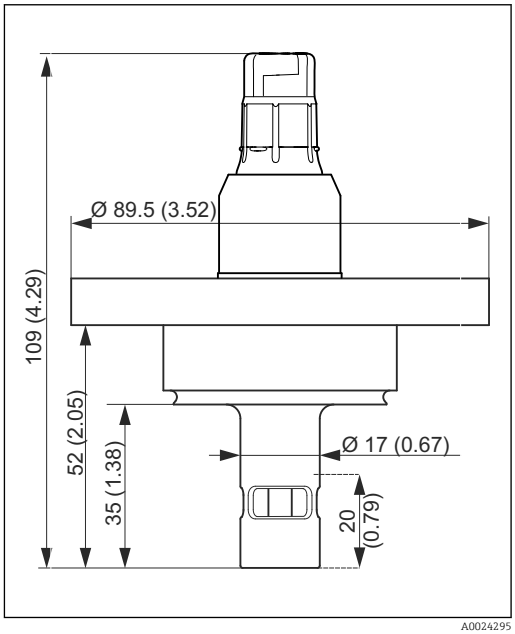
1 *fixed cable*
2 *Process connection (Clamp, Varivent, BioControl)*
3 *Coaxial measuring electrode*
4 *Minimum immersion depth*

Dimensions CLS16D

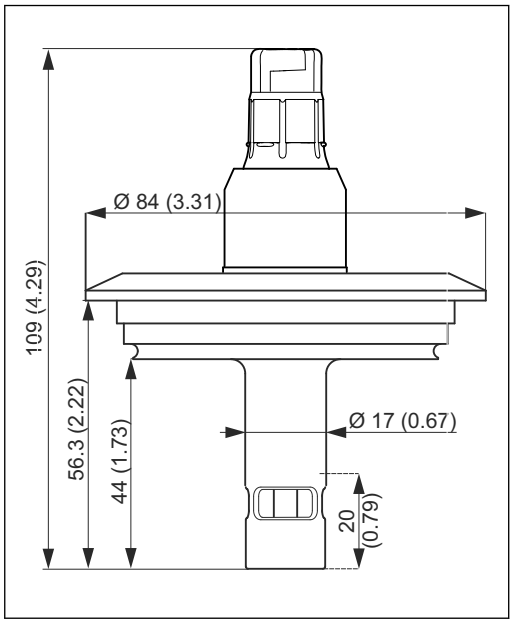


11 *Version with Clamp*

* *CLS16D, Clamp 1" = 50.5 mm*
CLS16D, Clamp 1.5" = 50.5 mm
CLS16D, Clamp 2" = 64 mm

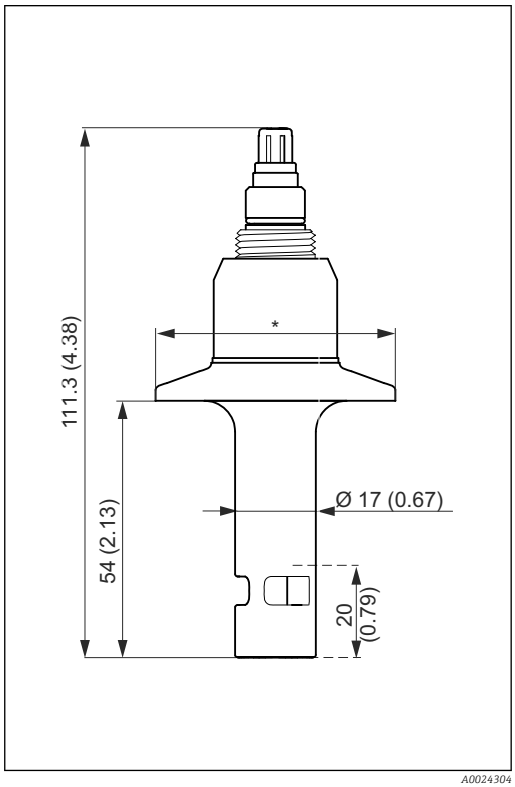


12 *Version with BioControl*



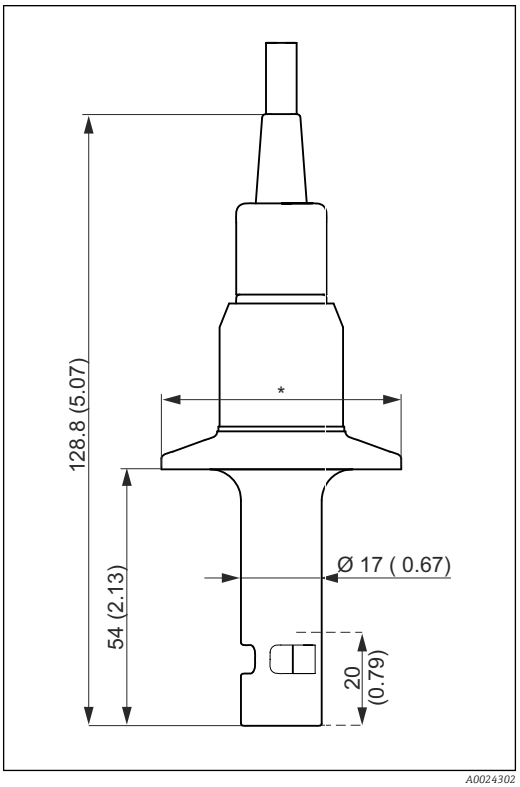
13 Version with Varivent
Measurements in mm (inch)

Dimensions CLS16



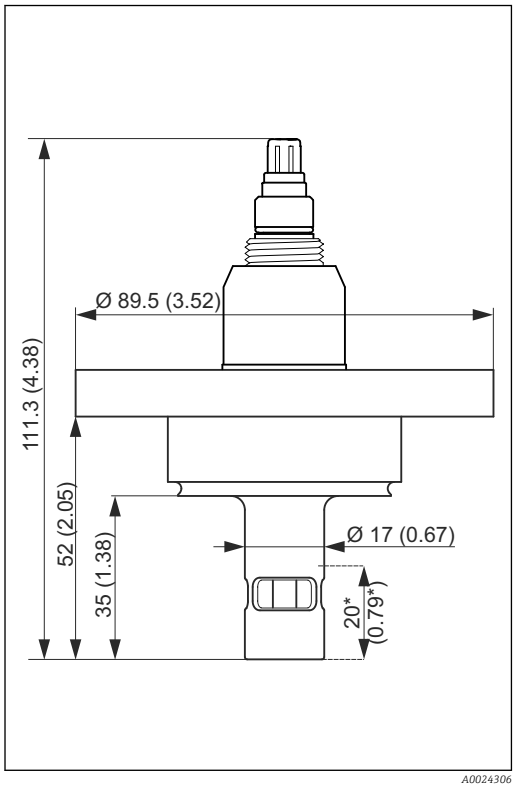
14 Plug-in head version with Clamp

* *CLS16, Clamp 1" = 50.5 mm*
CLS16, Clamp 1.5" = 50.5 mm
CLS16, Clamp 2" = 64 mm

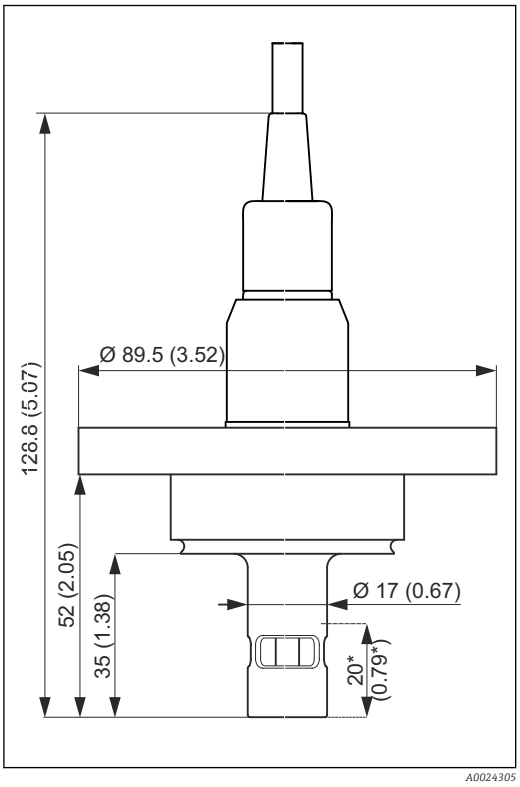


15 Fixed cable version with Clamp

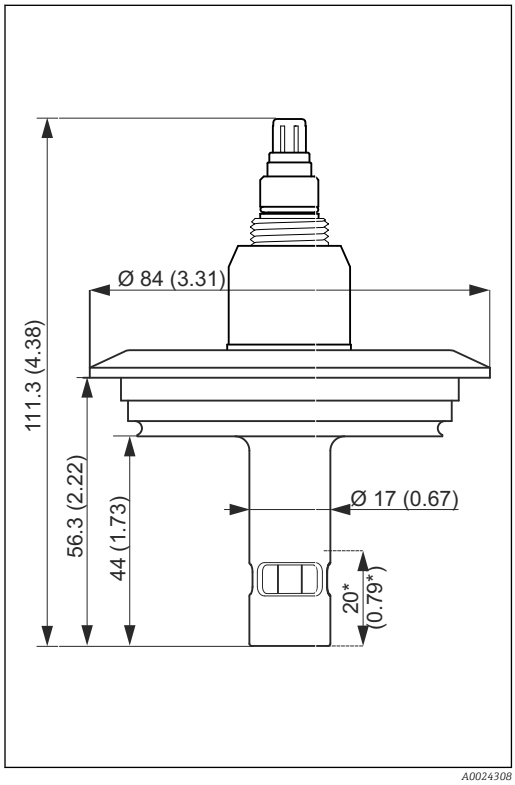
* *CLS16, Clamp 1" = 50.5 mm*
CLS16, Clamp 1.5" = 50.5 mm
CLS16, Clamp 2" = 64 mm



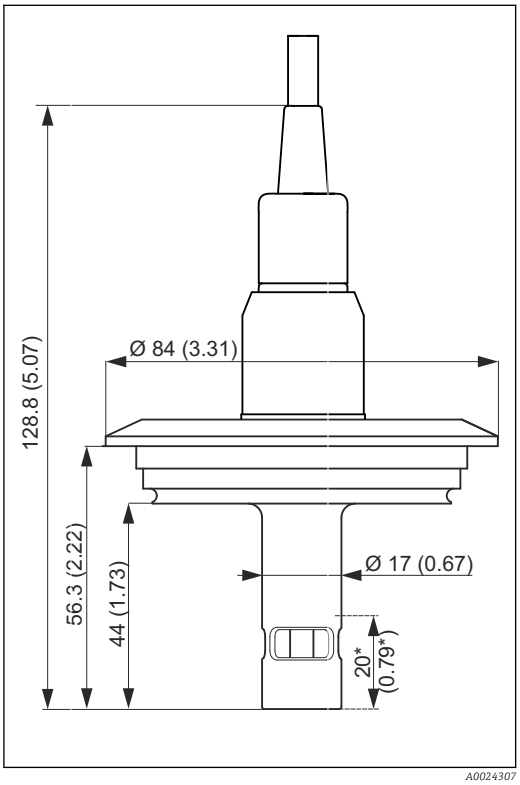
16 *Plug-in head version with BioControl*



17 *Fixed cable version with BioControl*



18 *Plug-in head version with Varivent*



19 *Fixed cable version with Varivent*

Measurements in mm (inch)

Weight	Approx. 0.13 to 0.75 kg (0.29 to 1.65 lbs) depending on version	
Materials (in contact with medium)	Electrodes	Electropolished, stainless steel 1.4435 (AISI 316L)
	Seal	Gasket seal ISOLAST (FFKM), FDA-compliant

Process connections	Clamp 1", 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	$R_a \leq 0.8$ µm, electropolished $R_a \leq 0.38$ µm, electropolished, optional

Certificates and approvals

CE mark	**Declaration of Conformity** The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EC directives. The manufacturer confirms successful testing of the product by affixing to it the CE mark.
Ex approvals	**CLS16D-**G** ATEX / NEPSI II 1G Ex ia IIC T3/T4/T6 Ga, IECEx Ex ia IIC T3/T4/T6 Ga **CLS16D-**O** FM/CSA IS/NI Cl. I Div.1&2 Gr. A-D in conjunction with Liquiline M CM42 transmitter **CLS16D-**V** ATEX/NEPSI II 3G Ex ic IIC T3/T4/T6 Gc for use in Zone 2 with Liquiline M CM42-KV*** transmitter **CLS16** ATEX II 1G EEx ia IIC T3/T4/T6 FM/CSA IS/NI Cl. I Div.1&2 Gr. A-D in conjunction with Liquiline M CM42 transmitter ATEX and FM/CSA versions of digital sensors with Memosens technology are indicated by a red-orange ring in the plug-in head.
EHEDG	Validated as follows: ▪ Cleanability in accordance with EHEDG, Document 2 ▪ Sterilizability in accordance with EHEDG, Document 5 ▪ Bacteria-tightness in accordance with EHEDG, Document 7
FDA	All materials in contact with the product are listed by the FDA.
Quality certificate	Stating the individual cell constant
Biological reactivity test (USP class VI)	Biological reactivity test certificate according to USP (United States Pharmacopeia) class VI part <87> and part <88> with batch traceability of materials in contact with the medium
Inspection certificate in accordance with EN 10204 3.1	A test certificate 3.1 in accordance with EN10204 is supplied depending on the version (→ Product Configurator on the product page).
ASME	Manufactured in accordance with ASME criteria (American Society of Mechanical Engineers)

Ordering information

Product page

www.endress.com/cls16d

www.endress.com/cls16

Product Configurator

The navigation area is located on the right of the product page.

1. Under "Device support" click "Configure your selected product".
   ↳ The Configurator opens in a separate window.
2. Select all the options to configure the device in line with your requirements.
   ↳ In this way, you receive a valid and complete order code for the device.
3. Export the order code as a PDF or Excel file. To do so, click the appropriate button at the top of the screen.

Scope of delivery

The scope of delivery includes:
- Sensor in the version ordered
- Operating Instructions

Accessories

The following are the most important accessories available at the time this documentation was issued. For accessories not listed here, please contact your service or sales office.

Measuring cable

CYK10 Memosens data cable
- 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

CPK9
- Terminated measuring cable for connecting analog sensors with TOP68 plug-in head
- Selection in accordance with product structure

For more information and to order, please contact your sales office.

Junction boxes (only CLS16)

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

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, traceable to SRM by NIST and PTB, for comparison 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

LENNTECH
WATER TREATMENT SOLUTIONS
info@lenntech.com Tel. +31-152-610-900
www.lenntech.com Fax. +31-152-616-289

Endress+Hauser
People for Process Automation