Датчики проводимости Condumax H CLS16

Техническая информация

По вопросам продаж и поддержки обращайтесь:

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Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Condumax H CLS16 and CLS16D

Hygienic conductivity sensor, analog or digital with Memosens technology, cell constant k = 0.1 cm^{-1}

Application

Measurement in pure and ultrapure water:
- Monitoring ion exchangers
- Reverse osmosis
- Distillation
- Electro-deionizing
- WFI (Water for Injection) in the pharmaceutical industry

The cell constant k of the sensor is 0.1 cm^{-1}. The measuring range reaches from 0.04 to 500 µS/cm.

Sensors with integrated temperature sensors are used with transmitters with automatic temperature compensation:
- Liquiline M CM42
- Mycom S CLM153
- Liquisys M CLM223/253

For measurement of resistivity, MΩ · cm measuring ranges are available in the menus of these transmitters.

Your benefits

- High measuring accuracy as cell constant is individually measured
- Hygienic process connections for installation in pipes or flow chambers
- Plug-in head (IP 68) / fixed cable (IP 67)
- Easy to clean thanks to electro-polished measuring surfaces
- Can be sterilized up to 150 °C (302 °F)
- Stainless steel 1.4435 (AISI 316L), meets the highest demands of the pharmaceutical industry
- Quality certificate stating the individual cell constant
- 3-A certificate
- Certified according to EHEDG Document 8
- Available with biological reactivity test certificate according to USP (United States Pharmacopeia) Part 87 and 88 Class VI
- Available with inspection certificate according to EN 10204-3.1

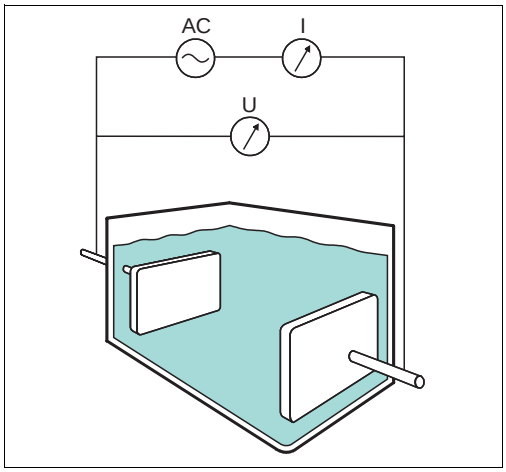
Further benefits offered by Memosens technology

- Maximum process safety through contactless inductive signal transmission
- Data safety through digital data transmission
- Easy handling thanks to storage of sensor-specific data
- Predictive maintenance possible thanks to registration of sensor load data

Function and system design

Measuring principle

Conductive measurement of conductivity



Conductive measurement of conductivity

AC Power supply
I Current meter
U Voltage meter

The conductivity of liquids is measured with the following measurement setup: Two electrodes are immersed in the medium. An AC voltage is applied to these electrodes which generates a current in the medium.
The electric resistance or its reciprocal value, the conductance G, is calculated according to Ohm's law. The specific conductivity κ is determined using the cell constant k that is dependent on the sensor geometry.

General properties

- **Electrodes**
  The sensor has coaxially arranged measuring electrodes made of electro-polished, stainless steel 1.4435 (AISI 316L).
- **Temperature measurement**
  A temperature sensor is installed in the inside electrode to measure the medium temperature.
- **Durable and sterilizable**
  – The sensors are pressure-proof up to 12 bar at 20 °C (180 psi at 68 °F).
  – They are underpressure-proof down to 0.1 bar at 20 °C (1.5 psi at 68 °F).
  – They are suitable for continuous operation at the following temperatures:
  CLS16: up to 120 °C at 8 bar (248 °F at 116 psi)
  CLS16D: up to 100 °C at 8 bar (212 °F at 116 psi)
  – The sensors are sterilizable up to 150 °C at 5 bar (302 °F at 72.5 psi), 45 min.

Important properties CLS16D

Maximum process safety

The inductive and non-contacting measured value transmission of Memosens guarantees maximum process safety and offers the following benefits:

- All problems caused by moisture are eliminated.
  – The plug-in connection is 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 measured value transmission.

Data safety through digital data transfer

The Memosens technology digitalizes the measured values in the sensor and transfers them to the transmitter contactlessly and free from interference potential. The result:

- An automatic error message is generated if the sensor fails or the connection between sensor and transmitter is interrupted.
- The availability of the measuring point is dramatically increased by immediate error detection.
- Application in hazardous areas is unproblematic; the integrated electronics are intrinsically safe.

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. When the sensor is connected, the calibration data are automatically transferred to the transmitter and used to calculate the current measured value. Storing the calibration data in the sensor allows for calibration and adjustment away from the measuring point. The result:

- Sensors can be calibrated unter optimum external conditions in the measuring lab. Wind and weather do neither affect the calibration quality nor the operator.
- The measuring point availability is dramatically increased by the quick and easy replacement of precalibrated sensors.
- 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.

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

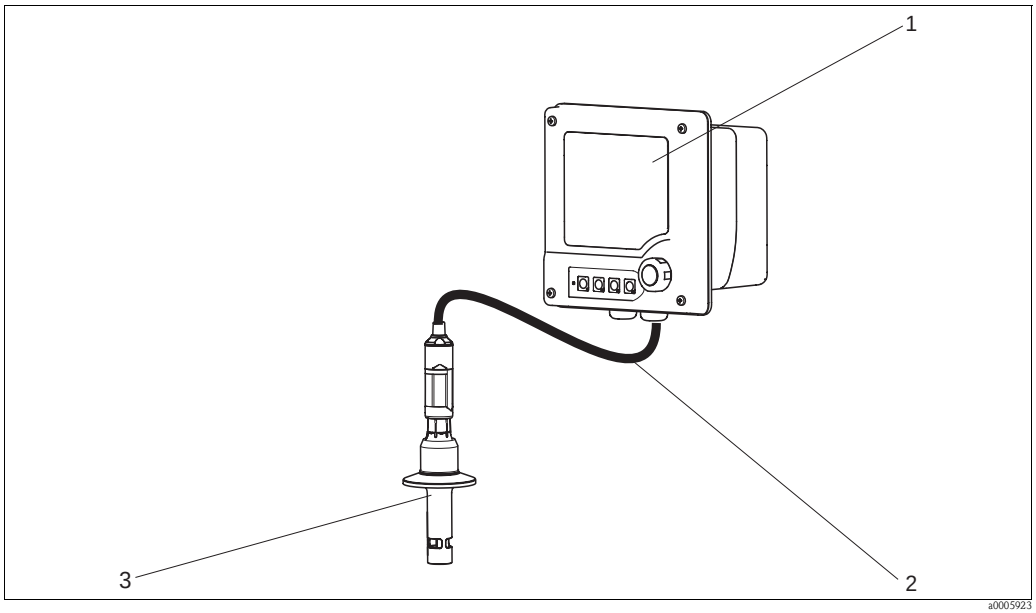
Data storage of CLS16D

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
  - Change in 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
  - Operating hours at temperatures above 80 °C / 100 °C (176 °F / 212 °F)
  - Number of sterilizations

Measuring system

A complete measuring system comprises:
- a CLS16 or CLS16D conductivity sensor
- a transmitter, e.g. Liquiline M CM42
- a measuring cable, e.g. CPK9 or CYK10 Memosens data cable



Measuring system example

1 Liquiline M CM42 transmitter
2 CYK10 Memosens data cable
3 Condumax H CLS16D

Input

Measured values

Conductivity
Temperature

Cell constant k

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

Measuring ranges

Conductivity	0.04 µS/cm to 500 µS/cm (referenced to water at 25 °C (77 °F))
Temperature	–5 to 150 °C (23 to 302 °F)

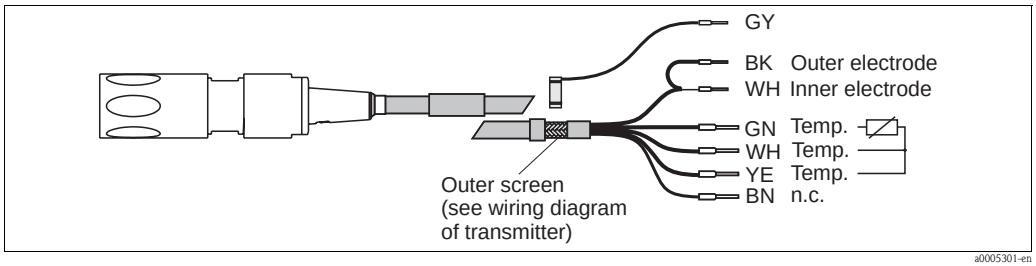
Temperature compensation

CLS16:	Pt 100, Pt 1000 Class A
CLS16D:	NTC

Cable specification

CLS16

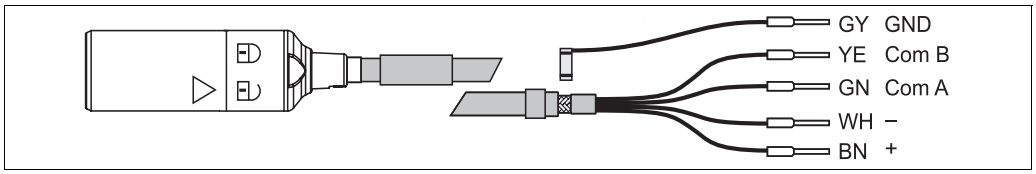
CLS16 is connected to the transmitter using the CPK9 measuring cable (see Accessories) or the fixed cable.



CPK9 measuring cable or fixed cable

CLS16D

CLS16D is connected to the transmitter using the Memosens data cable CYK10.



CYK10 Memosens data cable

Performance characteristics

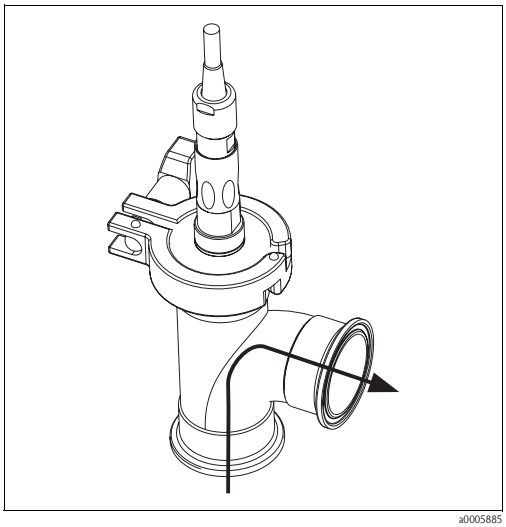
Measured error

Each individual sensor is factory-measured in a solution of approx. 5 µS/cm with a reference system traceable to NIST. The exact cell constant is entered into the supplied quality certificate.
The measured error is 1.0 %.

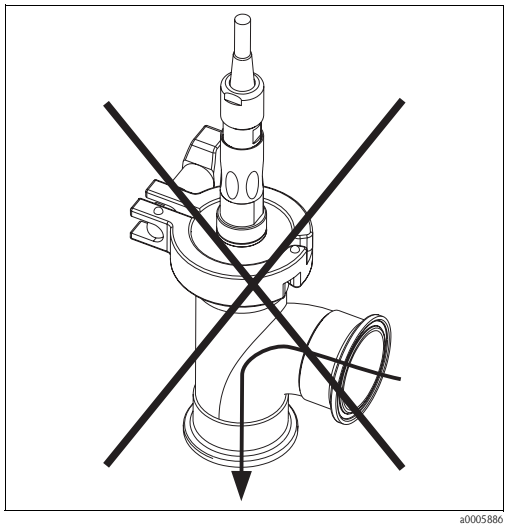
Installation

Installation instructions

The sensors are mounted directly via the process connection.
When installing the sensor in pipes, note the flow direction of the medium (see figure below).



Permissible flow direction



Non-permissible flow direction

The measuring surfaces must be completely immersed in the medium during operation.
When working in ultrapure water, ingress of air must be prevented since dissolved air, particularly CO_2, may increase conductivity by up to 3 µS/cm.

Environment

Ingress protection

CLS16	
Fixed cable:	IP 67 (≙ NEMA 6)
TOP68 plug-in system:	IP 68 (≙ NEMA 6)
CLS16D:	IP 68 (≙ NEMA 6)

Process

Process temperature

CLS16
- Normal operation: -5 to 120 °C (23 to 248 °F)
- Short-time operation (max. 45 min): max. 150 °C @ 5 bar (302 °F @ 72.5 psi)

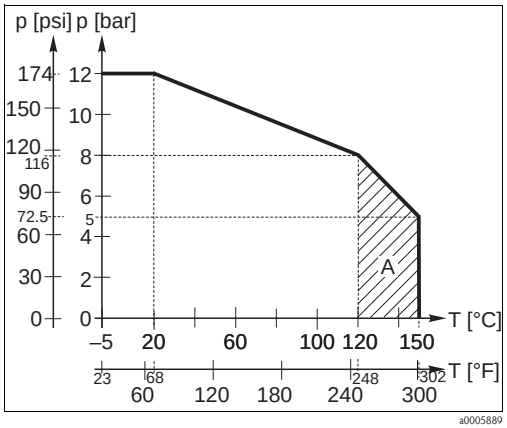
CLS16D
- Normal operation: -5 to 100 °C (23 to 212 °F)
- Short-time operation (max. 45 min): max. 150 °C @ 5 bar (302 °F @ 72.5 psi)

Process pressure

CLS16: 12 bar @ 20 °C (174 psi @ 68 °F)
8 bar @ 120 °C (116 psi @ 248 °F)
0.1 bar abs. @ 20 °C (1.5 psi abs. @ 68 °F) (underpressure)

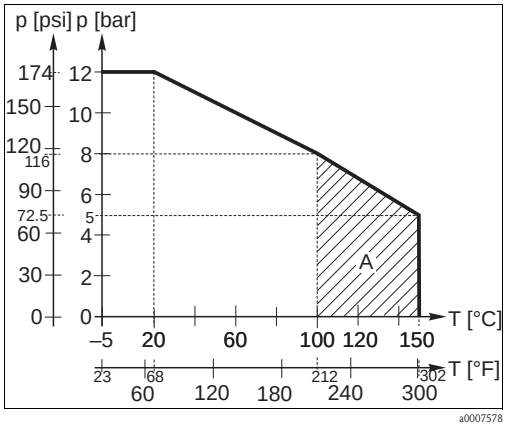
CLS16D: 12 bar @ 20 °C (174 psi @ 68 °F)
8 bar @ 100 °C (116 psi @ 212 °F)
0.1 bar abs. @ 20 °C (1.5 psi abs. @ 68 °F) (underpressure)

Pressure/temperature load curve



Pressure-temperature load curve of CLS16

A short-time sterilizable (45 min)

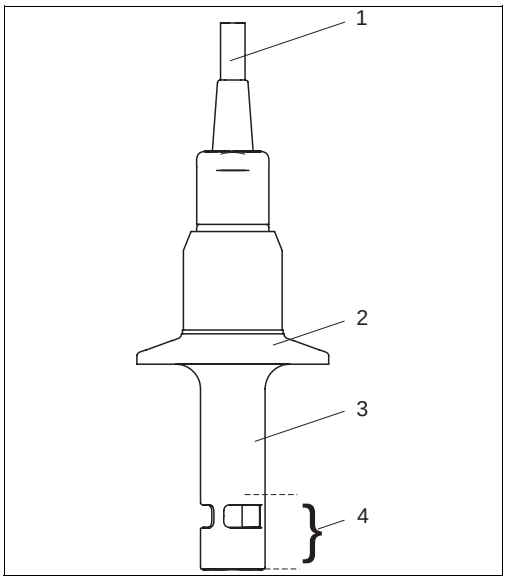


Pressure-temperature load curve of CLS16D

A short-time sterilizable (45 min)

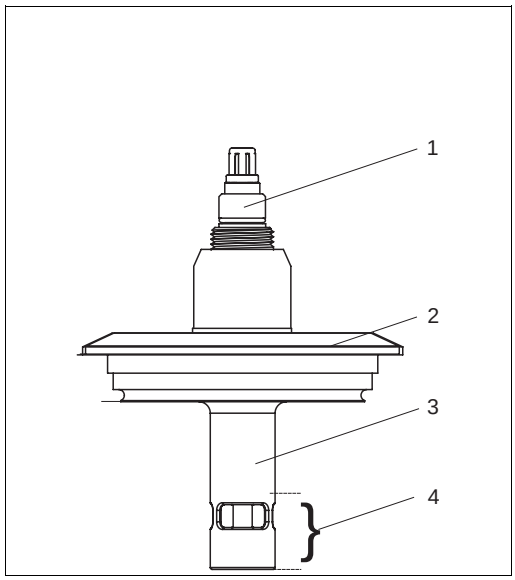
Mechanical construction

Design, dimensions



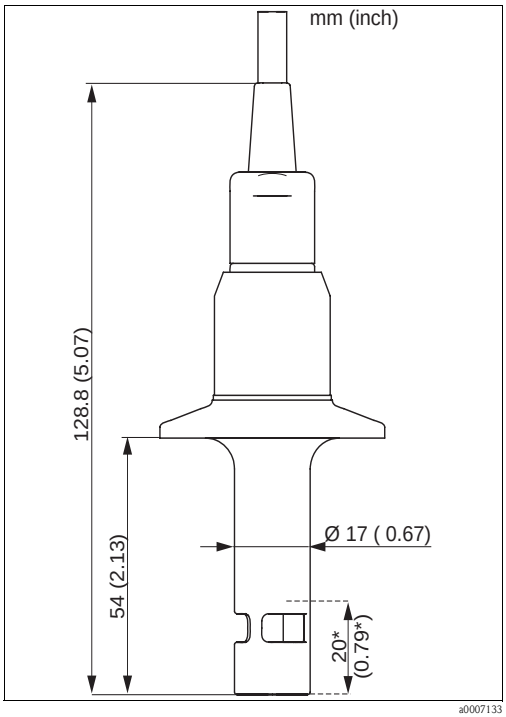
Fixed-cable version

1 Fixed cable
2 Process connection (clamp, Varivent, BioControl)
3 Coaxial measuring electrode, electro-polished, stainless steel 1.4435 (AISI 316L)
4 Minimum immersion depth



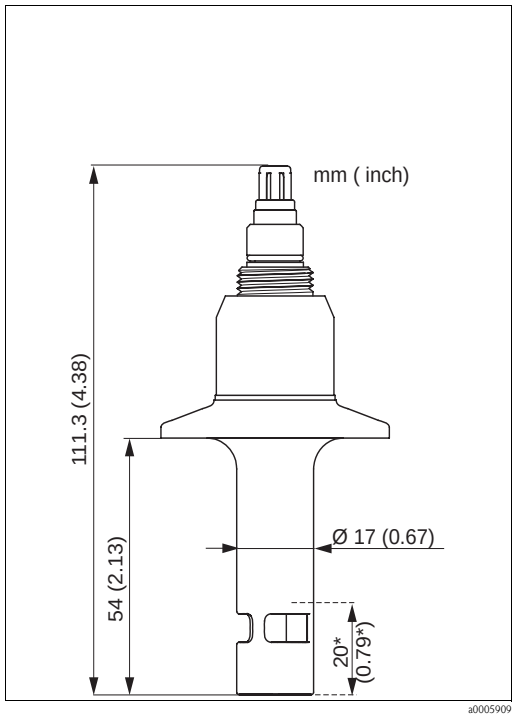
Plug-in head version

1 TOP68 plug-in head
2 Process connection (clamp, Varivent, BioControl)
3 Coaxial measuring electrode made of electro-polished, stainless steel 1.4435 (AISI 316L)
4 Minimum immersion depth



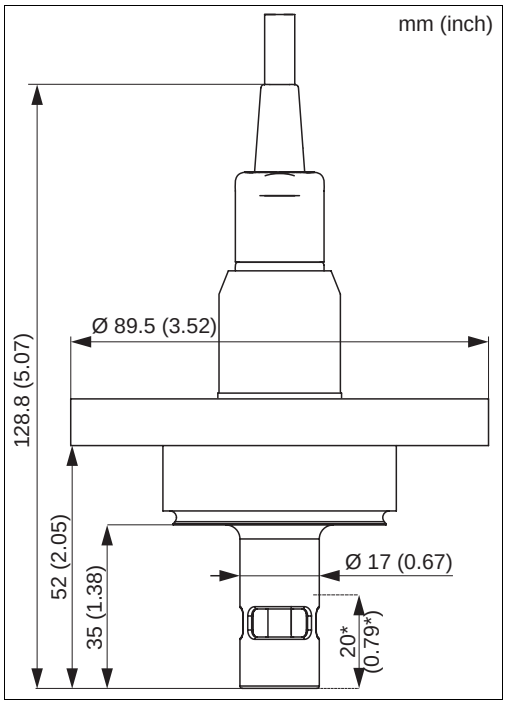
Dimensions of clamp connection, fixed-cable version

**minimum immersion depth*

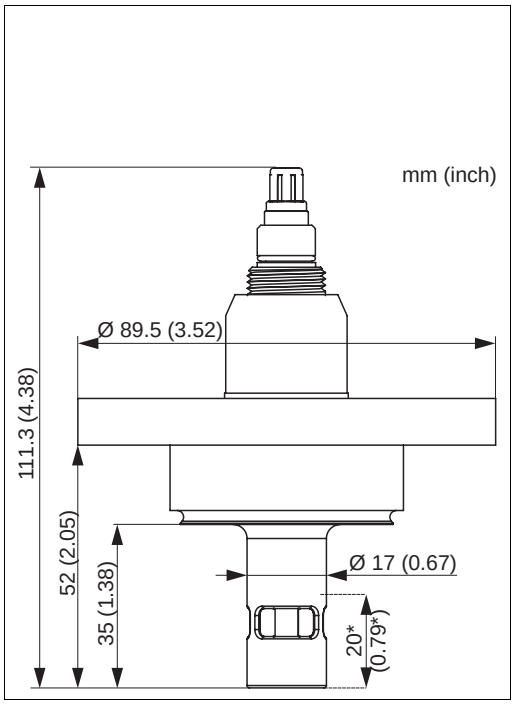


Dimensions of clamp connection, plug-in head version

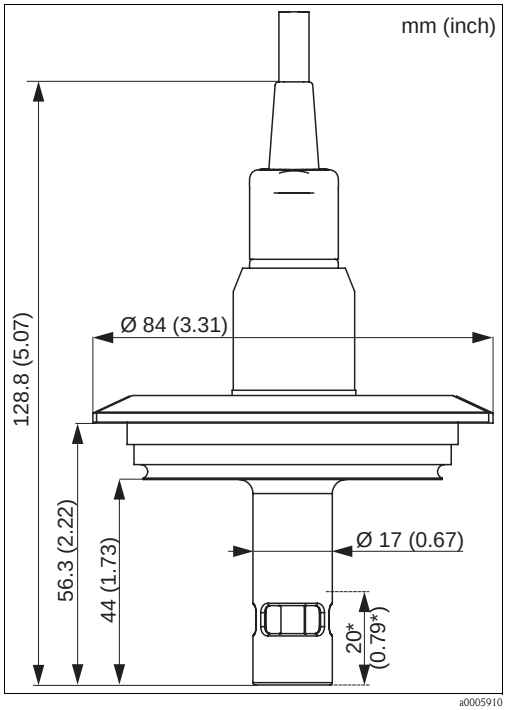
**minimum immersion depth*



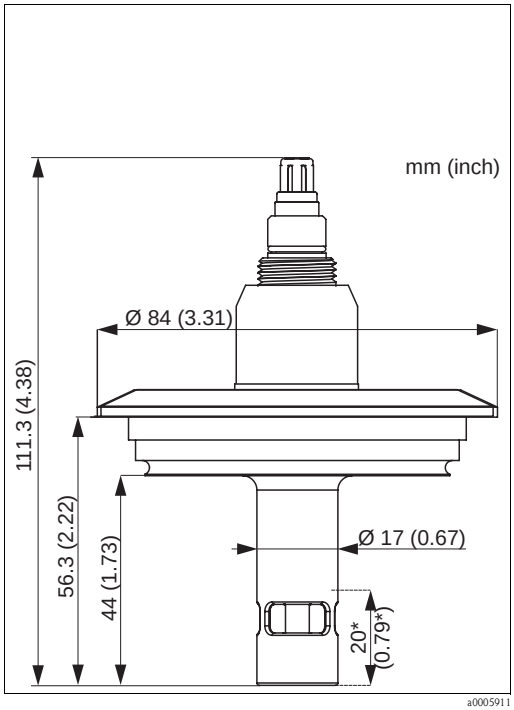
Dimensions of BioControl connection, fixed-cable version
**minimum immersion depth*



Dimensions of BioControl connection, plug-in head version
**minimum immersion depth*

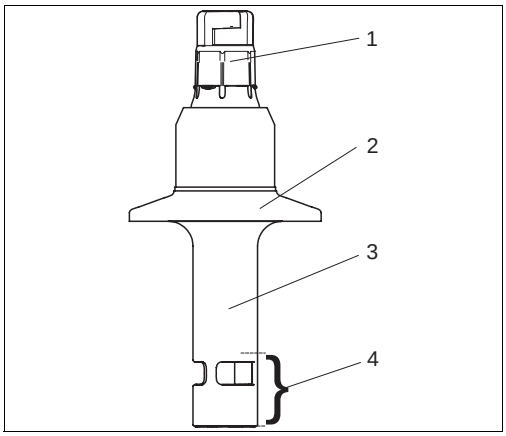


Dimensions of Varivent connection, fixed-cable version
**minimum immersion depth*



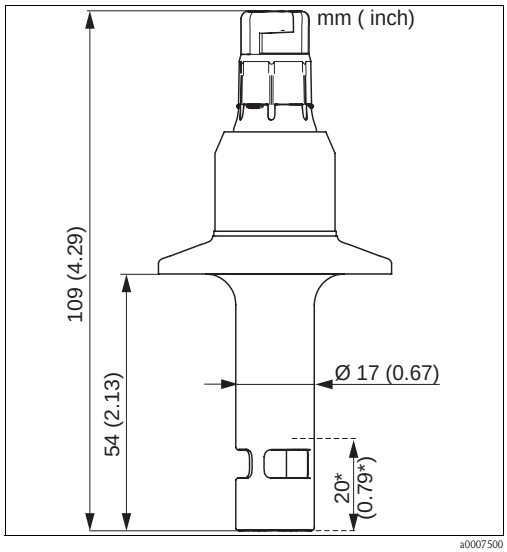
Dimensions of Varivent connection, plug-in head version
**minimum immersion depth*

Design, dimensions CLS16D



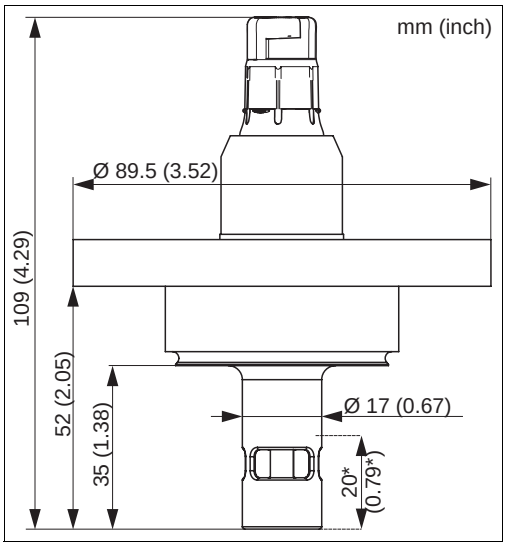
Design

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

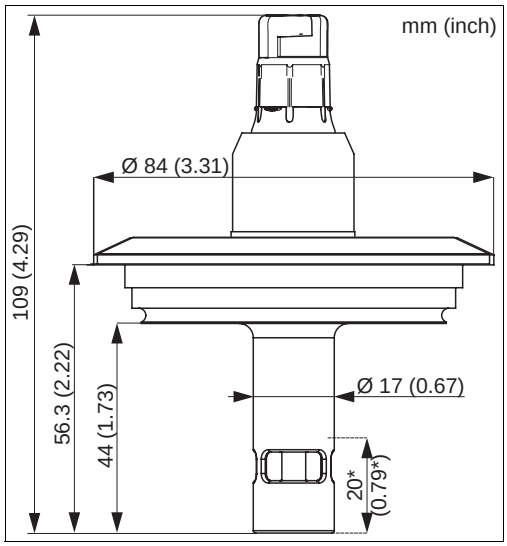


Dimensions of clamp connection

**minimum immersion depth*



Dimensions of BioControl connection



Dimensions of Varivent connection

Weight	Depending on version, approx. 0.13 to 0.75 kg (0.3 to 1.7 lb.)	
Materials in contact with medium	Electrodes: Seal:	electro-polished, stainless steel 1.4435 (AISI 316L) molded seal Isolast® (FFKM), listed with FDA
Surface roughness	$R_a \leq 0.8$ µm, electro-polished $R_a \leq 0.4$ µm, electro-polished, optional	
Process connection	Clamp 1", 1½", 2" according to ISO 2852 (also suitable for TriClamp®, DIN 32676) Tuchenhagen Varivent® N DN 50 to 125 Neumo BioControl® D50	

Maintenance

Checking the sensors

Intact seals are a prerequisite for safe and accurate measurement.
To ensure highest operational reliability and complete hygiene of the sensor according to 3-A Standard 74-, the seal should be replaced at regular intervals.

The actual maintenance intervals can only be determined by the operator since they strongly depend on the operating conditions such as:
- type and temperature of the medium
- type and temperature of the cleaning solution
- number of cleanings
- number of sterilizations
- ambient conditions

Recommended intervals for seal replacement

Application	Seal replacement (recommended interval)
Medium temperature between 50 to 100 °C (122 to 212 °F)	approx. every 18 months
Medium temperature below 50 °C (122 °F)	approx. every 36 months
Sterilization cycles, max. 145 °C (293 °F), 30 min	approx. 400 cycles

Cleaning the sensors

To ensure accurate measurement, clean the sensor regularly:

- Use appropriate cleaning solutions (e.g. Isopropanol) to remove light soilings and coatings of the sensor parts in contact with medium.
- After cleaning the sensor, rinse it with distilled or ultrapure water. Remnants of cleaning solutions might distort the measurement.

Certificates and approvals

Ex approval	■ ATEX II 1G EEx ia IIC T3 / T4 / T6 ■ FM/CSA in combination with the Liquiline M CM42 and Mycom S CLM153 transmitters for all product versions listed in the product structure (see Ordering Information)
EHEDG	Certified according to EHEDG Document 8 Validated for: ■ sterilizability according to EHEDG Document 5 ■ cleanability according to EHEDG Document 2 ■ bacteria tightness according to EHEDG Document 7
3-A	Certified according to 3-A Standard Number 74-
FDA	All materials in contact with medium are listed with FDA.
Quality certificate	With statement of the individual cell constant
Biological reactivity test (USP Class VI, optional)	Certificate on biological reactivity test according to USP (United States Pharmacopeia) Part <87> and Part <88> Class VI with lot traceability of the materials in contact with medium
Inspection certificate acc. to EN 10204-3.1 (optional)	Available for all process connections
ASME BPE-2002	Designed according to ASME BPE-2002 criteria (American Society of Mechanical Engineers)

Ordering information

Product structure CLS16

	Process connection and materials				
	3C	Clamp ISO 2852 1", stainless steel 1.4435 (AISI 316L)			
	3D	Clamp ISO 2852 1½", stainless steel 1.4435 (AISI 316L)			
	3E	Clamp ISO 2852 2", stainless steel 1.4435 (AISI 316L)			
	3F	Varivent N DN 50 to 125			
	3G	Neumo BioControl D50			
	4C	Clamp ISO 2852 1", stainless steel 1.4435 (AISI 316L), with inspection certificate acc. to EN 10204-3.1			
	4D	Clamp ISO 2852 1½", stainless steel 1.4435 (AISI 316L), with inspection certificate acc. to EN 10204-3.1			
	4E	Clamp ISO 2852 2", stainless steel 1.4435 (AISI 316L), with inspection certificate acc. to EN 10204-3.1			
	4F	Varivent N DN 50 to 125, with inspection certificate acc. to EN 10204-3.1			
	4G	Neumo BioControl D50, with inspection certificate acc. to EN 10204-3.1			
		Measuring cable connection			
		1	with TOP68, without cable		
		2	with 5 m (15 ft) fixed cable		
		3	with 10 m (30 ft) fixed cable		
			Temperature sensor		
			A	Integrated Pt 100 temperature sensor	
			B	Integrated Pt 1000 temperature sensor	
				Additional option	
				1P	Basic version
				1R	Ra < 0.4 µm with inspection certificate acc. to EN 10204-3.1
				1S	Certificate on biological reactivity test acc. to USP Class VI and Ra < 0.4 µm with inspection certificate acc. to EN 10204-3.1
				1U	Certificate on biological reactivity test acc. to USP Class VI
CLS16-					**complete order code**

Product structure CLS16D

	Process connection and materials			
	3C	Clamp ISO 2852 1", stainless steel 1.4435 (AISI 316L)		
	3D	Clamp ISO 2852 1½", stainless steel 1.4435 (AISI 316L)		
	3E	Clamp ISO 2852 2", stainless steel 1.4435 (AISI 316L)		
	3F	Varivent N DN 50 to 125		
	3G	Neumo BioControl D50		
	4C	Clamp ISO 2852 1", stainless steel 1.4435 (AISI 316L), with inspection certificate acc. to EN 10204-3.1		
	4D	Clamp ISO 2852 1½", stainless steel 1.4435 (AISI 316L), with inspection certificate acc. to EN 10204-3.1		
	4E	Clamp ISO 2852 2", stainless steel 1.4435 (AISI 316L), with inspection certificate acc. to EN 10204-3.1		
	4F	Varivent N DN 50 to 125, with inspection certificate acc. to EN 10204-3.1		
	4G	Neumo BioControl D50, with inspection certificate acc. to EN 10204-3.1		
		Additional option		
		1P	Basic version	
		1R	Ra < 0.4 µm with inspection certificate acc. to EN 10204-3.1	
		1S	Certificate on biological reactivity test acc. to USP Class VI and Ra < 0.4 µm with inspection certificate acc. to EN 10204-3.1	
		1U	Certificate on biological reactivity test acc. to USP Class VI	
			Approval	
			G	ATEX II 1G EEx ia IIC T4/T6
			1	Non-hazardous areas
CLS16D-				**complete order code**

Accessories

Connection

Measuring cables

CPK9 special measuring cable
- For sensors with TOP68 plug-in head, for high-temperature and high-pressure applications, IP 68
- Ordering acc. to product structure, see Technical Information (TI118C/07/en)

CYK71 measuring cable
- Non-terminated cable for the connection of sensors (e.g. conductivity sensors) or the extension of sensor cables
- Sold by the meter, order numbers:
  – non-Ex version, black: 50085333
  – Ex version, blue: 51506616

CYK10 Memosens data cable
- For digital sensors with Memosens technology
- Ordering according to product structure, see below

	Certificates	
	A	Standard, non Ex
	G	ATEX II 1G EEx ia IIC T6/T4

		Cable length	
		03	Cable length: 3 m (9.8 ft)
		05	Cable length: 5 m (16 ft)
		10	Cable length: 10 m (33 ft)
		15	Cable length: 15 m (49 ft)
		20	Cable length: 20 m (66 ft)
		25	Cable length: 25 m (82 ft)
		88	... m length
		89	... ft length

			Ready-made	
			1	Wire terminals
CYK10-				complete order code

CYK81 measuring cable
- non-terminated measuring cable for extension of sensor cables of e.g. Memosens, CUS31/CUS41
- 2 wires, twisted pair with shield and PVC-sheath (2 x 2 x 0.5 mm^2 + shield)
- Sold by the meter, order no. 51502543

Junction box

Junction box VBM
- For cable extension
- 10 terminals
- Cable entries: 2 x Pg 13.5 or 2 x NPT ½"
- Material: aluminum
- Ingress protection: IP 65 (≙ NEMA 4X)
- Order numbers:
  – cable entries Pg 13.5: 50003987
  – cable entries NPT ½": 51500177

Junction box VBM-Ex
- For cable extension in hazardous areas
- 10 terminals (blue)
- Cable entries: 2 x Pg 13.5
- Material: aluminum
- Ingress protection: IP 65 (≙ NEMA 4X)
- Order no.: 50003991

Junction box RM
- For cable extension (e.g. for Memosens sensors or CUS31/CUS41)
- 5 terminals
- Cable entries: 2 x Pg 13.5
- Material: PC
- Ingress protection: IP 65 (≙ NEMA 4X)
- Order no.: 51500832

Transmitters

Liquiline M CM42 (for analog conductivity sensors and digital conductivity sensors with Memosens technology)
- Modular two-wire transmitter for Ex and non-Ex areas
- Hart®, PROFIBUS or FOUNDATION Fieldbus available
- Ordering acc. to product structure, see Technical Information (TI381C/07/en)

Liquisys M CLM223/253 (for analog conductivity sensors)
- Transmitter for conductivity, field or panel-mounted housing,
- Hart® or PROFIBUS available
- Ordering acc. to product structure, see Technical Information (TI193C/07/en)

Mycom S CLM153 (for analog conductivity sensors)
- Transmitter for conductivity, one or two channel version, Ex or Non-Ex,
- Hart® or PROFIBUS available
- Ordering acc. to product structure, see Technical Information (TI234C/07/en)

Sensor regeneration

- Factory replacement of seals and factory recalibration of sensors; order no. 51505585

Calibration solutions

Precision solutions referred to SRM (Standard Reference Material) of NIST for qualified calibration of conductivity measuring systems according to ISO, with temperature table,
- 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

Calibration sets

Concal calibration set
- conductivity calibration set for ultrapure water applications
- complete, factory-calibrated measuring set with certificate, traceable to SRM of NIST and DKD
- for comparative measurement in ultrapure water applications up to max. 10 µS/cm
- order numbers, versions:
  – 230 V AC: 50083777
  – 115 V AC: 50083778

Recalibration Concal
- factory recalibration and new issue of calibration certificate, traceable to SRM of NIST and DKD
- factory calibration procedure according to ASTM D-5391-93
- order no. 51502486

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