Level | Pressure | Flow | Temperature | Analytics | Registration | Systems Components | Services | Solutions

Technical Information

Condumax CLS15 and CLS15D

Conductivity sensors, analog or digital with Memosens technology, Cell constant k = 0.01 cm^{-1} or k = 0.1 cm^{-1}

Application

Measurement in pure and ultrapure water:
- Monitoring ion exchangers
- Reverse osmosis
- Distillation
- Chip cleaning

The measuring range of the sensors depends on the cell constant k:
- k = 0.01 cm^{-1}: 0.04 to 20 µS/cm
- k = 0.1 cm^{-1}: 0.1 to 200 µS/cm

Sensors with a temperature sensor are used together with conductivity transmitters equipped with automatic temperature compensation:
- Liquiline CM442 / CM444 / CM448 (CLS15D only)
- Liquiline CM42
- Liquiline CM14 (CLS15D only)
- Mycom CLM153
- Liquisys 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
- Installation in pipes or flow chambers
- Compact design
- Available with plug-in head or fixed cable
- Easy to clean thanks to polished measuring surfaces
- Can be sterilized up to max. 140 °C (284 °F)
- Stainless steel 1.4435 (AISI 316L)
- Quality certificate stating the individual cell constant
- 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 in the sensor
- Predictive maintenance possible thanks to registration of sensor load data in the sensor

TI00109C/07/EN/13.12
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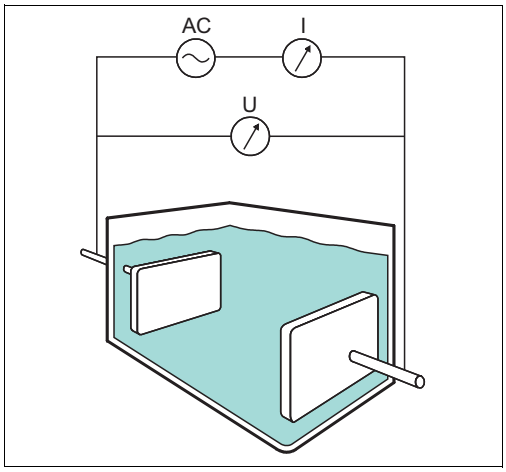
Endress+Hauser
People for Process Automation

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 two coaxially arranged measuring electrodes made of polished, stainless steel 1.4435 (AISI 316L).
- **Temperature measurement**
  In addition, a temperature sensor is installed in the inside electrode to measure the medium temperature.
- **Installation**
  The sensors are available with various process connections and can be installed directly.
  For simple installation in cross or T-pieces with DN 32, 40 or 50, adapter couplings (made of PVC for cementing) are available.
- **Durable and sterilizable**
  – The sensors are pressure-proof up to 12 bar at 20 °C (174 psi at 68 °F).
  – They are suitable for continuous operation up to 120 °C at 1 bar (248 °F at 14.5 psi).
  – Short-time sterilization up to 140 °C at 1 bar (284 °F at 14.5 psi) is possible.
  – For CLS15D, the maximum temperature for communication with the transmitter is 130 °C (266 °F).

Communication and data processing with CLS15D

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 high temperatures

Dependability with CLS15D

Reliability

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.

Maintainability

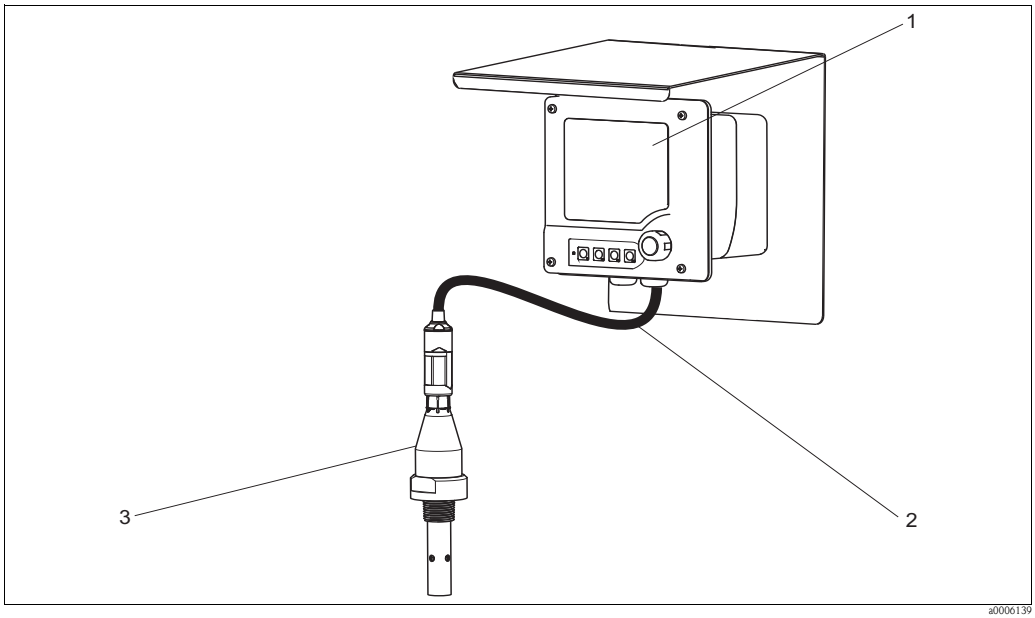
Sensors with Memosens technology have integrated electronics that allow for saving calibration data and further information such as total hours of operation and operating hours under extreme measuring conditions. When the sensor is connected, the calibration data are automatically transferred to the 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.

Integrity

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.

Measuring system

A complete measuring system comprises:
- a CLS15 or CLS15D conductivity sensor
- a transmitter, e.g. Liquiline CM42
- a measuring cable, e.g. CYK71 or CYK10 Memosens data cable



Measuring system example

1 Liquiline CM42
2 CYK10 Memosens data cable
3 Condumax CLS15D

Input

Measured variable

- Conductivity
- Temperature

Measuring range

Conductivity (referenced to water at 25 °C (77 °F))
CLS15D-A and CLS15-A 0.04 to 20 µS/cm
CLS15D-B and CLS15-B 0.10 to 200 µS/cm
valid in the specified temperature range
specified measuring accuracy up to 100 °C (212 °F)

Temperature
CLS15D –20 to 100 °C (–4 to 212 °F)
CLS15 –20 to 140 °C (–4 to 280 °F)
specified measuring accuracy up to 100 °C (212 °F)

Cell constant

CLS15-A and CLS15-A
$k = 0.01\ cm^{-1}$

CLS15D-B and CLS15-B
$k = 0.1\ cm^{-1}$

Temperature compensation

CLS15D
NTC

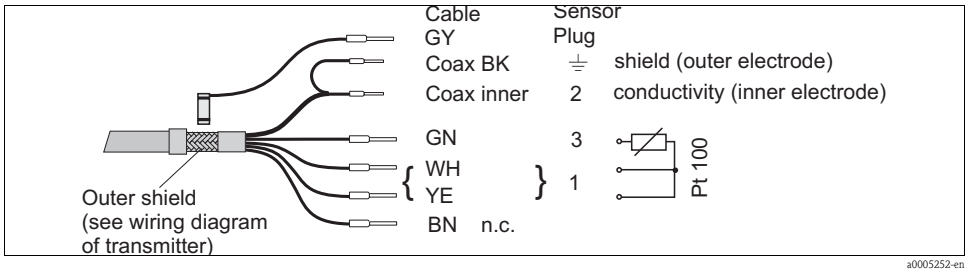
CLS15
Pt 100 (class A acc. to IEC 60751)

Power supply

Electrical connection

CLS15

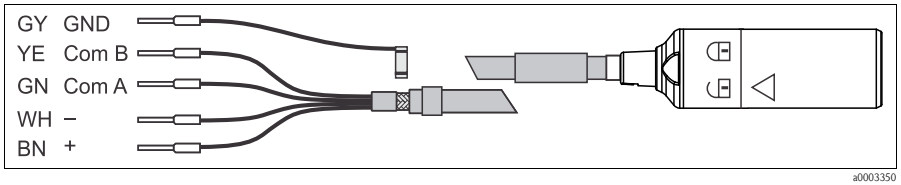
The sensor is connected to the transmitter using the measuring cable CYK71 or the fixed cable.



Measuring cable, CYK71 or fixed cable

CLS15D

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



Measuring cable CYK10

Performance characteristics, in general

Maximum measured error

Each individual sensor is factory measured in a solution of approx. 5 µS/cm for cell constant 0.01 cm^{-1} or approx. 50 µS/cm for cell constant 0.1 cm^{-1} on a reference measuring system referred to NIST or DKD. The accurate cell constant is entered in the supplied quality certificate. The maximum measured error in cell constant determination is 1.0%.

Performance characteristics, CLS15D only

Conductivity response time

$t_{95} \leq 3$ s

Temperature response time

CLS15D-A
$t_{90} \leq 39$ s

CLS15D-B
$t_{90} \leq 17$ s

Maximum measured error

2 % of the measured value

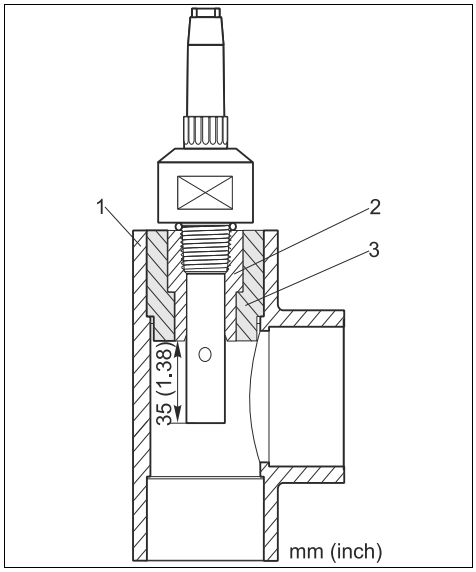
Repeatability

0.2 % of the measured value + 3 nS/cm

Installation

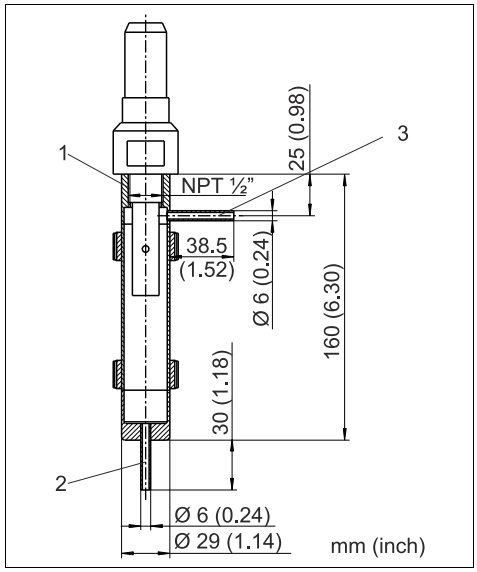
Installation conditions

The sensors are mounted directly via the thread NPT ½" or ¾" or clamp 1 ½" process connections. Optionally, the sensor can be installed in cross or T-pieces or in a flow chamber.



With NPT ½" installed in T- or cross piece

1 T- or cross piece (DN 32, 40 or 50)
2 PVC-threaded coupling for cementing (NPT ½" for DN 20, see Accessories)
3 Adapter coupling for cementing (for DN 32, 40 or 50, see Accessories)



With NPT ½" installed in flow assembly 71042405

1 Sensor support NPT ½"
2 Inlet
3 Outlet

The measuring surfaces of the sensor must be completely immersed in the medium during operation. Minimum immersion depth is 32 mm (1.26").
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

Ambient temperature

–20 to +60 °C (–4 to +140 °F)

Storage temperature

–25 to +80 °C (–10 to +180 °F)

Humidity

5 to 95%

Protection degree

CLS15	IP 67 / NEMA 6
CLS15D	IP 68 / NEMA Type 6P (10 m water column, 25 °C, 168 h)

Process

Process temperature

CLS15

Thread version w. fixed cable –20 to 100 °C (–4 to 212 °F)

Thread version with plug-in head, clamp version

Normal operation:	–20 to 120 °C (–4 to 248 °F)
Sterilization (max. 1 h):	max. 140 °C (284 °F)

CLS15D

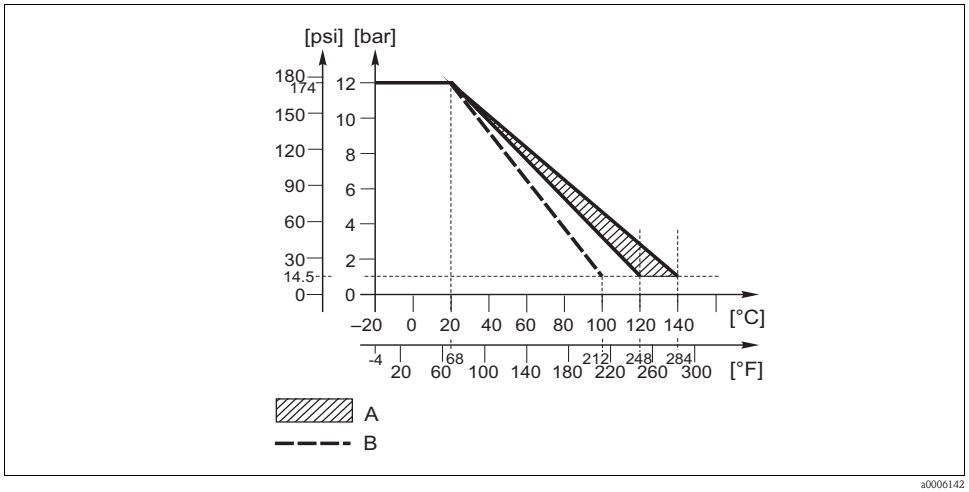
Normal operation:	–20 to 120 °C (–4 to 248 °F)
Sterilization (max. 1 h):	max. 140 °C (284 °F)

The maximum temperature for communication between Memosens sensors and the transmitter is 130 °C (266 °F).

Process pressure

12 bar (170 psi) at 20 °C (68 °F)

Pressure/temperature load curves



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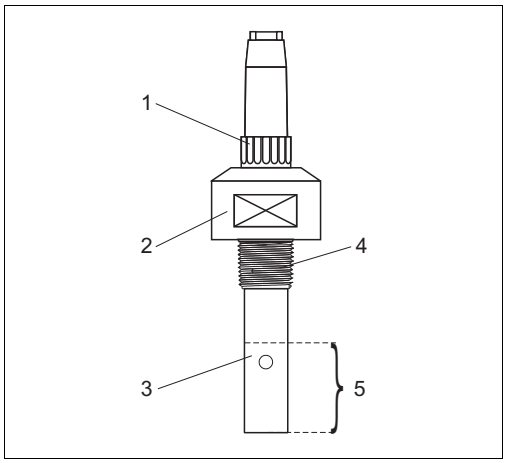
Mechanical pressure-temperature stability of

A Short-time sterilizable (1 h)
B Thread version with fixed cable

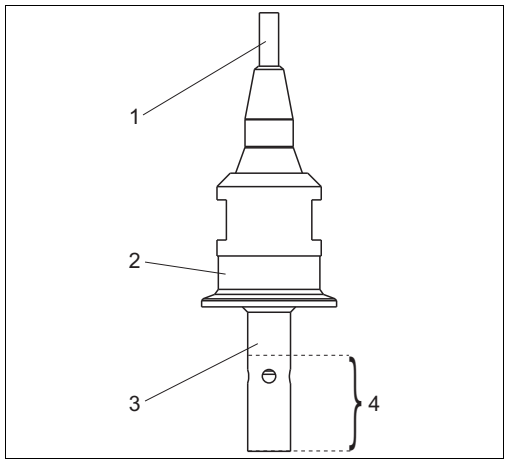
Mechanical construction

Design, dimensions of CLS15



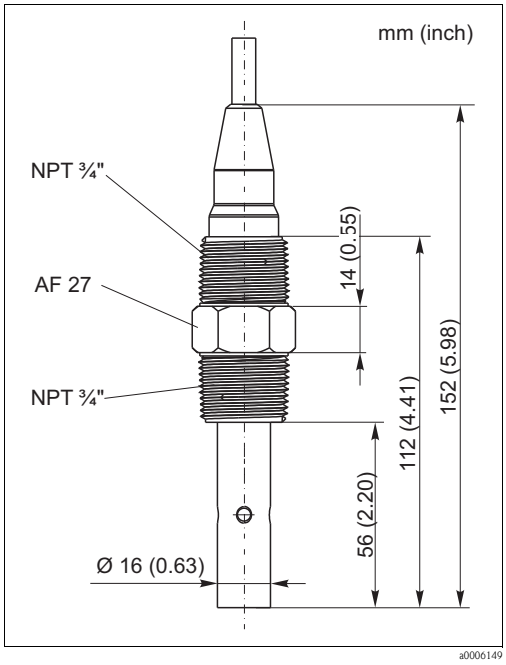
Plug-in head version with NPT ½ "

1 Connector
2 Plug-in head
3 Coaxial measuring electrode
4 Thread NPT ½"
5 Minimum immersion depth

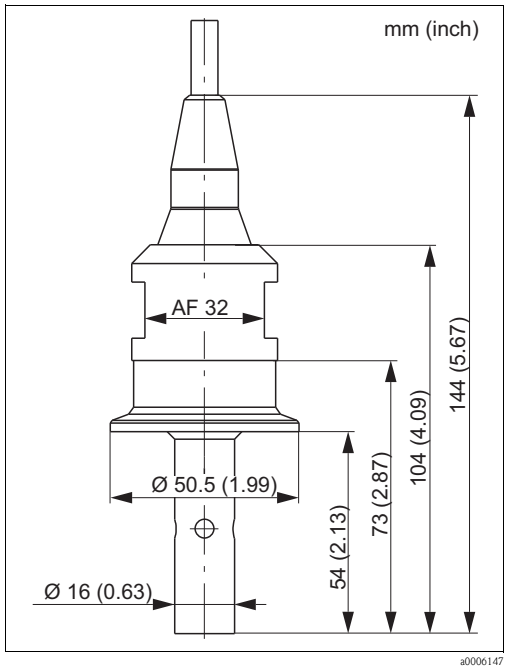


Fixed-cable version with clamp 1½"

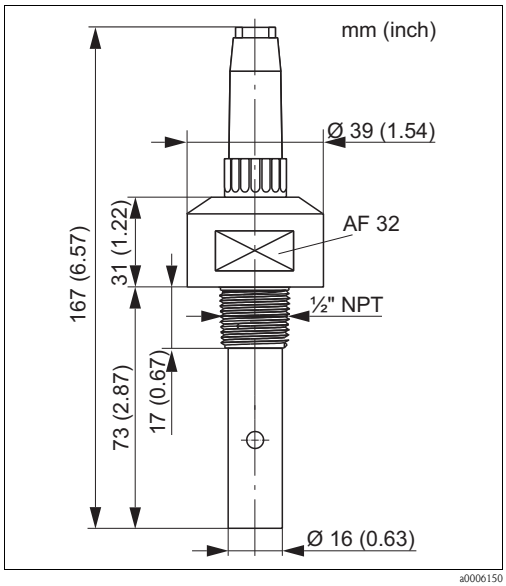
1 Fixed cable
2 Clamp 1½"
3 Coaxial measuring electrode
4 Minimum immersion depth



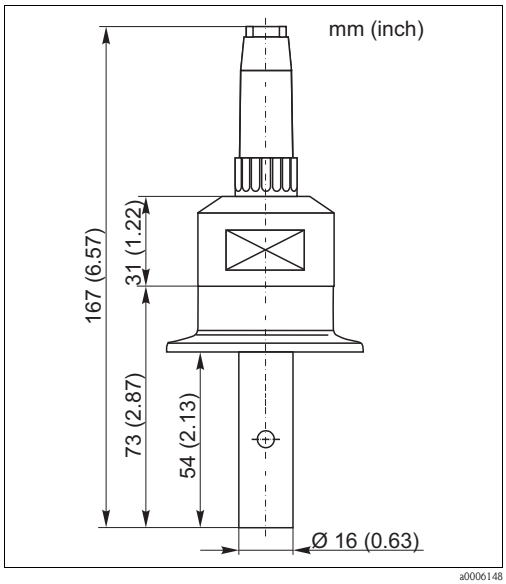
Dimensions of fixed-cable version with NPT ¾"



Dimensions of fixed-cable version with clamp 1½"

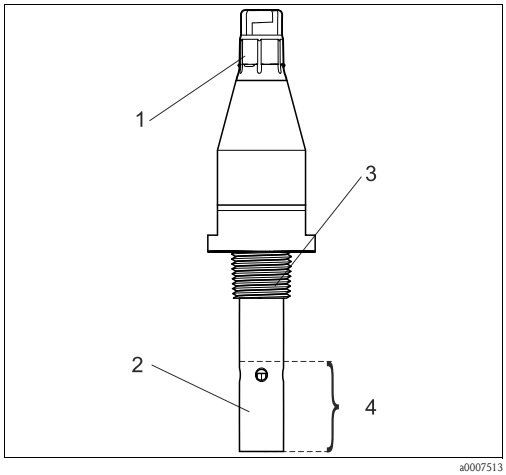


Dimensions of plug-in head version with NPT ½"



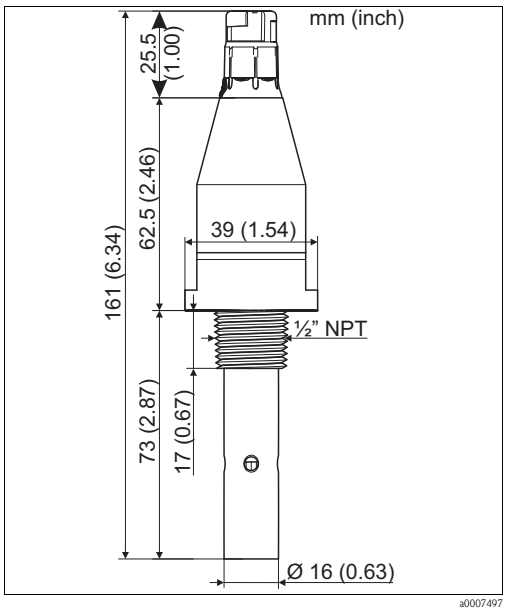
Dimensions of plug-in head version with clamp 1½"

Dimensions of CLS15D

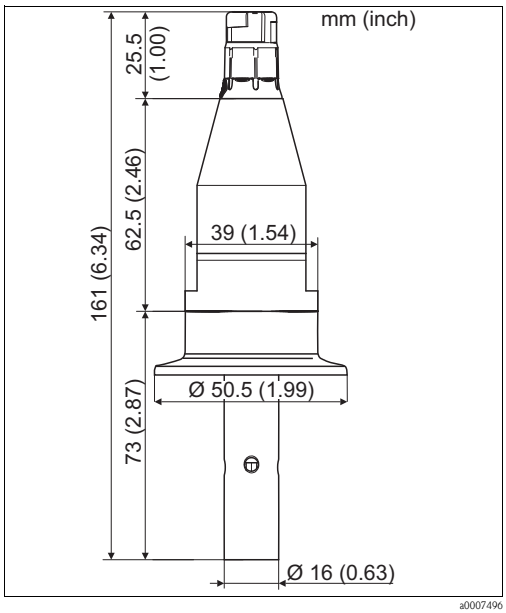


Version with thread

1 Memosens plug-in head
2 Coaxial measuring electrode
3 Thread
4 Minimum immersion depth



Dimensions of version with thread



Dimensions of version with clamp

Weight

Depending on version, approx. 0.3 kg (0.7 lb.)

Material

Electrodes:	polished, stainless steel 1.4435 (AISI 316L)
Sensor shaft:	polyethersulfone (PES-GF20)
O-ring, in contact with medium: (clamp version only)	EPDM

Surface roughness

$R_a \leq 0.8$ µm
($R_a \leq 0.4$ µm available as TSP C-LS020130-02)

Process connections

CLS15

Fixed-cable versions:	Plug-in head versions:
Thread NPT ¾"	Thread NPT ½"
Clamp 1½" acc. to ISO 2852	Clamp 1½" acc. to ISO 2852

CLS15D

Thread NPT ½" and ¾"
Clamp 1½" acc. to ISO 2852

Clamp connection:
Sensors with clamp connections can be fixed using sheet metal brackets or solid brackets.
Sheet metal brackets have a lower dimensional stability, uneven bearing surfaces causing point loads and sometimes sharp edges that can damage the clamp.
We strongly recommend to always use solid brackets because of their higher dimensional stability. Solid brackets may be applied over the total pressure-temperature range (see temperature-pressure load curve).

Certificates and approvals

Ex approval

CLS15
- ATEX II 1G Ex ia IIC T3 / T4 / T6
- FM/CSA IS/NI CL I Div. 1 & 2 GP A - D in combination with the Liquiline CM42 and Mycom CLM153 transmitters

CLS15D-G**
- ATEX /NEPSI II 1G Ex ia IIC T3 / T4 / T6, IECEx Ex ia IIC T6 Ga

CLS15D-O**
- FM/CSA IS/NI CL I Div. 1 & 2 GP A - D in combination with the Liquiline CM42 transmitter

CLS15D-V**
- ATEX/NEPSI II 3G Ex nL IIC T3 / T4 / T6 for the use in Zone 2 with transmitter Liquiline CM42-KV***

ATEX and FM/CSA versions of digital sensors with Memosens technology are indicated by an orange-red ring in the plug-in head.

Quality certificate

With statement of the individual cell constant

Inspection certificate acc. to EN 10204 3.1

available for clamp 1½" process connection

Ordering information

Product pages

www.products.endress.com/cls15
www.products.endress.com/cls15d

Product configurator

1. You can choose from the following options on the product page located on the right:

Product page function
:: Add to product list
:: Price & order information
:: Compare this product
:: Configure this product

2. Click "Configure this product".
3. The configurator opens in a separate window. You can now configure your device and receive the complete order code that applies for the device.
4. Afterwards, export the order code as a PDF or Excel file. To do so, click the appropriate button at the top of the page.

Product structure CLS15

The following product structure represents the status of printing. You can create a complete and valid order code on the Internet using the configurator tool.

	Measuring range and cell constant					
	A	Measuring range: 0.04 to 20 µS/cm (k = 0.01)				
	B	Measuring range: 0.1 to 200 µS/cm (k = 0.1)				
	L	PWIS free for cell constant k = 0.1				
		Process connection and materials				
		1A	Thread NPT ½", sensor shaft PES (plug-in head versions only)			
		1M	Thread NPT ¾", sensor shaft PES (fixed-cable versions only)			
		3D	Clamp 1½", stainless steel 1.4435 (AISI 316L)			
		4D	Clamp 1½", stainless steel 1.4435 (AISI 316L), with inspection certificate EN 10204 3.1			
			Measuring cable connection			
			1	4-pole SXP connector		
			2	with 5 m fixed cable		
			3	with 10 m fixed cable		
				Temperature sensor		
				A	Integrated Pt 100 temperature sensor	
CLS15-						**complete order code**

Product structure CLS15D

	Measuring range and cell constant					
	A	Measuring range: 0.04 to 20 µS/cm (k = 0.01)				
	B	Measuring range: 0.1 to 200 µS/cm (k = 0.1)				
	L	PWIS free for cell constant k = 0.1				
		Process connection and materials				
		1A	Thread NPT ½", sensor shaft PES			
		1M	Thread NPT ¾", sensor shaft PES			
		3D	Clamp 1½", stainless steel 1.4435 (AISI 316L)			
		4D	Clamp 1½", stainless steel 1.4435 (AISI 316L), with inspection certificate EN 10204 3.1			
			Approval			
			G	ATEX/NEPSI II 1G Ex ia IIC T3/T4/T6 Ga, IECEx Ex ia IIC T6 Ga		
			O	FM/CSA IS/NI Cl I Div. 1 & 2 GP A - D		
			V	ATEX/NEPSI II 3G Ex nL IIC T3/T4/T6		
			1	Non-hazardous area		
CLS15D-				**complete order code**		

Accessories

In the following sections, you find the accessories available at the time of issue of this documentation. For information on accessories that are not listed here, please contact your local service or sales center.

Installation

For sensors with NPT ½" process connection (CLS15-x1Axx):

Threaded couplings

PVC-threaded coupling
- For cementing in standard PVC cross or T-pieces with DN 20
- With G ½ internal thread, self-sealing with ½" NPT sensor thread
- Order no. 50066536

PVDF-threaded coupling
- With G ½ internal thread and G 1 external thread
- Pressure-proof up to 12 bar at 20 °C (174 psi at 68 °F), max. temperature 120 °C at 1 bar (248 °F at 14.5 psi), incl. O-ring
- Internal thread, self-sealing with NPT ½" sensor thread
- Order no. 50004381

Equalizing sleeves

PVC equalizing sleeves AM
- For adaptation of the PVC-threaded coupling to larger nominal diameters
- Diameters, order numbers:
  - AM 32: for installation into cross or T-pieces DN 32, order no. 50004738
  - AM 40: for installation into cross or T-pieces DN 40, order no. 50004739
  - AM 50: for installation into cross or T-pieces DN 50, order no. 50004740

Flow assemblies

Flow assembly
- For installation of conductivity sensors with NPT ½" thread
- Material: stainless steel 1.4404 (AISI 316 L)
- Inlet and outlet: 90°, Ø 6 mm (0.24")
- Volume: 0.69 l (0.18 US gal)
- Max. temperature: 100 °C (212 °F)
- Max. pressure: 16 bar (232 psi)
- Order no.: 71042405

Connection

Measuring cables

CYK71 measuring cable
- Non-terminated cable for the connection of sensors (e.g. conductivity sensors) or of sensor cables
- Sold by the meter, order numbers:
  - non-Ex version, black: 50085333
  - Ex version, blue: 50085673

CYK10 Memosens data cable
- For digital sensors with Memosens technology
  pH, redox, oxygen (amperometric), chlorine, conductivity (conductive)
- Ordering as per product structure (-> online Configurator, www.products.endress.com/cyk10)

CYK11 Memosens data cable
- Extension cable for digital sensors with Memosens protocol
- Ordering as per product structure (—> Online configurator, www.products.endress.com/cyk11)

Junction boxes

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

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

Conducal CLY421
- 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. 20 µS/cm
- Product page: www.products.endress.com/cly421
- Technical Information TI00496C/07/EN

Recalibration
- Depending on its operating hours and conditions Conducal has to be recalibrated at the factory at regular intervals.
- Recommended recalibration interval: 1 year

Instruments International

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People for Process Automation

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