

Conductivity Measuring Cells for High-Temperature Applications *ConduMax W CLS 12*

Two-electrode measuring sensors with
cell constant $k = 0.01/\text{cm}$ or $k = 0.1/\text{cm}$



Areas of application

The conductivity measuring cell CLS 12 is designed for industrial and power plant applications (e.g. condensate measurement) where low conductivities must be measured under high pressures and temperatures.

The measuring range of the cells depends on the cell constant k .

- $k = 0.01/\text{cm}$: 0.04 to 20 $\mu\text{S}/\text{cm}$
- $k = 0.1/\text{cm}$: 0.1 to 200 $\mu\text{S}/\text{cm}$

Measuring cells with a Pt 100 temperature sensor are used together with conductivity measuring instruments equipped with automatic temperature compensation:

- Mycom S CLM 153
- Liquisys M CLM 223/253
- MyPro CLM 431

For measurement of specific resistance, $\text{M}\Omega \cdot \text{cm}$ measuring ranges are available in the measuring transmitters of the Mycom and MyPro series.

Benefits at a glance

- Optimum adaptation to process conditions or mounting place due to different designs
- Mounting in pipes or flow chambers
- Application with temperatures of up to 320 °F (160 °C) and pressures of up to 580 psi
- Simple measuring cable connection due to large connection compartment
- Quality certificate stating the individual cell constant

Endress + Hauser

The Power of Know How

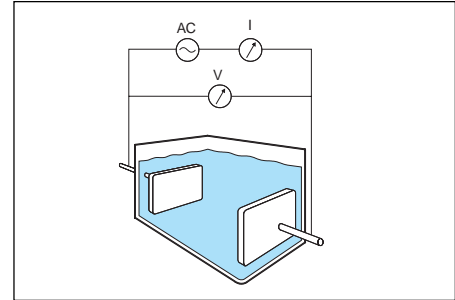


Function and system design

Measuring principle

Conductive conductivity measurement

The conductivity of liquids is measured with a measuring system that has two coaxially arranged electrodes similar to a capacitor. The electric resistance or its reciprocal value, the conductance G , is measured according to Ohm's law. The specific conductivity K is determined using the cell constant k that is dependent on the sensor geometry.



Conductive conductivity measurement

AC = Power supply

I = Current meter

V = Voltage meter

ConduMax W CLS 12 important properties

- **Electrodes**

ConduMax W CLS 12 has especially large coaxial measuring electrodes. These allow high flow rates and high accuracy

- **Temperature compensation**

In addition, a Pt 100 temperature sensor is installed in the inside electrode to measure the process temperature.

The high conductivity allows fast adjustment of the sensor to the process temperature, thereby guaranteeing precise automatic temperature compensation in the connected measuring transmitter.

- **Durability**

The sensors are distinguished by high thermal, chemical and mechanical resistances. The maximum operating pressure is 580 psi (40 bar) up to 212°F (100°C), the maximum operating temperature is 320°F (160°C) for up to 87 psi (6 bar).

- **Use in superheated steam or ultrapure water**

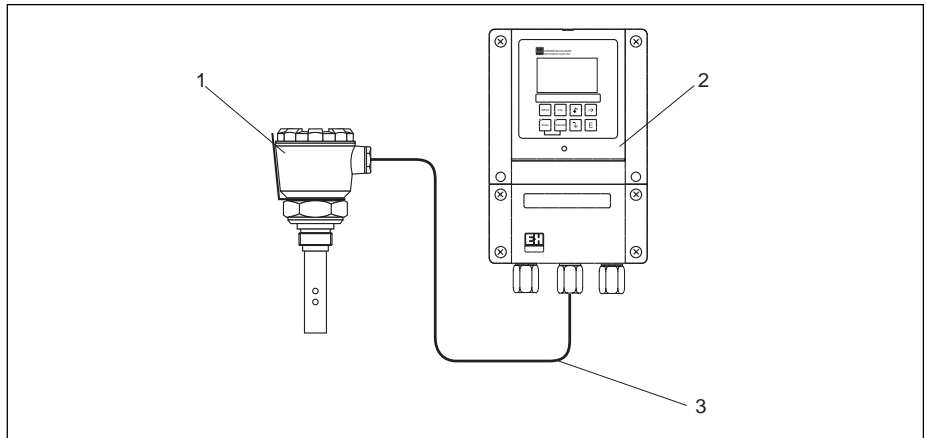
Special sealing materials are available for use in superheated steam or ultrapure water at high temperatures. For these applications, no nominal durability of the standard EPDM material can be given.

Measuring system

A complete measuring system consists of:

- A CLS 12 conductivity sensor
- A transmitter, e.g. Mycom S CLM 153
- A CYJK 71 or CYK 71-Ex measuring cable

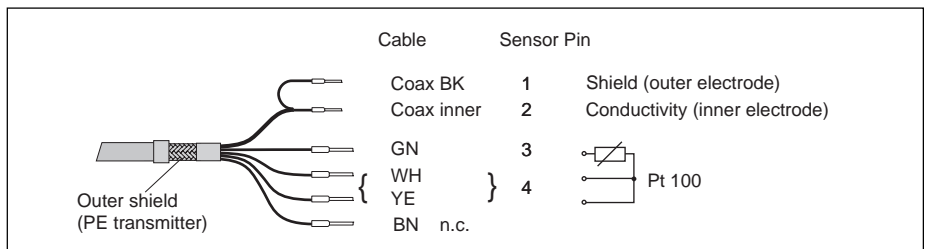
A CLA 751 flow chamber (refer to accessories) is available (optionally) which can be used for installation into the process.



Measuring system example
 1 CLS 12 ConduMax W sensor
 2 CLM 153 Mycom S transmitter
 3 Measuring cable

Input

Measured values	Conductivity and temperature	
Cell constant k	Dependent on version ordered: k = 0.01/cm k = 0.1/cm	
Measuring ranges	Conductivity	(referenced to water at 77°F) 0.04 μS/cm to 20 μS/cm 0.1 μS/cm to 200 μS/cm
	Temperature	-22° to +320°F (-30° to +160°C)
Temperature sensor	Pt 100	
Cable specifications	The ConduMax W is connected to the transmitter using the special measuring cable CYK 71 or CYK 71-Ex	



Measuring cable CYK 71 / CYK 71-Ex

Installation

Installation instructions

Sensors equipped with 1" NPT (or G1) thread can be mounted in a CLA 751 flow chamber (see accessories) or directly threaded into a pipe. When mounting the sensor, make sure that the measuring surfaces are completely wetted by the process fluid during operation.

When working in ultrapure water, ingress of air must be avoided since dissolved air, particularly CO₂, may increase the conductivity by up to 3 μS/cm.

The minimum insertion depth is 2" (50 mm).

Environment

Ingress protection

NEMA 6 (IP 67)

Ambient temperature

Refer to process temperature

Process

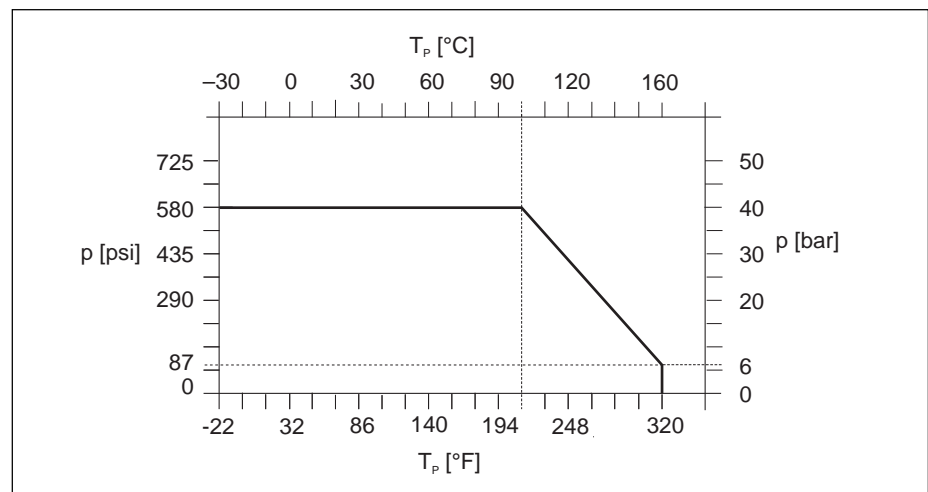
Process temperature

-22° to +320°F (-30° to +160°C)

Process pressure

Maximum 580 psi (40 bar) up to 212°F (100°C) without CLA 751 flow chamber
Maximum 174 psi (12 bar) up to 302°F (150°C) with CLA 751 flow chamber

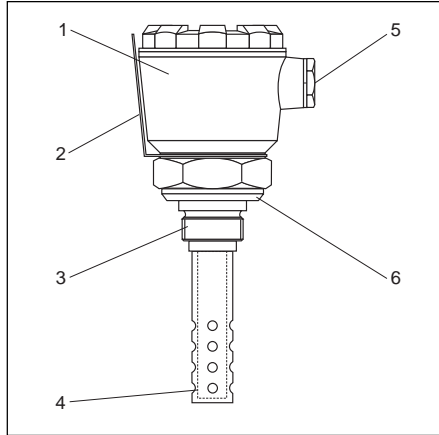
Pressure / temperature load curve



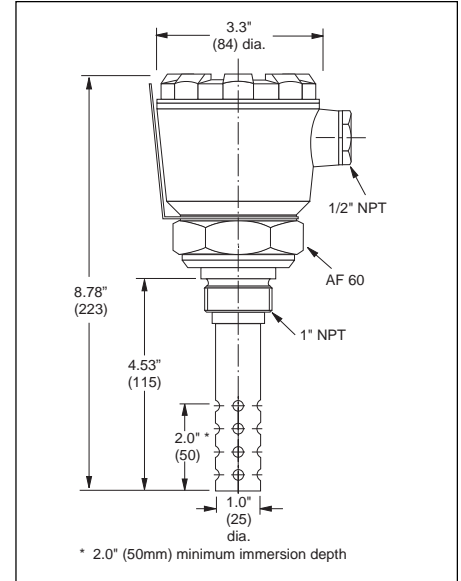
CLS 12 pressure/temperature load curve

Mechanical construction

Design, dimensions



- CLS design*
 1 Connection head
 2 Nameplate
 3 Process connection
 4 Electrodes (coaxially arranged)
 5 Measuring cable connection
 6 Sealing surface according to
 DIN 3852 BI 2, Form A



CLS 12, dimensions in inches (mm)

Weight Approximately 3.1 lb (1.4 kg)

Materials

Electrodes	316Ti SS
Process connection	316Ti SS
Connection head	Die-cast aluminum
Electrode seals	EPDM, PEEK

Process connection 1" NPT thread or G 1

Cable connection 1/2" NPT or Pg 16 cable gland

Certificates and approvals

Hazardous approvals ATEX II 1G EEx ia IIC T3 / T4 / T6
 FM approved, when used with MyPro CLM 431 and Mycom S CLM 153 transmitters, contact Endress+Hauser for approval.

Quality certificate With statement of the individual cell constant

Ordering information

ConduMax W CLS 12

Conductivity Measuring Cell CLS 12 - 1 2 3 4

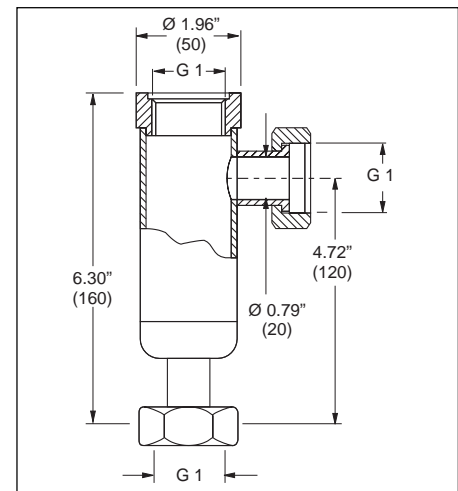
- 1 Measuring range and cell constant
 - A Range: 0.04 - 20 $\mu\text{S}/\text{cm}$ ($k = 0.01$)
 - B Range: 0.1-200 $\mu\text{S}/\text{cm}$ ($k = 0.1$)
- 2 Process connection/material
 - 1D G 1, 316Ti SS
 - 1K 1" NPT, 316Ti SS
 - 1M 3/4" NPT / PES cell shaft (only fixed cable)
 - 1N 1" NPT / PES (only fixed cable)
 - 4A Flange, 6 hole, ANSI / 316 SS
 - 4B Flange, DN 50, PN 40, 316 SS
 - 4C Flange, ANSI, 316 SS
- 3 Cable connection
 - 1 Pg 16 cable gland
 - 5 1/2" NPT conduit entry
- 4 Temperature sensor
 - A Integrated Pt 100 temperature sensor

Accessories

CLA 751 flow assembly

For installation of conductivity sensors with G 1 thread only.
 Inlet (bottom) and outlet (side), DN 20 with G 1 union nuts.
 Material: 316Ti SS
 Maximum temperature: 320°F (160°C)
 Maximum pressure: 174 psi (12 bar)

Order number: 50004201



Measuring cables

Special measuring cable CYK 71 for two electrode conductivity sensors with integrated temperature sensors, 1 low-noise coaxial line, 4 auxiliary cores at 0.75 mm² each with a common shield, outer diameter 0.25" (7 mm).

Sold by 1 meter lengths, minimum 15 ft (5 m)	Order number: 50085333
15 ft (5 m) length	Order number: 50088280
30 ft (10 m) length	Order number: 50088281
150 ft (50 m) length	Order number: 50088284
300 ft (100 m) length	Order number: 50088285

Special measuring cable / extension cable CYK 71-Ex, for hazardous applications, see CYK 71 above. Special cable is in blue sheath.

Sold by 1 meter lengths, minimum 15 ft (5 m) Order number: 50085673

Junction box VBM junction box for cable extension, with 10 screw terminals, NEMA 4X (IP 65)
 Cable entry, 1/2" NPT Order number: 50003987
 Cable entry, Pg 13.5 Order number: 51500177

VBM junction box for cable extension in hazardous area, with 10 high-impedance screw terminals (blue), NEMA 4X (IP 65): Order number 50003991

Calibration solutions Calibration solutions are precision solutions to SRM (Standard Reference Material) of NIST for qualified calibration of conductivity measuring systems according to ISO, accuracy ± 0.5%, with temperature table.
 CLY 11-A: 74 µS/cm, reference temperature 77°F (25°C), 500 ml container
 Order number: 50081902
 CLY 11-B: 149.6 µS/cm, reference temperature 77°F (25°C), 500 ml container
 Order number: 50081903

Calibration set ConCal conductivity calibration set is for ultrapure water applications, complete, factory-calibrated measuring set with certificate, traceable to SRM of NIST and DKD, comparative measurement in ultrapure water applications of up to 10 µS/cm.
 230 VAC units, order number: 50083777
 115 VAC units, order number: 50083778
 ConCal recalibration, for 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 number: 51502486

Related products For high temperature applications, up to 482°F (250°C) and process pressures up to 580 psi (40 bar), request ConduMax W CLS 13 conductivity sensor. Refer to Technical Information TI 083C.

Supplemental documentation

Hazardous documentation	Conductivity sensors for application in hazardous areas Order number: 51512902	XA 083C/07/a3
Transmitters	Mycom S CLM 153 transmitter Technical Information Liquisys M CLM 223/253 transmitter Technical Information MyPro CLM 431 transmitter Technical Information	TI 234C/24/ae TI 193C/24/ae TI 202C/24/ae
Calibration solutions / Calibration set	CLY 11 Calibration solutions Technical Information ConCal Calibration set Technical Information	TI 162C/24/ae TI 163C/24/ae

For application and selection assistance,
in the U.S. call 888-ENDRESS

For total support of your installed base, 24 hours
a day, in the U.S. call 800-642-8737

Visit us on our web site, www.us.endress.com

United States

Endress+Hauser, Inc.
2350 Endress Place
Greenwood, IN 46143
Phone: (317) 535-7138
888-ENDRESS
FAX: (317) 535-8498

Canada

Endress+Hauser
Canada Ltd.
1440 Graham's Lane
Unit 1, Burlington
ON, L7S 1W3
Phone: (905) 681-9292
800-668-3199
FAX: (905) 681-9444

Mexico

Endress+Hauser
Paseo del Pedregal No. 610
Col. Jardines del Pedregal
01900, Mexico D.F.
Mexico
Phone: (525) 568-2405
FAX: (525) 568-7459

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