

Conductivity Measuring Sensor *InduMax H CLS 52*

Electrodeless conductivity sensor with quick temperature measurement and hygienic design



CLS 52
Tri-clamp®



CLS 52
Perlick

The CLS 52 sensors are intended specifically for use in the food, beverage and pharmaceutical industries. They are injection-moulded and consist of a highly resistant plastic material (PEEK) that meets the extremely exacting hygienic demands of the food industry.

Areas of application

- Alkali / acid concentration control
- Phase separation of product/water and product/product mixtures in pipe systems
- Monitoring and control of bottle cleaning systems
- Product monitoring in breweries and the beverage industry
- CIP (clean in place) system control
- For use with measuring transmitter SmarTec S CLD 132 and Mycom S CLM 153

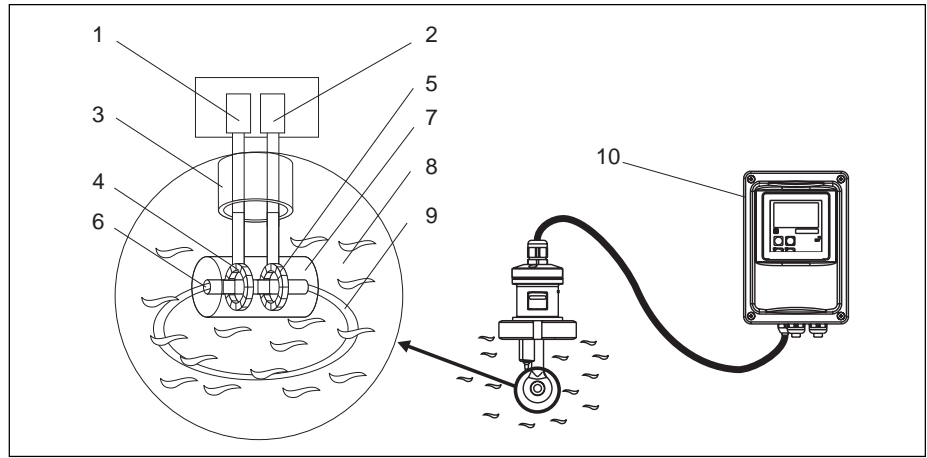
Benefits at a glance

- Insensitive to electrode fouling and polarization due to electrodeless measuring principle
- Suitable for food and beverage applications and hygienically perfect thanks to jointless design without crevices
- Hydrodynamic measuring sensor design assures low flow resistance
- Maintenance free non-contact measurement
- Ultrafast temperature response, $t_{90} < 5s$
- Easy in-line installation is guaranteed by use of standard adapters
- Measuring range from 10 $\mu S/cm$ to 2000 mS/cm

Operating Principle

Measuring and operating principle

- 1 Oscillator
- 2 Receiver and signal processing
- 3 Cable
- 4 Primary winding
- 5 Secondary winding
- 6 Bore
- 7 Sensor housing
- 8 Process medium
- 9 Induced electric current
- 10 Measuring transmitter



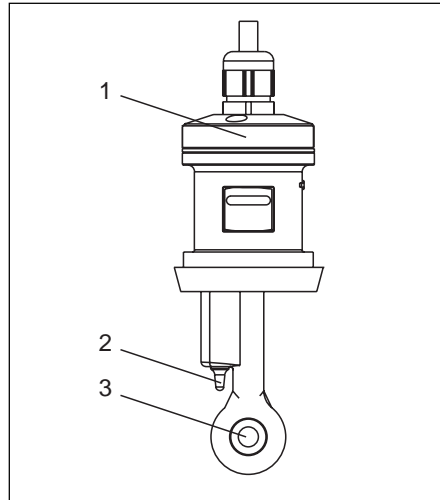
Conductivity measurement

In electrodeless conductivity measurement, a transmitting coil (4) generates a magnetic alternating field that induces an electric voltage in a liquid. The ions present in the liquid enable a current flow which increases with increasing ion concentrations. The ion concentration is proportional to the conductivity. The current (9) in the liquid generates a magnetic alternating field in the receiving coil (5).

The resulting current (9) induced in the receiving coil is measured and used to determine the conductivity value.

This measuring principle has the following advantages:

- No electrodes, therefore no polarization
- Accurate measurement in media or solutions with a tendency to sediment
- Complete galvanic separation of measurement from process.

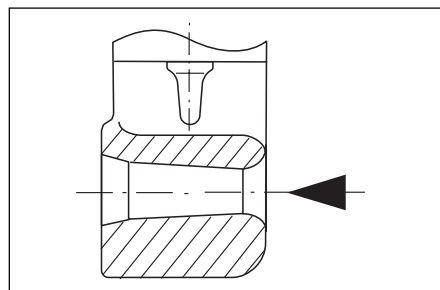


- CLS 52 sensor
- 1 Housing
 - 2 Temperature sensor
 - 3 Flow opening

Measuring technology according to the purity law

The sensor, injection-moulded from highly chemically, mechanically and thermally resistant PEEK (polyether ether ketone), does not have joints or crevices and is therefore hygienically safe. The sensor shaft holds the two induction coils and a Pt 100 temperature sensor. The temperature sensor is in direct thermal contact with the process via the special steel thermal conductivity socket. This assures extremely fast temperature response ($t_{90} < 5$ s).

The use of special components and materials makes the measuring cell suitable for continuous exposure to temperatures of 257°F (125°C), and brief exposure (maximum 30 minutes) to 284°F (140°C), for sterilization.

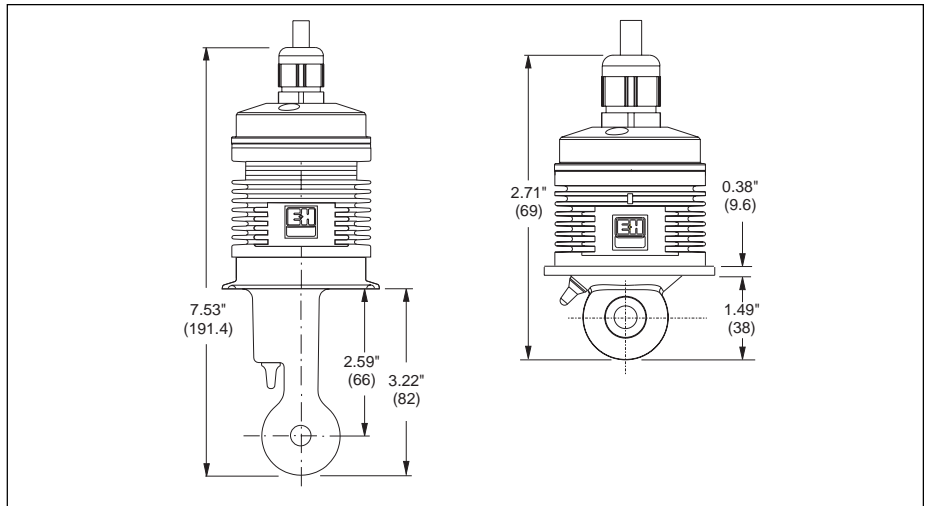


Detail view of conical measuring channel



Sensor CLS 52 with temperature sensor Pt 100

Dimensions

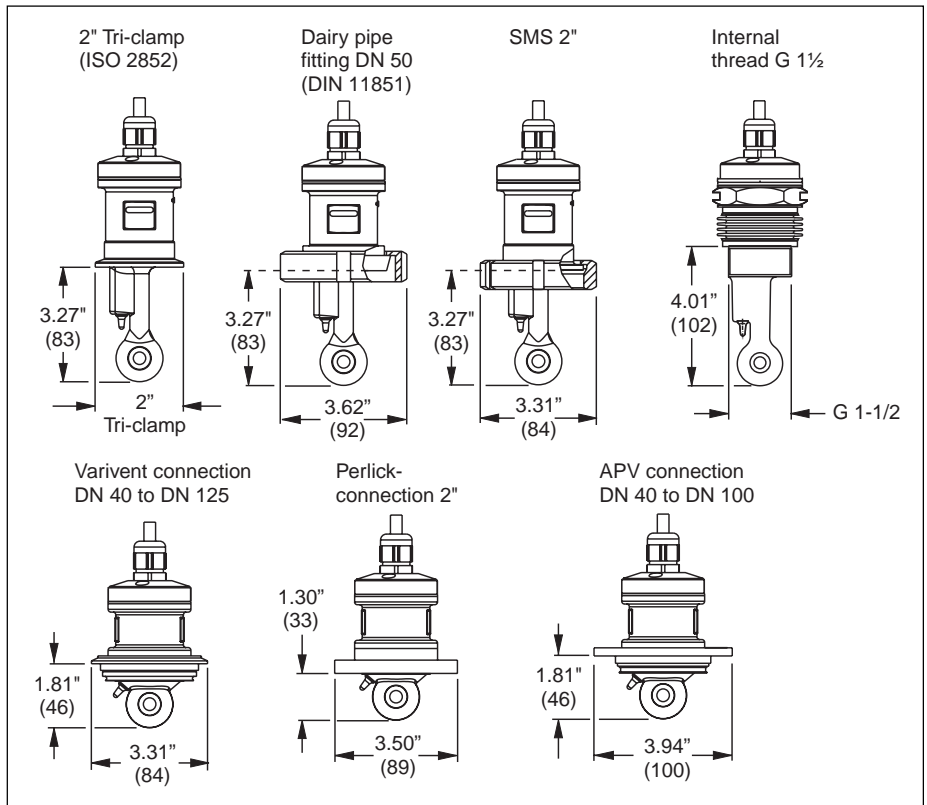


2" Tri-clamp version

Perlick mounting version

Process connections

For use in applications with high hygienic requirements, the CLS 52 sensor is available in various mounting versions.



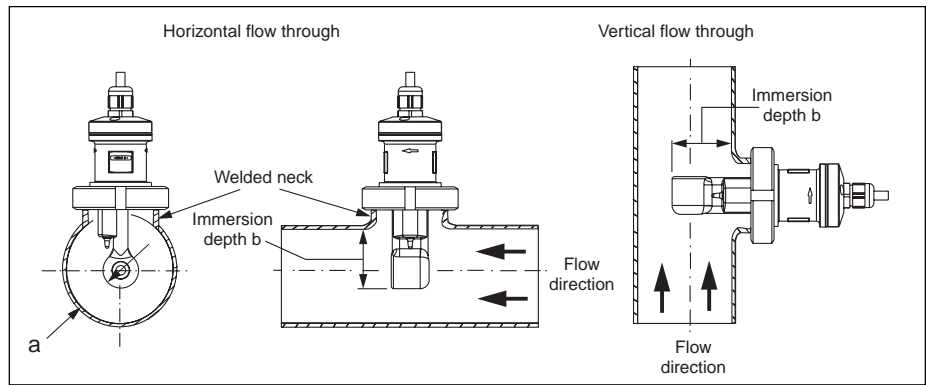
Notes on tri-clamp adapter

Two types of fastening brackets are available for attachment of the CLS 52 clamp version: sheet metal and solid brackets.

Due to the dimensional accuracy of the sheet metal bracket, it can only be used up to a maximum pressure of 87 psi (6 bar) at 68°F (20°C).

The dimensional accuracy of the solid bracket is much higher, allowing use in pressures up to 232 psi at 194°F (90°C). Refer to the pressure/temperature chart on page 5.

Installation



The diameter of the welded neck is dependent on the process connection used. The sensor has to be installed a minimum immersion depth "b" to avoid turbulences near the welded neck which would influence the measurement (see chart below).

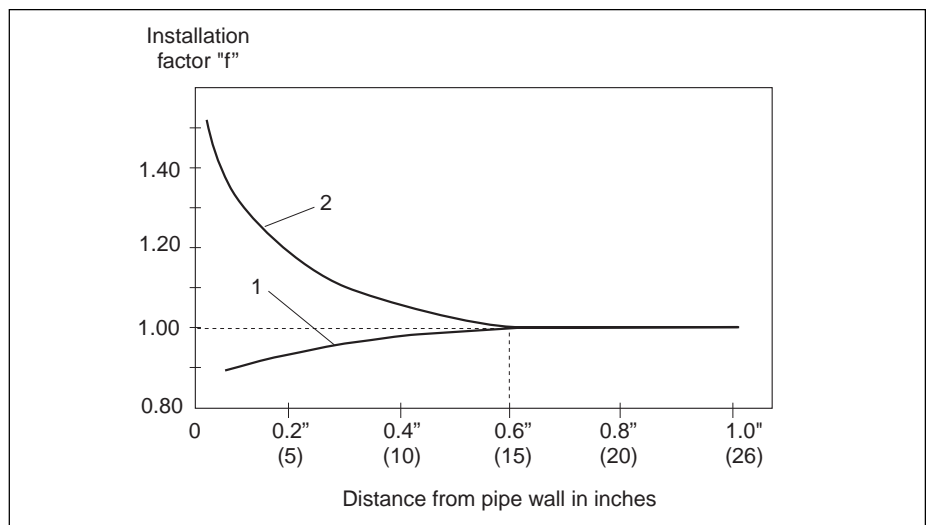
The diameter and the conductivity of the pipe socket as well as the distance from the pipe wall influence the size of the installation factor. The installation factor is programmed into the transmitter.

Installation factor

Sensor connection	Minimum immersion depth b	Diameter of pipe socket	Installation factor
Verivent, Perlick 2", APV	app. 1.3" (33 mm)	$\geq 1\text{-}1/2"$ (DN 40)	$f > 1$ (insulated) $f < 1$ (conductive)
Dairy pipe fitting, SMS 2" G 1-1/2 internal, 2" clamp	app. 2.6" (66 mm)	$\geq 2"$ (DN 50)	$f > 1$ (insulated) $f < 1$ (conductive)
for all connections	-	$\geq 2.5"$ (DN 65)	$f = 1$

The electric conductivity of the liquid primarily depends on the ion concentration. However, installation and sensor geometry are factors that need to be taken into account. In terms of measuring technique, the cell constant describes the geometry of the sensor.

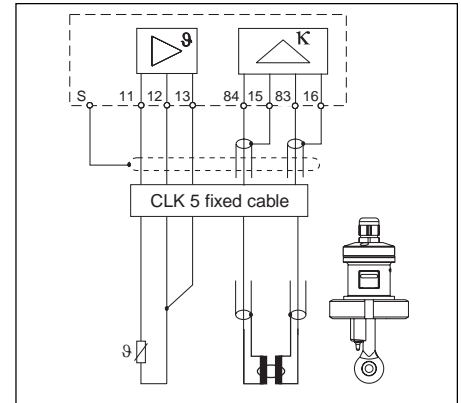
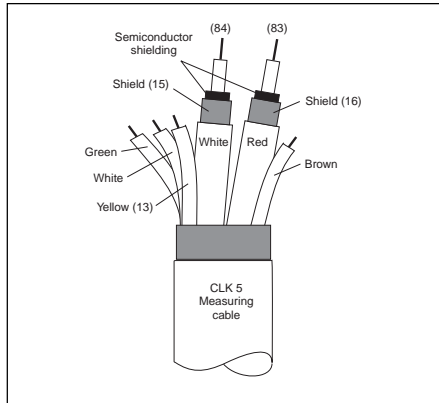
If the distance from the wall is sufficient, $a > 1.3"$ (33 mm), it is not necessary to consider the installation factor ($f = 1.00$). If the distance from the wall is smaller, the installation factor increases in the case of electrically insulating pipes ($f > 1$) and decreases in the case of electrically conductive pipes ($f < 1$).



Electrical connection

The connection of the CLS 52 to the transmitter is with a multicore shielded cable (CLK 5). The CLS 52 is specified with one of three standard cable lengths: 16 ft (5 m), 33 ft (10 m) or 65 ft (20 m).

In applications where the sensor is located further from the transmitter than the standard available cable lengths, a VBM junction box and CLK 5 extension cable is used. The maximum distance between the transmitter and sensor when using the junction box is 180 feet (55 m).

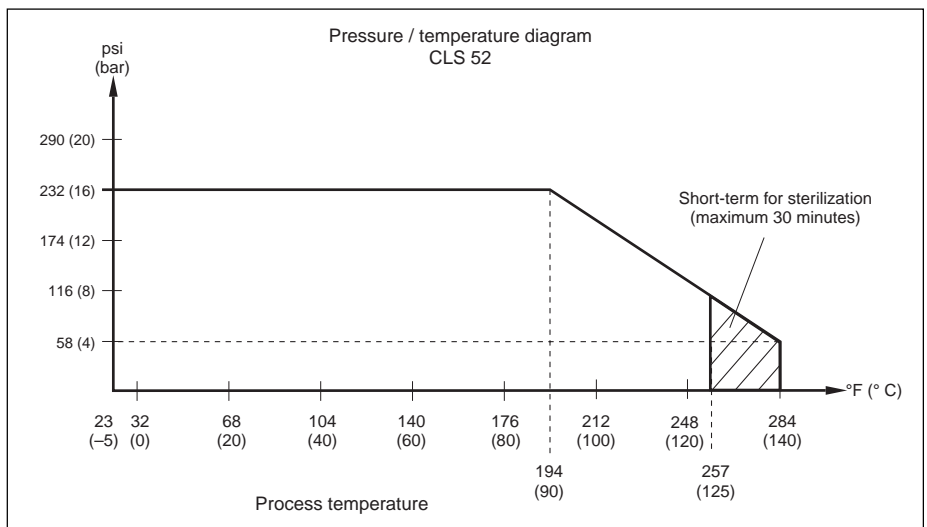


Resistance Table

Medium	Chemical Attack		Resistance	
	Concentration (%)	Temperature °F (°C)	316 L	PEEK
Nitric acid HNO ₃	up to 5	68° (20°)	+	+
		140° (60°)	+	+
		68° (20°)	+	+
		140° (60°)	+	-
Phosphoric acid H ₃ PO ₄	up to 10	68° (20°)	+	+
		68° (60°C)	+	+
Sodium hydroxide solution (NaOH)	up to 3	68° (20°)	+	+
		176° (80°C)	+	+

Resistances PEEK and 316L SS
 + Resistant
 - Not resistant

Pressure / Temperature Load



Permissible pressure and temperature ranges for the CLS 52

Technical Data**Conductivity Measurement**

Measuring Range	10 μ S/cm to 2000 mS/cm
Measured Value Deviation	23° to 212°F (-5° to +100°C), \pm (10 μ S + 0.5% MR) > 212°F (100°C), \pm (30 μ S + 0.5% MR)
Cell constant	k = 5.9/cm
Maximum cable length	180 feet (55 m)

Ambient conditions

Ambient Temperature	14° to 158°F (-10° to +70°C)
Storage Temperature	-13° to + 176°F (-25° to + 80°C)
Relative Humidity	5 to 95%
Protection Class	NEMA 6 (IP 67 to DIN 40050)

Temperature Measurement

Temperature sensor	Pt 100, Class A according to IEC 60751
Temperature response time	t ₉₀ < 5 seconds

Wetted Parts

Measuring Cell Material	PEEK
Peak-to-Valley Height	Ra \leq 240 grit (0.5 μ m)
Thermal Conductivity Socket	316 L SS
Seal	O-ring, CHEMRAZ™ (FDA approved)

Process conditions

Process Temperature	23° to 257°F (-5° to +125°C)
Sterilization	284°F (140°C) for maximum 30 minutes
Pressure	Maximum 232 psi at 194°F (16 bar at 90°C)

Required Pipe Cross Section

Tri-clamp, dairy pipe fitting, G 1-1/2, 2" SMS	Minimum 2" (DN 50)
Varivent, 2" Perlick, APV	Minimum 1-1/2" (DN 40)

Accessories

Measuring extension cable CLK 5
 NOTE: Maximum cable length between
 sensor and transmitter when using cable
 extension and junction box is 180 feet
 (55 m) PN: 50085473

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

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 \pm 0.5%, with
 temperature table. Reference tempera-
 ture is 77°F (25°C). Solutions are in
 500ml containers.

74 μ S/cm	PN: 50081902
149.6 μ S/cm	PN: 50081903
1.406 mS/cm	PN: 50081904
12.64 mS/cm	PN: 50081905
107 mS/cm	PN: 50081906

Ordering Information

CLS 52 Measuring Cell

CLS 52 -

1	2	3	4

- 1 Approval
 - A1 Standard
- 2 Version
 - MV1 Dairy type DN 50, DIN 11851
 - CS1 2" Tri-clamp®
 - GE1 G 1-1/2 threaded
 - PL1 Perlick fitting
 - VA1 Varivent adapter for DN 50 to 125
 - AP1 APV adapter for DN 40 to 80
 - SMS 2" SMS connector
- 3 Measuring Socket Material / Seal
 - A 316L SS / Chemraz
- 4 Cable Length
 - 1 16 foot (5 m)
 - 2 33 foot (10 m)
 - 3 65 foot (20 m)

Supplementary Documentation

- SmarTec S CLD 132
- Mycom S CLM 153

TI 207C/24/ae
TI 234C/24/ae

For application and selection assistance,
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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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