Technical Information
Indumax CLS54D

Hygienic inductive conductivity sensor for applications in the food, beverage, pharmaceutical and biotech industries

Application

The CLS54D conductivity sensor is specifically designed for use in hygienic applications in the food, beverage and pharmaceutical industries and in biotechnology. Thanks to its hygiene certificates and its food-safe, virgin PEEK design without any joints or crevices, it meets the strict demands of these industries. The CLS54 is ideal for:

- Phase separation of product/water and product/product mixtures in pipe systems
- Control of cleaning in place (CIP) processes in the return line
- Concentration control in the remaking of CIP cleaning agents
- Product monitoring in pipes, bottling plants and quality assurance
- Leakage monitoring

in the following industries:
- Dairies
- Breweries
- Beverages (water, juices, soft drinks)
- Pharmaceuticals and biotechnology

Use with Liquiline CM42, CM44x and CM14 transmitters.

Your benefits

- Unique hygienic design, therefore no risk of recontamination
- Has all the process connections commonly used in the hygiene sector
- Fast measurement with temperature response time t_{90} under 26 s, ensuring safe and efficient phase separation

Other advantages of Memosens technology

- Maximum process safety
- Data security thanks to digital data transmission
- Very easy to use as sensor data saved in the sensor
- Recording of sensor load data in the sensor enables predictive maintenance

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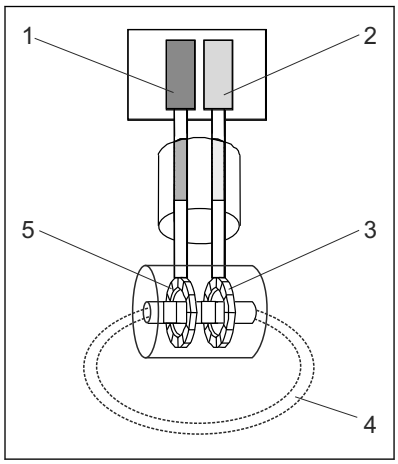
People for Process Automation

Function and system design

Measuring principle

Inductive conductivity measurement

An oscillator (1) generates an alternating magnetic field in the primary coil (5), which induces a current flow (4) in the medium. The strength of the current depends on the conductivity and thus on the ion concentration in the medium. The current flow in the medium, in turn, generates a magnetic field in the secondary coil (3). The resulting induced current is measured by the receiver (2) and used to determine the conductivity.



1 Oscillator
2 Receiver
3 Secondary coil
4 Current flow in the medium
5 Primary coil

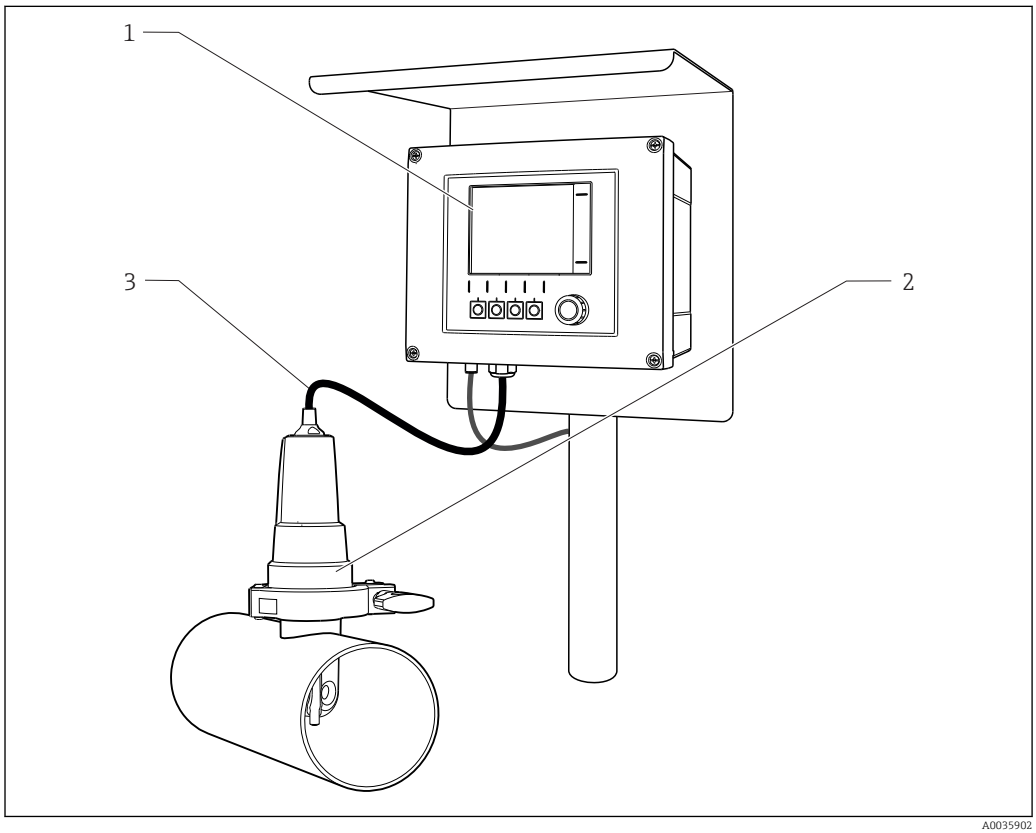
Advantages of inductive conductivity measurement:

- No electrodes and therefore no polarization effects
- Accurate measurement in media with a high degree of pollution and a tendency to form buildup
- Complete galvanic isolation of the measurement and the medium

Measuring system

A complete measuring system consists of the following components at least:

- The CLS54D inductive conductivity sensor
- A transmitter, e.g. Liquiline CM44x



1 Example of a measuring system

1 Transmitter Liquiline CM44x
2 Indumax CLS54D
3 Measuring cable

Communication and data processing

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 can store measuring system data in the sensor. These include the following:
- Manufacturer 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 to perform the last calibration
- Operating data
  - Temperature application range
  - Conductivity application range
  - Date of initial commissioning
  - Maximum temperature value
  - Hours of operation at high temperatures

Dependability

Reliability

Memosens technology digitizes the measured values in the sensor and transmits the data to the transmitter via a . 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 store calibration data and other 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 in evaluation programs. Thus, the current application of the sensors can be made to depend on their previous history.

Integrity

- Measured values cannot be distorted by moisture.
- EMC safety provided by screening measures in digital measured value transmission.

Input

Measured values

- Conductivity
- Temperature

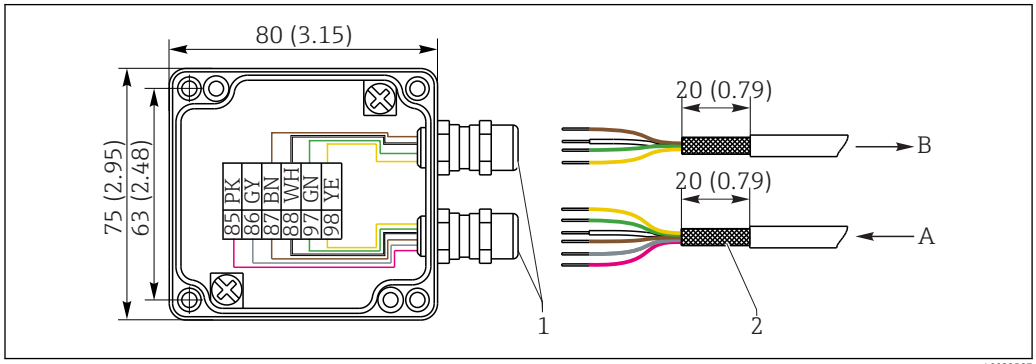
Measuring ranges	Conductivity	Recommended range: 100 µS/cm to 2000 mS/cm (uncompensated)
	Temperature	−10 to +150 °C (+14 to +302 °F)
Cell constant	k = 6.3 cm^{-1}	
Temperature measurement	Pt1000 (Class A according to IEC 60751)	

Power supply

Electrical connection

The sensor is supplied with a fixed cable. The wiring diagram is provided in the Operating Instructions of the transmitter used.

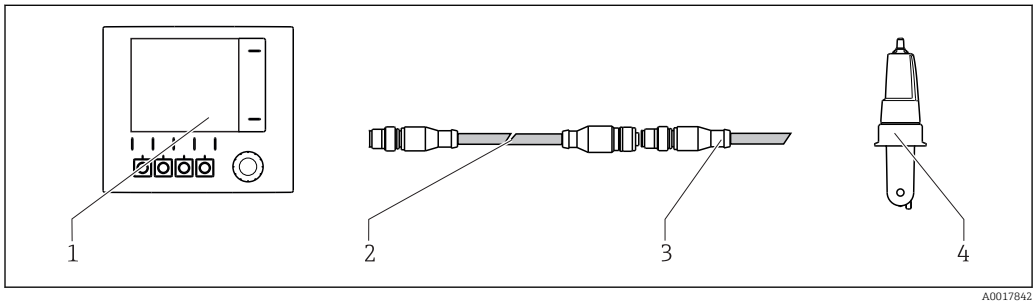
Connection via a junction box is necessary for a cable connection. The extension to the transmitter is via the CYK11 cable.



2 *Connection with CYK11 cable extension via junction box, dimensions in mm (inch)*

1 Cable glands - shield fixed in gland
2 Shielding
A CYK11 from transmitter
B Sensor cable

Sensors with a fixed cable and M12 plug can be extended with the CYK11 measuring cable and an M12 socket.



3 *CYK11 for extension with M12 connection*

1 Transmitter
2 CYK11 measuring cable with M12 connection
A CLS54D connecting cable with M12 plug
B Sensor CLS54D

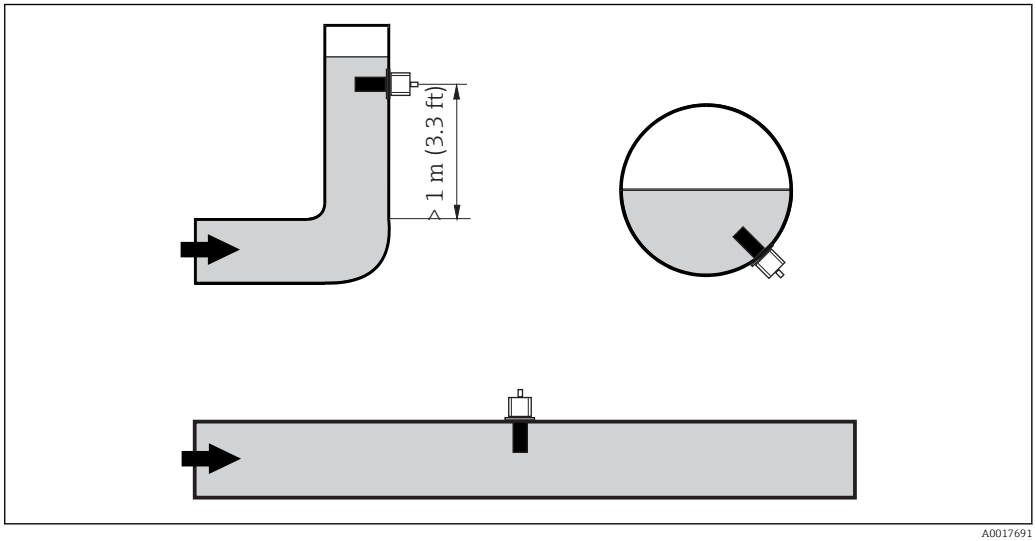
Performance characteristics

Conductivity response time	$t_{95} \leq 2$ s	
Temperature response time	$t_{90} \leq 26$ s	
Maximum measured error	< 100 °C (212 °F):	±(10 µS/cm + 0.5 % of reading), after calibration
	> 100 °C (212 °F):	±(25 µS/cm + 0.5 % of reading), after calibration
Repeatability	0.2 % of reading + 3 µS/cm	

Installation

Orientation

The sensor must be completely immersed in the medium. Avoid air bubbles in the area of the sensor.



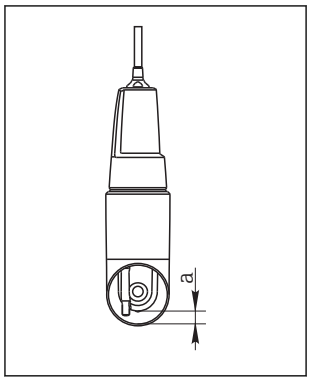
4 *Installation positions of the conductivity sensor*

If the flow direction changes (after pipe bends), turbulence in the medium can result. Install the sensor at a distance of at least 1 m (3.3 ft) downstream from a pipe bend.

The product should flow along the hole of the sensor (see the arrows on the housing). The symmetrical measuring channel allows flow in both directions.

Installation factor

The ionic current in the liquid is affected by the walls in confined installation conditions. This effect is compensated by what is referred to as the installation factor. The installation factor can be entered in the transmitter for the measurement or the cell constant is corrected by multiplying by the installation factor.
The value of the installation factor depends on the diameter and the conductivity of the pipe nozzle as well as the distance a between the sensor and the wall.
The installation factor f (f = 1.00) can be disregarded if the distance to the wall is sufficient (a > 15 mm, from DN 65).
If the distance to the wall is smaller, the installation factor increases for electrically insulating pipes (f > 1), and decreases for electrically conductive pipes (f < 1).
It can be measured using calibration solutions, or a close approximation can be determined from the diagram below.



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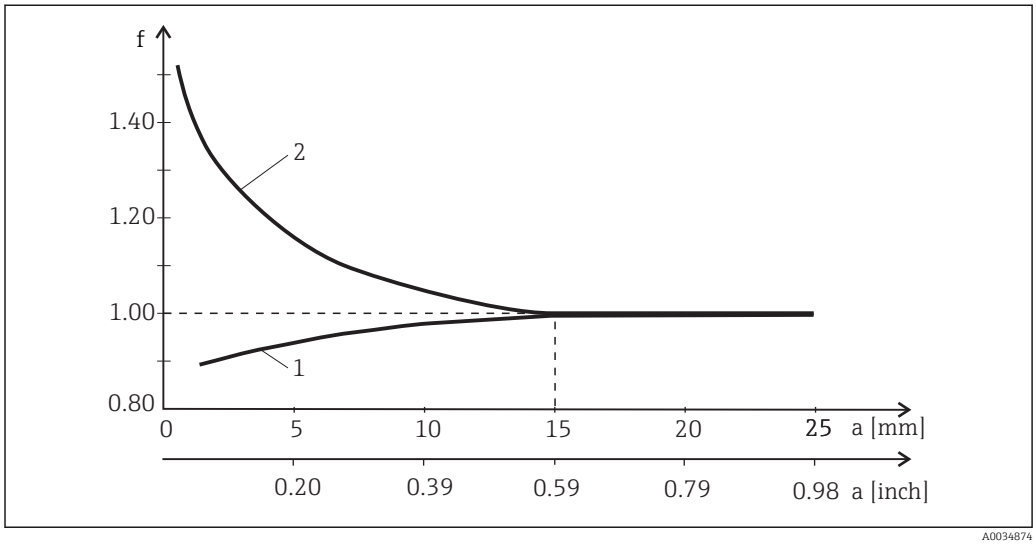
5 Installation CLS54D

a Wall distance



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6 Relationship between installation factor f and wall distance a

1 Electrically conductive pipe wall
2 Electrically insulating pipe wall

Air set

The digital sensor has already been adjusted at the factory. Onsite compensation is not required.

Environment

Ambient temperature range

-20 to +60 °C (-4 to 140 °F)

Storage temperature

-25 to +80 °C (-13 to +176 °F)

Humidity

5 to 95 %

Degree of protection

IP 68 / NEMA type 6P (1 m water column, 25 °C, 168 h)

Process

Process temperature

-10 to +125 °C (+14 to +257 °F)

Sterilization

150 °C (302 °F) / 6 bar (87 psi) absolute, (max. 60 min.)

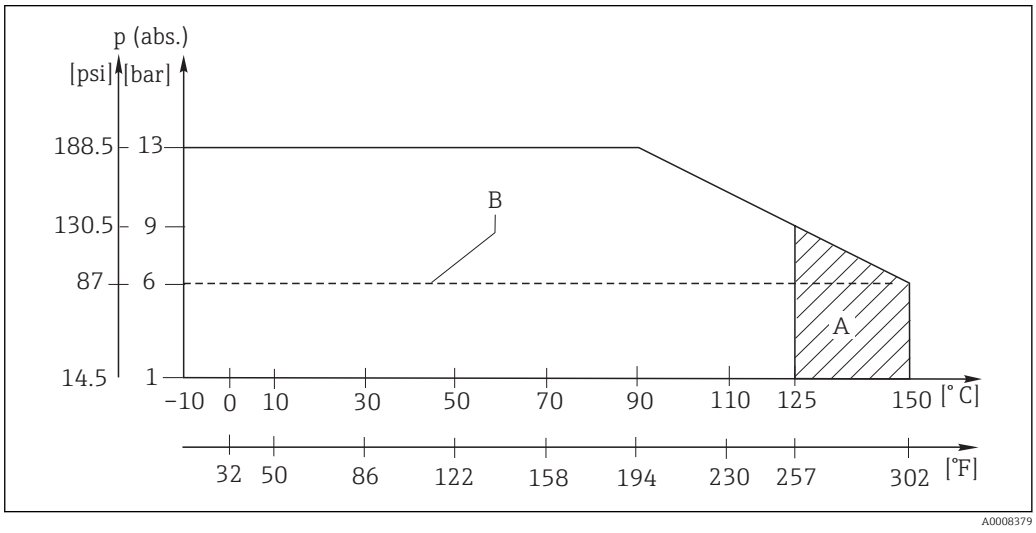
Process pressure (absolute)

13 bar (188.5 psi) up to 90 °C (194 °F)

9 bar (130.5 psi) at 125 °C (257 °F)

Underpressure down to 0.1 bar (1.45 psi)

Temperature/pressure ratings



7 Pressure/temperature ratings

A Temporarily for sterilization (max. 60 min.)
B MAWP (maximum allowable working pressure) according to ASME-BPVC Sec. VIII, Div 1 UG101 for CRN registration

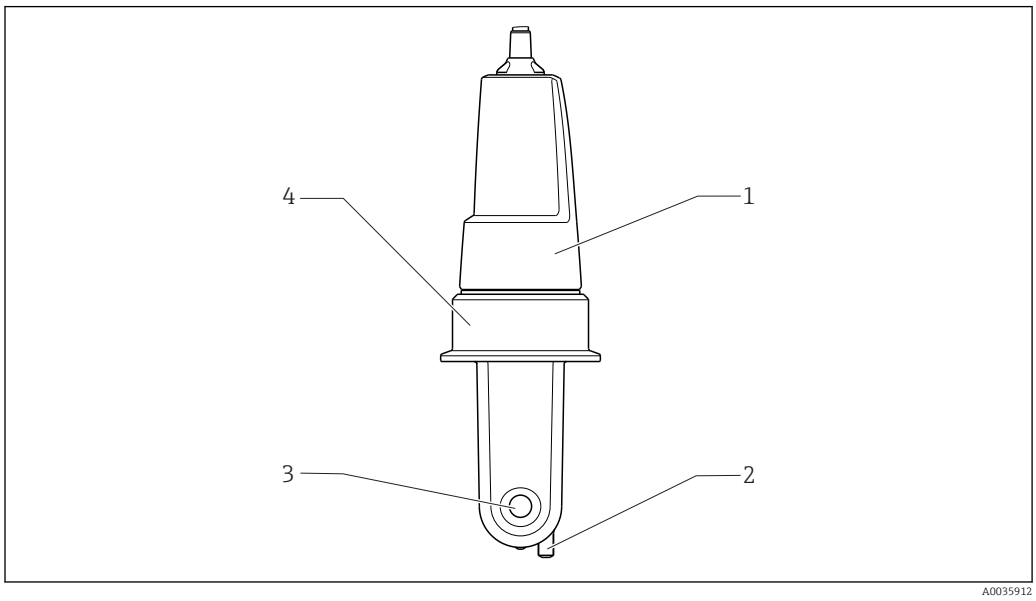
Flow velocity

For low-viscosity media:

Max. 10 m/s (32.8 ft/s)	For pipe diameters ≥ 80 mm (3.15 in)
Max. 5 m/s (16.4 ft/s)	For pipe diameters ≥ 50 < 80 mm (≥ 1.97 < 3.15 in)

Mechanical construction

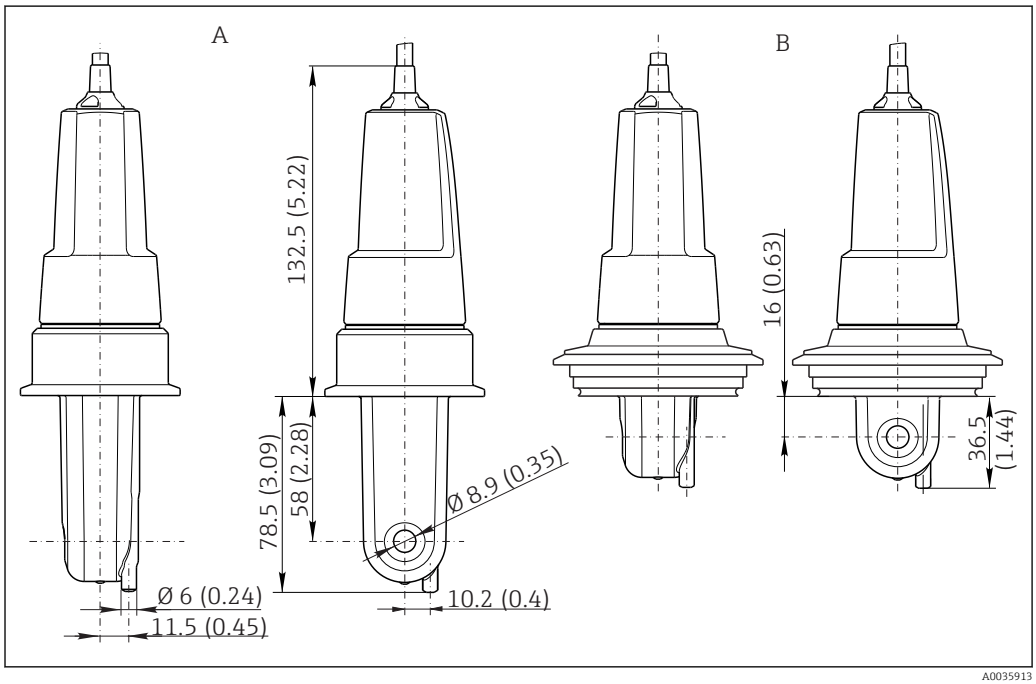
Design



8 Indumax CLS54D

1 Housing
2 Temperature sensor
3 Flow opening
4 Process connection

Dimensions



9 Dimensions in mm (in)

A Long version
B Short version

Weight

0.3 to 0.5 kg (0.66 to 1.1 lb.) depending on version plus cable

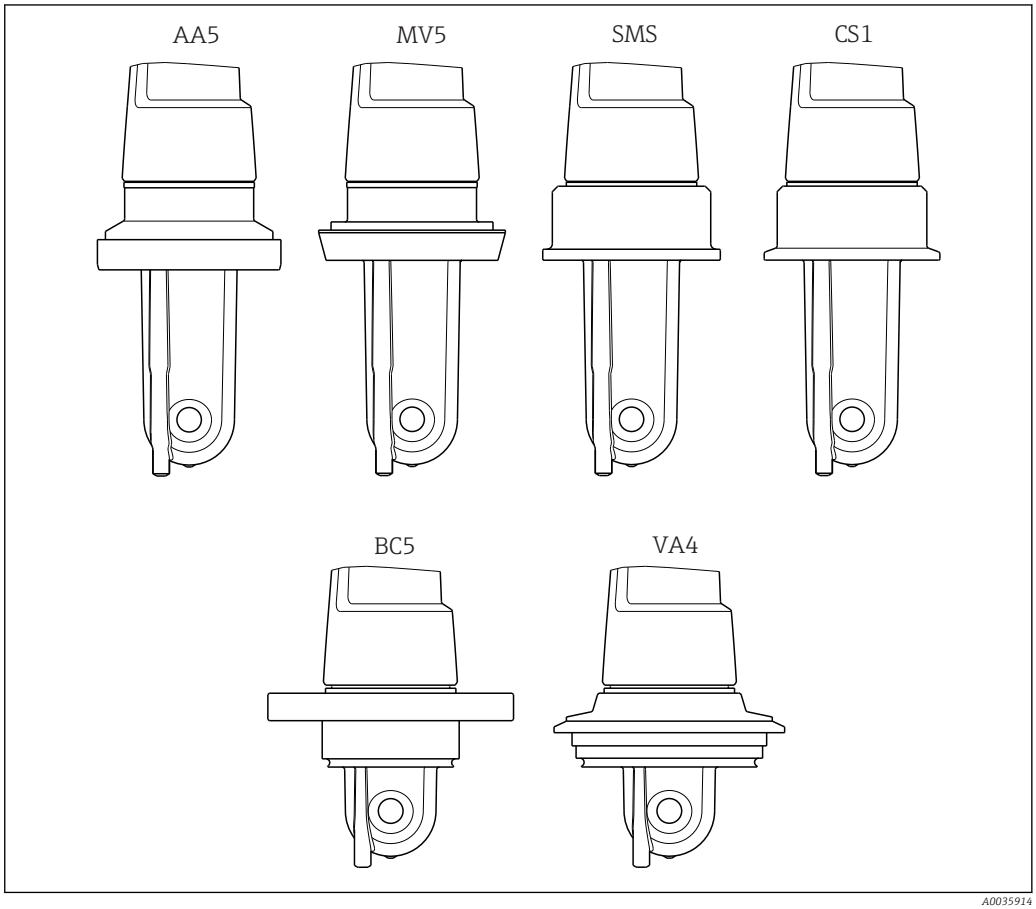
Materials

In contact with medium	Virgin PEEK
Not in contact with medium	PPS-GF40 SMS coupling: stainless steel 1.4301 (AISI 304) or 1.4307 (AISI 304L) Sanitary coupling: stainless steel 1.4404 (AISI 316L) Cable gland: PEEK Seals: FKM, Cable: TPE

Surface roughness

Ra ≤ 0.8 µm (smooth, injection-molded PEEK surface) at surfaces in contact with medium

Process connections



AA5 — *Aseptic coupling DIN 11864-1 form A, for pipe according to DIN 11850, DN 50 (the sensor has the shape of the aseptic liner)*

MV5 — *Sanitary connection DIN 11851, DN 50* [1)]

SMS — *SMS coupling 2"* [2)]

CS1 — *Clamp ISO 2852 (also for TriClamp, DIN 32676), 2" (long design)* [3)]

BC5 — *NEUMO BioControl D50, for pipe connection DN 40 (DIN 11866 series A, DIN 11850), DN 42.4 (DIN 11866 series B, DIN EN ISO 1127) or 2" (DIN 11866 series C, ASME-BPE)*

VA4 — *Varivent N DN 40 to 125*

1) The sanitary connection DIN 11851 is generally not considered to be hygienic. With the SKS Siersma adapter, this process connection meets the requirements of the 3-A standard.
2) Does not meet the hygienic requirements of EHEDG.
3) Only hygienic in conjunction with Hyjoin PEEK/stainless steel ring made by Hyjoin Ltd., UK, and KALREZ seal by Dupont

Chemical resistance

Medium	Concentration	PEEK
Caustic soda NaOH	0 to 15 %	20 to 90 °C (68 to 194 °F)
Nitric acid HNO_3	0 to 10 %	20 to 90 °C (68 to 194 °F)

Medium	Concentration	PEEK
Phosphoric acid H_3PO_4	0 to 15 %	20 to 80 °C (68 to 176 °F)
Sulfuric acid H_2SO_4	0 to 30 %	20 °C (68 °F)
Peracetic acid H_3C-CO-OOH	0.2 %	20 °C (68 °F)

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 EU directives. The manufacturer confirms successful testing of the product by affixing to it the CE mark.

Hygiene

FDA

All materials in contact with the product are listed by the FDA.

3-A

Certified according to 3-A Standard 74- ("3-A Sanitary Standards for Sensor and Sensor Fittings and Connections Used on Milk and Milk Products Equipment").

Biological reactivity (USP class VI) (optional)

Biological reactivity test certificate (Certificate of Compliance) according to USP (United States Pharmacopoeia) part<87> and part <88> class VI with lot number traceability of materials in contact with the medium.

Ordering information

Product page

www.endress.com/cls54D

Product Configurator

On the product page there is a **Configure** button to the right of the product image.

1. Click this button.
   ↳ 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 on the right above the selection window.

For many products you also have the option of downloading CAD or 2D drawings of the selected product version. Click the **CAD** tab for this and select the desired file type using picklists.

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 Center.

Cable extension

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

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-B, 149.6 µS/cm (reference temperature 25 °C (77 °F)), 500 ml (16.9 fl.oz)
  Order No. 50081903
- CLY11-C, 1.406 mS/cm (reference temperature 25 °C (77 °F)), 500 ml (16.9 fl.oz)
  Order No. 50081904
- CLY11-D, 12.64 mS/cm (reference temperature 25 °C (77 °F)), 500 ml (16.9 fl.oz)
  Order No. 50081905
- CLY11-E, 107.00 mS/cm (reference temperature 25 °C (77 °F)), 500 ml (16.9 fl.oz)
  Order No. 50081906

Technical Information TI00162C

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