

Technical Information

Indumax CLS54

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



Application

The CLS54 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 the Liquiline CM42 and Liquisys CLM223/253 transmitters; integral part of the Smartec CLD134 measuring system.

Your benefits

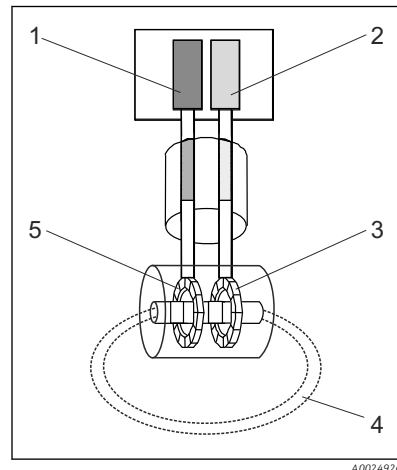
- Unique hygienic design, therefore no risk of recontamination
- Has all the hygiene certificates required in the hygiene sector
- Has all the process connections commonly used in the hygiene sector
- Durable thanks to fully encapsulated, sealless design
- Fast measurement with temperature response time t_{90} under 26 s, ensuring safe and efficient phase separation
- Insensitive to electrode contamination and polarization thanks to inductive measuring principle
- Explosion protection

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

Important features of Indumax CLS54

■ Hygiene

The injection-molded PEEK sensor offers outstanding chemical, mechanical and thermal resistance and is hygienically safe thanks to its seamless, crevice-free design. As only virgin PEEK is in contact with the medium, highest biological safety for the food, beverage and pharmaceutical sectors is guaranteed. The sensor has been designed according to the latest guidelines of the American Society of Mechanical Engineers - Bioprocessing Equipment (ASME BPE) and meets the requirements of EC Regulation No. 1935/2004 of the European Parliament on materials and articles intended to come into contact with food.

■ Certified hygiene

The sensor has all the necessary listings and approvals for the hygiene sector, such as exclusive use of FDA-listed materials for surfaces in contact with medium and certification according to EHEDG (European Hygienic Engineering & Design Group) and 3-A standards. A certificate for biological reactivity testing according to USP part <97> and <88> class VI including lot number tracking back to compounding is also available as an option.

■ Process connections

The sensor is available with all the process connections commonly used in hygienic applications. The most common connections can be supplied as standard. Other process connections can be ordered as a custom-made product.

■ Process temperature, process pressure

The use of special materials means that the sensor is suitable for exposure to continuous temperatures of up to 125 °C (257 °F). It may be exposed to temperatures of up to 150 °C (300 °F) for a short time (max. 60 min)). The sensor's pressure resistance is 12 bar (174 psi) at temperatures up to 90 °C (194 °F) and at higher temperatures is always above the steam pressure. The sensor is suitable for underpressure applications.

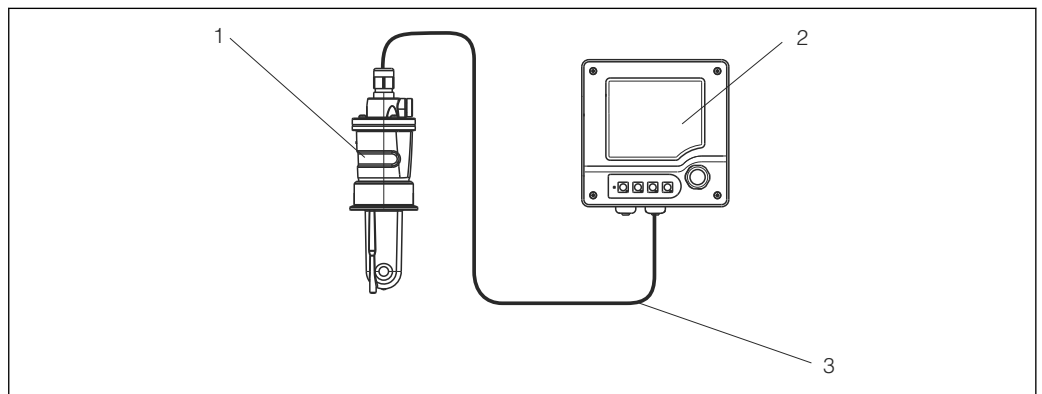
■ Temperature measurement

The sensor has an integrated temperature sensor with a temperature response time t_{90} of less than 26 s, making efficient phase separations possible at varying and quickly changing process temperatures. The temperature sensor is embedded into the PEEK body without any seals, thereby ensuring a long sensor service life.

Measuring system

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

- The CLS54 inductive conductivity sensor
- A transmitter, e.g. Liquiline CM42



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1 Example of a measuring system

- 1 Indumax CLS54
- 2 Liquiline CM42 transmitter
- 3 Measuring cable

Input

Measured values

- Conductivity
- Temperature

Measuring ranges

Conductivity	Recommended range: 100 $\mu\text{S/cm}$ to 2000 mS/cm (uncompensated)
Temperature	-10 to +150 $^{\circ}\text{C}$ (+14 to +302 $^{\circ}\text{F}$)

Cell constant

$k = 6.3 \text{ cm}^{-1}$

Temperature measurement

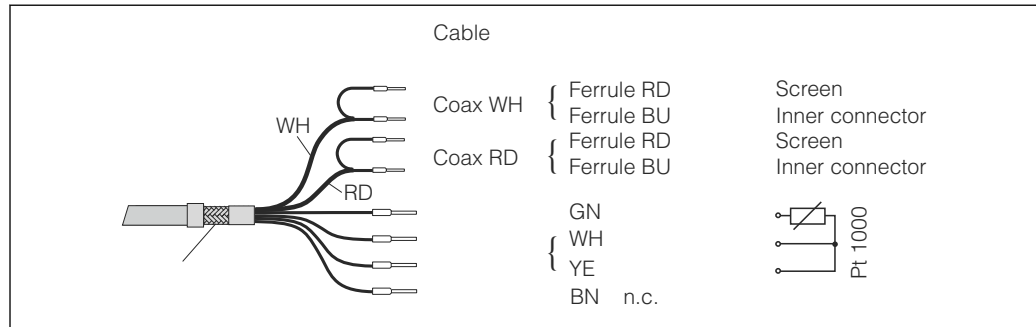
Pt 1000 (Class A according to IEC 60751)

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 VBM junction box is necessary for a cable connection. The extension to the transmitter is via the CLK6 cable.



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2 Fixed cable/special measuring cable CLK6

Cable length:

Max. total length of 55 m (180 ft)

Performance characteristics

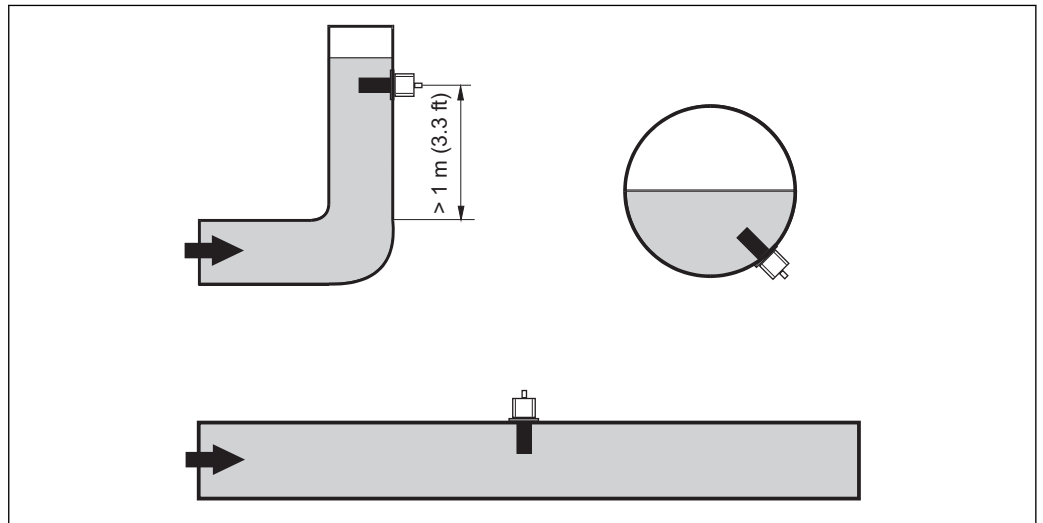
Temperature response time $t_{90} \leq 26 \text{ s}$

Maximum measured error $\pm (0.5 \% \text{ of reading} + 10 \mu\text{S/cm})$ after calibration
(plus uncertainty of the conductivity of the calibration solution)


Installation


Orientation

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



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 3 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 medium should flow parallel to the sensor bore (see arrows on the sensor body). The symmetrical measuring channel allows flow in both directions.

-  For a 3-A compliant installation, the following must be noted:

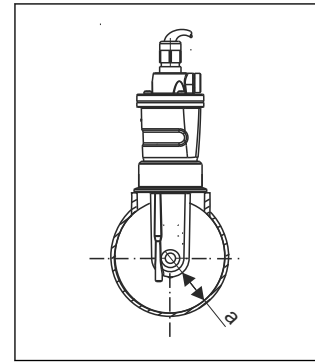
After the instrument is installed its hygienic integrity shall be maintained. All process connections must be 3-A compliant.

Installation factor

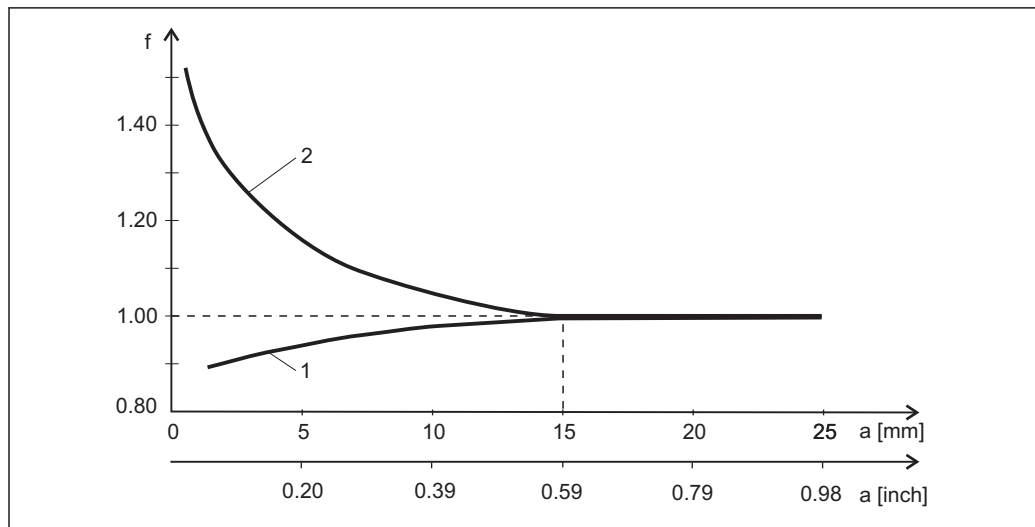
The ionic current in the liquid is affected by the walls in confined installation conditions. This effect is compensated by what is referred to as the installation factor. The installation factor can be entered in the transmitter for the measurement or the cell constant is corrected by multiplying by 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.



4 CLS54 installation
a Wall distance



5 Relationship between installation factor f and wall distance a
1 Electrically conductive pipe wall
2 Electrically insulating pipe wall

Air set

To compensate residual coupling in the cable and between the two sensor coils, zero adjustment in air ("air set") must be performed before installing the sensor. Follow the instructions provided in the Operating Instructions of the transmitter used.

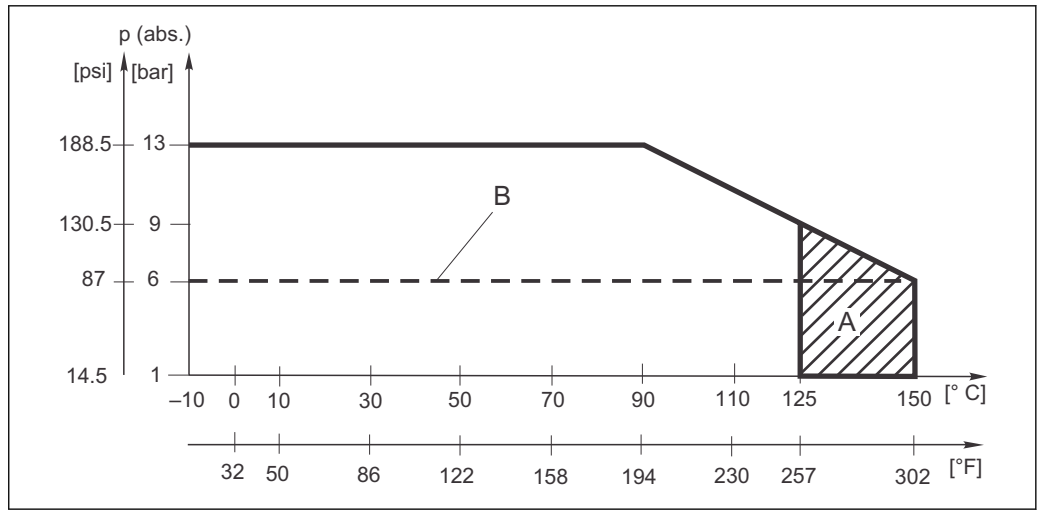
Environment

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 6 (1 m (3.3 ft) water column, 50 °C (122 °F), 168 h)

Process

Process temperature	-10 to +125 °C (+14 to +257 °F)
Sterilization	150 °C (302 °F) / 5 bar (72.5 psi) (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) 1 to 6 bar (14.5 to 87 psi) in CRN environment tested with 50 bar (725 psi) Underpressure down to 0.1 bar (1.45 psi)

Temperature/pressure ratings



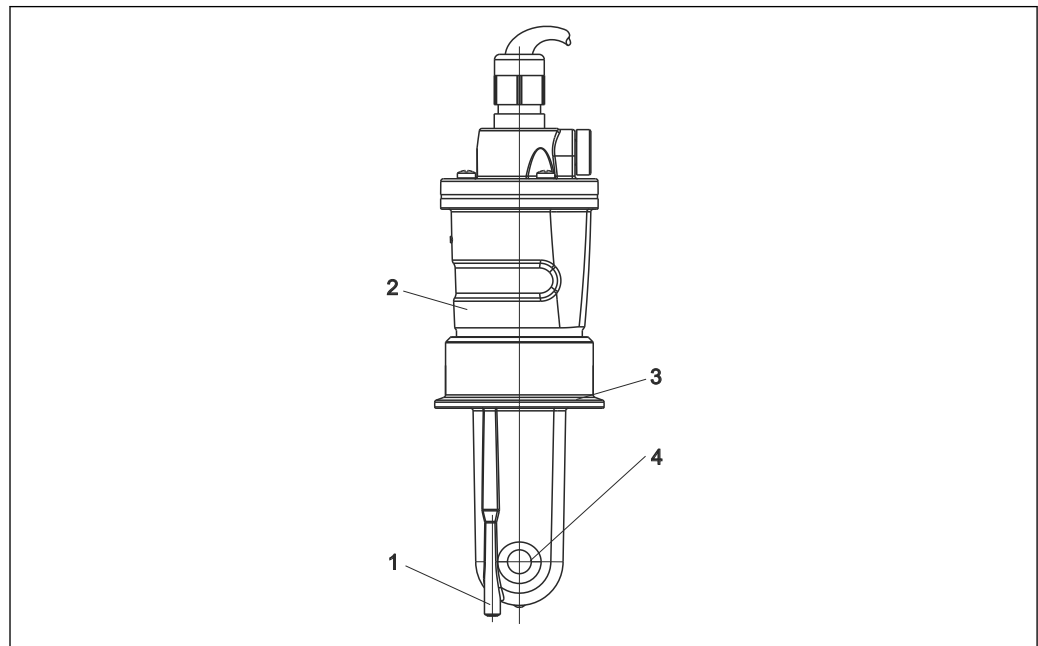
6 Pressure/temperature ratings

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

Mechanical construction

Design

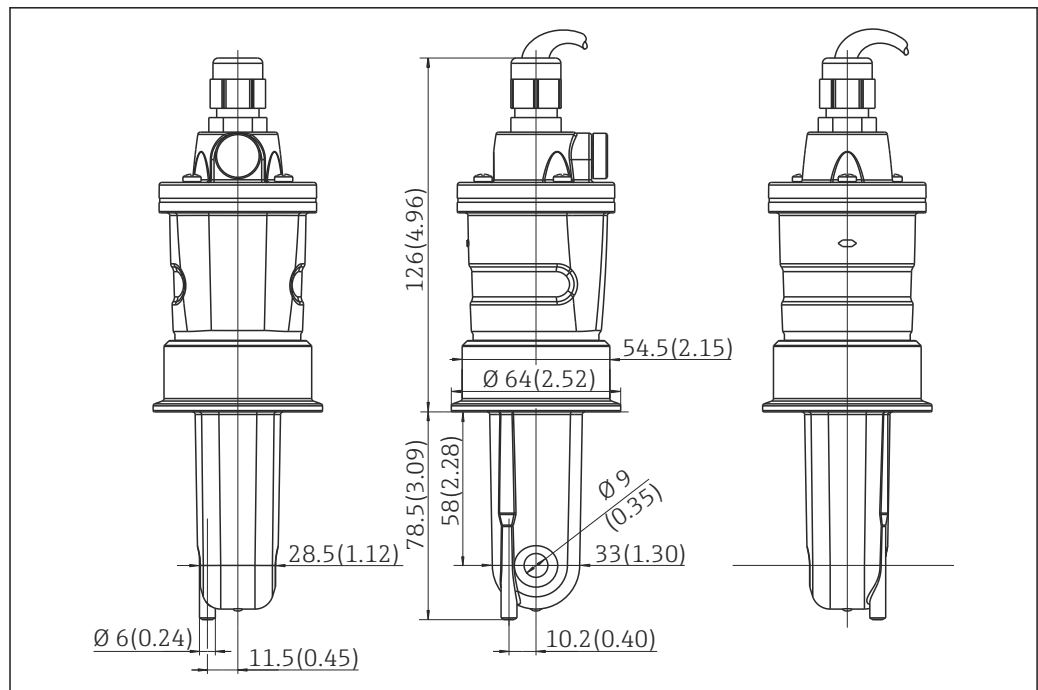


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7 Indumax CLS54

- 1 Temperature sensor
- 2 Housing
- 3 Process connection
- 4 Flow opening

Dimensions



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8 Dimensions in mm (inch) (long version)

Weight

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

Materials

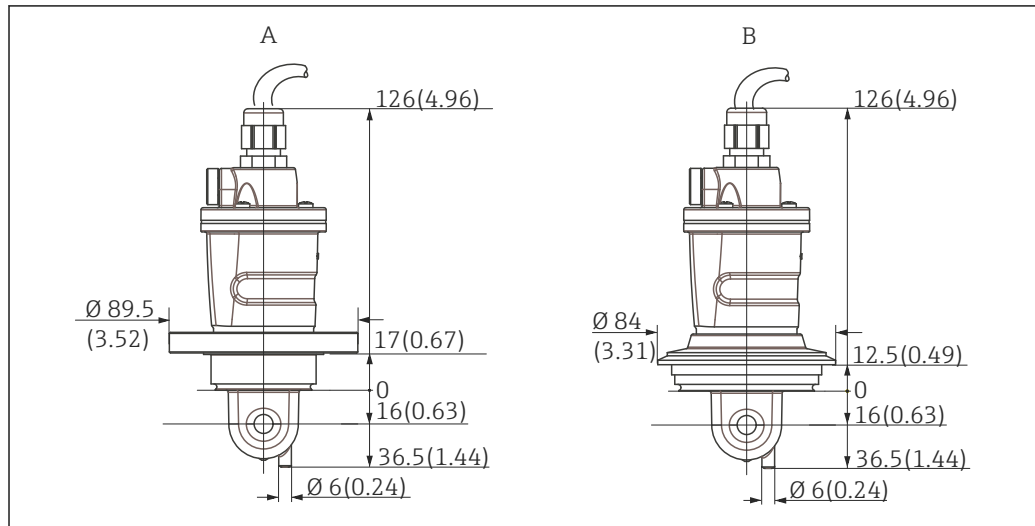
In contact with medium
Not in contact with medium

Virgin PEEK
PPS-GF40
Stainless steel 1.4404 (AISI 316L)
Screws: 1.4301 (AISI 304)
Cable gland: PVDF
Seals: FKM, EPDM
Cable: TPE

Surface roughness

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

Process connections

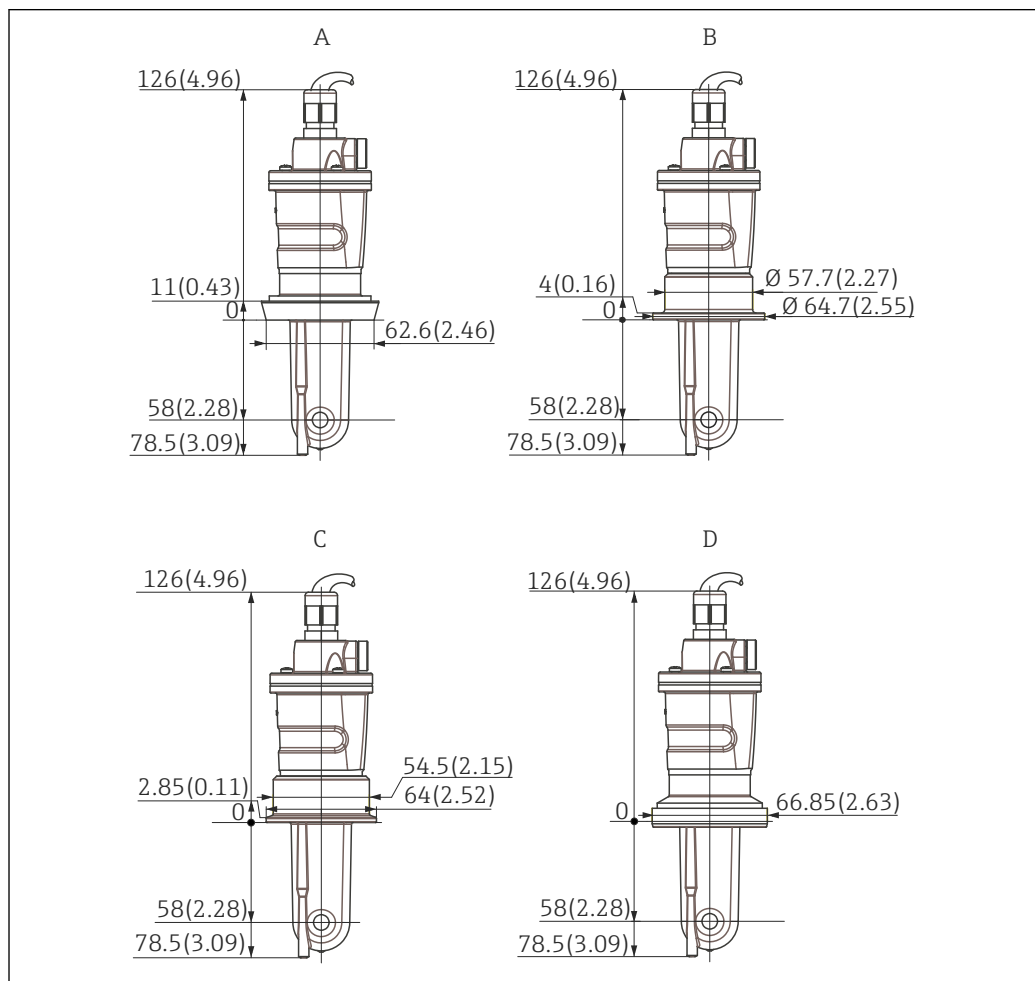


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9 Process connections for CLS54 (short version), dimensions in mm (inch)

A 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); 2" (DIN 11866 series C, ASME-BPE)

B Varivent N DN 40 to 125



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10 Process connections for CLS54 (long version), dimensions in mm (inch)

A Sanitary connection DIN 11851, DN 50

B SMS coupling 2"

C Clamp ISO 2852, 2"


D Aseptic coupling DIN 11864-1 form A, for pipe according to DIN 11850, DN 50

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)
Phosphoric acid H ₃ PO ₄	0 to 15 %	20 to 80 °C (68 to 176 °F)
Sulfuric acid H ₂ SO ₄	0 to 30 %	20 °C (68 °F)
Peracetic acid H ₃ C-CO-OOH	0.2 %	20 °C (68 °F)

Errors and omissions excepted

Certificates and approvals

CE mark	<p>Declaration of Conformity</p> <p>The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EC directives. The manufacturer confirms successful testing of the product by affixing to it the CE mark.</p>
Hygiene	<p>FDA</p> <p>All materials in contact with the product are listed by the FDA.</p> <p>EHEDG</p> <p>Certified cleanability according to EHEDG TYPE EL-class I.</p> <p> When using the sensor in hygienic applications, please note that the cleanability of the sensor also depends on the way the sensor is installed. To install the sensor in a pipe, use the appropriate and EHEDG-certified flow vessels for the particular process connection.</p> <p>3-A</p> <p>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").</p> <p>Biological reactivity (USP class VI) (option)</p> <p>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.</p>
Ex approvals	<ul style="list-style-type: none"> ▪ ATEX II 1G Ex ia IIC T3/T4/T6 ▪ CSA IS/NI Cl. I Div. 1 & 2 GP A - D in conjunction with the Liquiline M CM42 transmitter
Pressure approval	Canadian pressure approval for pipes according to ASME B31.3
Regulation (EC) No. 1935/2004	Meets the requirements of Regulation (EC) No. 1935/2004

Ordering information

Product page www.endress.com/cls54

Product Configurator The navigation area is located on the right of the product page.

1. Under "Device support" click "Configure your selected product".
 - ↳ 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 at the top of the screen.

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 office.

Cable extension

Measuring cable

Measuring cable CLK6

- Extension cable for inductive conductivity sensors, for extension via VBM junction box
- Sold by the meter, order number: 71183688

Junction box

VBM

- Junction box for cable extension
- 10 terminal strips
- Cable entries: 2 x Pg 13.5 or 2 x NPT ½"
- Material: aluminum
- Degree of protection: IP 65
- Order numbers
 - Cable entries Pg 13.5 : 50003987
 - Cable entries NPT ½": 51500177

Desiccant pouch

- Desiccant pouch with color indicator for VBM junction box
- Order No. 50000671

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



www.addresses.endress.com
