Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Indumax CLS54D

Inductive conductivity sensor with hygienic design for applications in the food, beverage and pharmaceutical industries and in biotechnology

Application

The CLS54D conductivity sensor is specifically intended for use in hygienic applications in the food, beverage and pharmaceutical industries and in biotechnology. Thanks to its food-grade virgin PEEK body, its jointless and creviceless design and its hygienic certificates, it meets the extremely exacting demands of these industries. The CLS54 is especially suitable for the following applications:

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

in the following industries

- Dairies
- Breweries
- Beverages (water, juices, soft drinks)
- Pharmaceuticals and biotechnology

The sensor can be used with the transmitters Liquiline CM44x, CM42 and CM14.

Your benefits

- Unique hygienic design, thus no risk of recontamination
- With all process connections commonly used in hygienic applications
- Fast measurement with temperature response time t_{90} under 26 s enables safe and efficient phase separations

Further benefits offered by Memosens technology

- Easy commissioning without doing any airset
- Reliable measured values thanks to automatic sensor recognition and active connection monitoring
- Traceability thanks to logging of sensor load data

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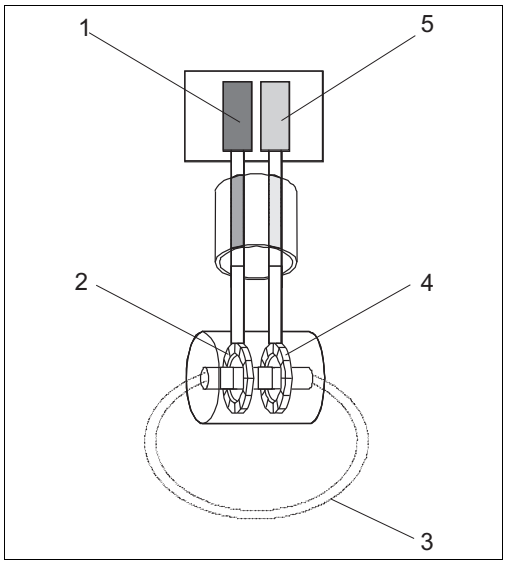
People for Process Automation

Function and system design

Measuring principle

Inductive conductivity measurement

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



Inductive conductivity measurement
1 Generator
2 Primary coil
3 Current flow in the medium
4 Secondary coil
5 Receiver

Benefits of inductive conductivity measurement
- No electrodes, therefore no polarization
- Accurate measurement in media or solutions with a high soiling degree and a tendency to deposition
- Complete galvanic separation of measurement and medium

Important properties Indumax CLS54D

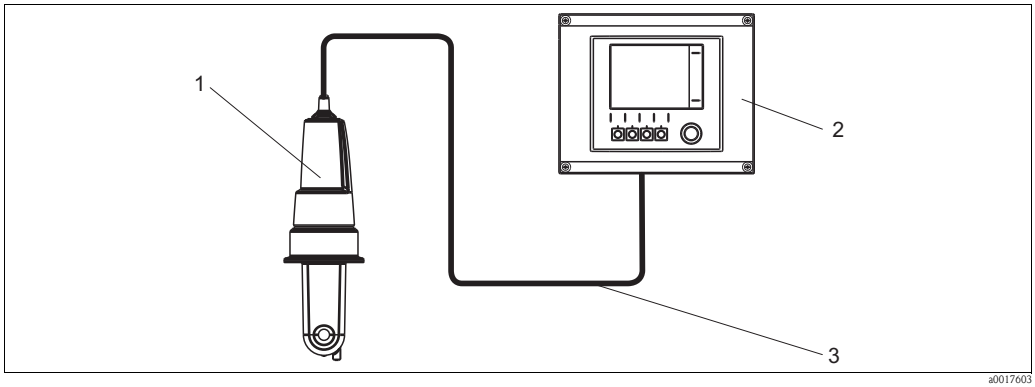
- **Hygiene**
  The injection-molded sensor is made of highly chemically, mechanically and thermally resistant PEEK. It does not have joints or crevices and is therefore hygienically safe. The exclusive use of virgin PEEK as material in contact with medium guarantees highest biological safety for the food, beverage and pharmaceutical areas. The sensor has been designed according to the effective guidelines of ASME BPE (The American Society of Mechanical Engineers – Bioprocessing Equipment).
- **Certified hygiene**
  The sensor has all necessary listings and approvals for hygienic areas, such as exclusive use of FDA-listed materials for surfaces in contact with medium and certification according to EHEDG guidelines (European Hygienic Engineering and Design Group) as well as 3-A. A certificate on the biological reactivity test according to USP part <87> and <88> class VI including lot tracing back to compounding is available as option.
- **Process connections**
  The sensor is available with all process connections commonly used in hygienic applications. The most common connections are available as standard. Further process connections can be ordered as special versions.
- **Process temperature, process pressure**
  The use of special components and materials makes the sensor suitable for continuous exposure to temperatures of +125 °C (275 °F). Short-time (max. 60 min.), it may be exposed to +150 °C (300 °F) for sterilisation. The sensor is pressure-resistant up to 12 bar (174 psi) up to 90 °C (194 °F). At higher temperatures, its pressure resistance is always higher than the respective steam pressure. The sensor is suitable for underpressure applications.
- **Temperature measurement**
  The sensor has an integrated temperature sensor with a temperature response time $t_{90} < 26$ s. This enables economically efficient phase separations at variying and quickly changing process temperatures. The temperature sensor is embedded into the PEEK body eliminating the need for seals which ensures a long service life.

Advantages of digital sensors with Memosens protocol

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

Measuring system

A complete measuring system comprises:
- a CLS54D inductive conductivity sensor
- a transmitter, e.g. Liquiline CM44x



Measuring system example

1 Indumax CLS54D
2 Transmitter Liquiline CM44x
3 Measuring cable

Input

Measured values

Conductivity
Temperature

Cell constant k

k = 6.3 cm^{-1}

Measuring ranges

Conductivity	recommended range: 100 µS/cm to 2000 mS/cm (uncompensated)
Temperature	–10 to +150 °C (+14 to +302 °F)

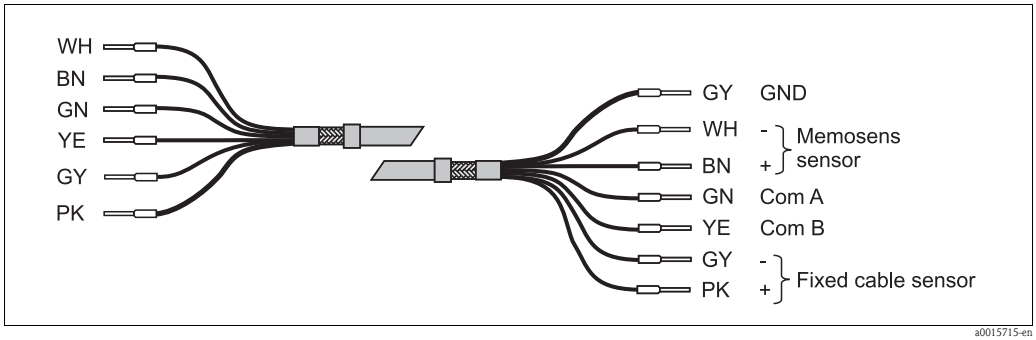
Temperature measurement

Pt 1000 (class A acc. to IEC 60751)

Power supply

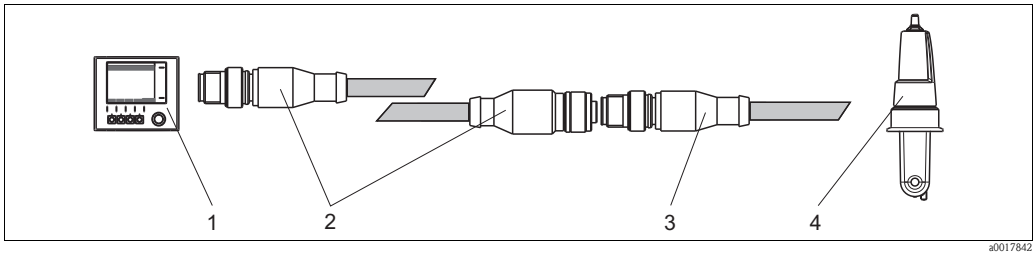
Cable specification

The sensor is supplied with a fixed cable.The connection to the transmitter can be extended using the CYK11 special measuring cable.



CYK11 with ferrules - max. length of the complete cable: 100 m (330 ft)

To extend fixed-cable sensors with M12 plug, use the measuring cable CYK11 with M12 connectors.



CYK11 with M12 connectors

1 Transmitter
2 Special measuring cable CYK11 with M12 connectors
3 Fixed cable of CLS54D with M12 connector
4 CLS54D sensor

Performance characteristics

Temperature response time

$t_{90} \leq 26$ s

Conductivity response time

$t_{95} \leq 2$ s

Measured error

± (0.5 % of measured value + 10 µS/cm) after calibration, valid for T < 100 °C (212 °F)
± (0.5 % of measured value + 25 µS/cm) after calibration, valid for T > 100 °C (212 °F)
(plus inaccuracy of the calibration)

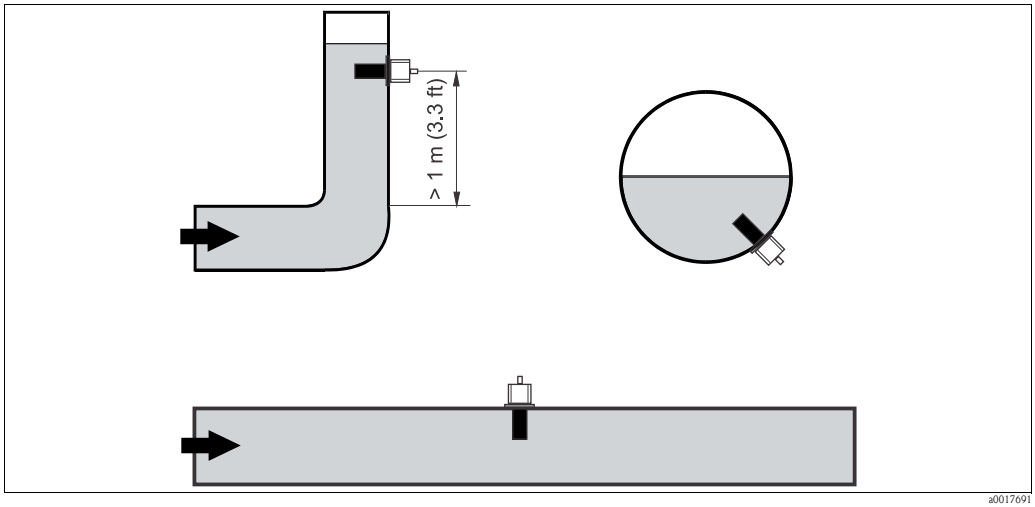
Repeatability

0.2 % of the measured value + 3 µS/cm

Installation

Installation instructions

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

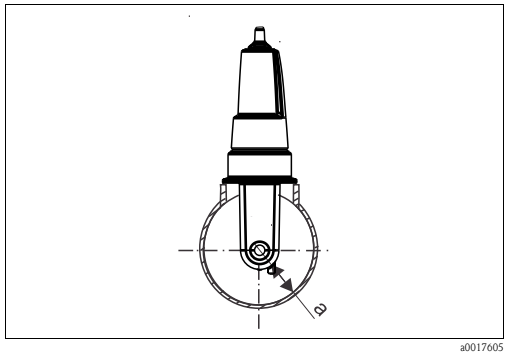


Installation positions of conductivity sensors

After elbow pipes, turbulences can occur in the medium. Therefore it is necessary to install the sensor with a minimum distance of 1 m (3.3 ft) after an elbow pipe.

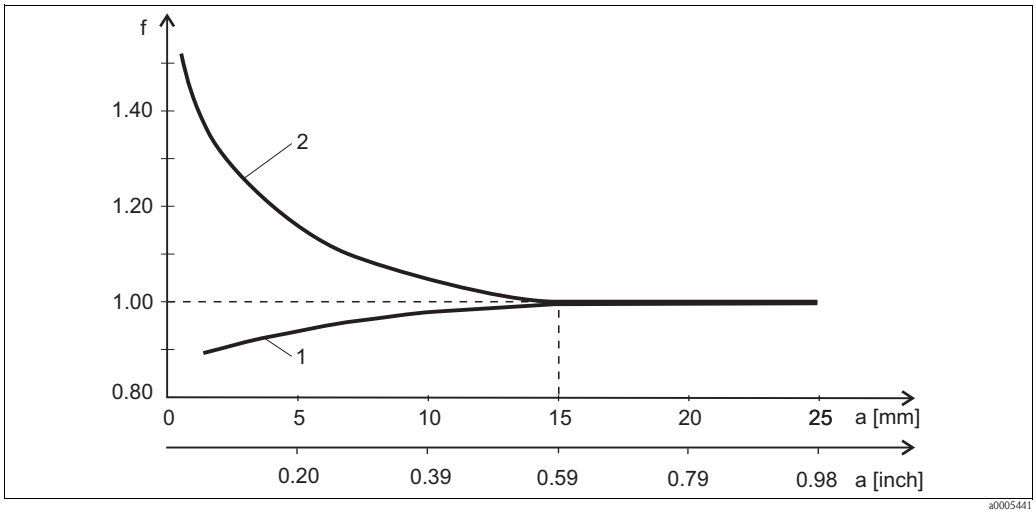
The medium should flow through the flow opening of the sensor (see indicator arrow of the sensor body). The symmetrical mesauring channel allows a flow in both directions.

In narrow installation conditions, the ion flow in the medium is affected by the pipe walls. This effect is compensated by the so-called installation factor. The installation factor can be entered in the transmitter or the cell constant can be corrected by multiplication with the installation factor to ensure correct measurement.
The value of the installation factor depends on the diameter and the conductivity of the pipe as well as the sensor's distance from the wall.
If the distance from the wall is sufficient (a > 15 mm, from DN 65), 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 case of electrically insulating pipes (f > 1) and decreases in case of electrically conductive pipes (f < 1).
The installation factor can be measured using calibration solutions or it can be approximately determined from the diagram beside.



Installation of CLS54D

a Sensor distance from the pipe wall



Dependance of installation factor f on wall distance a

1 Conductive pipe
2 Insulating pipe

Airset	The sensor has been adjusted at the factory, an on-site compensation is not necessary.

Environment

Ambient temperature	–20 to +60 °C (-4 to +140 °F)
Storage temperature	-25 to +80 °C (-13 to +176 °F)
Relative humidity	5 to 95 %
Ingress protection	IP 68 (10 m water column, 25 °C, 168 h) / NEMA Type 6P

Process

Process temperature

–10 to +125 °C (14 to 257 °F)

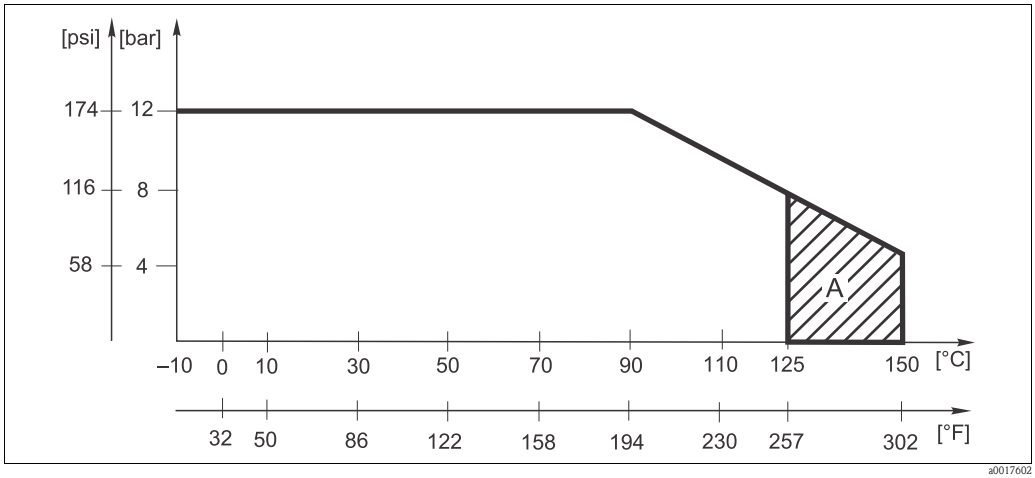
Sterilization

150 °C / 5 bar (300 °F / 72.5 psi) (max. 60 minutes)

Process pressure

12 bar (174 psi) up to 90 °C (194 °F)
8 bar (116 psi) at 125 °C (257 °F)
Underpressure down to 0.1 bar (1.45 psi) absolute

Pressure / temperature load curve



Pressure / temperature load curve

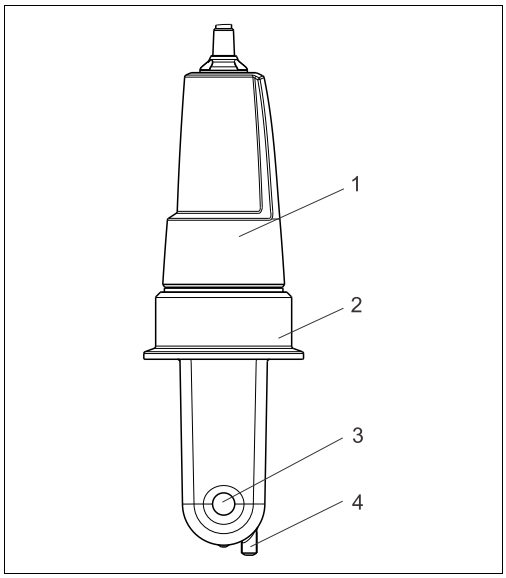
A short-time sterilization (max. 60 min.)

Flow velocity

max. 10 m/s (33 ft/s) for pipe diameters ≥ 80 mm for low viscous media
max. 5 m/s for pipe diameters ≥ 50 mm and < 80 mm for low viscous media

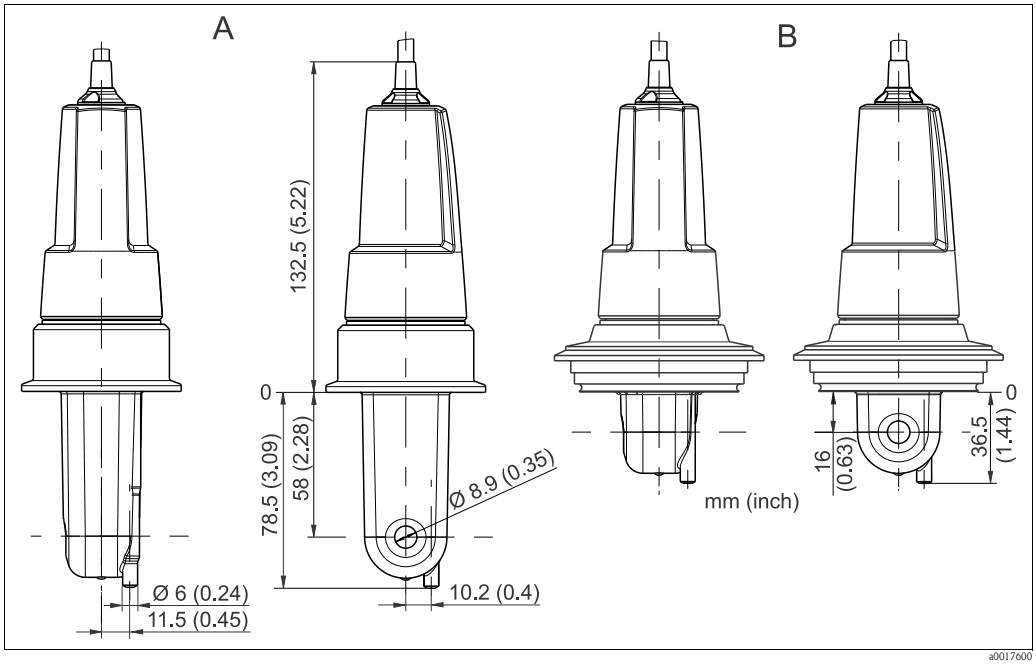
Mechanical construction

Design, dimensions



1 Housing
2 Process connection
3 Flow opening
4 Temperature sensor

Indumax CLS54D



Dimensions

A Long version
B Short version

Weight

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

Surface roughness

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

Materials

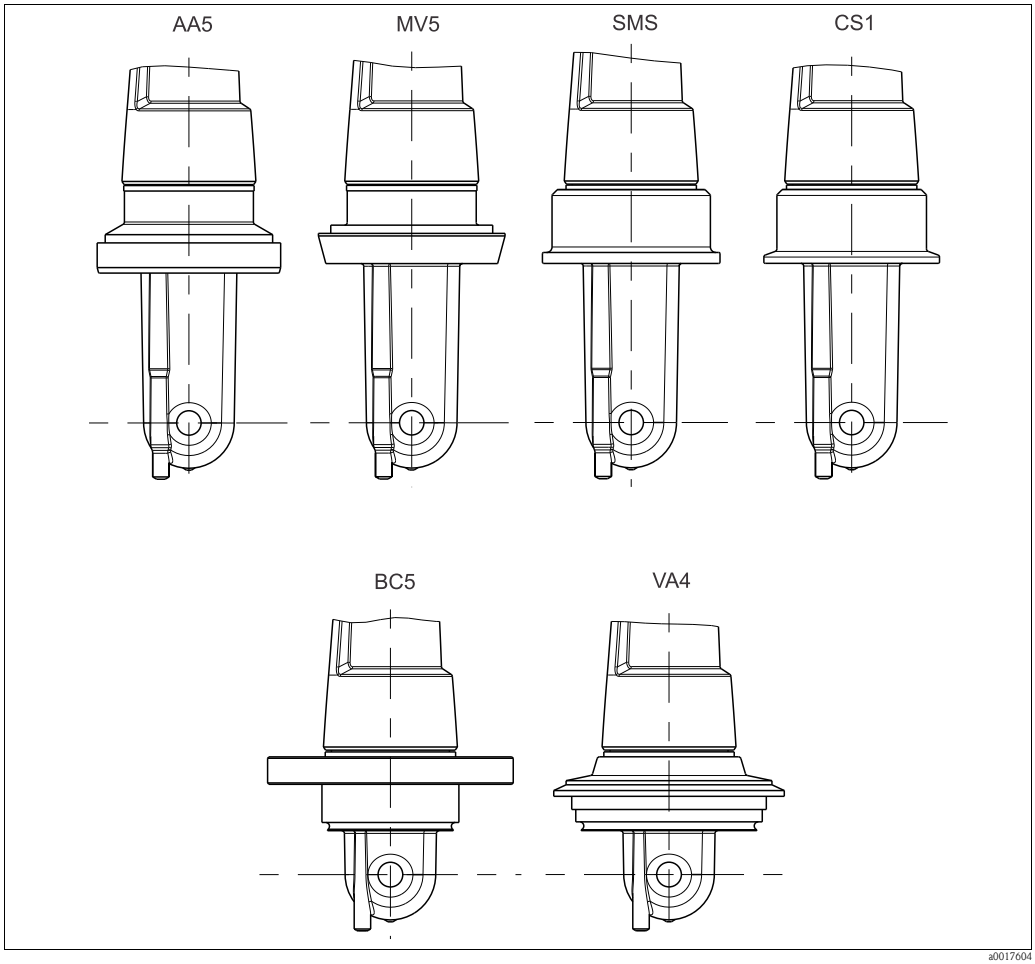
In contact with medium	Virgin PEEK
Not in contact with medium	PPS-GF40
	Stainless steel 1.4404 (AISI 316L)
	FKM, EPDM (seal)
	PEEK (cable gland)
	TPE (cable)

Process connections

- Dairy pipe fitting DIN 11851, DN 50 [a)]
- Aseptic fitting DIN 11864-1 form A, for pipe according to DIN 11850, DN 50
- Clamp ISO 2852 (also for TriClamp, DIN 32676), 2" [b)]
- SMS 2" [c)]
- Varivent N DN 40 - 125
- NEUMO BioControl D50

Additional process connections are available on request.

a) Dairy pipe fitting DIN 11851 is generally not considered hygienic. With the adapter SKS Siersma, it meets the 3-A standards requirements.
b) Clamp connection is only hygienic in connection with Hyjoin PEEK/stainless steel ring from Hyjoin Ltd., UK, and Kalrez seal from Dupont
c) Process connection SMS 2" is not considered hygienic according to the requirements of EHEDG.



Process connections CLS54D

AA5 Aseptic fitting DIN 11864-1 form A, for pipe according to DIN 11850, DN 50
MV5 Dairy pipe fitting DIN 11851, DN 50
SMS SMS 2"
CS1 Clamp ISO 2852, 2"
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)
2" (DIN 11866 series C, ASME-BPE)
VA4 Varivent N DN 40 to 125

Chemical durability

Medium	Concentration	PEEK
Caustic soda NaOH	0 to 15 %	20 to 90 °C (68 to 194 °F)
Nitric acid HNO_3	0 to 25 %	20 to 90 °C (68 to 194 °F)
Phosphoric acid H_3PO_4	0 to 15 %	20 to 80 °C (68 to 176 °F)
Sulphuric acid H_2SO_4	0 to 30 %	20 °C (68 °F)
Peracetic acid H_3C-CO-OOH	0.2 %	20 °C (68 °F)

No responsibility is taken for the correctness of this information.

Certificates and approvals

Hygienic certificates

FDA
All materials in contact with medium are listet at FDA.

EHEDG
Certified for cleanability according to EHEDG document 2

The cleanability of a sensor also depends on the way of installation. To install the sensor in a pipe system use the appropriate and EHEDG certified flow assembly for the respective process connection.

3-A
Certified according to 3-A Standard 74-04 ("3-A Sanitary Standards for Sensor and Sensor Fittings and Connections Used on Milk and Milk Products Equipment").

Biological reactivity (USP class VI) (optional)
Certificate (Certificate of Compliance) on biological reactivity tests according to USP (United States Pharmacopeia) part <87> und part <88> class VI with traceability of the materials in contact with medium.

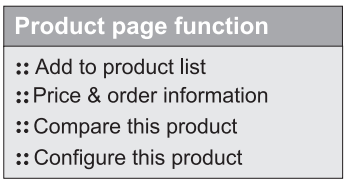
Ordering information

Product structure

You can create a valid and complete order code using the Endress+Hauser Configurator tool on the Internet.

Enter the following address into your browser to access the relevant product page:
www.products.endress.com/cls54d

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



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.

Scope of delivery

The scope of delivery comprises:
- 1 sensor Indumax CLS54D in the ordered version
- 1 Operating Instructions BA00508C/07/EN

Accessories

Measuring cables

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 box RM
- For cable extension (e.g. for Memosens sensors)
- 5 terminals
- Cable entries: 2 x Pg 13.5
- Material: PC
- Ingress protection: IP 65
- Order no.: 51500832

Calibration solutions

Precision solutions, traceable to SRM (standard reference material) by NIST, for qualified calibration of conductivity measurement systems according to ISO 9000, with temperature table
- 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
  107.0 mS/cm (reference temperature 25 °C / 77 °F), 500 ml / 16.9 fl.oz
  Order no. 50081906

Instruments International

Endress+Hauser
Instruments International AG
Kaegenstrasse 2
4153 Reinach
Switzerland

Tel.+41 61 715 81 00
Fax+41 61 715 25 00
www.endress.com
info@ii.endress.com

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