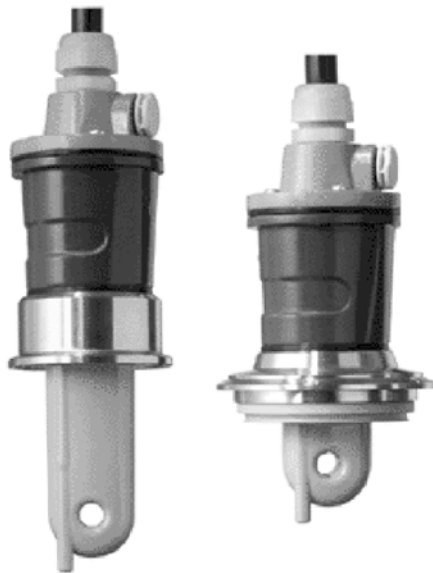


Technical Information

Indumax H CLS54

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



Application

The CLS54 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 M CM42, Lquisys M CLM223/253 and Mycom S CLM153; it is part of the measuring system Smartec S CLD134 and compatible with the transmitter electronics of Smartec S CLD132.

Your benefits

- Unique hygienic design, thus no risk of recontamination
- With all hygienic certificates required in hygienic applications
- With all process connections commonly used in hygienic applications
- Durable thanks to encapsulated, jointless design
- Fast measurement with temperature response time t_{90} under 26 s enables safe and efficient phase separations
- Insensitive to electrode soiling and polarization thanks to electrodeless, inductive measuring principle
- Suitable for application in hazardous areas



With
quality certificate

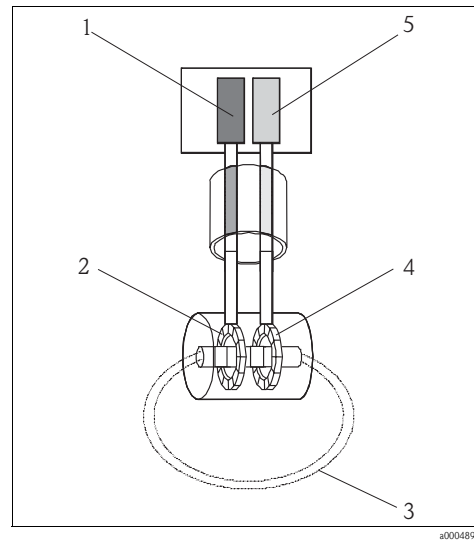


Function and system design

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 polarisation
- 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 H CLS54

■ 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). 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 +275°F (125°C). Short-time (max. 60 min.), it may be exposed to +300°F (150°C) for sterilisation. The sensor is pressure-resistant up to 174 psi (12 bar) at room temperature. At higher temperatures, its pressure resistance is always higher than the respective steam pressure. The sensor is suitable for underpressure applications.

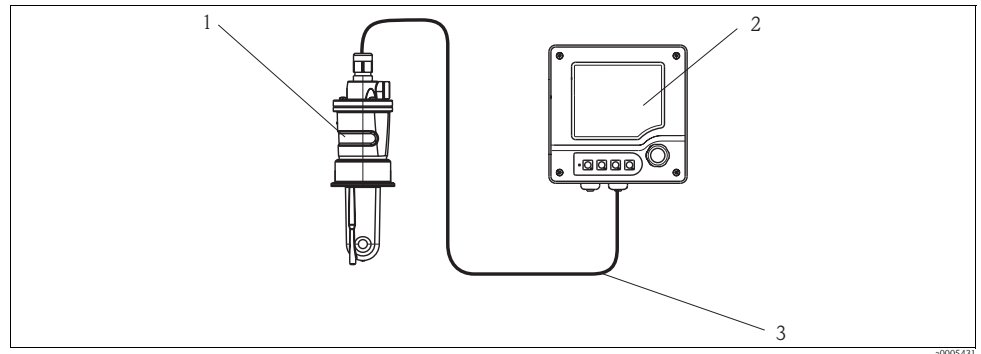
■ Temperature measurement

The sensor has an integrated temperature sensor with a temperature response time $t_{90} < 26$ s. This enables economically efficient phase separations at varying 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.

Measuring system

A complete measuring system comprises:

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

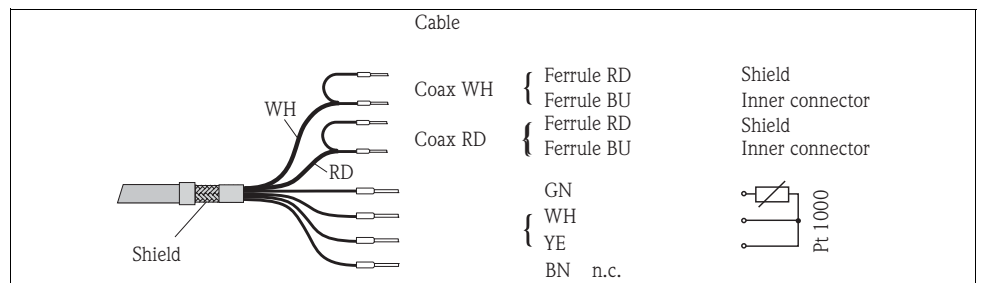


Measuring system example

- 1 Indumax H CLS54
- 2 Transmitter Liquiline CM42
- 3 Measuring cable

Input

Measured values	Conductivity Temperature	
Cell constant k	$k = 5.2 \text{ cm}^{-1}$	
Measuring ranges	Conductivity Temperature	recommended range: 100 $\mu\text{S/cm}$ to 2000 mS/cm (uncompensated) +14 to +302°F (-10 to +150°C)
Temperature measurement	Pt 1000 (class A acc. to IEC 60751)	
Cable specification	Indumax H is supplied with a fixed cable. The connection to the transmitter can be extended using the CLK5 special measuring cable.	



Fixed cable / CLK5 special measuring cable

Cable length: max. 180 ft (55 m) total length

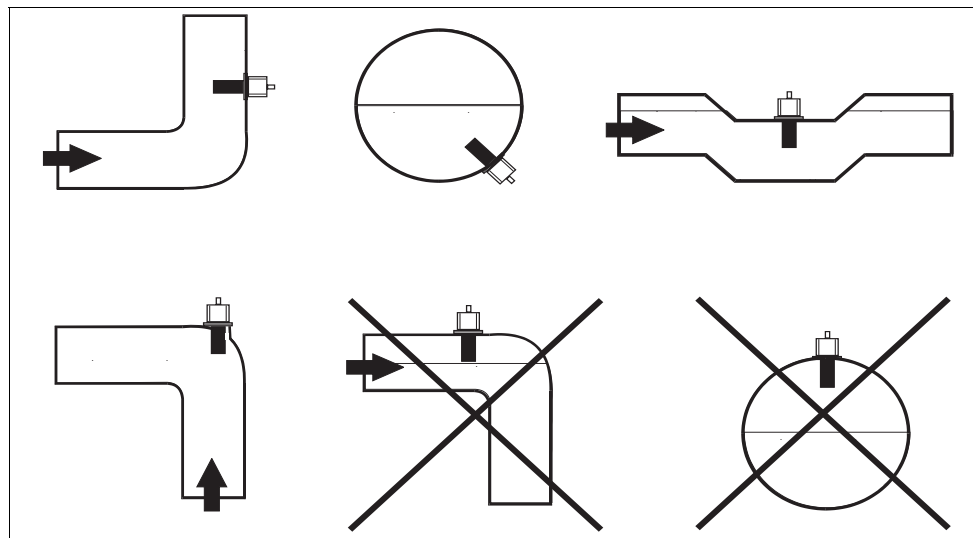
Performance characteristics

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

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

Installation

Installation instructions The sensor has to be immersed completely into the media. Avoid bubbles in the area of the sensor.



Installation positions of conductivity sensors

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

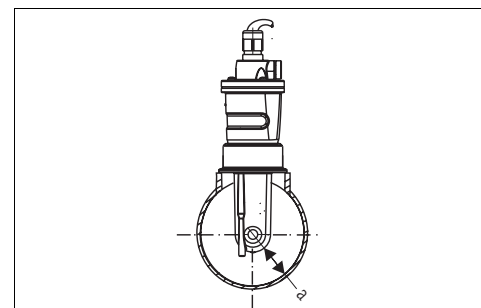
In narrow installation conditions, the ion flow in the medium is affected by the pipe walls. This effect is compensated by the so-called installation factor. The installation factor can be entered in the transmitter or the cell constant can be corrected by multiplication with the installation factor 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 ($a > 0.6'' / 15 \text{ mm}$, from $2-1/2'' / \text{DN } 65$), it is not necessary to consider the installation factor ($f = 1.00$).

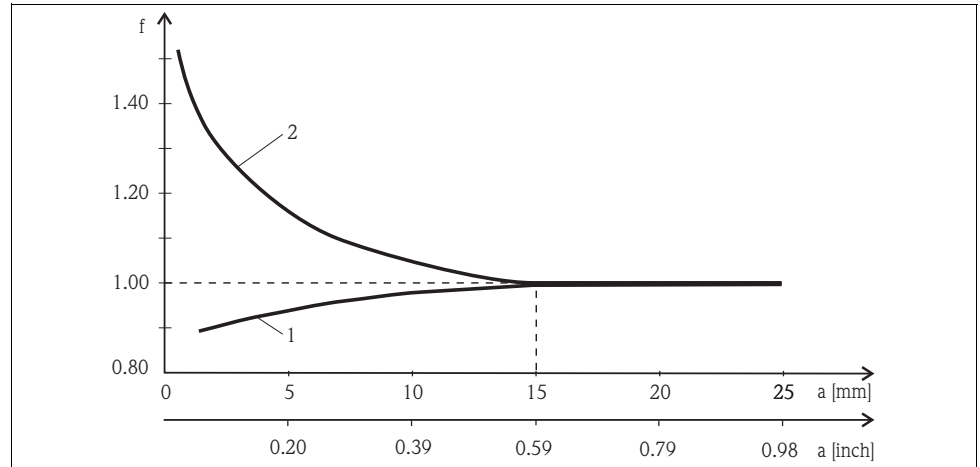
If the distance from the wall is smaller, the installation factor increases in case of electrically insulating pipes ($f > 1$) and decreases in case of electrically conductive pipes ($f < 1$).

The installation factor can be measured using calibration solutions or it can be approximately determined from the diagram beside.



Installation of CLS54

a Sensor distance from the pipe wall

Dependence of installation factor f on wall distance a

- 1 Conductive pipe
- 2 Insulating pipe

Air set

To compensate residual coupling in the cable and between the two sensor coils, you must perform a zero calibration in air ("air set") before installing the sensor. For further information, refer to the Operating Instructions of your transmitter.

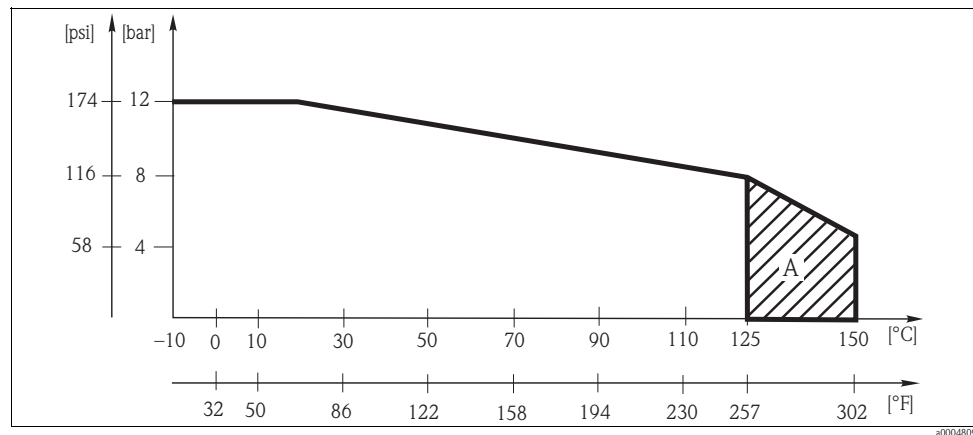
Environment

Ambient temperature	-4 to +140°F (-20 to +60°C)
Storage temperature	-13 to +176°F (-25 to +80°C)
Relative humidity	5 to 95 %
Ingress protection	NEMA 6P / IP 68 (3.28 ft / 1m) water column, 122°F (50°C), 168 h

Process

Process temperature	+14 to +257°F (-10 to +125°C)
Sterilisation	302°F / 72.5 psi (150°C / 5 bar), max. 60 min.
Process pressure	174 psi (12 bar) at 68°F (20°C) 116 psi (8 bar) at 257°F (125°C) underpressure down to 1.45 psi (0.1 bar) absolute

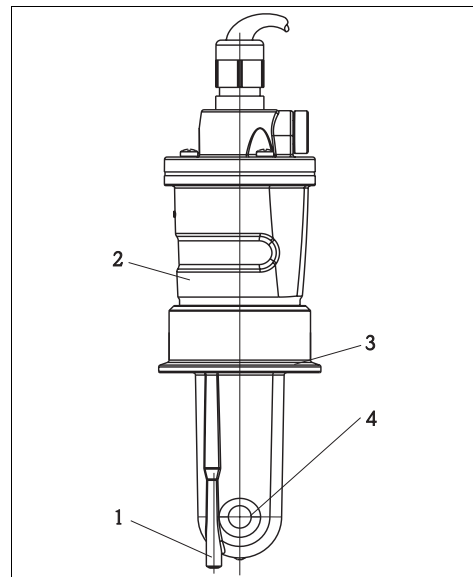
Pressure / temperature load curve



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

Mechanical construction

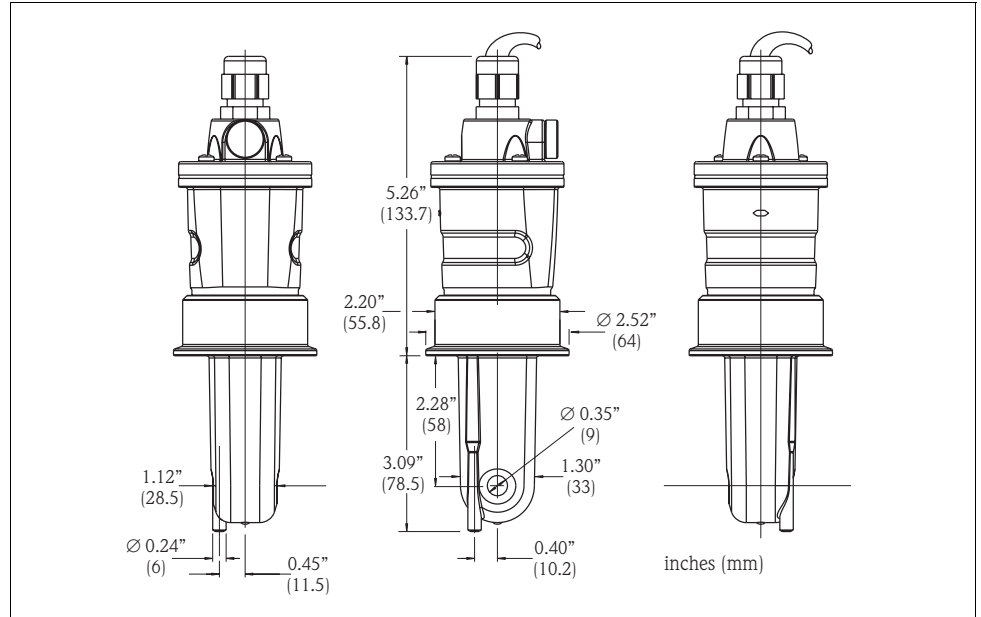
Design, dimensions



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

Indumax H CLS54

a0005430



Dimensions CLS54 (long version)

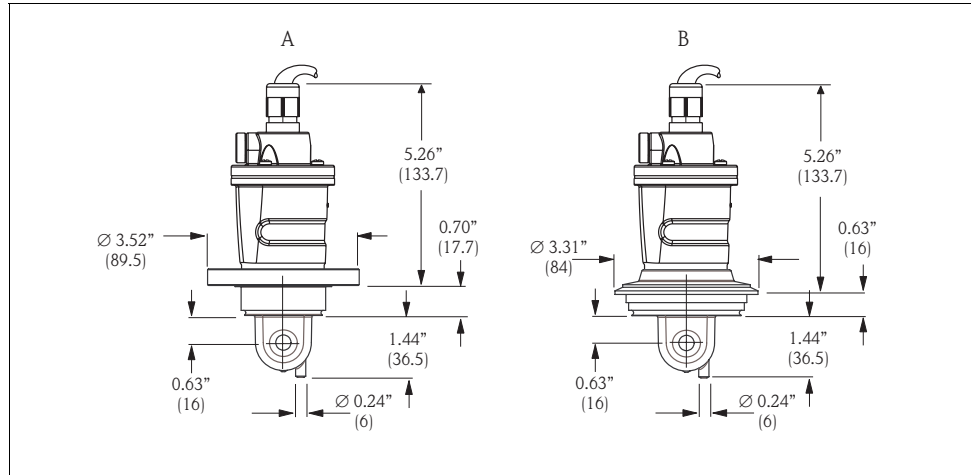
Weight	Depending on version 0.66 to 1.1 lb. (0.3 to 0.5 kg) plus cable	
Surface roughness	Ra ≤ 0.8 μm (smooth, injection-molded PEEK surface) for the surfaces in contact with medium	
Materials	In contact with medium Not in contact with medium	Virgin PEEK PPS-GF40 Stainless steel AISI 316L (1.4435) PVDF (cable gland) NBR, EPDM (seal) 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 Tri-Clamp®, DIN 32676), 2" ^{b)}
- SMS 2" ^{a)}
- Varivent N DN 40 - 125
- NEUMO BioControl D50

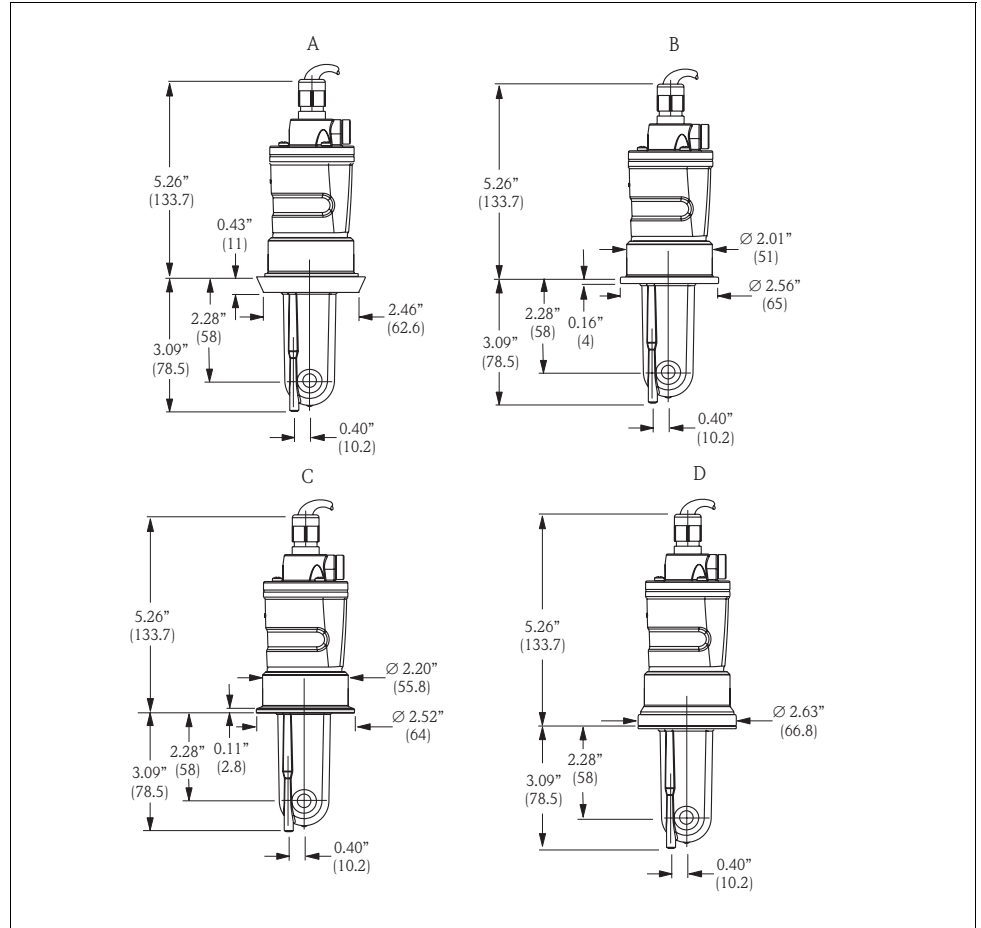
Additional process connections are available on request.

- a) Process connection is not hygienic according to EHEDG
 b) Clamp connection is only hygienic in connection with Hyjoin PEEK/stainless steel ring from Hyjoin Ltd., UK, and Kalrez seal from Dupont



Process connections CLS54 (short version)

- A NEUMO BioControl D50
 B Varivent N DN 40 - 125



Process connections CLS54 (long version)

- A Dairy pipe fitting DIN 11851, DN 50
- B SMS 2"
- C Tri-clamp ISO 2852, 2"
- D Aseptic fitting DIN 11864-1 form A, for pipe according to DIN 11850, DN 50

Electrical connection

Fixed cable connection with cable gland

Chemical durability

Medium	Concentration	PEEK
Caustic soda NaOH	0 to 15 %	68 to 194°F (20 to 90°C)
Nitric acid HNO ₃	0 to 25 %	68 to 194°F (20 to 90°C)
Phosphoric acid H ₃ PO ₄	0 to 15 %	68 to 176°F (20 to 80°C)
Sulphuric acid H ₂ SO ₄	0 to 30 %	68°F (20°C)
Peracetic acid H ₃ C-CO-OOH	0.2 %	68°F (20°C)

No responsibility is taken for the correctness of this information.

Certificates and approvals

Hygienic certificates

FDA

All materials in contact with medium are listed at FDA.

EHEDG

Certified for cleanability according to EHEDG document 2



Note!

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

Certification according to 3-A Standard 74-02 is pending ("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 on biological reactivity tests according to USP (United States Pharmacopeia) part <87> and part <88> class VI with traceability of the materials in contact with medium.

Ex approvals

- ATEX II 1G EEx ia IIC T3/T4/T6
- FM/CSA IS NI Cl. I, II, III, Div. 1 & 2; group A - G in connection with the transmitter Liquiline M CM42

Ordering information

Product structure Indumax H CLS54

Approval	
A	Non-Ex area
G	ATEX II 1G EEx ia IIC T3/T4/T6
O	FM IS NI Cl. I, II, III, Div. 1 & 2, Group A - G
S	CSA IS NI Cl. I, II, III, Div. 1 & 2, Group A - G
Process connection	
MV5	Dairy pipe fitting DIN 11851, DN 50 ¹⁾
AA5	Aseptic fitting DIN 11864-1 form A, pipe DIN 11850, DN 50
CS1	Tri-clamp ISO 2852, 2" (long) ²⁾
SMS	SMS, 2" ¹⁾
VA4	Varivent [®] N DN 40 to 125
BC5	NEUMO BioControl [®] D50
Supplementary equipment	
0	Standard
2	Biological reactivity tests according to USP <87>, <88> class VI
Cable length	
1	Fixed cable 16 ft. (5 m)
2	Fixed cable 33 ft. (10 m)
3	Fixed cable 66 ft. (20 m)
Temperature sensor	
2	Integrated temperature sensor Pt 1000
CLS54-	complete order code

¹⁾ process connection is not hygienic according to EHEDG

²⁾ Clamp connection is only hygienic in connection with Hyjoin PEEK/Stainless Steel Ring from Hyjoin Ltd., UK, and Kalrez seal from Dupont

Accessories

Measuring cables

- CLK5 measuring cable
Extension cable for connecting CLS52/54 and transmitter via the VBM junction box, sold by the meter;
order no. 50085473
 - Junction box VBM
for cable extension, with 10 terminals, IP 65 / NEMA 4X
- | | |
|---------------------|--------------------|
| Cable entry Pg 13.5 | Order no. 50003987 |
| Cable entry NPT ½" | Order no. 51500177 |
-

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
-

Related products

- Indumax P CLS50
Highly resistant inductive conductivity sensor for standard, hazardous and high-temperature applications;
for ordering information, see Technical Information TI182C/24/ae
- Smartec S CLD134
Measuring system for conductivity and concentration measurement in the food industry;
for ordering information, see Technical Information TI401C/24/ae

Documentation

Transmitters

- Mycom S CLM153, Technical Information TI234C/24/ae
 - Lquisys M CLM223/253, Technical Information TI193C/24/ae
 - Lquisys M CLM223F, Technical Information TI237C/24/ae
 - Liquiline M CM42, Technical Information TI381C/24/ae
 - CLS54-G, Safety instructions for electrical equipment in hazardous areas, XA400C/07/a3
-

Calibration solutions

- Precision calibration solution CLY11, Technical Information TI162C/24/ae

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