



Level



Pressure



Flow



Temperature

Liquid  
Analysis

Registration

Systems  
Components

Services

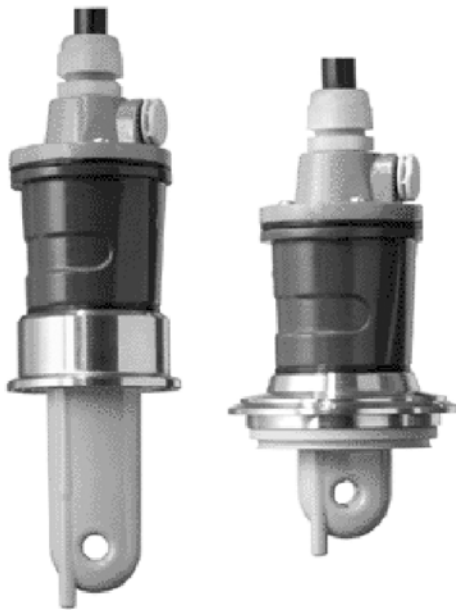


Solutions

## 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, Liquisys 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 polarisation thanks to electrodeless, inductive measuring principle
- Suitable for application in hazardous areas



Standard Number 74-03



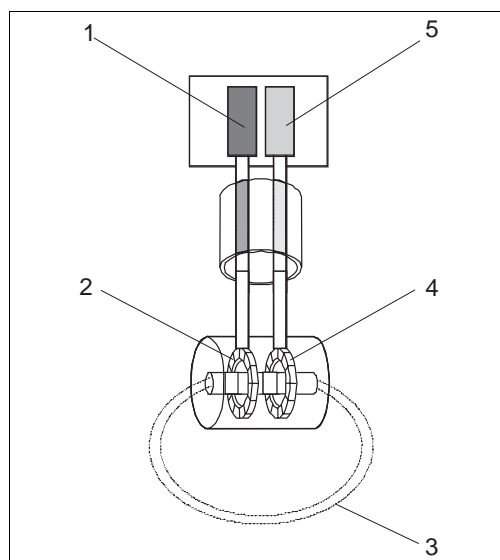
With  
quality certificate

## 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) 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.

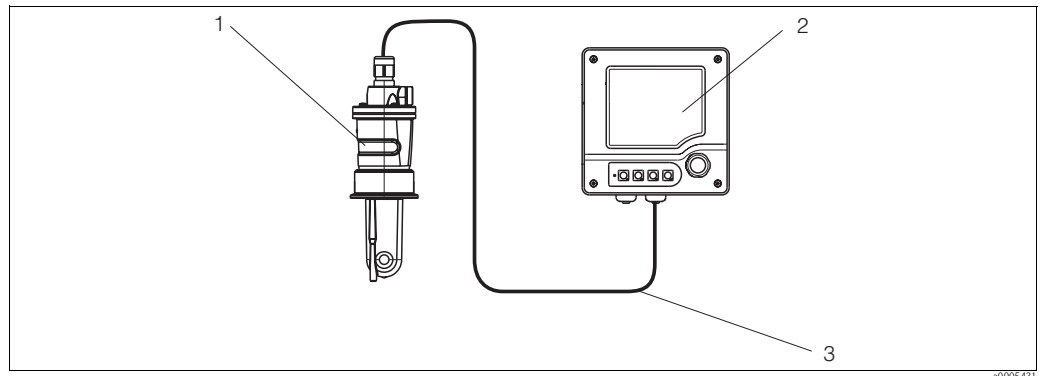
#### ■ Temperature measurement

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

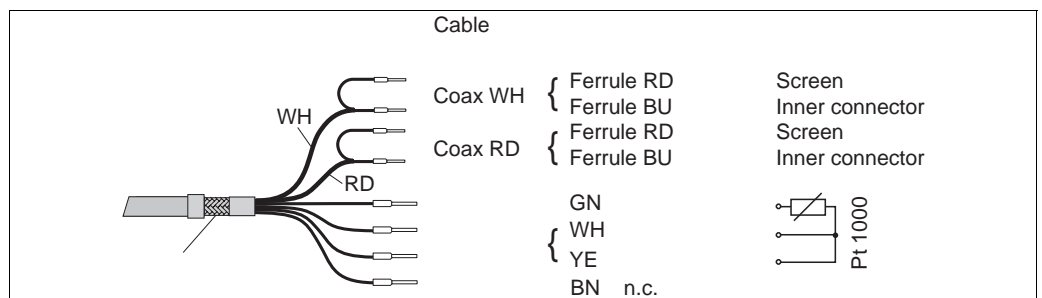


Measuring system example

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

**Input**

<b>Measured values</b>	Conductivity Temperature	
<b>Cell constant k</b>	k = 5.2 cm <sup>-1</sup>	
<b>Measuring ranges</b>	Conductivity Temperature	recommended range: 100 µS/cm to 2000 mS/cm (uncompensated) -10 to +150 °C (+14 to +302 °F)
<b>Temperature measurement</b>	Pt 1000 (class A acc. to IEC 60751)	
<b>Cable specification</b>	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. 55 m (180.46 ft total length)

## Performance characteristics

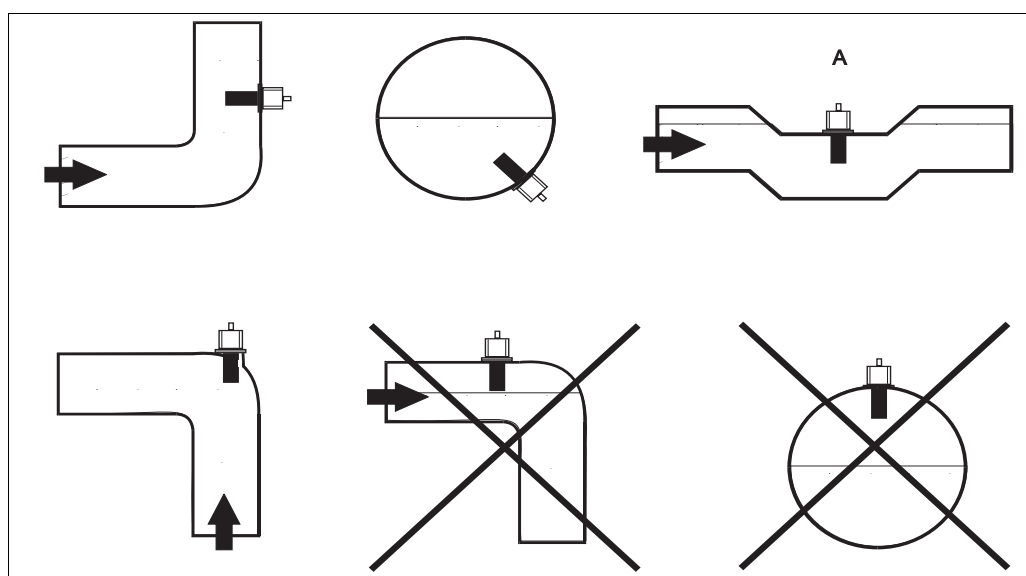
**Temperature response time**  $t_{90} \leq 26 \text{ s}$

**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*

A Installation position is not usable for hygienic applications.

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.

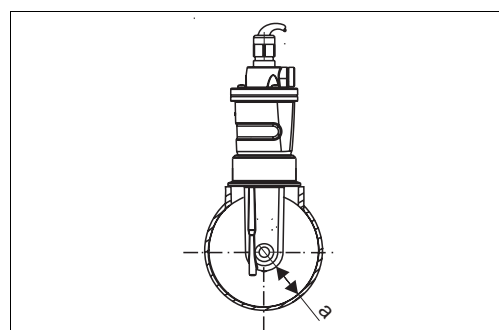
In narrow installation conditions, the ion flow in the medium is affected by the pipe walls. This effect is compensated by the so-called installation factor. The installation factor can be entered in the transmitter or the cell constant can be corrected by multiplication with the installation factor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

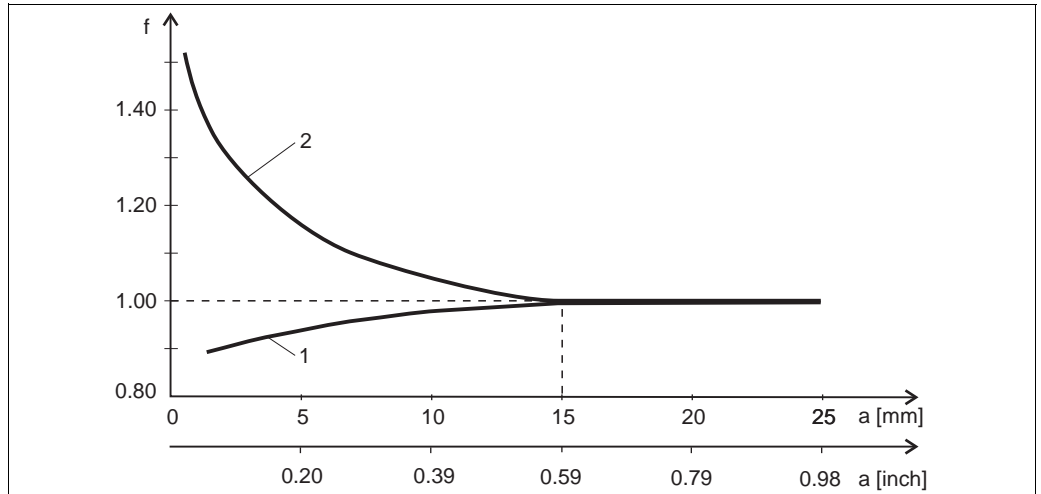
If the distance from the wall is smaller, the installation factor increases in case of electrically insulating pipes ( $f > 1$ ) and decreases in case of electrically conductive pipes ( $f < 1$ ).

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



*Installation of 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.

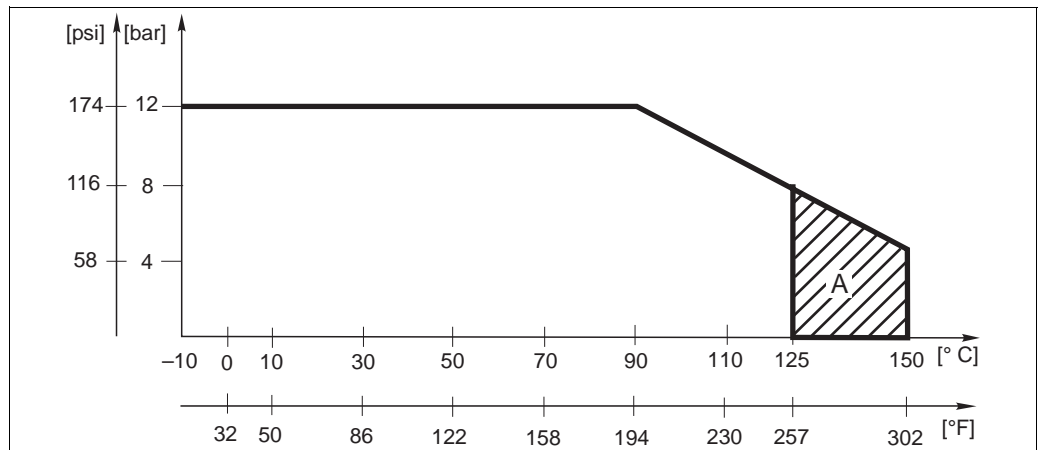
**Environment**

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

## Process

<b>Process temperature</b>	-10 to +125 °C (+14 to +257 °F)
<b>Sterilisation</b>	150 °C / 5 bar (302 °F / 72.5 psi) (max. 60 min.)
<b>Process pressure</b>	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

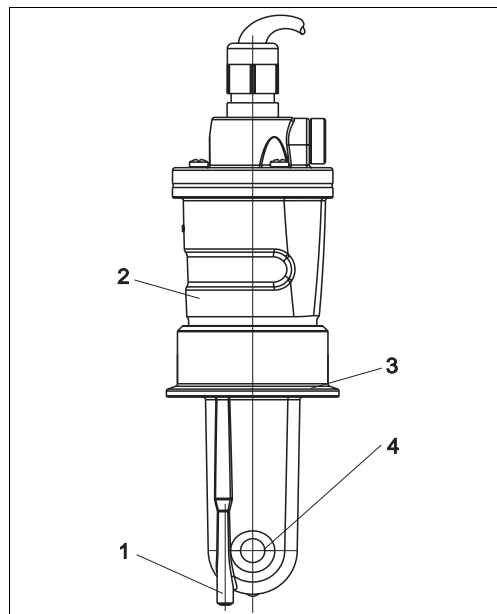
### Pressure / temperature load curve



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

## Mechanical construction

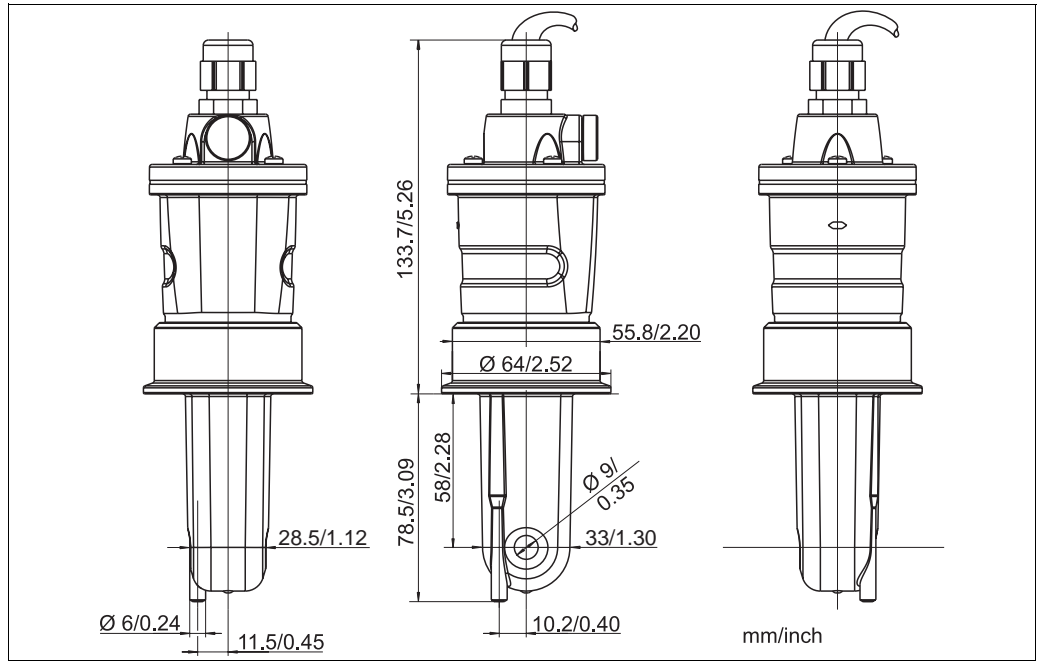
### Design, dimensions



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

Indumax H CLS54

a0005430



Dimensions CLS54 (long version)

**Weight**

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

**Surface roughness**

$R_a \leq 0.8 \mu\text{m}$  (smooth, injection-molded PEEK surface) for the surfaces in contact with medium

**Materials**

In contact with medium  
Not in contact with medium

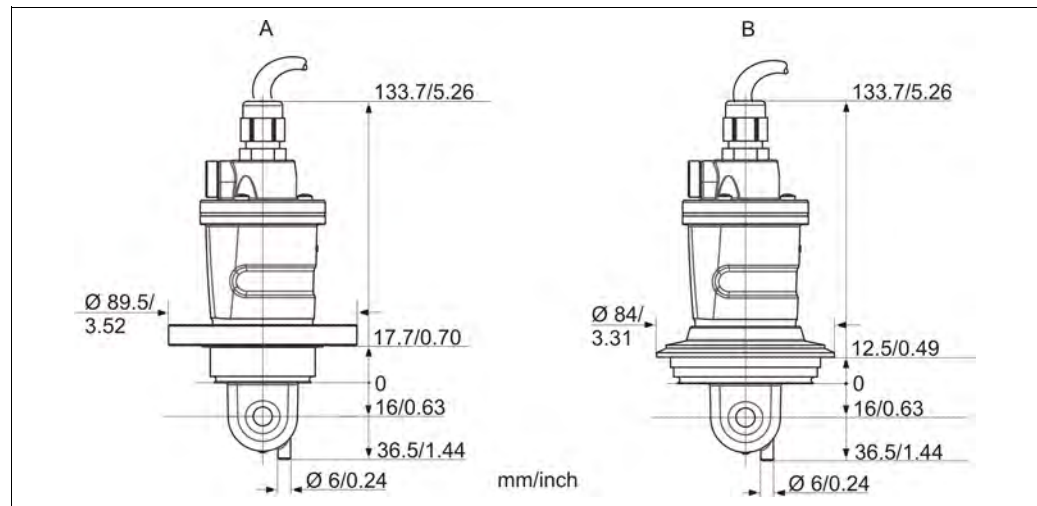
Virgin PEEK  
PPS-GF40  
Stainless steel 1.4404 (AISI 316L)  
Screws: 1.4301 (AISI 304)  
PVDF (cable gland)  
FKM, EPDM (seal)  
TPE (cable)

**Process connections**

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

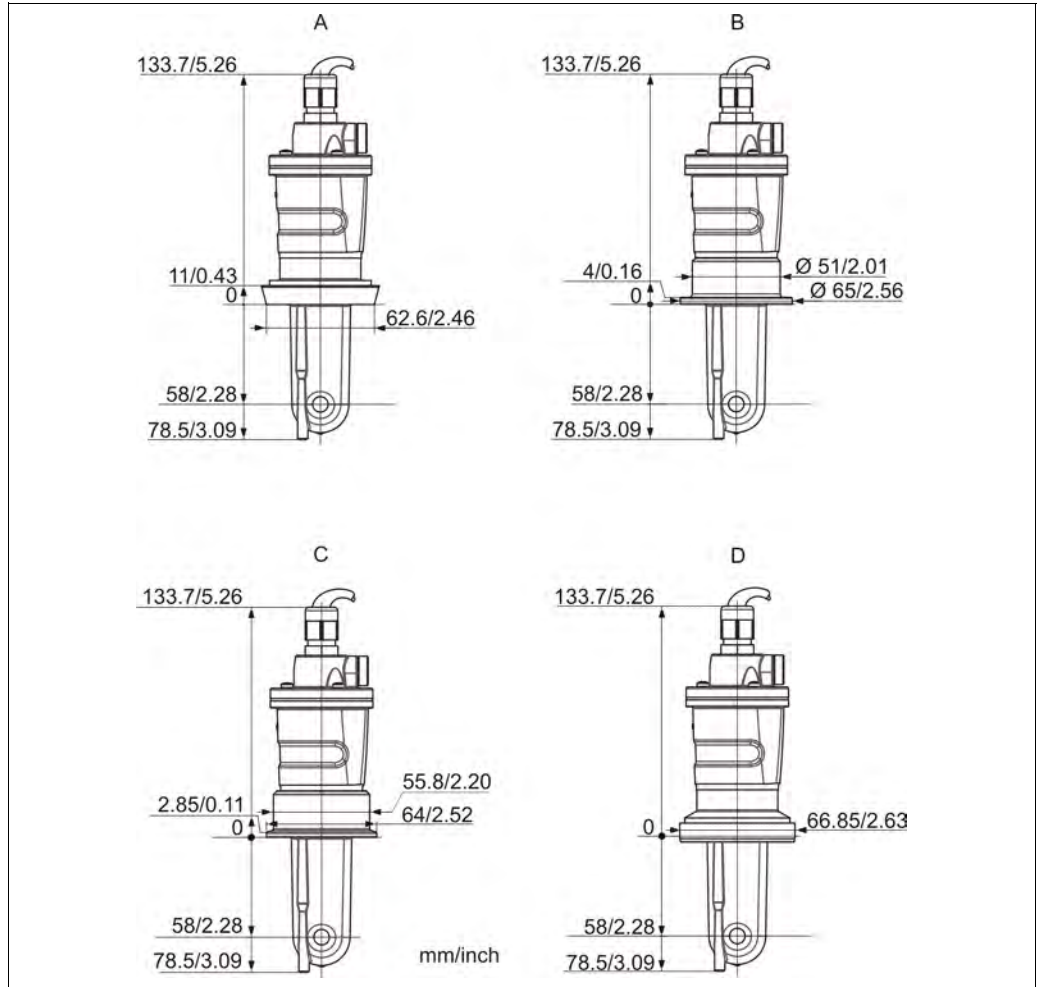
Additional process connections are available on request.

- 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  
 c) Process connection is not considered hygienic according to the requirements of EHEDG.



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 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 %	20 to 90 °C (68 to 194 °F)
Nitric acid HNO <sub>3</sub>	0 to 25 %	20 to 90 °C (68 to 194 °F)
Phosphoric acid H <sub>3</sub> PO <sub>4</sub>	0 to 15 %	20 to 80 °C (68 to 176 °F)
Sulphuric acid H <sub>2</sub> SO <sub>4</sub>	0 to 30 %	20 °C (68 °F)
Peracetic acid H <sub>3</sub> C-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 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

Certified according to 3-A Standard 74-03 ("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 <sup>1)</sup>
AA5	Aseptic fitting DIN 11864-1 form A, pipe DIN 11850, DN 50
CS1	Clamp ISO 2852, 2" (long) <sup>2)</sup>
SMS	SMS, 2" <sup>3)</sup>
VA4	Varivent <sup>®</sup> N DN 40 to 125
BC5	NEUMO BioControl <sup>®</sup> D50
Supplementary equipment	
0	Standard
2	Biological reactivity tests according to USP <87>, <88> class VI
Cable length	
1	Fixed cable 5 m (16.41 ft.)
2	Fixed cable 10 m (32.81 ft.)
3	Fixed cable 20 m (65.62 ft.)
Temperature sensor	
2	Integrated temperature sensor Pt 1000
CLS54-	<b>complete order code</b>

<sup>1)</sup> Dairy pipe fitting DIN 11851 is generally not considered hygienic. With the adapter SKS Siersma, it meets the 3-A standards requirements.

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

<sup>3)</sup> Process connection is not considered hygienic according to the requirements of EHEDG.

## 广州晋合水处理设备有限公司



地 址：广东省广州市海珠区工业大道333号华新园区7幢218  
电 话：020-88191905  
传 真：020-61139917  
邮 编：510300  
邮 箱：jinhewater@jinhewater.com  
网 址：<http://www.jinhewater.com>

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