

## Conductivity Measuring Cells *ConduMax W CLS 21*

**Two-electrode measuring sensors with fixed cable  
or connector version with integrated Pt 100 temperature  
sensor**

**Cell constant  $k = 1/\text{cm}$**



### Areas of application

Measurement in media of medium and high conductivities:

- Medium separation in medium conductivities (milk/water)
- Medium separation in high conductivities (alkaline solution/water)
- Drinking water treatment
- Wastewater treatment

The cell constant  $k$  of the sensor is  $k = 1/\text{cm}$ . The measuring range reaches from  $10 \mu\text{S}/\text{cm}$  to  $20 \text{mS}/\text{cm}$

Sensors with a Pt 100 temperature sensor are used together with transmitters equipped with automatic temperature compensation.

- Mycom CLM 153
- Lquisys M CLM 223 / 253
- MyPro CLM 431

For measurement of specific resistance,  $\text{M}\Omega \cdot \text{cm}$  measuring ranges are available in the programs of these transmitters.

### Benefits at a glance

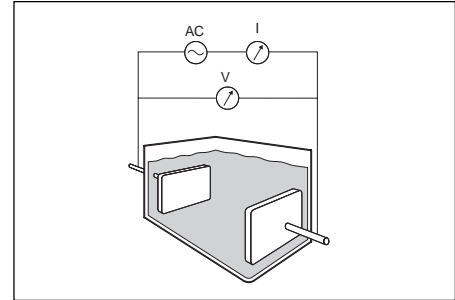
- Different designs guarantee optimum adaptation to the process conditions and methods of installation
- Installation in pipes or flow chambers
- Compact design
- Available with connector or fixed cable
- High chemical, thermal and mechanical stability
- NEMA 4 (IP 65) with connector, NEMA 6 (IP 67) with fixed cable
- Quality certificate stating the individual cell constant

## Function and system design

### Measuring principle

#### Conductive conductivity measurement

The conductivity of liquids is measured with a measuring system that has two coaxially arranged electrodes similar to a capacitor. The electric resistance or its reciprocal value, the conductance  $G$ , is measured according to Ohm's law. The specific conductivity  $K$  is determined using the cell constant  $k$  that is dependent on the sensor geometry.



Conductive conductivity measurement  
 AC = Power supply  
 I = Current meter  
 V = Voltage meter

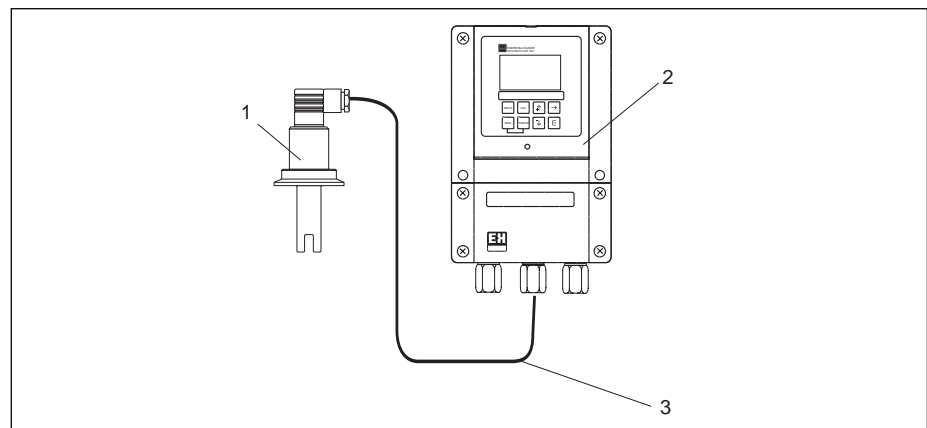
### ConduMax W CLS 21 important properties

- **Electrodes**  
 ConduMax W CLS 21 has two coaxial electrodes made of graphite for a large measuring range.
- **Temperature compensation**  
 In addition, a Pt 100 temperature sensor is installed inside the electrode to measure the process temperature.
- **Easy connection**  
 The connector versions are connected via a 4-pole DIN plug. The plug is equipped with a Pg 9 cable gland for measuring cable insertion. The fixed cable versions are ready for operation and do not need any further cable connection.
- **Durable and sterilizable**  
 The sensor is pressure-proof up to 232 psi (16 bar) at 68°F (20°C) and can be applied with temperatures up to 302°F (150°C) at 14.5 psi (1 bar).

### Measuring system

A complete measuring system consists of:

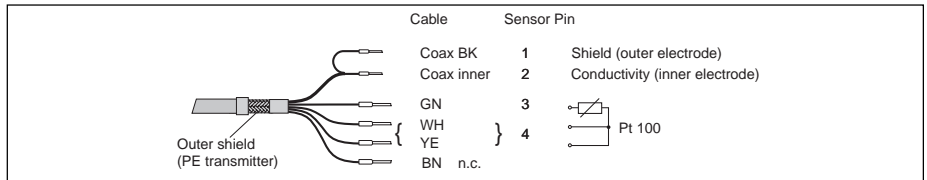
- A CLS 16 conductivity sensor
- A transmitter, e.g. Mycom S CLM 153
- A CYK 71 or CYK 71-Ex measuring cable for connector versions



Measuring system example  
 1 CLS 21 ConduMax W sensor  
 2 CLM 153 Mycom S transmitter  
 3 Measuring cable

## Input

<b>Measured values</b>	Conductivity and temperature	
<b>Cell constant k</b>	k = 1/cm	
<b>Measuring ranges</b>	Conductivity	(referenced to water at 77°F) 10 μS/cm to 20mS/cm
	Temperature	-4° to +302°F (-20° to +150°C)
<b>Temperature sensor</b>	Pt 100	
<b>Cable specifications</b>	The ConduMax W is connected to the transmitter using the CYK 71 / CYK 71-Ex or fixed cable.	

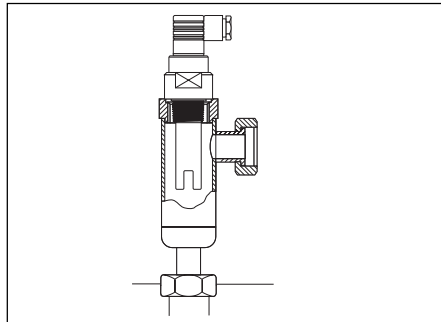


CYK 71/CYK 71-Ex measuring cable

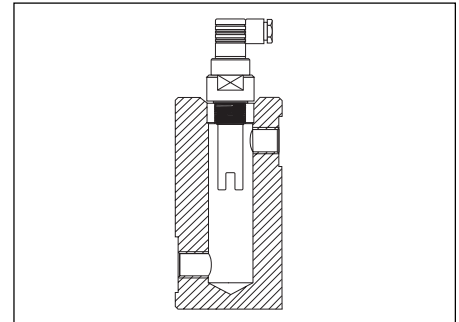
## Installation

### Installation instructions

The sensors are mounted directly via the process connection or optionally installed in a flow chamber.

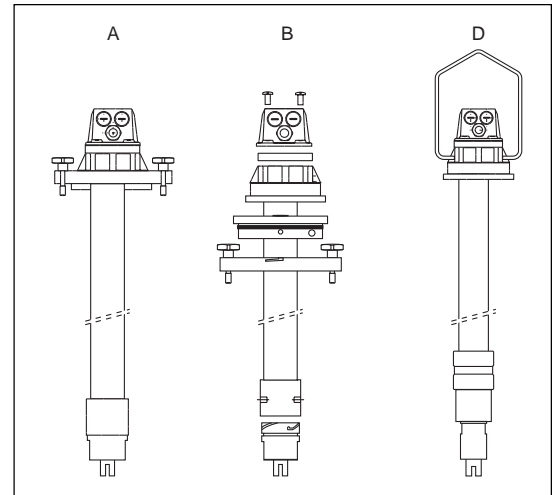


Installation in the CLA 751 flow chamber



Installation in the CLA 752 flow chamber

For installation of sensors with G1 thread in tanks, the CLA 111 immersion and process assembly are available (see Accessories).



**NOTE:**  
Ensure that the measuring surfaces are completely wetted by the process during operation.

DipFit W CLA 111, mounting versions A, B, and D

## Environment

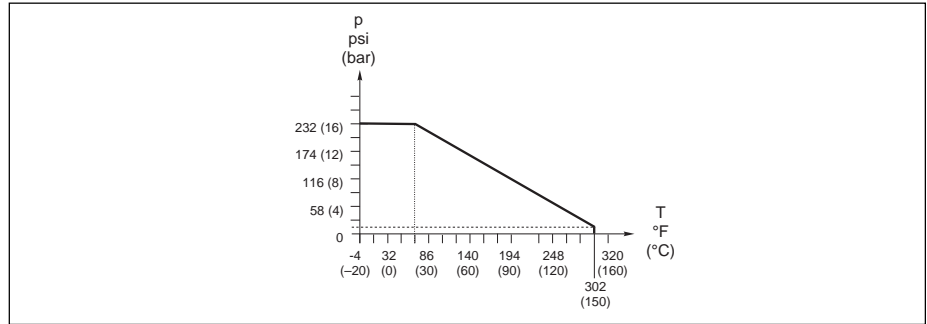
**Ingress protection** NEMA 6 (IP 67), fixed cable version  
NEMA 4 (IP 65), connector version

## Process

**Process temperature** -4° to +302°F (-20° to +150°C) at 14.5 psi (1 bar)

**Process pressure** 232 psi (16 bar) at 68°F (20°C)

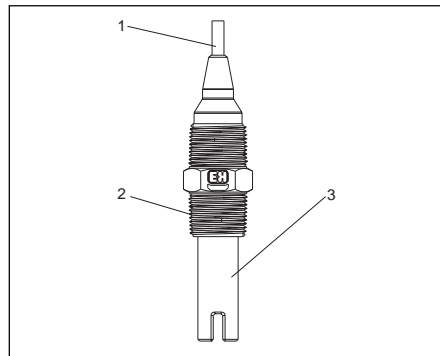
### Pressure / temperature load curve



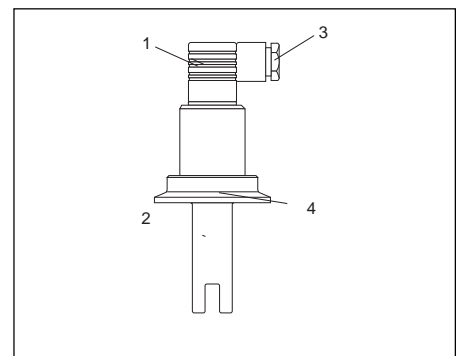
## Mechanical construction

### Design, dimensions

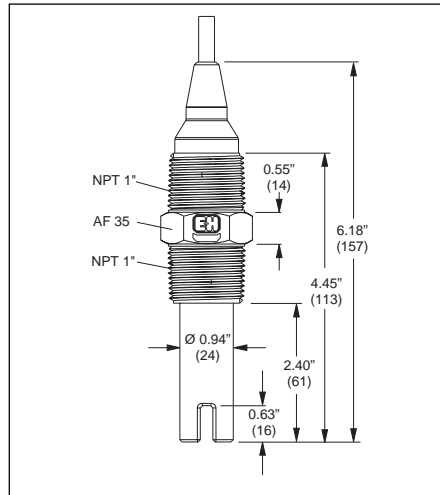
Dimensions are in inches (mm)



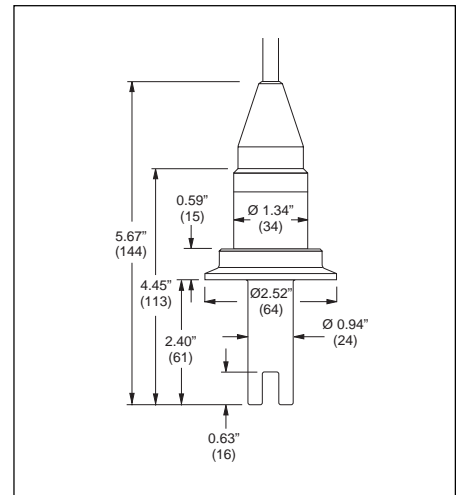
*Fixed cable version*  
1 Fixed cable  
2 1" NPT thread  
3 Measuring electrode



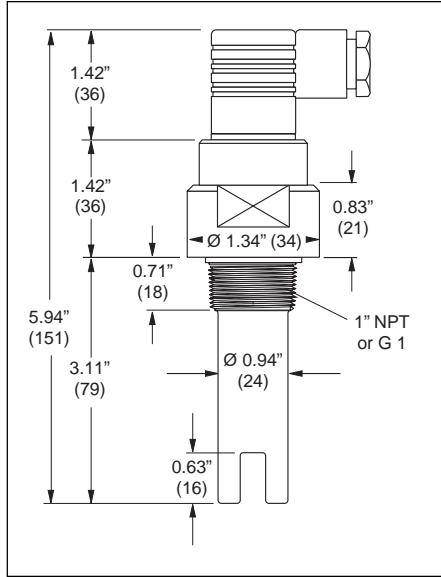
*Connector version*  
1 Four-pole connector  
2 Measuring electrode  
3 Pg 9 cable gland  
4 2" Tri-clamp



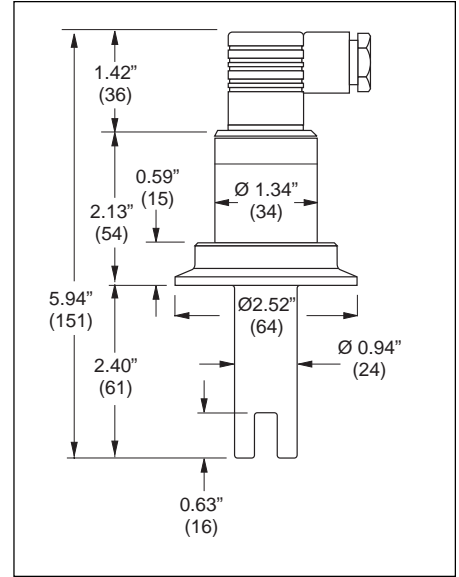
*Fixed cable version with 1" NPT thread*



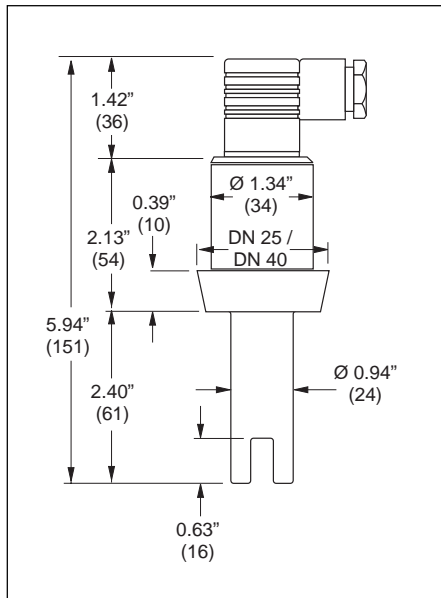
*Fixed cable version with 2" Tri-clamp*



G 1 thread connector version



2" Tri-clamp, connector version



Connector version with dairy fitting

**Weight**

Approximately 0.7 lb (0.3 kg), depending on version

**Mateirals**

Electrodes	Graphite
Sensor shaft	Polyethersulfone (PES)

**Process connection**

Fixed cable version	
Threaded	1" NPT
Clamp	2" Tri-clamp according to ISO 2852
Connector version	
Threaded	G 1
Clamp	2" Tri-clamp according to ISO 2852
Dairy fitting	DN 20 or DN 40 according to DIN 11851

## Certificates and approvals

### Hazardous approvals

ATEX II 1G EEx ia IIC T3 / T4 / T6  
 FM approved, when used with MyPro CLM 431 and Mycom S CLM 153 transmitters, contact Endress+Hauser for approval.

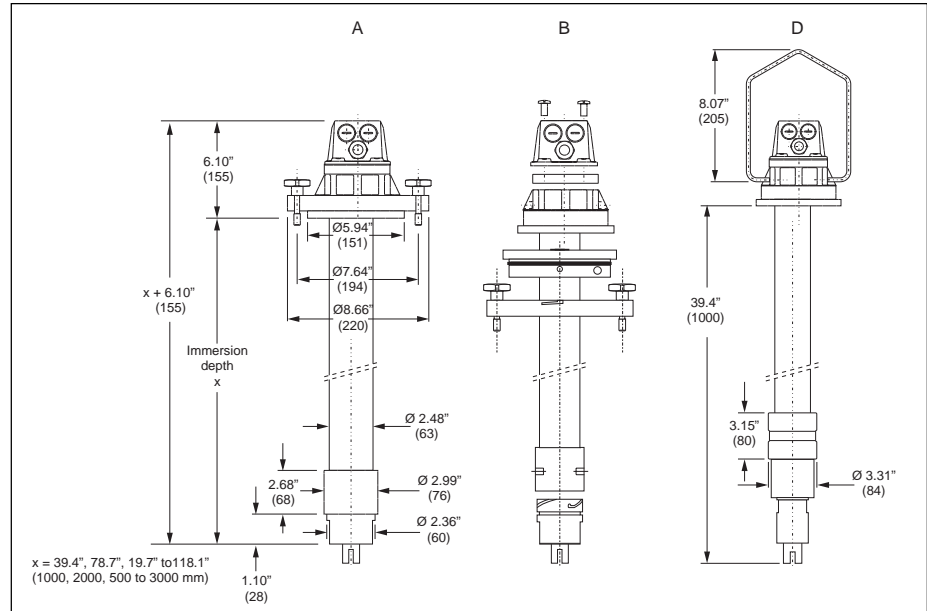
### Quality certificate

With statement of the individual cell constant

## Accessories

### Assemblies

DipFit W CLA 111 immersion and process assembly for open and closed tanks with DN 100 flange. Refer to Technical Information TI 135C/24/ae for ordering information.



DipFit CLA 111, DN 100 flange, mounting versions A, B and D

### CLA 751 Flow assembly

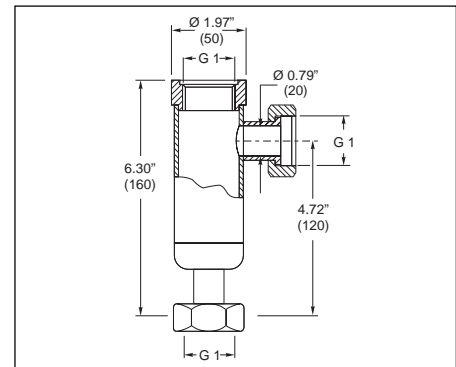
For installation of conductivity sensors with G 1 thread. Inlet (bottom) and outlet (side) DN 20 with G1 union nuts.

Material: 316Ti SS

Max. temperature: 320°F (160°C)

Max. pressure: 174 psi (12 bar)

Order number: 50004201



### CLA 752 Flow chamber

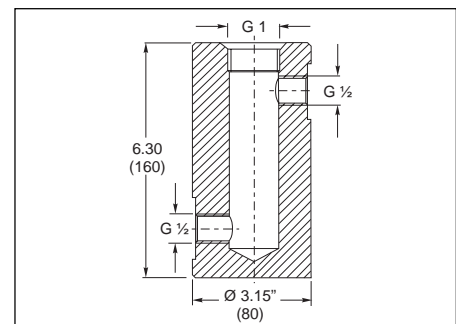
For installation of conductivity sensors with G1 thread. Inlet (bottom) and outlet (side) DN 20 with G 1/2 internal thread.

Material: Polypropylene (PP)

Max. temperature: 194°F (90°C)

Max. pressure: 87 psi (6 bar)

Order number: 50033772



**Measuring cables**

Special measuring cable CYK 71 for two electrode conductivity sensors with integrated temperature sensors, 1 low-noise coaxial line, 4 auxiliary cores at 0.75 mm<sup>2</sup> each with a common shield, outer diameter 0.25" (7 mm).

Sold by 1 meter lengths, minimum 15 ft (5 m)	Order number: 50085333
15 ft (5 m) length	Order number: 50088280
30 ft (10 m) length	Order number: 50088281
150 ft (50 m) length	Order number: 50088284
300 ft (100 m) length	Order number: 50088285

Special measuring cable / extension cable CYK 71-Ex, for hazardous applications, see CYK 71 above. Special cable is in blue sheath.

Sold by 1 meter lengths, minimum 15 ft (5 m)	Order number: 50085673
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**Junction box**

VBM junction box for cable extension, with 10 screw terminals, NEMA 4X (IP 65)

Cable entry, 1/2" NPT	Order number: 50003987
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Cable entry, Pg 13.5	Order number: 51500177
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VBM junction box for cable extension in hazardous area, with 10 high-impedance screw terminals (blue), NEMA 4X (IP 65): Order number 50003991

**Calibration solutions**

Calibration solutions are precision solutions to SRM (Standard Reference Material) of NIST for qualified calibration of conductivity measuring systems according to ISO, accuracy ± 0.5%, with temperature table.

CLY 11-A: 74 µS/cm, reference temperature 77°F (25°C), 500 ml container

Order number: 50081902

CLY 11-B: 149.6 µS/cm, reference temperature 77°F (25°C), 500 ml container

Order number: 50081903

CLY 11-C: 1.406 mS/cm, reference temperature 77°F (25°C), 500 ml container

Order number: 50081904

CLY 11-D: 12.64 mS/cm, reference temperature 77°F (25°C), 500 ml container

Order number: 50081905

**Supplemental documentation**

**Hazardous documentation**

Conductivity sensors for application in hazardous areas  
Order number: 51512902

XA 083C/07/a3

**Transmitters**

Mycom S CLM 153 transmitter Technical Information

TI 234C/24/ae

Liquisys M CLM 223/253 transmitter Technical Information

TI 193C/24/ae

MyPro CLM 431 transmitter Technical Information

TI 202C/24/ae

**Calibration solutions**

CLY 11 Calibration solutions Technical Information

TI 162C/24/ae

**Immersion assembly**

DipFit W CLA 111 assembly Technical Information

TI 135C/24/ae

## Ordering information

### ConduMax W CLS 21

Conductivity Measuring Cell CLS 21 -  1  2  3  4

- 1 Measuring range / cell constant  
C 10  $\mu$ S/cm to 20 mS/cm / k = 1/cm
- 2 Process connection / material
  - 1E G 1 (connector version only) / PES
  - 1I G 1 / 316 SS
  - 1K 1" NPT / 316 SS
  - 1M 3/4" NPT (fixed cable version only) / PES
  - 1N 1" NPT (fixed cable version only) / PES
  - 2A DN 25 dairy type DIN 11851 (connector version only) / PES
  - 2B DN 40 dairy type DIN 11851 (connector version only) / PES
  - 2C Dairy type, SMS / PES
  - 2D Dairy type, SMS / PES
  - 2F Dairy type SMS / SS
  - 3B 2" Tri-clamp / PES
  - 3C 2" Tri-clamp / SS
- 3 Measuring cable connection
  - 2 With 15 ft (5 m) fixed cable
  - 3 With 30 ft (10 m) fixed cable
  - 4 4-pole DIN connector with Pg 9 cable entry  
(CYK 71 cable sold separately)
- 4 Temperature sensor
  - A Integrated Pt 100 sensor
  - B Integrated PTC temperature sensor
  - D Without temperature sensor
  - G With Pt 1000 temperature sensor

For application and selection assistance,  
in the U.S. call 888-ENDRESS

For total support of your installed base, 24 hours  
a day, in the U.S. call 800-642-8737

Visit us on our web site, [www.us.endress.com](http://www.us.endress.com)

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