

Conductivity measuring cell

Installation and operating instructions



English (GB) Installation and operating instructions

Original installation and operating instructions.

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1. Symbols used in this document



Warning
If these safety instructions are not observed, it may result in personal injury.



Caution
If these safety instructions are not observed, it may result in malfunction or damage to the equipment.



Note
Notes or instructions that make the job easier and ensure safe operation.

2. General information

These installation and operating instructions contain all information important for users of the **conductivity measuring cell**:

- technical data
- instructions on commissioning, use and maintenance
- safety information.

Should you require further information or should you encounter problems that are not handled in sufficient depth in this manual, please contact Grundfos.

We shall be pleased to support you with our comprehensive know-how in the fields of measuring and control technology as well as water treatment.

We always welcome suggestions on how to optimise our installation and operating instructions to satisfy our customers.

2.1 Warranty

A warranty claim in accordance with our general terms of sale and delivery is only valid if these requirements are complied with:

- The device has been used in accordance with the information in this manual.
- The device has not been dismantled or handled incorrectly in any manner.
- Repairs have only been carried out by authorised personnel.
- Only original parts have been used for repairs.



Warning
Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

3. Description of the device

3.1 Assembly

The complete measuring system comprises:

- the measuring amplifier Conex® DIS-C (not included)
- the conductivity measuring cell with temperature sensor.

3.2 Principles of conductivity measurement

In metallic conductors, electricity is transported by freely moving electrons, whereas in electrolytes, the electrical current is carried by ions. All water-dissolved components that are in ionogenic form contribute towards conductivity. The conductivity is a sum parameter.

Different types of ions vary in their electrical charge and migration rate. The migration rate is highly dependent on temperature, which means the influence of temperature must always be taken into account when measuring conductivity.

Specific electrolytic conductivity is measured in Siemens per cm (S/cm). Siemens per cm is the reciprocal value of electrical resistance.

This measurement is based on a theoretical liquid cube with sides of a length of 1 cm. In practice, cells rarely have such an even geometric shape. The cell constant C is used to specify the correlation between the actual measured conductivity and the displayed specific conductivity.

The measuring cell is inserted in a flow armature, and the water to be measured flows around it. The Conex® DIS-C measuring and regulation device amplifies the signal from the measuring cell and calculates the signal (e.g. against cable and temperature compensation parameters). The result is displayed digitally and can also be registered using the analog output. The result is shown as an actual value.

4. Applications

The conductive or inductive conductivity measuring cell with Conex® DIS-C is used for measuring conductivity and for regulation of disturbance variables using a connected control element.

4.1 Field of application for measurements

Principal uses:

- waste water treatment
- water purification
- recycling
- in metal processing industries
- in the chemical industry
- in the foodstuff processing industry.

5. Safety

The owner/operations manager of the system is responsible for the following:

- compliance with country-specific safety regulations
- training of operating personnel
- provision of prescribed protective gear
- implementation of regular maintenance.

5.1 Obligations of the owner/operations manager

The owner/operations manager must ensure that persons working with the described device fulfil these requirements:

- They are acquainted with the regulations concerning working safety and accident prevention.
- They have been trained in use of the device.
- They have read and understood the warning information and handling symbols.
- The owner/operations manager is also responsible for ensuring that this manual is kept in the immediate vicinity of the device and is always available for the operating personnel.

5.2 Avoidance of danger

Warning



Do not dismantle the device!

Cleaning, maintenance and repairs must only be carried out by authorised personnel!



Warning

Other applications than those described in section 4. Applications are not approved and not permitted. Grundfos accepts no liability for any damage resulting from incorrect use.

6. Identification

6.1 Nameplate

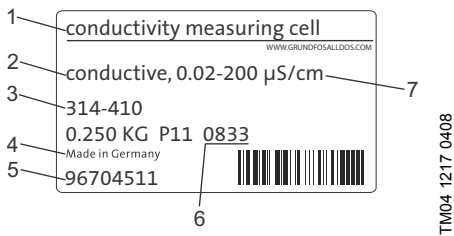


Fig. 1 Nameplate, conductivity measuring cell

Pos.	Description
1	Product name
2	Measuring principle
3	Model
4	Country of origin
5	Product number
6	Year and week of production
7	Measuring range

7. Measuring principle

7.1 Conductive conductivity

The measuring cell contains two open electrodes to which an AC voltage is applied. The liquid has a specific conductivity between the electrodes:

$$\frac{1}{R}$$

The measuring cell has a constant value (c), which is determined by the distance (d) and the area of the electrodes (A):

$$c = \frac{d}{A}$$

Depending on the resistance of the liquid, a specific current (I) is generated by the applied voltage (U). The conductivity (x) of the liquid is calculated as follows:

$$x = c \cdot \frac{1}{R} = \frac{d}{A} \cdot \frac{I}{U}$$

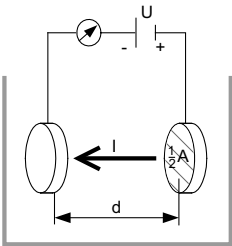


Fig. 2 Conductive conductivity

Pos.	Description
d	Distance between the electrodes
A	Area of the electrodes
U	Applied voltage
I	Generated current

7.2 Inductive conductivity

The measuring cell contains two measuring coils in a ring-type enclosure. The liquid flows through and around the enclosure.

A sinusoidal AC voltage (U1) is applied at the first coil, which induces a current (I) in the liquid, and this in turn induces a voltage (U2) in the second coil depending on the resistance of the liquid.

The conductivity of the liquid is determined by the measured voltage (U2) and the constant value.

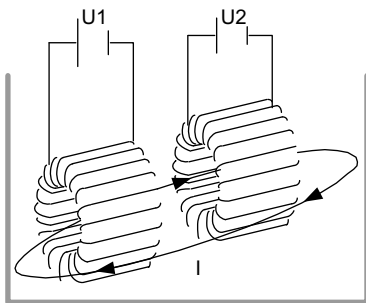


Fig. 3 Inductive conductivity

TM03 7009 4409

Pos.	Description
U1	Applied voltage
U2	Measured voltage
I	Current

8. Conductivity measuring cells for conductive measurements

The measuring cells 96609150, 96609151 and 96609152 are standard measuring cells for virtually all applications.

They consist of a PVDF body with PVDF and FKM inserts, two concentric stainless steel electrodes (material: stainless steel 1.4571), a PVDF 3/4" internal thread and a connector head.

The measuring cell is supplied with an integrated temperature sensor Pt100. The sensor can be connected to Conex® DIS-C, CC devices.



Fig. 4 Conductivity measuring cells for conductive measurements

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8.1 Technical data

Maximum temperature	135 °C (liquid media)
Maximum pressure (at 25 °C)	16 bar (at 25 °C)
Accuracy	± 1 %
Built-in temperature sensor	Pt100
Minimum immersion depth	60 mm

8.1.1 Cell constant c, measuring range

Product number	Cell constant c value	Measuring range [μS/cm]	
		Start	End
96609150	0.05	0	200
96609151	0.2	0	2000
96609152	1	0	20000

8.1.2 Cable

Product number	Description	Length
96611925	Type LIYCY 4 x 0.5 mm ²	5 m
96611928		15 m
96611929		25 m

Note

The maximum cable length between the sensor and measuring amplifier is 50 metres.

8.1.3 Maximum velocity of approach in dependence of the existing conductivity

Conductivity	Maximum velocity of approach
< 500 µS	1 m/s
500 µS - 2000 µS	2 m/s
> 2000 µS	Signal is independent of velocity of approach

8.1.4 Dimensional sketch

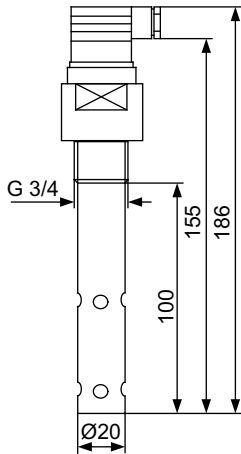


Fig. 5 Dimensional sketch of conductivity measuring cells for conductive measurements

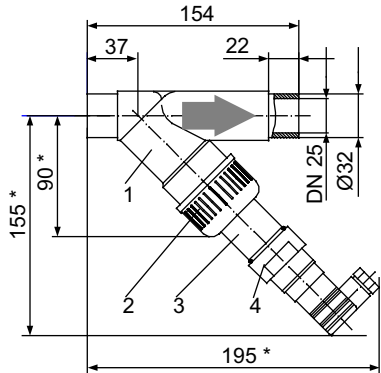
8.2 Flow armature

The flow armature with pipe connection for adhesive bonding is designed for simple applications for inserting a conductivity measuring cell. The measuring cell can be easily installed using union nuts.

Order numbers for the flow armatures are available on request.

Note

The installation position is shown in fig. 6.



Dimensions in mm
* approximate values

Fig. 6 Flow armature

Pos.	Description
1	Transparent enclosure (PVC-U)
2	Union nut (PVC-U, grey)
3	Adaptor D (PVC-U, grey)
4	Conductivity measuring cell

Specifications for flow armature

Maximum pressure	6 bar
Maximum temperature	40 °C
Diameter/ nominal width	DN 25
Length	Approximately 380 mm
Material	PVC

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TM03 7011 4409

8.3 Installation

8.3.1 Installing the flow armature

Note

See fig. 6 for the installation position of the armature.

Glue the ends together using adhesive bonding.

8.3.2 Installing the measuring cell in the flow armature

Screw the measuring cell into the G 3/4 thread of the measuring cell adaptor.

8.3.3 Installing the measuring cell without flow armature

The measuring cell can be installed directly in pipework or at branches, e.g. in a t-piece. For the installation position, please note that the minimum immersion depth of the electrode shaft is 60 mm.

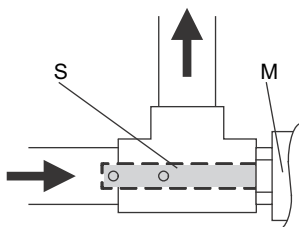


Fig. 7 Installing the measuring cell without flow armature

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Pos.	Description
M	Measuring cell
S	Electrode shaft

8.4 Electrical connections

The conductivity measuring cells for conductive measurements are wired according to the following connection chart.

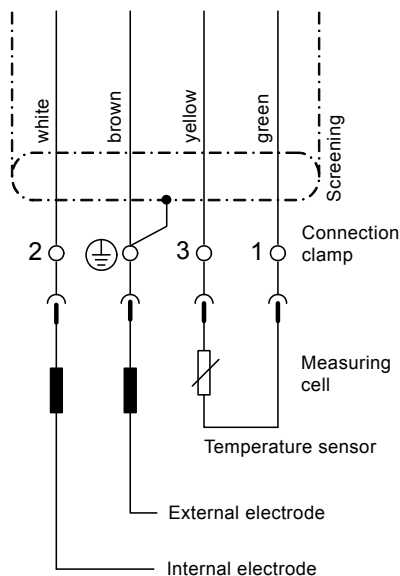


Fig. 8 Electrical connection of 96609150, 96609151 and 96609152

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8.4.1 Connecting the measuring cell

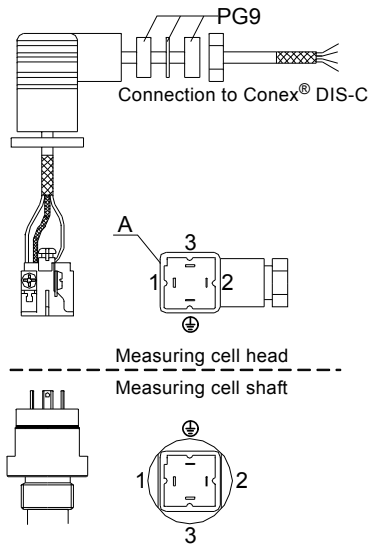


Fig. 9 Connecting the measuring cell

Connecting cables

1. Separate the measuring cell head and measuring cell shaft to open the measuring cell connector.
2. Remove the central screw from the outlet box.
3. To remove the contact holder (clamping part), lift up "A" using a screwdriver.
4. Loosen the PG9 cable gland, and insert the cable.
5. Strip and connect the cable and wires.
6. Screw the cable screwing and outlet box back into place.
7. Reconnect the measuring cell connector.



Warning

The screening must not be connected on the device side.

Caution

Make sure the gaskets are sealed correctly.

Note

Connect the measuring amplifier according to the measuring amplifier instructions.

9. Conductivity measuring cell for inductive measurements

The measuring cell 95720194 for inductive conductivity measurements is made of PP. The measuring cell includes two internal measuring coils, 6 metres of permanently connected cable and an integrated temperature sensor.

The sensor can be connected to Conex® DIS-C, CI devices.



Fig. 10 Conductivity measuring cell for inductive measurements

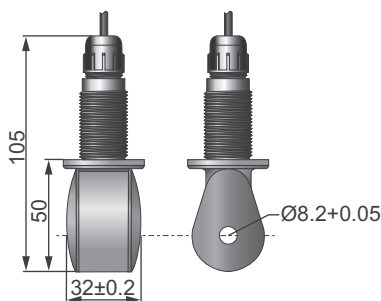
9.1 Technical data

Maximum temperature	90 °C
Maximum pressure at 20 °C	10 bar
Maximum pressure at 60 °C	6 bar
Accuracy	± 2 %
Built-in temperature sensor	NTC
Cable	6 metres included

9.1.1 Measuring range

Measuring range [mS/cm]	
Start	End
0	2
0	20
0	200
0	2000

9.1.2 Dimensional sketch



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Fig. 11 Dimensional sketch of inductive measuring cells

Note *Install the inductive measuring cell so that the liquid flows through the ring.*

9.2 Electrical connections

The conductivity measuring cell for inductive measurements is supplied fully wired.

Note *Connect the measuring amplifier according to the measuring amplifier instructions.*

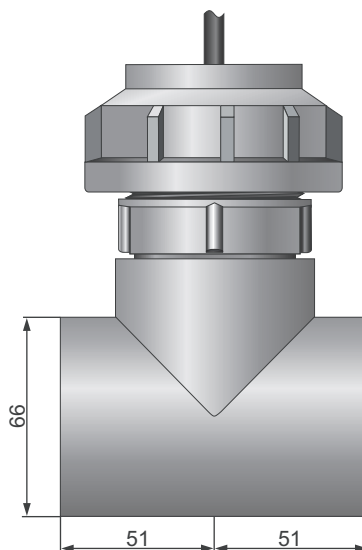
9.2.1 Cable / extension cable

Product number	Description
95720380	4-wire, individually screened, type CAT B 23290 Top line 8 8150-1 4P22, 10 m extension cable

Note *The maximum cable length between the sensor and measuring amplifier is 16 metres.*

9.3 Flow armature

Product number	Description
95720197	Flow armature, PP
95720198	Flow armature, PVC



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Fig. 12 Flow armature

Maximum temperature	• 90 °C (PP) • 40 °C (PVC)
Nominal width	DN 50
Length	102 mm
Material	• PP • PVC

9.4 Installation

9.4.1 Installing the flow armature

- PVC: Glue the DN 50 connection.
- PP: Weld the DN 50 connection.

9.4.2 Installing the measuring cell in the flow armature

Insert the measuring cell into the armature, and tighten with the connection nut.

Caution *Make sure the gaskets are sealed correctly.*

Note *Install the parts according to the sketch so that the liquid flows through the ring.*

9.5 Electrical connections

For the electrical connection of the sensor see section [9.2 Electrical connections](#).

9.6 Immersion armature

Product number	Description
95720196	Immersion armature, PP
Immersion depth	Minimum 100 mm / maximum 900 mm
Diameter	25 mm
Length	1000 mm
Material	PP
Maximum temperature	90 °C

9.6.1 Dimensional sketch

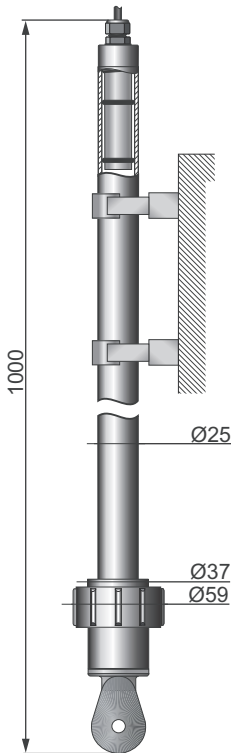


Fig. 13 Dimensional sketch of inductive measuring cells with immersion armature

9.6.2 Installation

Installing the measuring cell in the immersion armature

- Screw the measuring cell into the immersion armature.
- Mount the pipe clamp on the tank wall, keeping a distance to the tank wall of approximately 100 mm and attach the immersion armature,
- or insert the immersion armature in the tank, keeping a distance to the tank wall of approximately 100 mm.

Caution Make sure the gaskets are secure.

Note Install the parts according to the sketch so that the liquid flows through the ring.

9.7 Electrical connections

For the electrical connection of the sensor see section [9.2 Electrical connections](#).

10. Disposal

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

Subject to alterations.

TM04 1420 3914

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