



## Inductive Conductivity Transmitter

**B 20.2752**  
**Operating Instructions**

09.02/00345262



Please read these Operating Instructions before starting up the instrument. Keep the operating instructions in a place which is accessible to all users at all times. Please assist us to improve these operating instructions. Your suggestions will be most welcome.



All the necessary settings are described in this manual. If any difficulties should still arise during start-up, please do not carry out any unauthorised manipulations, as this might endanger your rights under the instrument warranty! Please contact the nearest subsidiary or the main factory.



When returning chassis, assemblies or components, the rules of EN 100 015 “Protection of electrostatically sensitive devices” must be observed. Use only the appropriate ESD packaging material for transport.

Please note that we cannot be held liable for damage caused by ESD (electrostatic discharge).

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## 1.1 Typographical conventions

### 1.1.1 Warning signs



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**Danger**

This symbol is used when there may be **danger to personnel** if the instructions are disregarded or not followed accurately.

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**Warning**

This symbol is used when there may be **damage to equipment or data** if the instructions are disregarded or not followed accurately.

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**Warning**

This symbol is used where **special care** is required when handling components liable to damage through electrostatic discharge.

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### 1.1.2 Note signs



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**Note**

This sign is used when your **special attention** is drawn to a remark.

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**Reference**

This sign refers to **further information** in other handbooks, chapters or sections.

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abc<sup>1</sup>

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**Footnote**

Footnotes are notes which **refer to certain points** in the text. Footnotes consist of two parts:

Marking in the text and the footnote text.

The markings in the text are arranged as continuous raised (superscript) numbers.

The footnote text (in smaller typeface) is placed at the bottom of the text and starts with a number and a full stop.

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**Action**

This sign indicates that an **action to be performed** is described.

The individual steps are marked by this asterisk, e.g.

\*

\* Unscrew crosspoint screws

\* Remove housing cover

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# 1 Introduction

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## 1.2 Instrument description

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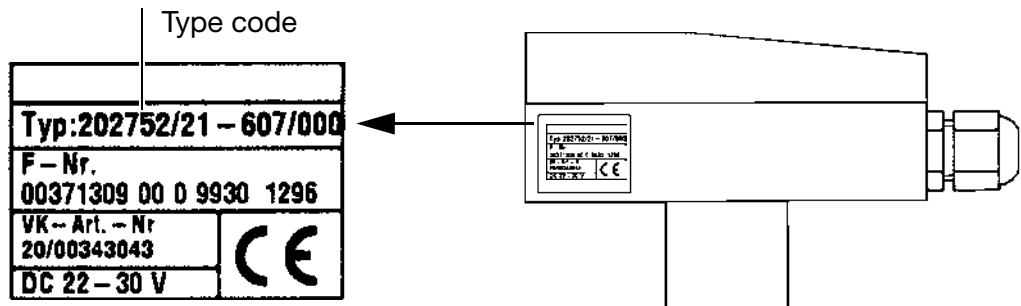
<b>Transmitter</b>	<p>The transmitter for measuring specific conductivity has been designed for use on site. The sturdy housing (IP67 protection) of glassfibre reinforced polyamide protects the electronics and the electrical connections from corrosive environmental conditions. A 3-wire transmitter for conductivity and a 2-wire transmitter for temperature (output signals 4 – 20mA) are provided as standard. As an option, the conductivity can be shown on an integrated 3½ digit LCD digital display. The current signals can be processed by suitable indicator/control units or directly on a PLC.</p>
<b>Process connections</b>	<p>For a variety of applications, the unit can be provided with different process connections. If not otherwise specified, the male threads and process connections are made of stainless steel V2A 1.4301.</p>
<b>Typical applications</b>	<p>The transmitter is used in liquid media where severe deposits of dirt, oil, grease, gypsum or lime are to be expected:</p> <ul style="list-style-type: none"><li>- Food, drinks and pharmaceutical industry</li><li>- Product monitoring (phase separation product/product mixture/water) in the drinks industry, breweries and dairies</li><li>- Operation (e.g. phase separation detergent/rinsing water) of cleaning processes e.g. for bottle cleaning plants and tank cleaning</li><li>- Concentration control for acids and caustic solutions e.g. in galvanisation and process chemistry</li><li>- Use in CIP plants</li><li>- Water and waste water technology, e.g. car wash and non-drinking water monitoring</li><li>- Dosing of chemicals</li><li>- Leakage indication with separate circuits, e.g. for heating and cooling plants</li></ul>

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## 2 Identifying the instrument version

### 2.1 Label

#### Location



The label is fixed onto the housing, with an additional one inside the housing cover.

### 2.2 Type designation

#### Type code

202752/ (1) (2) (3)  
 .. - ... / ...

(1) Basic type additions	Code
version 1, no temperature compensation	10
version 2, with single temperature compensation	21
version 2, with 4-fold temperature compensation	22
version 3, with single temperature compensation	31
version 3, with 4-fold temperature compensation	32

(2) Process connection	Code
male thread 1¼" pipe A	107
male thread 1½" pipe A	108
male thread 2" pipe A	110
union nut 2¾", PVC (G+F), e. g. in combination with extra codes /355, /356 or /357	160
screwed pipe joint DN 50, DIN 11851	607
screwed pipe joint DN65, DIN 11851	608
screwed pipe joint DN80, DIN 11851	609
clamp connection 2½"	617
connection VARIVENT DN50	686
SMS screw joint DN2"	690

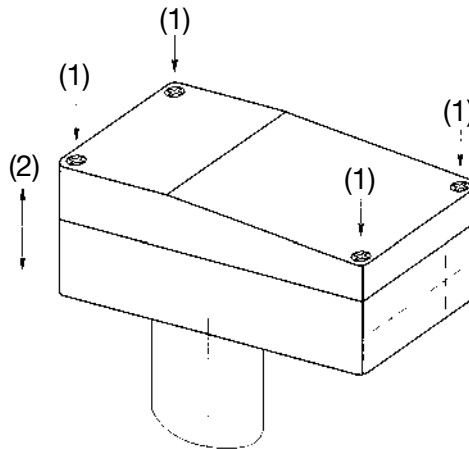
(3) Extra codes <sup>1</sup>	Code
no extra code	000
integral digital display (3½ digits), conductivity	110
integral digital display (3½ digits), conductivity alternating with temperature (not available for version with 4-fold TC)	111
PVC tee DN50 (G+F)	355
PVC through-flow fitting	356
PVC tee DN50 with screwed butt joint	357
high-temperature application	765
special measuring cell length, length specification in plain text (max. 500 mm)	766
measuring cell material PEEK (standard material PVDF)	767

1. Extra codes are listed in sequence and separated by commas

# 3 Settings inside the instrument

## 3.1 Selecting the measurement range

Opening the housing cover



- \* Unscrew the 4 crosspoint screws (1).
- \* Remove cover (2).



When closing, take care that the sealing ring is clean and properly seated!

### Procedure

#### Step 1: Select measurement range group

- \* Insert jumper of socket JO3 in position I, II or III.

#### Step 2: Select measurement range

for fixed range:

- \* Insert links between the screw terminals of terminal strip J01  
or

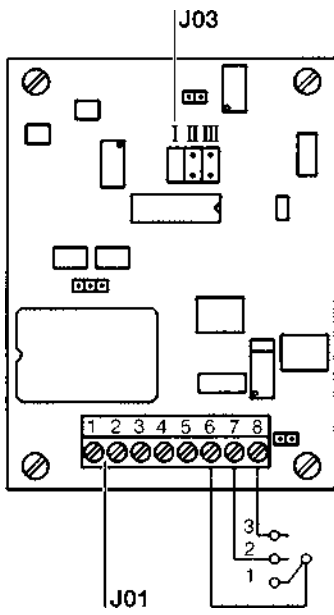
for variable range:

- \* Connect external floating contacts

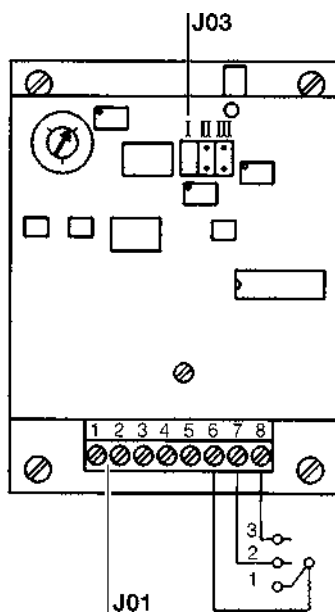
### Evaluation table

Meas. range group (J03)	Measurement range in mS/cm (J01)		
	1 (no links)	2 (links 6 - 7)	3 (links 6 - 8)
<b>Type 202752/10 without temperature compensation</b>			
I	0 – 200	0 – 20	0 – 2
II	0 – 200	0 – 2000	0 – 20
III	0 – 500	0 – 50	0 – 5
<b>Type 202752/21 (22) with single (4-fold) temperature compensation</b>			
I	0 – 100	0 – 10	0 – 1
II	0 – 1000	0 – 100	0 – 10
III	0 – 250	0 – 25	0 – 2.5
<b>Type 202752/31 (32) with single (4-fold) temperature compensation</b>			
I	not permitted		
II	not permitted		
III	0 – 200	0 – 20	0 – 2

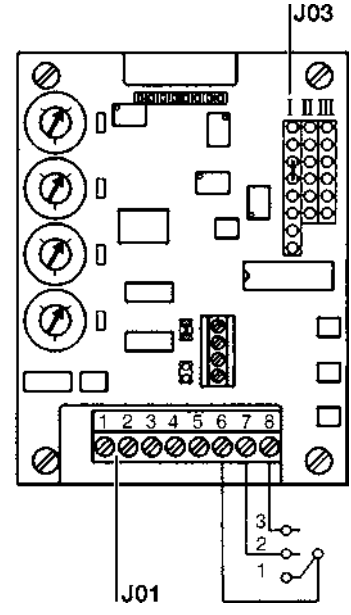
## 3 Settings inside the instrument



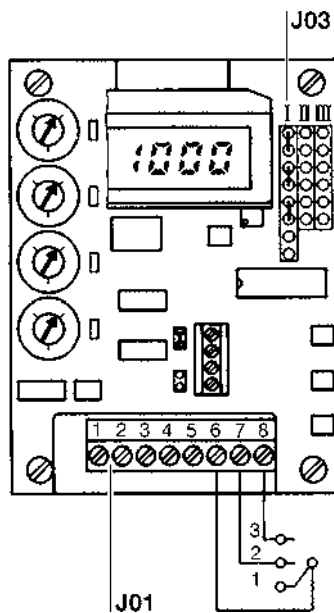
**Type 202752/10**  
without  
temperature compensation



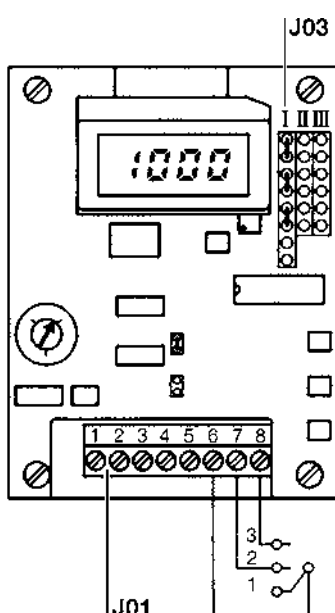
**Type 202752/21 (/31)**  
with single  
temperature compensation



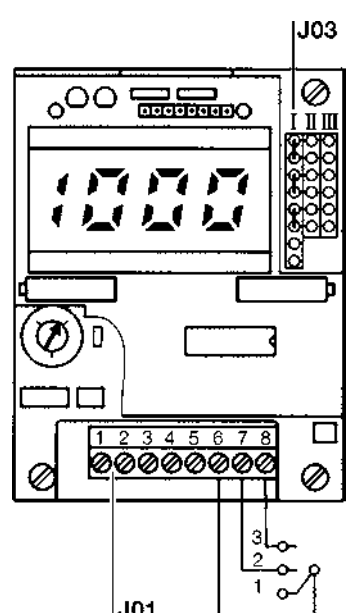
**Type 202752/22 (/32)**  
with 4-fold  
temperature compensation



**Type 202752/22 (/32)/110**  
with 4-fold  
temperature compensation



**Type 202752/21 (/31)/110**  
with single  
temperature compensation



**Type 202752/21 (/31)/111**  
with single  
temperature compensation

## 3 Settings inside the instrument

### 3.2 Temperature compensation (TC)

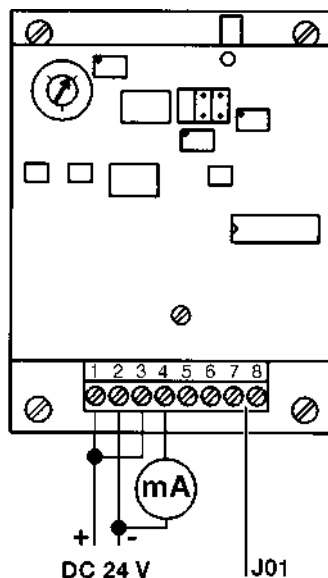
#### General

The cell is fitted with a Pt100 temperature sensor for temperature measurement and compensation. The conductivity of a liquid depends on its consistency and temperature. Even if the consistency remains constant, the actual conductivity will change with temperature. The temperature compensation (in the following called TC) corrects the actual conductivity as measured to the internationally recognized 25°C reference temperature. Since the temperature coefficient is medium-specific, it is necessary to set the correct temperature coefficient on the instrument during commissioning. This temperature coefficient is valid for a specific consistency of a particular liquid.

#### Preparation

##### Electrical connection (screw terminal J01):

- \* Connect the DC 24 V supply voltage
- \* Connect indicator unit or multimeter with a range of 4 – 20 mA (optionally integrated in instrument; extra codes 110 or 111).

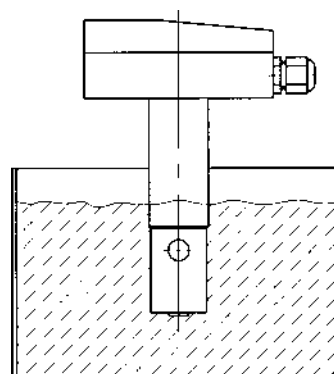


##### Measurement medium:

- \* Immerse cell in vessel filled with the medium



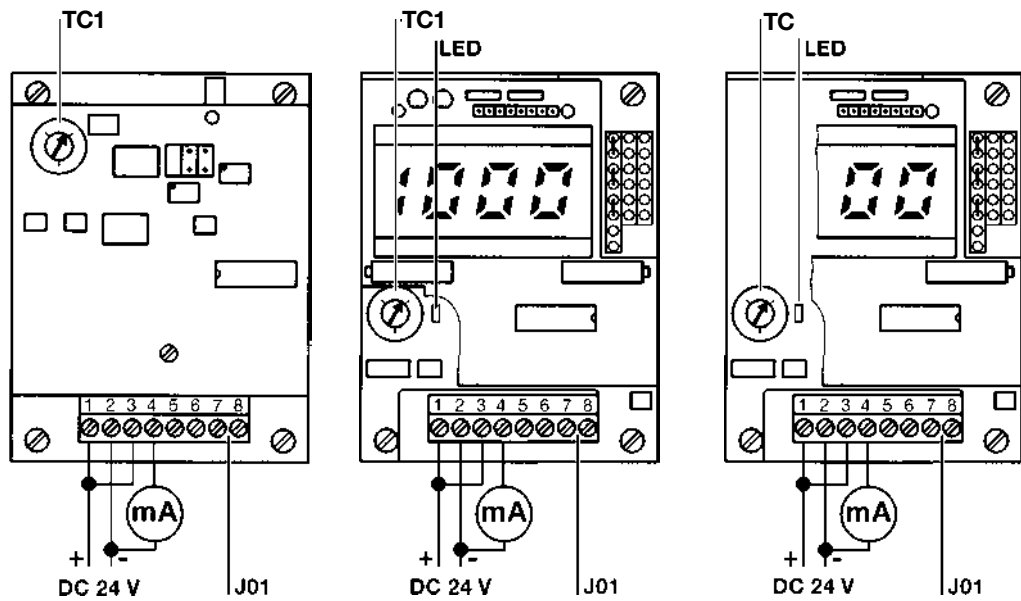
The clearance to all sides of the vessel, as well as to the bottom, must not be less than 5 mm, otherwise the measurement will be inaccurate. An even temperature distribution is equally important. The cell has to be kept still during measurement.



## 3 Settings inside the instrument

### 3.2.1 Single TC

#### Adjustment



Type 202752/21 (/31)    Type 202752/21 (/31)/110    Type 202752/21 (/31)/111

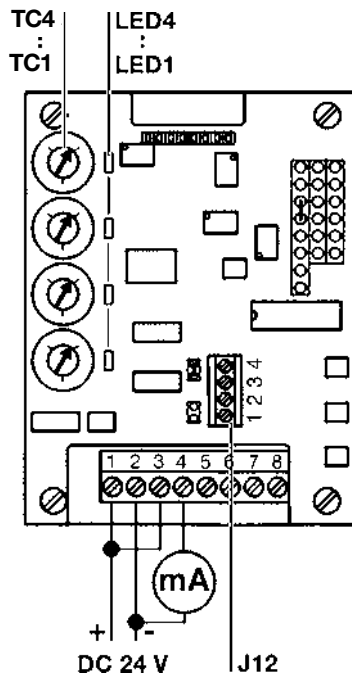
- \* Set the TC potentiometer to 0 (left stop)
- \* Temper measurement medium to 25°C
- \* Note down the display value
- \* Heat/cool medium to the intended operating temperature
- \* Using the TC potentiometer, set the value that was previously noted down

☞ The temperature coefficient is set correctly.

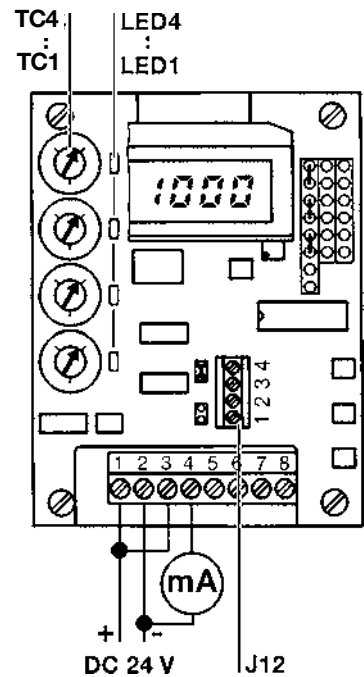
# 3 Settings inside the instrument

## 3.2.2 4-fold TC

Selecting the TC potentiometer



Type 202752/22 (/32)



Type 202752/22 (/32) /110

By applying a voltage between the screw terminals listed in the table, the relevant potentiometer for the medium available in the present process step can be activated.

\* Connect voltage according to the table

Screw terminals (J12)	TC1	TC2	TC3	TC4
1	-	+24 V	-	+24 V
2	-	-	-	-
3	-	-	+24 V	+24 V
4	-	0 V	0 V	0 V

The TC potentiometer that is operated is optically indicated by an LED.

### Adjustment

- \* Set TC potentiometer to 0 (left stop)
- \* Temper the measurement medium to 25°C
- \* Note down the display value
- \* Heat/cool measurement medium to the intended operating temperature
- \* Using the TC potentiometer, set the value that was previously noted down

☞ The temperature coefficient is set correctly.

## 4 Fitting in position

### 4.1 Location

#### Basics

The location should be easily accessible and free from vibration. The permitted ambient temperature must be observed (taking into account possible heat emission).

⇒ Section 7.1 “Technical data”

The transmitter can best be fitted in position in a pipe of DN65 or larger by means of a tee with an NW50 screwed pipe joint.



The installation has to be depressurised before assembly and disassembly!

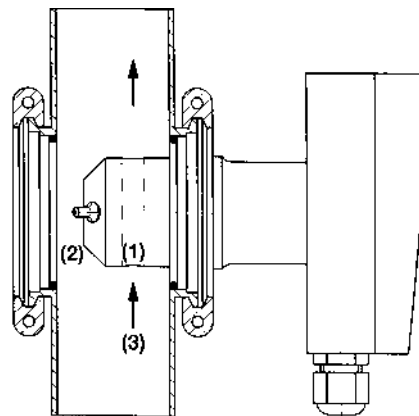
Depending on the application, any liquid that runs out may be corrosive!

The instrument is not suitable for installation in areas with an explosion hazard!

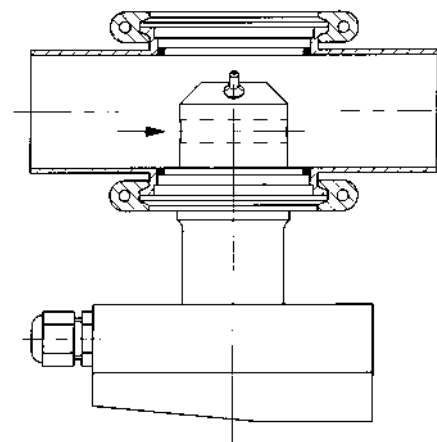
#### Operating position

The operating position is generally unrestricted. However, it is essential to ensure a continuous exchange of the measurement medium in the through-flow channel (3).

The probe body (1) must be enveloped on all sides by the measurement medium. The clearance (2) to the walls should not be less than 5 mm, otherwise the measurement could be falsified.



Example: Version “Varivent”



#### Vertical mounting

If possible, the inductive conductivity transmitter should be installed in pipes with a vertical orientation, in order to avoid falsification of the measurements through gas bubbles. Through-flow must be from the bottom to the top. It is advisable to rotate the housing so that the electrical connections point downwards.

If the inductive conductivity transmitter is to be installed in horizontal pipes, then it should be mounted from below to avoid gas bubbles which could falsify the measurement.

#### Horizontal mounting

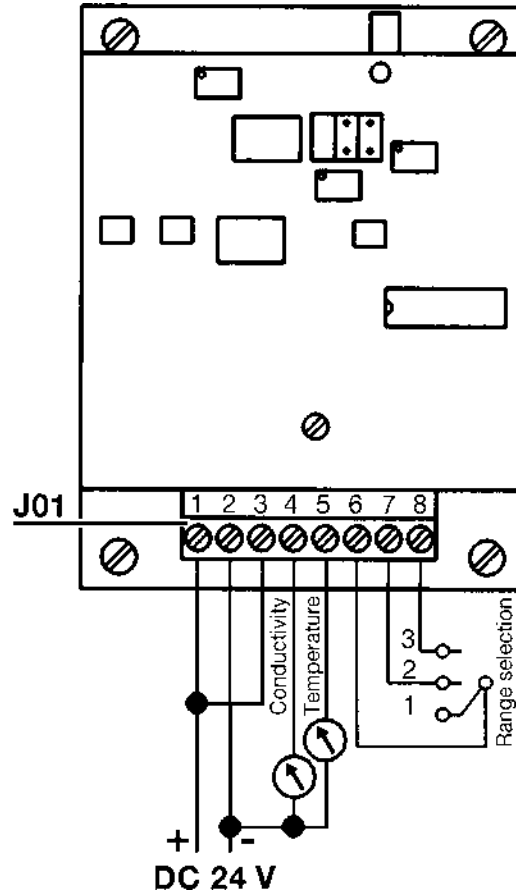
# 5 Electrical connection

## 5.1 Connection diagram



Take care that the supply and the output have the correct polarity!  
 Incorrect polarity will result in the destruction of the outputs!

Valid for all instrument versions



Auf richtige Polung der Spannungsversorgung und des Ausganges achten! Verpolung führt zur Zerstörung der Ausgänge!!

Connection	Screw terminal strip J01
Supply 24 V DC (+) (-)	1 and 3 2
Conductivity output 4 – 20 mA	4
Temperature output 4 – 20 mA	5
Range selection range 1	no links
Range selection range 2	link between 6 and 7
Range selection range 3	link between 6 and 8

## 6 What to do if ...?

### 6.1 Fault finding

#### Possible errors

Problem	possible cause	Action
no measurement display or current output	supply missing	check supply, check terminals
measurement display 000 or current output 4 mA	sensor not immersed in medium; level in vessel is too low	fill vessel
	through-flow fitting blocked	clean through-flow fitting
	sensor faulty	⇒ Section 6.2 “Instrument testing”
erroneous or unstable measurement display	sensor not sufficiently immersed	fill vessel
	inadequate mixing	ensure thorough mixing; take care that the sensor has a flow clearance of approx. 5 mm in all directions
	gas bubbles	check installation site, ⇒ Section 4.1 “Location”
display overflows if TC setting is other than 0%/°C	temperature transmitter is not connected to the supply	insert a link between terminals 1 and 3 of J01

### 6.2 Instrument testing

#### General

Ex-factory, the instrument is calibrated and maintenance-free. However, if any measurement deviations from unknown causes occur, the transmitter can be tested as follows.



Do not adjust any potentiometer (factory setting)!

The only adjustment on the instrument that is permitted is the TC setting.

⇒ Section 3.2 “Temperature compensation (TC)”

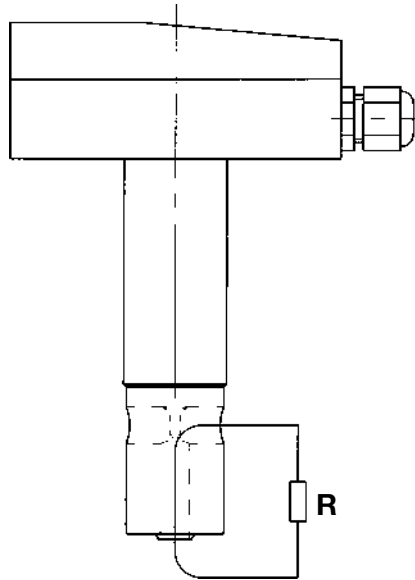
# 6 What to do if ...?

## 6.2.1 Testing with ohmic resistance (resistance loop)

### Position of resistance loop



Do not touch the sensitive part of the cell, or let it come into contact with anything during calibration, otherwise the measured value will be falsified.



- \* Lead the wire through the measurement cell (see diagram)
- \* Connect resistor R to wire

### Calculation of resistance

Style of measuring cell	Cell constant K
T-shape	5.45 1/cm
“Varivent”	7.30 1/cm

Formula to calculate the resistance of the resistance loop:

$$R = \frac{K}{L_f}$$

R = resistance of resistance loop

K = cell constant

L<sub>f</sub> = required conductivity display in S/cm

Note: 1 mS/cm = 1·10<sup>-3</sup> S/cm

Example =  $\frac{\text{T-shaped cell}}{\text{required display 10mS/cm}}$

$$R = \frac{5.45 \text{ 1/cm}}{10 \cdot 10^{-3} \text{ S/cm}} = 545 \Omega$$

To obtain a display of 10 mS/cm, the resistance loop must have a resistance of 545 Ohm.

### Carrying out the test

- \* Calculate the test resistances according to the formula above.
- \* Connect the instrument electrically,
  - ⇒ Section 5 “Electrical connection”.
- \* Select the measurement range to suit the test resistances,
  - ⇒ Section 3.1 “Selecting the measurement range”.
- \* Set TC to 0%/°C
  - ⇒ Section 3.2 “Temperature compensation (TC)”.
- \* Attach resistance loop as on diagram.

The output and (if appropriate) the display of the instrument, or of the indicator unit that is connected, must correspond to the calculated value. From the current value of the measurement output, the actual conductivity at the measuring cell can be calculated as follows:

$$\text{Conductivity at the cell} = \frac{\text{Measurement output [mA]} - 4 \text{ mA}}{16 \text{ mA}} \cdot \text{Range end}$$

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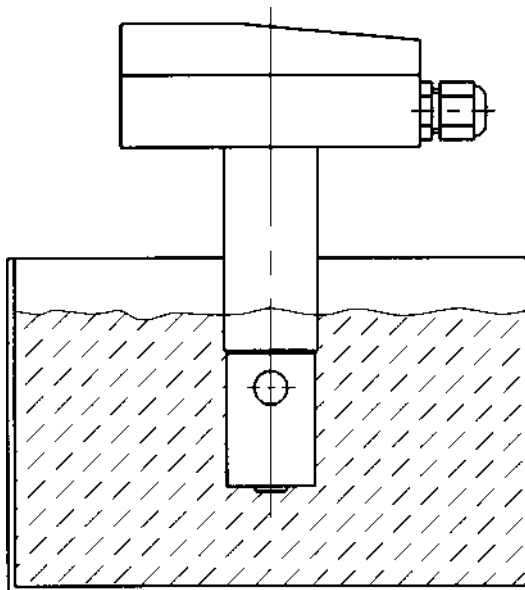
## 6 What to do if ...?

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### 6.2.2 Testing with a reference solution

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Immersion in  
test solution



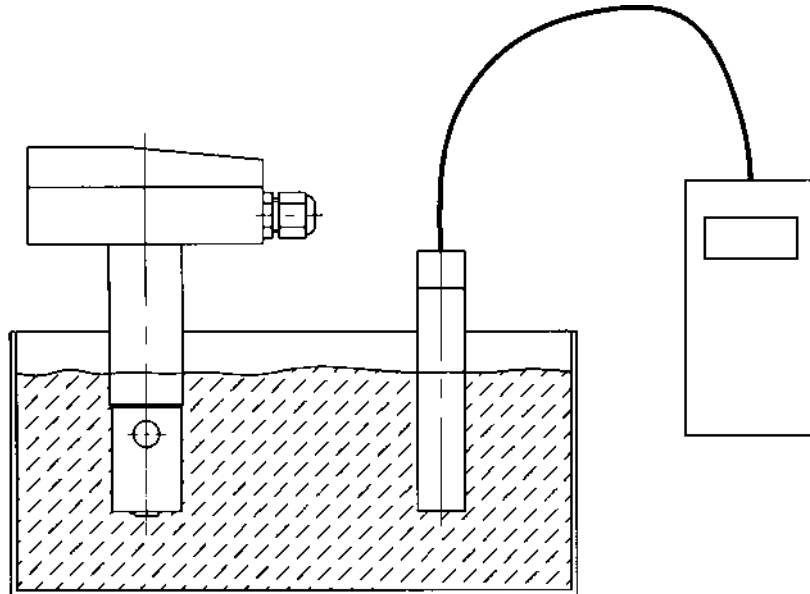
Carrying out  
the test

- \* Provide conductivity test solution in a vessel of adequate size
  - ⇒ Section 3.2 “Temperature compensation (TC)”,  
e.g. conductivity test solution with a conductivity of 1.44 mS/cm, 12.88 mS/cm or 111.8 mS/cm.
- \* Connect instrument electrically,
  - ⇒ Section 5 “Electrical connection”.
- \* Select measurement range according to the conductivity test solution
  - ⇒ Section 3.1 “Selecting the measurement range”
- \* Set TC to 0%/°C
  - ⇒ Section 3.2.1 “Single TC” or Section 3.2.2 “4-fold TC”.
- \* Immerse cell in vessel and hold it still during measurement.
- \* The output and (if appropriate) the indication of the instrument, or of the indicator unit that is connected, must correspond to the value of the test solution (taking into account the temperature of the conductivity test solution).
- \* From the current value of the measurement output, the actual conductivity at the cell can be calculated as follows:

$$\text{Conductivity at the cell} = \frac{\text{Measurement output} \quad \bullet \text{ Range end}}{[\text{mA}] - 4 \text{ mA}} \cdot 16 \text{ mA}$$

### 6.2.3 Testing with a reference instrument

#### Immersion in test solution



#### Carrying out the test

- \* Provide conductivity test solution in a vessel of adequate size,
  - ⇒ Section 3.2 “Temperature compensation (TC)”.
- \* Connect the instrument electrically,
  - ⇒ Section 5 “Electrical connection”.
- \* Select measurement range according to the test solution
  - ⇒ Section 3.1 “Selecting the measurement range”.
- \* Set TC to 0%/°C stellen,
  - ⇒ Section 3.2.1 “Single TC” or Section 3.2.2 “4-fold TC”.
- \* Set TC to 0%/°C, also on reference instrument (see Operating Instructions for reference instrument). If this is not possible, the test solution has to be tempered to the reference temperature of the reference instrument.
- \* Immerse the cell to be tested and the cell of the reference instrument in the vessel and hold them still during measurement.
- \* The output and the indication of the instrument to be tested, or the display of the indicator unit that is connected and that of the reference instrument, must correspond, taking into account the permissible instrument errors.
- \* From the current value of the measurement output, the actual conductivity at the measuring cell can be calculated as follows:

$$\text{Conductivity at the cell} = \frac{\text{Measurement output [mA]} - 4 \text{ mA}}{16 \text{ mA}} \cdot \text{Range end}$$

## 6 What to do if ...?

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### 6.2.4 Testing the temperature transmitter

#### Calculation of the temperature at the sensor

Only the measurement output of the transmitter can be checked here. The temperature sensor is housed in a metallic pin on the measuring cell.

- \* From the current value of the measurement output, the temperature at the temperature sensor can be calculated as follows:

$$\text{Temperature at temperature sensor} = \frac{\text{Measurement output [mA]} - 4 \text{ mA}}{16 \text{ mA}} \cdot 150^{\circ}\text{C}$$

If, during testing according to item 6.2, errors occur which are larger than those specified in the Data Sheet, please contact the manufacturer.

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## 7.1 Technical data

### Conductivity transmitter

Meas. ranges (mS/cm)	1	2	3
<b>Type 202752/10 without temperature compensation</b>			
Group I	0 – 200	0 – 20	0 – 2
Group II	0 – 2000	0 – 200	0 – 20
Group II / III	0 – 500	0 – 50	0 – 5
<b>Type 202752/21 (22) with single (4-fold) temperature compensation</b>			
Group I	0 – 100	0 – 10	0 – 1
Group II	0 – 1000	0 – 100	0 – 10
Group II / III	0 – 250	0 – 25	0 – 2.5
<b>Type 202752/31 (32) with single (4-fold) temperature compensation</b>			
Group I	not permitted		
Group II	not permitted		
Group II / III	0 – 200	0 – 20	0 – 2
Current output	3-wire circuit, 4–20mA		
Current drawn	max. 120mA		
Characteristic	linear		
Accuracy	2% or better		
max. permitted burden	$R_{Bmax} = 500\Omega$		
Display (option)	3½ digit LCD digital display for conductivity		

### Temperature transmitter

Measurement range	0 – 150°C
Current output	2-wire circuit, 4–20mA
Current drawn	max. 40mA (in fault condition)
Characteristic	linear
Accuracy	2% or better
max. permitted burden	$R_{Bmax} = \frac{U_V - 14V}{0.02A}$ $R_{Bmax}$ = maximum burden permitted in Ohm $U_V$ = supply voltage in Volt

### Temperature compensation (option)

Reference temperature	25°C
Temperature coefficient	1 x 0 – 3%/°C or 4 x 0 – 3%/°C adjustable, can be freely assigned via non-floating voltage
Compensation range	0 – 100°C

## 7 Appendix

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### Measuring cell

Material	PVDF (standard), PEEK Note: Temperature, pressure and measurement medium influence the life of the cell
Temperature of measurement medium	120°C max. 140°C for short periods (sterilisation) with process connection -160 PVC union nut, for extra code /355 and /356: 55°C max. with special length /766: 80°C max. shaft material: PVDF
Pressure	10 bar max.

### Electrical data

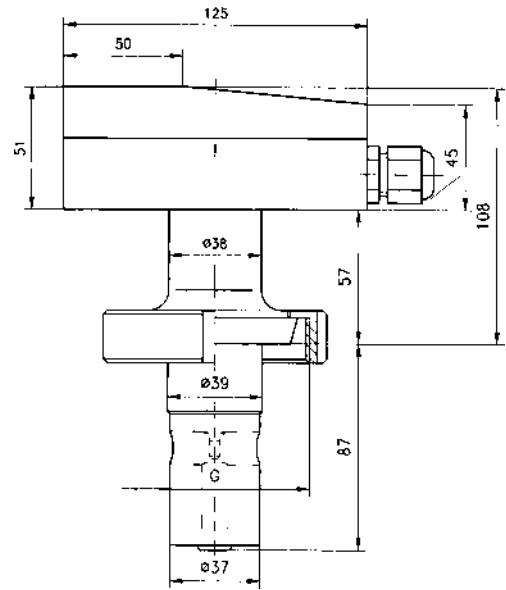
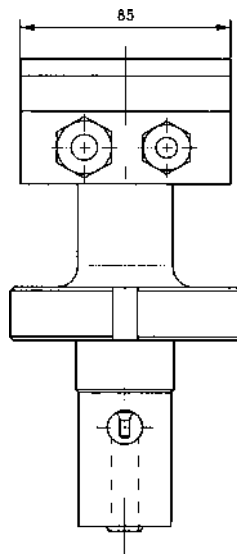
Supply	22 – 30V DC nominally 24V DC
Electrical connection	plug-in connectors with screw terminals

### Housing

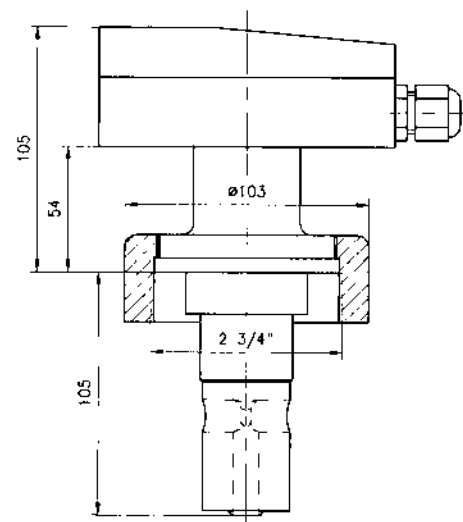
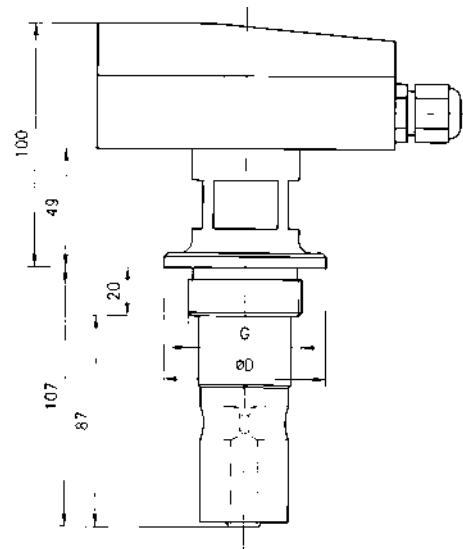
Housing	glassfibre reinforced polyamide two Pg glands (Pg9 and Pg11)
Size in mm	Section 7.2 "Dimensions"
Permissible ambient temperature	-5 to +70°C for extra code/110 and /111: 0 – 50°C
Permissible storage temperature	-10 to +85°C
Climatic conditions	rel. humidity ≤ 85%, no condensation
Operating position	unrestricted
Protection	IP67
Weight	2 kg

## 7.2 Dimensions

Screwed pipe joint DIN 11851	
606	screwed pipe joint DN 40
607	screwed pipe joint DN 50
608	screwed pipe joint DN 65
609	screwed pipe joint DN 80



Male thread		Ø D
107	male thread 1¼" pipe A	60
108	male thread 1½" pipe A	68
110	male thread 2" pipe A	78

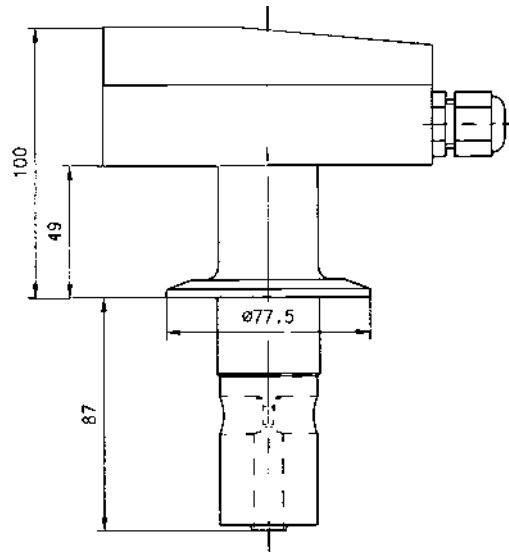


Union nut	
160	union nut 2¾", PVC

# 7 Appendix

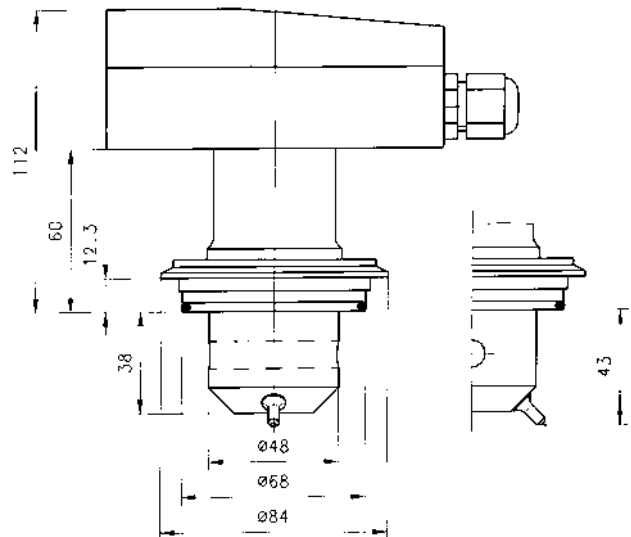
## Clamp connection

617	clamp connection 2½"
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## VARIVENT connection

686	VARIVENT connection DN 40/50 (at present, available in PVDF only)
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## SMS thread

690	SMS thread DN 2"
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