# Handheld Meter for Conductivity (CR), Specific Electrical Resistivity, TDS, and Salinity
# Type 202710/30




## Operating Manual

JUMO

20271030T90Z001K000

V2.00/EN/00463204

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# 1 Typographical conventions

## 1.1 Warning symbols



**DANGER!**

This symbol indicates that **personal injury from electrocution** may occur if the appropriate precautionary measures are not taken.



**CAUTION!**

This symbol in connection with the signal word indicates that **damage to assets or data loss** will occur if the respective precautionary measures are not taken.

## 1.2 Note symbols



**NOTE!**

This symbol refers to **important information** about the product, its handling, or additional use.

*

**Action instruction**

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

# 2 General information

## 2.1 Preface

Read through this document carefully and familiarize yourself with the operation of the device before you start using it. Keep this document close at hand and in the immediate vicinity of the device so that you or the specialist personnel can consult it at all times in case of doubt.

Mounting, startup, operation, maintenance, and decommissioning must only be performed by personnel with a specialist qualification. The specialist personnel must have carefully read through and understood the operating manual prior to commencing any work.

The liability and warranty of the manufacturer for damage and consequential damage is rendered void in the event of improper use, failure to observe this operating manual, deployment of personnel with insufficient qualifications, and unauthorized modifications to the device.

The manufacturer is not liable for costs or damages incurred by the user or by third parties through the use of this device, particularly in the event of improper use of the device or in the event of misuse or malfunctions relating to the connection or the device.

## 2.2 Intended use

When used with a securely connected sensor, the device is designed for measuring conductivity, specific electrical resistivity, salt content, and TDS.

The safety information (see chapter 2.3 "Safety information") in this operating manual must be observed.

The device must only be used under the conditions or for the purposes for which it has been designed.

The device must be handled with care, protected against pollutants, and used according to the technical data.

## 2.3 Safety information

The device has been built and tested according to the safety regulations for electrical measuring devices. Please observe the customary safety precautions and the device-specific safety information in this operating manual.



**DANGER!**

If it is assumed that risk-free operation of the device is no longer possible, the device must be decommissioned and guarded against subsequent startup by means of an identification marking. The safety of the user may be compromised by the device if, for example, the device

- features visible damage,
- no longer operates in the specified manner,
- has been stored in unsuitable conditions for an extended period of time.

In case of doubt, send the device to the manufacturer for repair/maintenance.



**DANGER!**

**Do not operate with a defective power supply unit!**

In this case, potentially fatal excess voltage may occur at the sockets of the device!



**DANGER!**

The device is not suitable for safety applications, emergency off equipment, or applications in which a malfunction could lead to injuries and material damage.

Failure to observe this note may lead to serious damage to health and material damage!



**DANGER!**

This device must not be used in a potentially explosive environment. If the device is operated in a potentially explosive environment, there is an increased hazard of deflagration, fire, or explosion due to formation of sparks!



**NOTE!**

The function and operational safety of the device can only be maintained under the climatic conditions specified in chapter Chapter 11 "Technical data", page 40.

If the device is transported from a cold environment to a warm environment, the device may malfunction due to condensate formation. In this case, it is necessary to wait for the device temperature to align with the room temperature prior to startup.



**NOTE!**

When connecting to other devices, take particular care in planning the wiring. Under certain circumstances, internal connections in third-party devices (e.g. connection of GND to ground) may lead to impermissible voltage potentials that can cause impaired function or even destruction of the device itself or a connected device.



**NOTE!**

**Please do not connect any devices to socket 1 (see Chapter 4.3 "Connections", page 12)!**

# 2 General information

## 2.4 Notes on operation and maintenance



**NOTE!**

The device and sensor must be handled with care and used according to the technical data (do not throw, do not subject to impact, etc.). The connectors and sockets must be protected against pollutants.

### 2.4.1 Battery operation



**NOTE!**

If ⚠ is displayed at the same time as "bAt" is shown in the bottom display, the battery has been used up and must be replaced. However, the device function remains guaranteed for a certain period of time.

If "bAt" is shown in the top display, the battery voltage is no longer sufficient for device operation and the battery is now completely used up.



**NOTE!**

The battery must be removed if the device is stored at an ambient temperature of over 50 °C. The battery should be removed if the device is not used for an extended period of time.

It is necessary to set the real-time clock once again after subsequent startup.

### 2.4.2 Power supply unit operation



**CAUTION!**

When a power supply unit is connected, its voltage must be between DC 10.5 V and 12 V. Do not generate any excess voltage! Basic power supply units may feature excess open circuit voltage, which may lead to malfunction or destruction of the device!

Prior to connecting the power supply unit to the electricity grid, it must be ensured that the operating voltage stated on the power supply unit corresponds to the mains voltage.

## 3.1 Nameplate

**Position**

The nameplate is affixed to the base of the battery compartment.

**Example**




**Fabrication number (F-No.)**

The fabrication number provides information such as the production date (year/week). The production date relates to the characters in positions **12** to **15** (from the left).

Example: F-No. = 00822713 01 0 **1815** 0001

The device was produced in the **15**th calendar week of 20**18**.

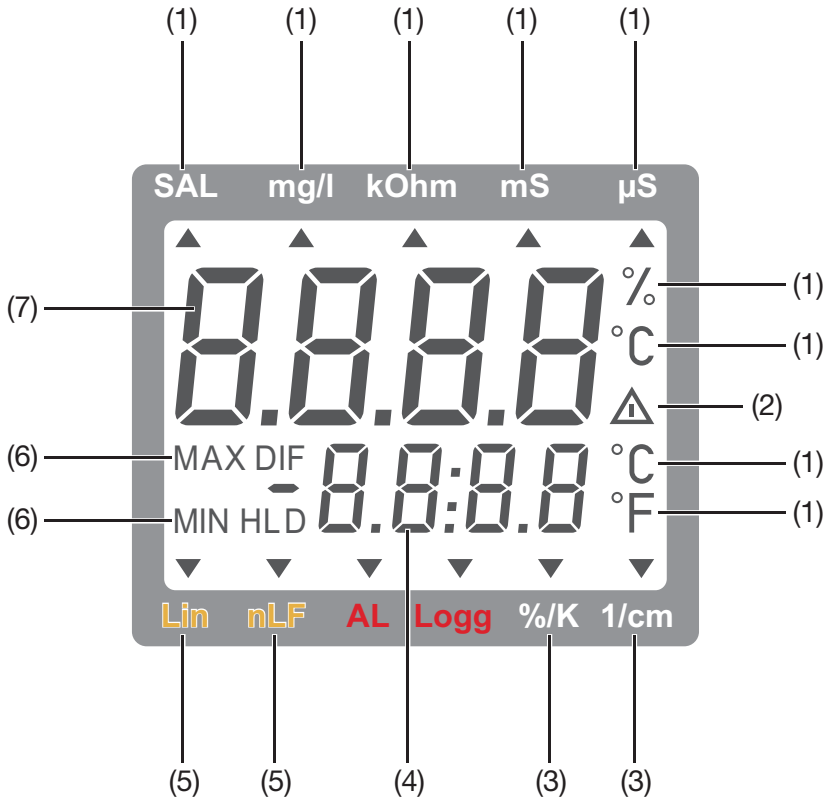
## 3.2 Order details

| | (1) | Basic type |
|---|---|---|
| 202710/30 | | Manual measuring device for conductivity (CR), specific electrical resistivity, TDS, and salinity |
| | **(2)** | **Extra codes** |
| 000 | | None |
| 071 | | Including carry case |

| | (1) | | (2) |
|---|---|---|---|
| **Order code** | | / | |
| **Order example** | 202710/30 | / | 000 |

# 4 Operation

## 4.1 Display




(1) Display of the **measured value unit**

(2) **Warning signal**:
In case of low battery or recalibration request

(3) **Temperature coefficient** configuration unit

(4) **Subsidiary display/subsidiary measured value**:
Temperature measured value

(5) Display of the selected **temperature compensation**

(6) Display elements for the appearance of the minimum (MIN), maximum (MAX), or saved measured value (HLD)[a]

(7) **Main display/main measured value**:
Conductivity (mS/cm, µS/cm)
specific electrical resistivity (kΩcm)
TDS/filtrate dry residue (mg/l)
Salinity (SAL)

[a] The "DIF" display is not supported in this device.

## 4.2 Control elements

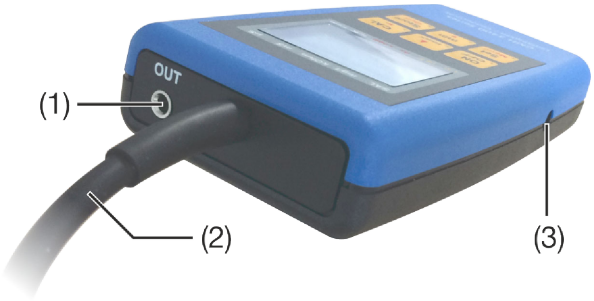
The descriptions printed in black on the control keys relate to functions that are available in measurement mode.

The descriptions and symbols printed in red on the control keys relate to functions that are available when setting the device.

| Key | Function during the measurement | Function in setting menu |
|---|---|---|
| ON OFF (1) | **On/off** switch | |
| min ▼ (5)<br>▲ max (2) | **min/max...**<br>***... pressed briefly:***<br>Display minimum or maximum value measured so far<br>***... pressed for 2 seconds:***<br>Delete the value in question | ▲ / ▼<br>Enter values or modify settings |
| CAL ► (3) | **CAL...**<br>***... pressed for 2 seconds:***<br>Start calibration of the relative cell constants (only possible in operating mode "cond" = conductivity) | ►<br>"Scroll" through the parameter sublevels of the submenu |
| Store Quit (6) | **Store:**<br>Hold and save the current measured value ("HLD" in display) | **Quit:**<br>Return to measuring, entries/ settings will be saved |
| Set Menu (4) | **Set...**<br>**... pressed briefly:**<br>Toggle between units (only possible when setting the parameter "InP" to the value "SEt")<br>**... pressed for 2 seconds:**<br>Call up the setting menu | **Menu:**<br>Return to setting menu, entries/ settings will be saved |

# 4 Operation

## 4.3 Connections




(1) This socket does not have a function, please do not connect any devices
(2) Connecting cable of the securely connected conductivity measuring cell
(3) Socket for connecting a power supply unit

## 4.4 Stand-up hinge

**Stand-up hinge closed**




**Stand-up hinge positioned at 90°/180°**




**Operation:**

✱ Pull on the "**open**" lettering to fold out the stand-up hinge to a **position of 90** ° (1). Pull on the "**open**" lettering again to fold out the stand-up hinge to a **position of 180** ° (2).

**Functions:**

When the **stand-up hinge is closed**, the device can be laid flat on the table or secured on a belt.

When the stand-up hinge is at a **position of 90** °, the device can be set up on an even surface.

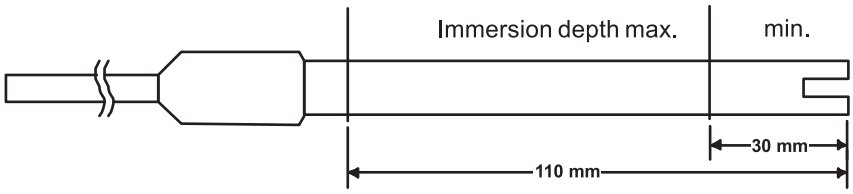
When the stand-up hinge is at a **position of 180** °, the device can be hung on a hook, for example.

## 5.1 The measuring cell

The conductivity measurement is a relatively straightforward measurement. The measuring cell that is securely connected to the device remains stable for a long time when properly used and can be aligned using the integrated calibration function (see chapter 7.2, page 33).

**Use**

For measuring purposes, the measuring cell must be immersed in the measurement medium to a minimum depth of 30 mm and a maximum depth of 110 mm.




The measuring cell can be stored dry or standing in clean water.

A measuring cell that has been stored under dry conditions requires a slightly longer time to display a stable measured value than a measuring cell that has been stored under wet conditions.

Before the measuring cell is moved into a liquid with a significantly different conductivity, it should be rinsed and the residual moisture should be captured with an absorbent cloth or paper.

**NOTE!**

Never bring the measuring cell into contact with water-repellent substances such as oil or silicone.

When performing measurements in measurement media with low conductivity, it is necessary to ensure sufficient flow to the electrodes.

If an unexpectedly high or low conductivity is measured, this can be traced back to pollutants on the electrodes. In this case, the measuring cell can be cleaned with an aqueous detergent solution.

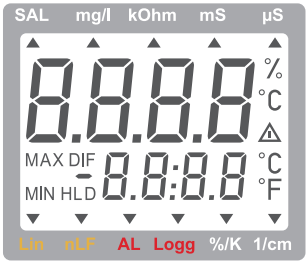
# 5 Measuring

## 5.2 Switching on the device

**NOTE!**

**The device is preconfigured per default for measuring the conductivity with automatic selection of the measuring range (Auto Range).**

✱ Briefly press the ON OFF key.




The device activates all display segments for a short time (segment test).

If a correction of the relative cell constant (see chapter 7.2, page 33) has been performed, the device accordingly provides a brief display of "SCL" and the set relative cell constant after the segment test.

If a zero point correction (offset) or slope correction has been performed on the temperature sensor (see chapter 7.1, page 33), the device accordingly provides a brief display of "Corr" after the segment test.

The device is subsequently ready to commence measuring.

## 5.3 Measuring the conductivity

### Definition

Conductivity[1] is the ability of a material or an electrolyte to conduct electric current.

In aqueous solutions (electrolytes), the current flows through the charge transport of the ions dissolved in the electrolyte. The conductivity measurement is therefore excellently suited to determining the concentration of saline solutions, acids, and lyes.

The conductivity is the reciprocal of the specific electrical resistivity and is stated by the device in µS/cm or mS/cm.

### Select the measurand

**The device is preconfigured per default for measuring the conductivity with automatic selection of the measuring range (Auto Range).**

**If the device has been configured for a different measurand in a user-defined operation, first change the measurand (see "Parameter "InP": selection of a measurand", page 21).**

If the measuring range is selected automatically, the measuring range with the best dissolution is always selected from the measuring ranges listed.

[1] Specifically relates to electrical conductivity here

**Measuring ranges**

- 0.0 to 200.0 µS/cm
- 0 to 2000 µS/cm
- 0.00 to 20.0 mS/cm
- 0.0 to 200.0 mS/cm

For the purpose of measurement, a fixed set measuring range can also be selected instead of the measuring range being selected automatically, see "Parameter "rAnG": selection of the display range or the measuring range", page 23.

## 5.4 Measuring the specific electrical resistivity

**Definition**

The specific electrical resistivity is the reciprocal of the conductivity and is stated by the device in kOhm × cm.

**Select the measurand**

**If the device has been configured for a different measurand in a user-defined operation, first change the measurand (see "Parameter "InP": selection of a measurand", page 21).**

If the measuring range is selected automatically, the measuring range with the best dissolution is always selected from the measuring ranges listed.

**Measuring ranges**

- 0.000 to 2.000 kΩ × cm
- 0.00 to 20.00 kΩ × cm
- 0.0 to 100.0 kΩ × cm

For the purpose of measurement, a fixed set measuring range can also be selected instead of the measuring range being selected automatically, see "Parameter "rAnG": selection of the display range or the measuring range", page 23.

## 5.5 Measuring the filtrate dry residue (TDS measurement)

**Definition**

The TDS measurement (**T**otal **D**issolved **S**olids) uses the conductivity and a conversion factor "C.tdS" to determine the filtrate dry residue TDS (evaporation residue). The conversion factor is entered manually in the configuration menu of the device (see "Parameter "C.tdS": conversion factor for TDS measurement", page 22).

This method is well suited to performing simple concentration measurements, e.g. of salt solutions. The results are displayed in mg/l.

**Display value TDS (in mg/l) = conductivity (in µS/cm) × C.tdS (conversion factor)** at temperature compensation (t.Cor) = "nLF" and reference temperature (t.rEF) = 25 °C.

The following approximate values apply for C.tdS:

| | |
|---|---|
| 0.50 | Monovalent salts with 2 ion types (NaCl, KCl, etc.) |
| 0.50 | Natural waters/surface water, drinking water |
| 0.65 to 0.70 | Salt concentration of aqueous fertilizer solutions |

**NOTE!**

The stated values for "C.tdS" are only reference values that are good for estimates but are not suitable for precise measurements.

For precise measurements, the conversion factor must be determined for the respective solution type and the concentration range being considered.

This can be performed either through calibration with familiar comparative solutions or through actual evaporation of a certain quantity of fluid with a determined conductivity and subsequent weighing of the dry residue.

### Select the measurand

**If the device has been configured for a different measurand in a user-defined operation, first change the measurand (see "Parameter "InP": selection of a measurand", page 21).**

If the measuring range is selected automatically (default setting), the measuring range with the best dissolution is always selected from the measuring ranges listed below.

### Measuring ranges

- 0.0 to 200.0 mg/l
- 0 to 2000 mg/l

For the purpose of measurement, a fixed set measuring range can also be selected instead of the measuring range being selected automatically, see "Parameter "rAnG": selection of the display range or the measuring range", page 23.

## 5.6 Measuring the salinity

### Definition

The salinity (salt content) of seawater can be measured in the measurement type "SAL".

The display in the device does not feature a unit and corresponds to the salt content in g/kg (grams of salt per kilogram of seawater) or per mil (‰). The description "PSU" (Practical Salinity Unit) is also commonly used.

The salinity measurement in this device relates to the International Oceanographic Tables (IOT). Accordingly, a salinity of 35 g/kg is taken as a reference value (standard mass concentration) for seawater.

However, depending on the location, weather, seasons, etc., the salt composition at the various measurement points may deviate from the standard mass concentration, sometimes considerably. Refer to the IOT tables in such cases.

**NOTE!**

This measurement is intended exclusively for measuring seawater. The salinity measurement is not suitable for determining the salt concentration of other saline solutions. A measurement according to TDS is recommended in such cases, see Page 15.

**Select the measurand**

**If the device has been configured for a different measurand in a user-defined operation, first change the measurand (see "Parameter "InP": selection of a measurand", page 21).**

**Measuring range**

- 0.0 to 70.0 ‰ (g/kg)

**NOTE!**

The salinity measurement features dedicated automatic temperature compensation, independent of the menu settings concerning temperature compensation for conductivity.

## 5.7 Temperature compensation

The conductivity and TDS of aqueous solutions depend on the temperature. Thanks to the temperature compensation, the solution is counted back to a uniform reference temperature.

The normal reference temperature, which is preset in the device, is 25 °C.

### 5.7.1 Nonlinear temperature compensation "nLF" according to EN 27888

The nonlinear temperature compensation for natural waters ("nLF" according to EN 27888) is sufficiently accurate for most applications, for example in the area of fish breeding and for measuring surface water and drinking water.

**Recommended area of application**

The "nLF" compensation is recommended for conductivity measurements between 60 µS/cm and 1000 µS/cm.

### 5.7.2 Linear temperature compensation "t.Lin"

If the temperature compensation type is not precisely known, the "linear temperature compensation" is used in practice (see "Parameter "t.Lin": compensation coefficient", page 25). This involves making the simplified assumption that the ratio of the temperature to the concentration will take a linear trajectory across the measuring range being considered.

#### Conductivity calculation within the device

The conductivity is hereby calculated using the following equation. In this regard, the parameter "t.Lin" corresponds to the formula value "$TK_{lin}$".

$$LF_{Tref} = \frac{LF_{Tx}}{1 + \frac{TK_{lin}}{100} \times (Tx - Tref)}$$

$LF_{Tref}$ = Conductivity at reference temperature
$TK_{lin}$ = Linear temperature coefficient
$LF_{Tx}$ = Uncompensated conductivity at current temperature
Tx = Current temperature
Tref = Reference temperature

#### Calculating the temperature coefficient

A temperature coefficient can be calculated, for example, by determining the conductivity of a solution at 2 temperatures (T1 and T2) with the temperature compensation switched off (t.Cor = oFF).

$$TK_{lin} = \frac{(LF_{T1} - LF_{T2}) \times 100\ \%}{(T1 - T2) \times LF_{T1}}$$

$TK_{lin}$ = Linear temperature coefficient
$LF_{T1}$ = Conductivity at temperature T1
$LF_{T2}$ = Conductivity at temperature T2

**NOTE!**

Temperature coefficients of around 2.0 %/K are most common.

## 5.8 Saving a measured value with the hold function (HLD)

The device features a "HOLD" function for saving a measured value.

Depending on the device configuration (see "Parameter "Auto HLD": automatic saving of a measured value", page 27), the measured value can be saved either by pressing the Store Quit key or automatically when a stable measured value is reached.

When the measured value has been saved successfully, the message "HLD" appears on the device display.

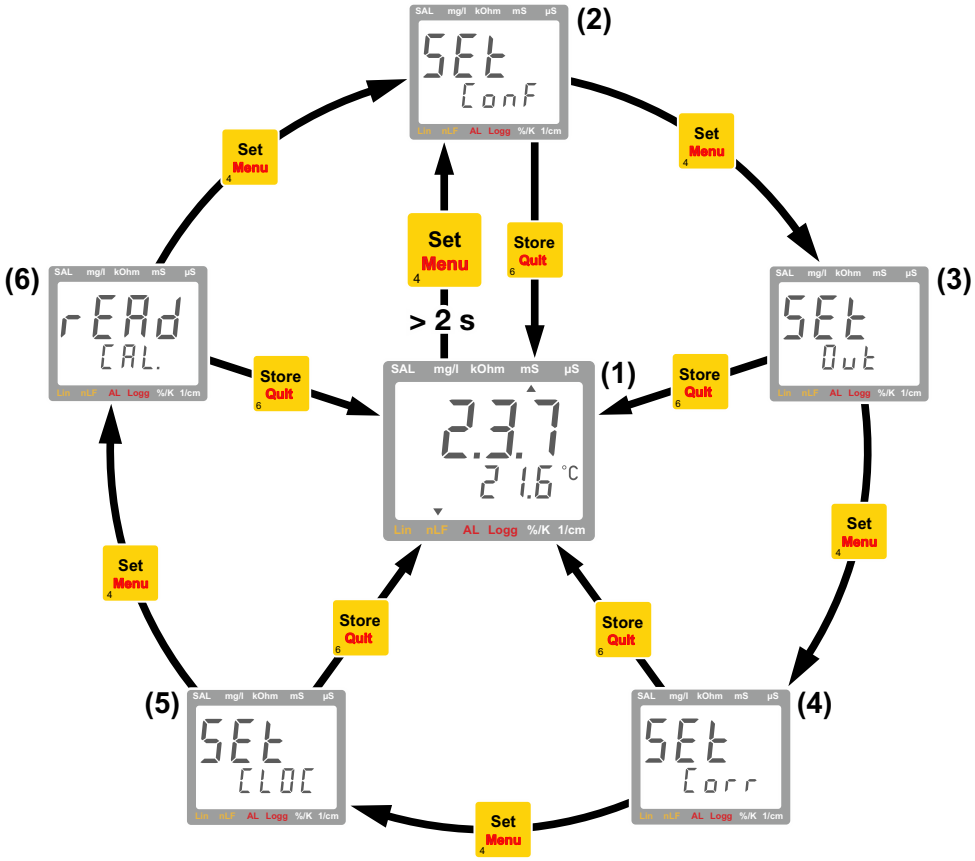
Press the Store Quit key again to delete the saved value.
When automatic saving is activated, the next stable measured value will subsequently be saved.

## 6.1 Calling up the setting menu

### Overview of the setting menu

The setting menu is called up from measurement mode by pressing the Set Menu key for at least 2 seconds (main display "SEt").

The 5 individual submenus in the setting menu are then selected by repeatedly pressing the Set Menu key.




| | |
|---|---|
| Measuring | **(1)** Display in measurement mode |
| Configuring the device | **(2)** General settings, see page 20 |
| | **(3)** Settings for the serial output, see page 28 |
| Parameterizing the device | **(4)** Offset/zero point correction and slope correction of the temperature measurement, see page 29 |
| | **(5)** Settings for the real-time clock, see page 30 |
| Providing information | **(6)** Read calibration data[a], see page 36 |

[a] Only possible if calibration data is stored in the device.

**NOTE!**

The configuration is stopped if no keys are pressed for over 2 minutes. Any changes made up to this point will not be saved!

# 6 Device settings

## 6.2 Resetting to default settings

**NOTE!**

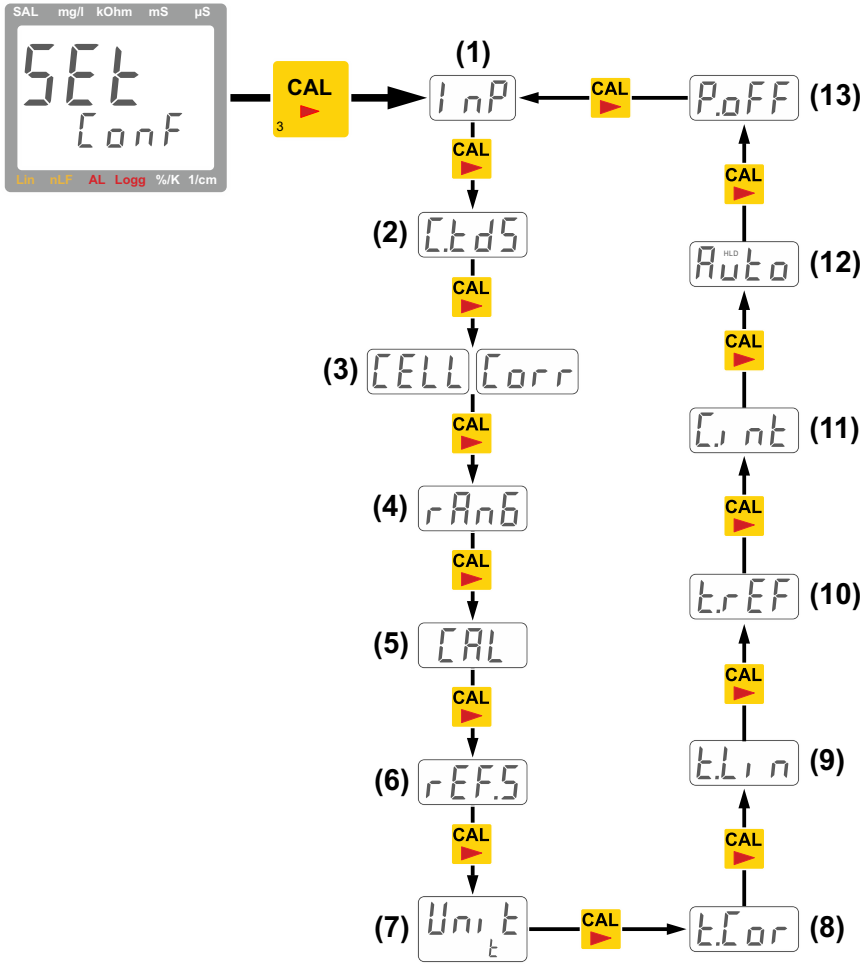
If the Set Menu and Store Quit keys are pressed simultaneously for over 2 seconds, the device is reset to the default settings.

## 6.3 Configuring the device

### 6.3.1 Submenu "SEt ConF": general settings

#### Overview of the parameters

After calling up the setting menu with Set Menu and selecting the submenu "SEt ConF", use the CAL key to select the parameter to be configured.




**NOTE!**

Certain parameters can only be accessed when certain device settings have been made.

| | Parameters |
|---|---|
| **(1)** | "InP": selection of a measurand, see page 21 |
| **(2)** | "C.tdS": conversion factor for TDS measurement, see page 22 |
| **(3)** | "CELL Corr": setting the relative cell constant, see page 22 |
| **(4)** | "rAnG": selection of the display range or the measuring range, see page 23 |
| **(5)** | "CAL": preconfiguration for the calibration of the relative cell constant, see page 23 |
| **(6)** | "rEF.S": selection of the standard reference solution for the calibration of the relative cell constant, see page 24 |
| **(7)** | "Unit t": temperature unit °C/°F, see page 24 |
| **(8)** | "t.Cor": setting the temperature compensation, see page 25 |
| **(9)** | "t.Lin": compensation coefficient, see page 25 |
| **(10)** | "t.rEF": setting the reference temperature, see page 26 |
| **(11)** | "C.int": calibration timer, see page 26 |
| **(12)** | "Auto HLD": automatic saving of a measured value, see page 27 |
| **(13)** | "P.oFF": automatic device switch-off, see page 27 |

**NOTE!**

In the following list of parameters, the setting options for the default setting are shown in **bold** in each case.

### Parameter "InP": selection of a measurand

✱ Select the desired measurand with the max and min keys:

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|  | **Cond** | **Conductivity** |
| | rESi | Specific electrical resistivity |
| | tdS | Filtrate dry residue |
| | SAL | Salinity (salt content) |
| | SEt | Selection of the measurand in measurement mode using the "Set" key |

✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

# 6 Device settings

### Parameter "C.tdS": conversion factor for TDS measurement

The parameter "C.tdS" can only be accessed when the measurand "TDS" is selected.

✱ Use the max and min keys to set the conversion factor:

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|  | 0.40 to **1.00** | Conversion factor for TDS measurement |

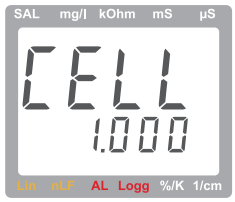
✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

### Parameter "CELL Corr": setting the relative cell constant

✱ Use the max and min keys to manually set the relative cell constant:

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|  | 0.800 to<br>**1.000** to<br>1.200 | Manual setting of the relative cell constant |

✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

### Parameter "rAnG": selection of the display range or the measuring range

The parameter "rAnG" can only be accessed when one of the measurands "Conductivity", "Specific electrical resistivity", or "TDS" is selected.

✱ Use the max and min keys to select the display range:

| Menu/parameter | Setting option | Meaning | |
|---|---|---|---|
|  | **Auto** | **Automatic measuring range selection** | **Measurand** |
| | 200.0 µS/cm | 0.0 to 200.0 µS/cm | Conductivity |
| | 2000 µS/cm | 0 to 2000 µS/cm | |
| | 20.0 mS/cm | 0.00 to 20.0 mS/cm | |
| | 200.0 mS/cm | 0.0 to 200.0 mS/cm | |
| | 2.000 kohm | 0.00 to 2.000 kΩ × cm | Specific electrical resistivity |
| | 20.00 kohm | 0.00 to 20.00 kΩ × cm | |
| | 100.0 kohm | 0.0 to 100.0 kΩ × cm | |
| | 200.0 mg/l | 0.0 to 200.0 mg/l | TDS |
| | 2000 mg/l | 0 to 2000 mg/l | |

✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

### Parameter "CAL": preconfiguration for the calibration of the relative cell constant

The parameter "CAL" can only be accessed when the measurand "Conductivity" is selected.

✱ Use the max and min keys to choose whether alignment should be performed with a customer-specific reference solution (Edit) or with a selection of standard reference solutions (rEF.S):

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|  | Edit | Customer-specific reference solution |
| | **rEF.S** | **Standard reference solutions** |

✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

# 6 Device settings

### Parameter "rEF.S": selection of the standard reference solution for the calibration of the relative cell constant

If a selection has been made to calibrate the relative cell constant with a selection of standard reference solutions (see page 23), use this parameter to specify a standard reference solution for calibrating the relative cell constant.

✱ Use the max and min keys to select one of the standard reference solutions:

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|  | **1413 µS** | **Reference solution 0.01 M KCl** |
| | 2760 µS | Reference solution 0.02 M KCl |
| | 12.88 mS/cm | Reference solution 0.1 M KCl |
| | 50 mS/cm | Seawater comparative solution KCl |
| | 111.8 mS/cm | Reference solution 1 M KCl |

✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

### Parameter "Unit t": temperature unit °C/°F

✱ Use the max and min keys to select the temperature unit:

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|  | **°C** | **All temperatures stated in degrees Celsius** |
| | °F | All temperatures stated in degrees Fahrenheit |

✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

### Parameter "t.Cor": setting the temperature compensation

The parameter "t.Cor" cannot be selected when the measurand "Salinity" is selected.

✱ Use the max and min keys to select the temperature compensation:

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|  | oFF | Do not compensate conductivity measurement |
| | **nLF** | **Nonlinear function for natural waters according to EN 27888 (ISO 7888), e.g. for groundwater, surface water, or drinking water** |
| | Lin | Linear temperature compensation |

✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

### Parameter "t.Lin": compensation coefficient

The parameter "t.Lin" can only be selected if the setting option "Lin" has been chosen when selecting the temperature compensation ("t.Cor").

To determine the compensation coefficient see chapter 5.7.2 "Linear temperature compensation "t.Lin"", page 18.

✱ Use the max and min keys to set the temperature coefficient:

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|  | 0.300 to<br>**2.000** to<br>3.000 | Temperature coefficient in %/K |

✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

# 6 Device settings

### Parameter "t.rEF": setting the reference temperature

The parameter "t.rEF" can only be accessed if the setting option "Lin" or "nLF" has been chosen when selecting the temperature compensation (t.Cor).

✱ Use the max and min keys to set the reference temperature:

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|  | **25°C/77°F** | **Reference temperature 25°C/77°F** |
| | 20°C/68°F | Reference temperature 20°C/68°F |

✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

### Parameter "C.int": calibration timer

✱ Use the max and min keys to set the calibration timer:

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|  | 1 to 730 | Time interval for calibration timer in days |
| | **oFF** | **No calibration timer** |

✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

### Parameter "Auto HLD": automatic saving of a measured value

✱ Use the max and min keys to activate or deactivate automatic saving of a measured value:

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|  | on | Automatic saving of a stable measured value (Auto Hold) |
| | **oFF** | **Standard hold function at the push of a button (see chapter 4.2 "Control elements", page 11)** |

✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

### Parameter "P.oFF": automatic device switch-off

✱ Use the max and min keys to set the switch-off delay:

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|  | 1 to<br>**20** to<br>120 | Switch-off delay in minutes.<br>If no key is pressed, the device switches off automatically once this period of time has elapsed |
| | oFF | Automatic switch-off deactivated (permanent operation) |

✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

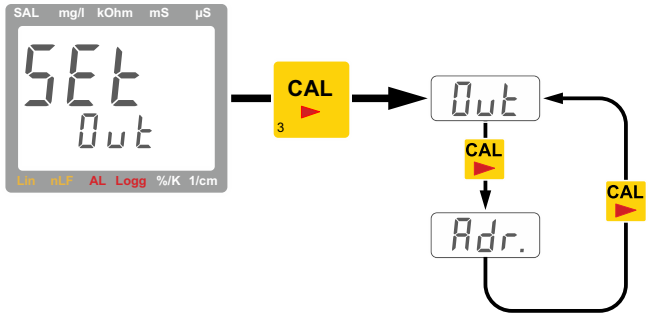
✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

# 6 Device settings

## 6.3.2 Submenu "SEt Out": serial interface settings

### Overview of the parameters

After calling up the setting menu with Set Menu and selecting the submenu "SEt Out", use the CAL key to select the parameter to be configured.




### Parameter "Out": serial interface

**NOTE!**

The functions of the serial interface are not supported in this device. The interface should always be deactivated in order to minimize power consumption.

✱ Use the max and min keys to deactivate the interface:

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|   | oFF | Interface deactivated. Minimizes the power consumption of the device |
| | **Ser** | **Interface activated. Not supported in this device; increases the power consumption of the device!** |

✱ Press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

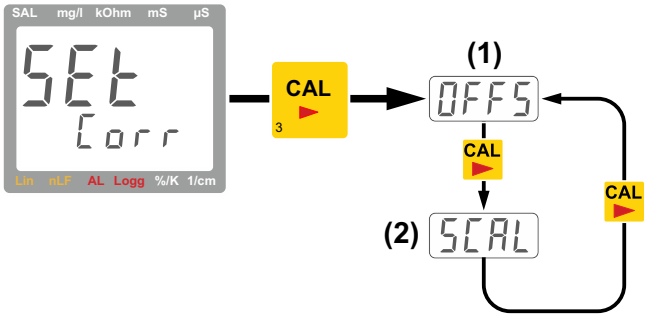
✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

## 6.4 Parameterizing the device

### 6.4.1 Submenu "SEt Corr": offset/zero point correction and slope correction of the temperature measurement

**Overview of the parameters**

After calling up the setting menu with Set Menu and selecting the submenu "SEt Corr", use CAL to select the parameter to be configured.

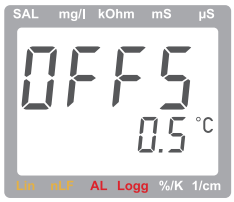



**Parameters**

| | |
|---|---|
| **(1)** | "OFFS": offset/zero point correction of the temperature measurement, see page 29 |
| **(2)** | "SCAL": slope correction of the temperature measurement, see page 30 |

**Parameter "OFFS": offset/zero point correction of the temperature measurement**

✱ Use the max and min keys to set the zero point correction:

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|  | **oFF** | **No zero point correction of the temperature measurement** |
| | -5.0 to +5.0°C | Zero point correction of the temperature measurement in °C |
| | -9.0 to +9.0°F | Zero point correction of the temperature measurement in °F |



✱ Press the CAL key to save the setting and move to the next parameter **or**

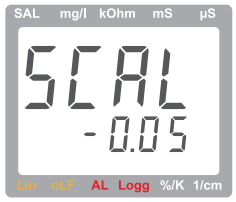
✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

# 6 Device settings

### Parameter "SCAL": slope correction of the temperature measurement

✱ Use the max and min keys to set the slope correction:

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|  | **oFF** | **No slope correction of the temperature measurement** |
| | -5.0 to 5.0 | Slope correction of the temperature measurement in % |

✱ Press the CAL key to save the setting and move to the next parameter **or**

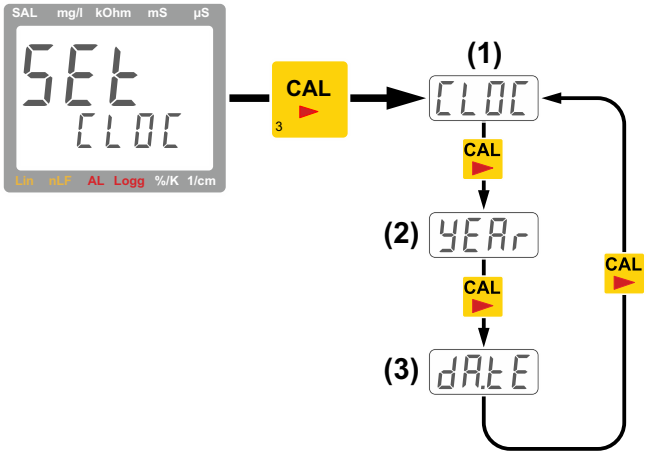
✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

## 6.4.2 Submenu "SEt CLOC": setting the real-time clock

### Overview of the parameters

After calling up the setting menu with Set Menu and selecting the submenu "SEt CLOC", use CAL to select the parameter to be configured.




**Parameters**

| | |
|---|---|
| **(1)** | "CLOC": setting the time, see page 31 |
| **(2)** | "YEAr": setting the year, see page 31 |
| **(3)** | "dAtE": setting the date, see page 32 |

### Parameter "CLOC": setting the time

✱ Use the max and min keys to set the time:

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|  | HH:MM | Hours (HH) and minutes (MM)<br>Press the ▲/▼ keys to set the time in increments of 1 minute<br>Press and hold the ▲/▼ keys to continuously move through the time setting; press and hold for an extended period to move in increments of 10 minutes |

✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

### Parameter "YEAr": setting the year

✱ Use the max and min keys to set the year:

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|  | YYYY | 4-digit year |

✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

**Parameter "dAtE": setting the date**

✱ Use the max and min keys to set the date:

| Menu/parameter | Setting option | Meaning |
|---|---|---|
|  | DD:MM | Days (DD) and months (MM) |

✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

### 6.4.3 Submenu "rEAd CAL.": reading the calibration data

The reading of the calibration data is described separately, see chapter 8.1.2 "Reading the calibration data ("rEAd CAL")", page 36.

## 7.1 Offset/zero point correction and slope correction of the temperature input

The parameters "OFFS" (see page 29) and "SCAL" (see page 30) can be used to carry out a zero point correction or slope correction of the temperature input.

Reliable references (e.g. ice water, controlled precision water baths, or similar) must be available for this purpose.

If a correction has been carried out (deviation from the default setting), this is indicated with the message "Corr" when the device is switched on.

The default setting of the zero point and slope values is: "oFF" = 0.0, i.e. no correction performed.

**Effect of the correction on the temperature display**

| Correction type | Device display |
|---|---|
| Offset/zero point correction | Measured value – "OFFS" |
| Offset/zero point correction and slope correction | (measured value – "OFFS") × (1+ "SCAL"/100) |

## 7.2 Calibrating the relative time constant

In addition to direct entry, the relative cell constant can also be determined automatically via the parameter "CELL Corr" (see page 22).

### 7.2.1 Calibration using customer-specific reference solution ("CAL Edit" function)

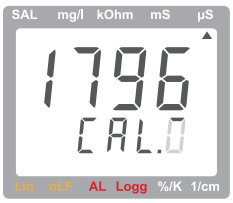
This function enables the user to automatically calibrate the relative cell constant with a user-specific reference solution featuring a precisely identified conductivity.

**Menu selection**

- ✱ Start configuration.
- ✱ Select submenu "SEt ConF".
- ✱ Call up parameter "CAL".
- ✱ Use the max and min keys to select the "Edit" setting option.

**Measuring**

- ✱ Immerse the conductivity measuring cell in the reference solution.
- ✱ Press the CAL key for >2 s.




The main display of the device shows the measured actual value (e.g. 1796 µS/cm) and the subsidiary display shows "CAL." with a symbol rotating around the last digit.

# 7 Calibration

**Calibration**

✱ Use the max and min keys to enter the value of the reference solution.

✱ Press the Store Quit key to save the setting.

The device will then return to measurement mode, or it will display an error message if necessary.

The resulting relative cell constant is briefly shown and can always be viewed in the "SEt ConF" menu under the parameter "CELL Corr".

## 7.2.2 Calibration using standard reference solutions ("CAL rEF.S" function)

This function enables the user to automatically calibrate the relative cell constant with a selection of standard reference solutions.

**Menu selection**

✱ Start configuration.

✱ Select submenu "SEt ConF".

✱ Call up parameter "CAL".

✱ Use the max and min keys to select the "REF.S" setting option.

**Selecting the standard reference solution**

✱ Press the CAL key to call up the parameter "rEF.S".

✱ Use the max and min keys to select one of the standard reference solutions:

| Menu/parameter | Setting option[a] | Meaning |
|---|---|---|
|  | 1413 µS | Reference solution 0.01 M KCl |
| | 2760 µS | Reference solution 0.02 M KCl |
| | 12.88 mS/cm | Reference solution 0.1 M KCl |
| | 50 mS/cm | Seawater comparative solution KCl |
| | 111.8 mS/cm | Reference solution 1 M KCl |

[a] The specifications relate to 25 °C. The temperature responses of the standard reference solutions are stored in the device and are automatically compensated.

✱ Press the Store Quit key to save the setting.

The device will then return to measurement mode.

**Calibration**

✱ Immerse the conductivity measuring cell in the standard reference solution.

✱ Press the CAL key for >2 s.

| | |
|---|---|
|  | The main display of the device shows the measured actual value (e.g. 1407 µS/cm) and the subsidiary display shows "CAL." with a symbol rotating around the last digit. |

Once a stable value has been determined, the device will save the correction factor and return to measurement mode, or it will display an error message if necessary.

The resulting relative cell constant is briefly shown and can always be viewed in the "SEt ConF" menu under the parameter "CELL Corr".

### 7.2.3 Error messages during calibration

| Display | Meaning | Explanation |
|---|---|---|
| CAL.-Err.1 | Relative cell constant too large | Determined relative cell constant must not be > 1.2 |
| CAL.-Err.2 | Relative cell constant too small | Determined relative cell constant must not be < 0.8 |
| CAL.-Err.3 | Solution in incorrect range | Incorrect reference solution, way beyond the tolerance |
| CAL.-Err.4 | Incorrect temperature | Reference solution outside the permissible temperature (0.0 to 34.0 °C, or 0.0 to 27.0 °C with reference solution 111.8 mS/cm) |

## 7.3 Determining the relative time constant with a calculation

As an alternative to calibrating the relative time constant, this can also be determined using a calculation and manually entered on the device using the parameter "CELL Corr". A reference solution is also required for this purpose. The calculation is carried out as stated in the following example.

**Example**

**KCl solution with the concentration 0.1 M: 1413 µS/cm at 25°C**
(At other temperatures, switch off the temperature compensation (t.Cor = oFF) and use the conductivity value that corresponds to the temperature!)

Assumption: $\text{Conductivity}_{\text{display}} = 1500\ \mu S \times cm^{-1}$ at set relative cell constant ("CELL Corr") out of 1.000

Conductivity of the solution at 25 °C ($\text{conductivity}_{\text{target}}$) = $1413\ \mu S \times cm^{-1}$

$$\text{Relative cell constant k} = \frac{\text{Leitfähigkeit}_{\text{Soll}}}{\text{Leitfähigkeit}_{\text{Anzeige}}} = \frac{1413\ \mu S \times cm^{-1}}{1500\ \mu S \times cm^{-1}} = 0{,}942$$

In this example, the parameter "CELL Corr" must be set to the value "0.942".

# 8 Maintenance

## 8.1 Good laboratory practice (GLP)

Good laboratory practice involves regularly monitoring the device and the accessories. In the case of conductivity measurements, the correct calibration of the relative cell constants must be ensured in particular. The device provides support in this regard with the functions "C.int" (calibration timer) and "rEAD CAL" (calibration data display).

### 8.1.1 Calibration timer ("C.Int")

You can enter a fixed interval upon which the device will automatically remind you that a new calibration needs to be performed.

The length of the interval depends on your application.

Once the interval has elapsed, "CAL" flashes in the display.

To set the interval see "Parameter "C.int": calibration timer", page 26

### 8.1.2 Reading the calibration data ("rEAd CAL")

The last calibration is stored in the device with the date and calibration values and can be called up as follows.

✱ Press the Set Menu key for at least 2 seconds.

"Set ConF" appears in the display.

✱ Keep pressing the Set Menu key until "rEAd CAL." appears in the display.

✱ Briefly press the CAL key to switch the display between:

| | |
|---|---|
|  | "Cal." and "FACt" are displayed alternately in the main display<br>The value of the relative cell constant is shown in the subsidiary display |
|  | "Cal." and "rEF" are displayed alternately in the main display<br>The reference value with which the relative cell constant was aligned is shown in the subsidiary display |
|  | The date of the data record is shown in the main display<br>The time of the data record is shown in the subsidiary display |

✱ Press the Store Quit key to stop reading the calibration data.

## 8.2 Real-time clock ("CLOC")

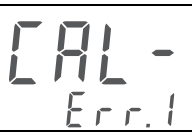
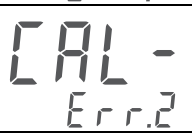
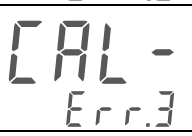
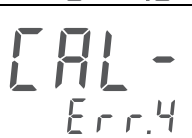
The real-time clock is used for the chronological assignment of the calibration. You should therefore check the settings as required, particularly after replacing the battery.

# 9 Error and system messages

### Error messages during measurement

| Display | Cause | Remedy |
|---|---|---|
|  | Battery voltage low, the function can still be guaranteed only for a short time. | Insert new battery |
|  | Battery is used up | Insert new battery |
| | During mains operation: incorrect voltage | Test power supply unit, replace if necessary |
| No display or muddled characters, device does not respond to keys being pressed | Battery voltage too low | Insert new battery |
| | During mains operation: power supply unit defective or incorrect voltage/polarity | Test power supply unit, replace if necessary |
| | System error | Remove battery or power supply unit, wait briefly before reconnecting |
| | Device error/device defect | Send in device for repair |
|  | Measuring range exceeded | Check whether the measured value is above the permissible measuring range of the sensor |
| | Measuring cell is defective | Send in device for repair |
|  | Measuring range not reached | Check whether the measured value is below the permissible measuring range of the sensor |
| | Measuring cell is defective | Send in device for repair |
|  | System error | Send in device for repair |
| | Measuring range exceeded or not reached by a significant margin | Check whether the measured value is within the permissible measuring range of the sensor |
|  | Display value cannot be calculated, measuring range or input value exceeded | Check measuring range |
| | Display value cannot be calculated, measured values too unstable | Wait for signal control of the device |
|  | Preset calibration interval elapsed | Calibrate device |
| | Last calibration invalid | |

### Error message during automatic alignment

| Display | Cause | Remedy |
|---|---|---|
|  | Relative cell constant too large | Determined relative cell constant must not be > 1.2 |
|  | Relative cell constant too small | Determined relative cell constant must not be < 0.8 |
|  | Solution in incorrect range | Incorrect reference solution, way beyond the tolerance |
|  | Incorrect temperature | Reference solution outside the permissible temperature (0.0 to 34.0°C, or 0.0 to 27.0°C with reference solution 111.8 mS/cm) |

## 10.1 Returns



**DANGER!**

All devices that are returned to the manufacturer must be free from measuring material residue and other hazardous substances. Measuring material residue on the case or on the sensor may pose a hazard to persons or the environment.



**NOTE!**

Use suitable transport packaging when returning the device, especially if the device is still functioning.

Ensure that the device is protected by sufficient insulation material in the packaging.

## 10.2 Disposal



**DISPOSAL!**

Hand in empty batteries at the corresponding collection points.

Do not dispose of the device in the household waste. Should the device need to be disposed of, please send this directly to us (with the sufficient postage). We will dispose of the device in a proper and environmentally friendly manner.

# 11 Technical data

### Measuring ranges

| | |
|---|---|
| Conductivity | 0.0 to 200.0 µS/cm |
| | 0 to 2000 µS/cm |
| | 0.00 to 20.00 mS/cm |
| | 0.0 to 200.0 mS/cm |
| Specific electrical resistivity | 0.005 to 100.0 kΩ × cm |
| TDS | 0.0 to 1999 mg/l |
| Salinity | 0.0 to 70.0 g/kg (PSU) |
| Temperature | -5.0 to +100.0 °C |
| | 23.0 to 212 °F |

### Accuracy

| | |
|---|---|
| Conductivity | ±0.5 % from mean value, ±0.3 % margin of error or ±2 µS/cm |
| Temperature | ±0.2 K |

### Connections

| | |
|---|---|
| Conductivity | Measuring cell securely connected to device |
| Temperature | |

### Measuring cell

| | |
|---|---|
| Version | 2-pin graphite measuring cell with integrated temperature sensor |
| Electrode material | Special graphite |
| Shaft material | Polysulfone (PSU) |
| Dimensions | Ø 12 mm × 120 mm |
| Ambient temperature | -5.0 to +80.0 °C (long term), briefly up to +100 °C |

### Display

| |
|---|
| 2 4-digit, 7-segment LCD displays (main display 12.4 mm high, subsidiary display 7 mm high) with additional symbols. |

### Additional functions

| | |
|---|---|
| Min./max. memory | Maximum and minimum value for conductivity are saved together with the temperature at which the extreme value occurred |
| Hold function | Standard hold function at the push of a button or Auto Hold |

### Case

| | |
|---|---|
| Material | ABS, break-proof |
| Protection type | IP65 (front) |
| Dimensions | 142 × 71 × 26 mm (L × W × H) |
| Ambient temperature | -25 to +50 °C; 0 to 95 % relative humidity (non-condensing) |
| Storage temperature | -25 to +70 °C |
| Weight | Approx. 225 g (including battery and measuring cell) |

### Power supply

| | |
|---|---|
| Battery operation | 9 V battery, type IEC 6F22 (included in scope of delivery) |

| | |
|---|---|
| Mains operation | External power supply unit (DC 10.5 to 12 V) with coaxial power connector, exterior Ø 5.5 mm (-), inner pin Ø 1.9 mm (+) (not included in scope of delivery) |
| Current consumption | 2 mA (with serial interface switched off) |
| Battery display | " ⚠ " and "bAt" displayed automatically when battery is used up |

### Auto-off function

| |
|---|
| If activated, the device switches off automatically if it is not operated for an extended period of time (select period between 1 and 120 min). |

### EMC

| |
|---|
| The device complies with the significant protection requirements defined in the Directive of the Council on the approximation of the laws of the Member States relating to electromagnetic compatibility (2004/108/EC). Additional error: <1 %. |

### Scope of delivery

| | |
|---|---|
| Part no. 00454356 | Manual measuring device type 202710/30, 9 V battery, operating manual |
| Part no. 00454357 | Manual measuring device type 202710/30, 9 V battery, operating manual, carry case |

# 12 China RoHS

|  | JUMO More than sensors + automation |
|---|---|
| 产品组别<br>Product group: 202710 | 产品中有害物质的名称及含量<br>China EEP Hazardous Substances Information |
| 部件名称<br>Component Name | |

| | 铅<br>（Pb） | 汞<br>（Hg） | 镉<br>（Cd） | 六价铬<br>（Cr(VI)） | 多溴联苯<br>（PBB） | 多溴二苯醚<br>（PBDE） |
|---|---|---|---|---|---|---|
| 外壳<br>Housing<br>(Gehäuse) | ○ | ○ | ○ | ○ | ○ | ○ |
| 过程连接<br>Process connection<br>(Prozessanschluss) | X | ○ | ○ | ○ | ○ | ○ |
| 螺母<br>Nuts<br>(Mutter) | ○ | ○ | ○ | ○ | ○ | ○ |
| 螺栓<br>Screw<br>(Schraube) | ○ | ○ | ○ | ○ | ○ | ○ |

本表格依据SJ/T 11364的规定编制。
This table is prepared in accordance with the provisions SJ/T 11364.
○：表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。
Indicate the hazardous substances in all homogeneous materials' for the part is below the limit of the GB/T 26572.

×：表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。
Indicate the hazardous substances in at least one homogeneous materials' of the part is exceeded the limit of the GB/T 26572.

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