Handheld Meter for pH, Redox, and rH
Type 202710/20

Operating Manual

JUMO

20271020T90Z001K000

V2.00/EN/00461261

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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

The device is designed to measure pH values and redox potential using appropriate sensors. The sensor connection operates via a BNC socket.

NOTE!

pH and redox measurements require different sensor types!

There is also the option of connecting a temperature probe (Pt1000 with banana plugs, part no. 00648463). The measured temperature is displayed on the subsidiary display of the device and is employed for the automatic temperature compensation (ATC) of the pH, rH, or mV_H measurement.

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 was constructed and tested according to the safety requirements for electrical measuring devices. Please observe the general, customary safety precautions and the device-specific safety information in this operating manual.

DANGER!

If it is to be assumed that risk-free operation of the device is no longer possible, the device must be taken out of service 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 14 "Technical data", page 53.

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 14)!

2.4 Notes on operation and maintenance

NOTE!

The device and sensors must be handled with care and deployed 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 fitted to the base of the battery compartment.

Example

Fabrication number (F-Nr.)

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-Nr. = 00822713 01 0 **1505** 0001

The device was produced in the **05**th calendar week of 20**15**.

3.2 Order details

	(1)	Basic type
202710/20		Manual measuring device for pH, redox, and rH
	(2)	**Extra code**
000		none
070		including carry case with pH 4.00 and pH 7.00 calibration solutions

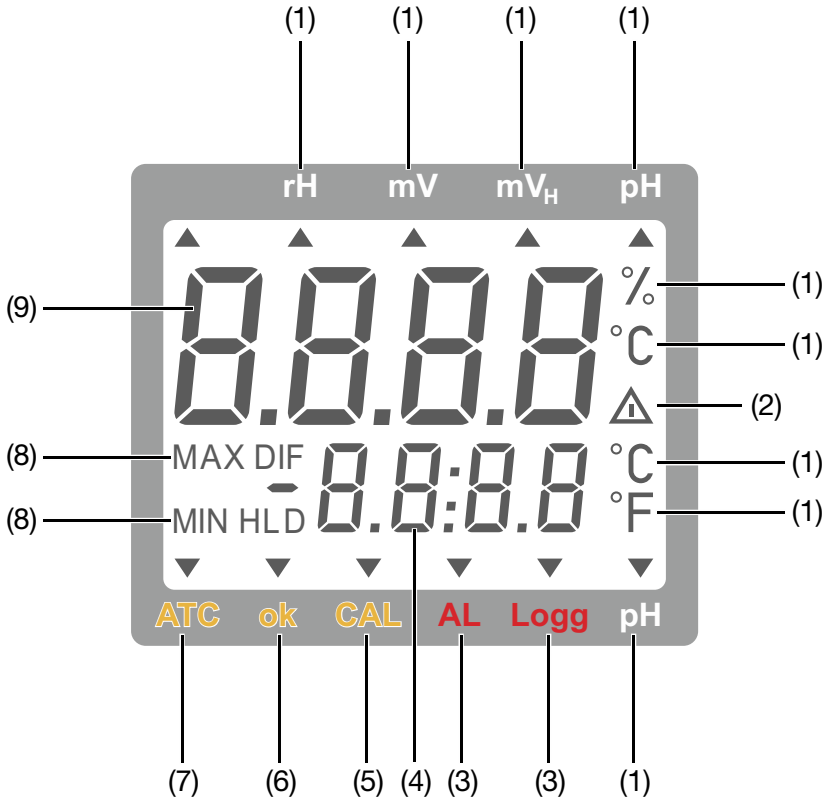
	(1)		(2)
Order code		/	
Order example	202710/20	/	000

3.3 Accessories

Type	Part no.
Immersion temperature probe (Pt1000 with banana plug)	00648463

4 Operation

4.1 Display



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

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

(3) **No function**

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

(5) Signals in **operating mode "pH"** that the device is in the **calibration procedure**

(6) Signals a **stable** measured value

(7) Signals that a temperature probe has been connected and that the **automatic temperature compensation (ATC) is thus active**.

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

(9) **Main display/main measured value:**
pH value (pH)
redox voltage (mV, mV_H)
rH value (rH)

[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) ▲ max (2)	**min/max...** ***... pressed briefly:*** Display minimum or maximum value measured so far ***... pressed for 2 seconds:*** Delete the value in question	▲ / ▼ Enter values or modify settings
CAL ► (3)	**CAL...** (only in operating mode "pH") **... pressed briefly:** Display the condition of the combination electrode (1x press), display the calibration data (additional presses) ***... pressed for 2 seconds:*** Start the pH calibration	► "Scroll" through the parameter sublevels of the submenu
Store Quit (6)	**Store:** Hold and save the current measured value ("HLD" in display)	**Quit:** Return to measuring, entries/ settings will be saved
Set Menu (4)	**Set...** (in operating modes "pH", "rH", and "mV_H" **... pressed briefly:** manual temperature input if no temperature probe is connected. additionally for "rH" mode: manual input of pH value (press key a second time) **... pressed for 2 seconds:** Call up the setup menu	**Menu:** Return to setting menu, entries/ settings will be saved

4 Operation

4.3 Connections

(1) BNC socket to connect a pH or a redox combination electrode
(2) This socket doesn‘t have a function, please don‘t connect any devices
(3) Socket for connecting a power supply unit
(4)/(5) Banana sockets to connect a Pt1000 temperature probe (part no. 00648463)

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 Preparing the device for the measurement

NOTE!

The device is preconfigured per default for measuring the pH value.

NOTE!

When measuring, always ensure that your pH and redox combination electrode is in good condition and was cleaned and dried before being inserted into the solution.

✱Connect the combination electrode and, if applicable, the temperature probe to the device.

✱Briefly press the ON OFF key.

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

If a zero point correction (offset) or slope correction has been performed on the voltage or temperature measurement (see chapter 7.1, page 32), the device accordingly briefly displays "Corr" after the segment test.

The device is subsequently ready to commence measuring.

5.2 Measuring the pH value

Selecting the measurand

The device is preconfigured per default for measuring the pH value.

If the device has been configured for a different measurand in a user-defined operation, first select the measurand "pH" (see "Parameter "InP": selection of a measurand", page 35).

Definition

The pH value describes the acidity or alkalinity of an aqueous solution.

pH values under 7 indicate acidity, pH values over 7 indicate alkalinity, pH 7 = neutral.

5 Measuring

The pH value is calculated based on the negative common logarithm of the hydrogen ion activity (this is often approximately the same as the hydrogen ion concentration):

$$\text{pH value} = -\log_{10}\left(\frac{c(H^+) \times f(H^+)}{1\ \text{mol/l}}\right)$$

$c(H^+)$ = hydrogen ion concentration in mol/l

$f(H^+)$ = activity coefficient of the hydrogen ions (usually < 1)

The abbreviation "pH" stands for ***p****ondus* **H***ydrogenii* (Latin: *pondus* = weight; *Hydrogenium* = hydrogen).

Since the pH value is dependent on temperature, it should always be recorded together with the measured temperature.

Example: pH 5.87 at 22.8 °C.

The pH measurement is a very precise but also sensitive measurement. The measured signals are very weak (high-impedance), especially when measured using weak/ion-deficient media.

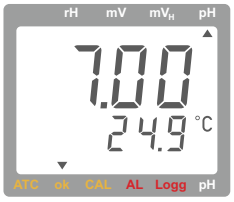
The following points should therefore be observed:

- Avoid malfunctions (electrostatic charges, etc.)
- Stir measurement solution slowly to achieve a stable measured value
- Dry plug-in contacts and keep them clean
- If possible, do not immerse the combination electrodes in the measurement solution beyond the shaft for a long time (except for with special waterproof versions)
- Configure the combination electrode sufficiently frequently (calibration interval is dependent on the combination electrode and the usage and can vary between an hour and several weeks)
- Use a suitable combination electrode.

Measuring without temperature probe

✱Insert the pH combination electrode and the temperature probe into the solution and gently stir until a stable measured value is achieved.

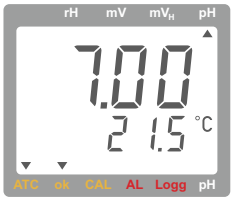
✱Adjust the temperature value of the measurement solution using the max and min keys.



The measured pH value appears on the main display and the set temperature appears on the subsidiary display of the device.

Measuring with temperature probe

✱Insert the pH combination electrode and the temperature probe into the solution and gently stir until a stable measured value is achieved.



The measured pH value appears in the main display and the measured temperature appears on the subsidiary display of the device.

5.3 Measuring the redox potential

Selecting the measurand

If the device has been configured for a different measurand in a user-defined operation, first select the measurand "mV" (see "Parameter "InP": selection of a measurand", page 35).

Definition

The redox potential (or: ORP) indicates the extent to which the measured sample has an oxidizing or reducing effect in relation to the hydrogen standard electrode.

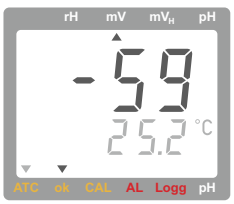
This potential is often used in swimming pools as a measurand for the disinfecting effect of a chlorine. The redox value is also an important parameter for aquarists as fish can only live within a particular redox range. The measured value also plays an important role in drinking water treatment, water monitoring, and in industry.

The measurement occurs with the commonly used silver/silver chloride combination electrodes (reference system with 3 molar potassium chloride solution). The measured value can be taken directly ("mV" setting) or be automatically converted with temperature compensation to the "hydrogen standard electrode reference system" using the "mV$_H$" setting.

Calibration, such as with pH measurement, does not take place with redox measuring. The suitability of combination electrodes can, however, be checked at any time using redox test solutions.

Measuring

✱Insert the redox combination electrode into the solution and gently stir.



The measured redox potential appears in the main display of the device.

If a temperature probe is connected, the measured temperature also appears on the subsidiary display of the device.

5 Measuring

5.4 Detecting the rH value

Selecting the measurand

If the device has been configured for a different measurand in a user-defined operation, first select the measurand "rH" (see "Parameter "InP": selection of a measurand", page 35).

Definition

The rH value is a value calculated from a pH **and** a redox measurement. It is used, for example, to describe the antioxidant power of food. This is a measurement used to determine the ability of food to reduce harmful free radicals (bioelectronics according to Prof. Vincent).

There are two ways of determining the rH value using this device:

- by **manually inputting the pH value** or
- by **automatically transferring the pH value** from a pH measurement

5.4.1 Determining the rH value by manually inputting the pH value

Prerequisite:

- The pH value of the measurement solution must be known.
- A redox combination electrode must be connected to the device.

Measuring without temperature probe

✱Briefly press the Set Menu key.

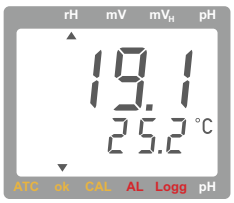
✱Adjust the temperature value of the measurement solution using the max and min keys.

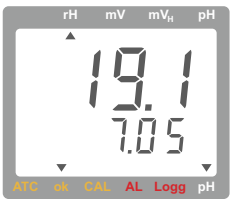
✱Briefly press the Set Menu key again.

✱Adjust the pH value of the measurement solution using the max and min keys.

✱Confirm and save the entries with the Store Quit key.

✱Insert the redox combination electrode into the solution and gently stir.





The determined rH value appears on the main display, the input values for the temperature and pH appear alternately on the subsidiary display of the device.

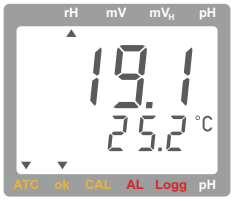
Measuring with temperature probe

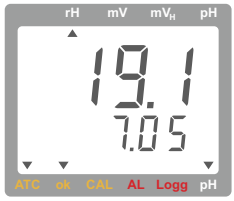
✱Briefly press the Set Menu key.

✱Adjust the pH value of the measurement solution using the max and min keys.

✱Confirm and save the entries with the Store Quit key.

✱Insert the redox combination electrode into the solution and gently stir.





The determined rH value appears on the main display, the measured value for the temperature and the input value for the pH appear alternately on the subsidiary display of the device.

5.4.2 Determining the rH value by automatically transferring the pH value

Prerequisites

- A pH and a redox combination electrode, as well as a temperature probe if required, must be placed in the measurement solution
- The pH combination electrode must be connected to the device
- The device must first be configured for the measurand "pH"

Measuring without temperature probe

✱Connect the pH combination electrode to the device.

✱Briefly press the Set Menu key.

✱Adjust the temperature value of the measurement solution using the max and min keys.

✱Save the temperature value with the Store Quit key.

✱Save the stable measured pH value with the Store Quit key ("HLD" appears in the display).

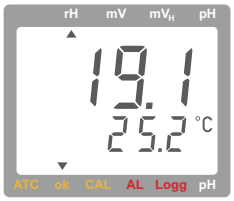
NOTE!

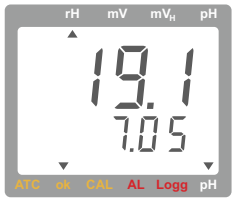
Do not switch off the device until the rH measurement is finished or the saved pH value will be deleted.

✱Connect the redox combination electrode to the device.

✱Configure the device for measurand "rH".

✱Gently stir the measurement solution.





The determined rH value appears on the main display, the input value for the temperature and the measured value for the pH appear alternately on the subsidiary display of the device.

Measuring with temperature probe

✱Connect the pH combination electrode to the device.

✱Save the stable measured pH value with the Store Quit key ("HLD" appears in the display).

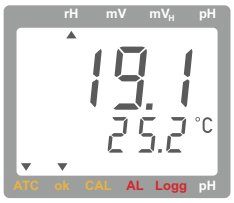
NOTE!

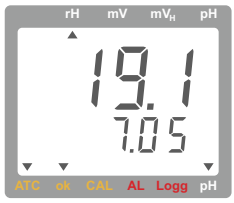
Do not switch off the device until the rH measurement is finished or the saved pH value will be deleted.

✱Connect the redox combination electrode to the device.

✱Configure the device for measurand "rH".

✱Gently stir the measurement solution.





The determined rH value appears on the main display, the measured values for the temperature and pH appear alternately on the subsidiary display of the device.

5.5 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 38), 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 Calibration of the pH combination electrode

6.1 General information regarding calibration

The parameters of pH combination electrodes are subject to fluctuations due to aging and individual variations. It is therefore advisable to check the calibration of the combination electrode before taking a measurement. If the deviation is unacceptable, the combination electrode must be recalibrated.

Buffer solutions with an exact pH value are needed for calibration.

The device can be configured for the following buffer series:

- Standard series (4.01 pH, 7.00 pH, and 10.01 pH)
- DIN series (1.68 pH [A], 4.01 pH [C], 6.87 pH [D], 9.18 pH [F], and 12.45 pH [G])
- or any buffer (neutral buffer within the range 6.5 to 7.5 pH).

CAUTION!

The operating life of buffer solutions is limited and is significantly shortened by inadequate cleaning and drying of the combination electrode when switching between solutions. This can lead to calibration errors!
If possible, use new solutions when calibrating.
Rinse with de-ionized or distilled water!

NOTE!

The automatic temperature compensation when calibrating

Both the signal of the pH combination electrode and the pH buffer are dependent on temperature. A Pt1000 temperature probe (optional) connected to the manual measuring device automatically compensates for temperature influence.

If a temperature probe is not available, the actual temperature of the respective buffer should be entered as accurately as possible, see chapter 6.4 "Calibration without temperature probe", page 25.

The temperature influences of the buffers are also compensated for when using the standard buffer series or the DIN buffer series.
When using any buffer, the pH values of the buffers must be entered in line with the current temperature.

6.2 Preparing for calibration

- ✱ Configure the device for the measurand "pH", **see "Parameter "InP": selection of a measurand", page 35**
- ✱ Select the calibration method (1, 2 or 3 point calibration), see "Parameter "CAL": selection of the number of calibration points", page 36
- ✱ Select the buffer series for the calibration, see "Parameter "CAL.P": selection of the buffer series", page 37
- ✱ Carefully remove the protective cap (containing 3 mol KCl) from the combination electrode.
- ✱ Rinse the combination electrode and the temperature probe (if available) with de-ionized (distilled) water and dry.

6 Calibration of the pH combination electrode

6.3 Calibration with temperature probe

6.3.1 Calibration with standard buffer series, example using technical buffer series

Calibration point 1

✱ Press the CAL key for at least 2 seconds to start the calibration.

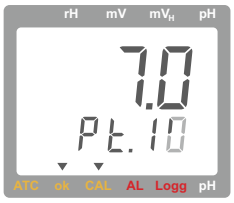
✱ Insert the combination electrode and the temperature probe into the first buffer solution and gently stir.

NOTE!

If the **2 or 3 point calibration** has been selected as the calibration method, the device expects a neutral buffer solution within the range pH 6.5 to pH 7.5 for the first calibration point.

The device automatically detects the buffer solutions of the technical buffer series and the DIN buffer series.

If the **1 point calibration** has been selected as the calibration method, any buffer solution can be employed (so, for example, also pH 4 or pH 10 when selecting a technical buffer series).

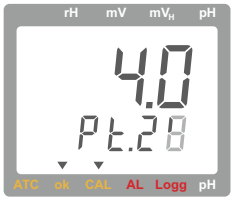


The value "7.0" appears on the main display of the device, "Pt.1" and a revolving symbol appear on the subsidiary display of the device.

If the measured pH value is outside of the acceptable range, the value "7.0" flashes.

If the measured pH value is within the acceptable range and is stable, the device saves the value automatically as calibration point 1.

With 1 point calibration selected, the condition of the combination electrode is then briefly displayed and then the 1 point calibration is completed and the device returns to measurement mode.



The values "4.0" and "10.0" appear alternately on the main display of the device, "Pt.2" and a revolving symbol appear on the subsidiary display of the device to indicate that a buffer solution with either pH 4 or pH 10 is expected as the second buffer solution.

Rinsing

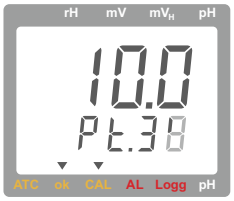
✱ Rinse the combination electrode and the temperature probe with de-ionized (distilled) water and dry.

Calibration point 2

✱ Insert the combination electrode and the temperature probe into the second buffer solution and gently stir.

The device detects the selected buffer solution automatically and saves the measured pH value as calibration point 2 as soon as it is stable.

With 2 point calibration selected, the condition of the combination electrode is then briefly displayed and then the 2 point calibration is completed and the device returns to measurement mode.



The value of the third calibration point flashes on the main display of the device, "Pt.3" and a revolving symbol appear on the subsidiary display of the device.

Rinsing

✱ Rinse the combination electrode and the temperature probe with de-ionized (distilled) water and dry.

Calibration point 3

✱ Insert the combination electrode and the temperature probe into the third buffer solution and gently stir.

The device detects the buffer solution automatically and saves the measured pH value as calibration point 3 as soon as it is stable.

Finally, the condition of the combination electrode is briefly displayed and then the 3 point calibration is completed and the device returns to measurement mode.

6.3.2 Calibration with any buffers

NOTE!

For a sufficiently accurate reading of the slope, the pH values of the selected buffer solutions should not be too close together (minimum gap of 2 pH from the neutral buffer).

Calibration point 1

✱ Press the CAL key for at least 2 seconds to start the calibration.

✱ Use the max and min keys to set the value for the neutral buffer solution.

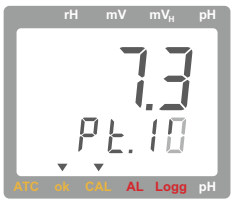
✱ Insert the combination electrode and the temperature probe into the first (neutral) buffer solution and gently stir.

NOTE!

If the **2 or 3 point calibration** has been selected as the calibration method, the device expects a neutral buffer solution within the range pH 6.5 to pH 7.5 for the first calibration point.

If the **1 point calibration** has been selected as the calibration method, any buffer solution with a known pH value can be employed.

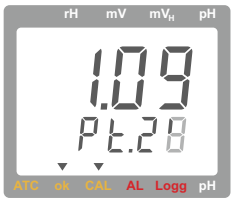
6 Calibration of the pH combination electrode



The set value is on the main display of the device, "Pt.1" and a revolving symbol appear on the subsidiary display of the device.

✱ Press the Store Quit key when the measured value is stable (small triangle appears on the display above the yellow "ok" label).

With 1 point calibration selected, the condition of the combination electrode is then briefly displayed and then the 1 point calibration is completed and the device returns to measurement mode.



The value on the main display of the device flashes, "Pt.2" and a revolving symbol appear on the subsidiary display of the device to indicate that the input of the pH value for the second buffer solution is expected.

✱ Use the max and min keys to set the value for the second buffer solution.

Rinsing

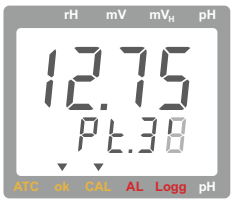
✱ Rinse the combination electrode and the temperature probe with de-ionized (distilled) water and dry.

Calibration point 2

✱ Insert the combination electrode and the temperature probe into the second buffer solution and gently stir.

✱ Press the Store Quit key when the measured value is stable (small triangle appears on the display above the yellow "ok" label).

With 2 point calibration selected, the condition of the combination electrode is then briefly displayed and then the 2 point calibration is completed and the device returns to measurement mode.



The value on the main display of the device flashes, "Pt.3" and a revolving symbol appear in the subsidiary display of the device to indicate that the input of the pH value for the third buffer solution is expected.

✱ Use the max and min keys to set the value for the third buffer solution.

Rinsing

✱ Rinse the combination electrode and the temperature probe with de-ionized (distilled) water and dry.

Calibration point 3

* Insert the combination electrode and the temperature probe into the third buffer solution and gently stir.
* Press the Store Quit key when the measured value is stable (small triangle appears on the display above the yellow "ok" label).

Finally, the condition of the combination electrode is briefly displayed and then the 3 point calibration is completed and the device returns to measurement mode.

6.4 Calibration without temperature probe

6.4.1 Calibration with standard buffer series, example using technical buffer series

Calibration point 1

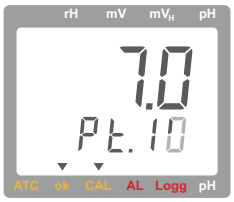
* Press the CAL key for at least 2 seconds to start the calibration.
* Insert the combination electrode into the first buffer solution and gently stir.

NOTE!

If the **2 or 3 point calibration** has been selected as the calibration method, the device expects a neutral buffer solution within the range pH 6.5 to pH 7.5 for the first calibration point.

The device automatically detects the buffer solutions of the technical buffer series and the DIN buffer series.

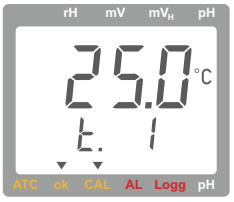
If the **1 point calibration** has been selected as the calibration method, any buffer solution can be employed (so, for example, also pH 4 or pH 10 when selecting a technical buffer series).



The value "7.0" appears on the main display of the device, "Pt.1" and a revolving symbol appear on the subsidiary display of the device.

If the measured pH value is outside of the acceptable range, the value "7.0" flashes.

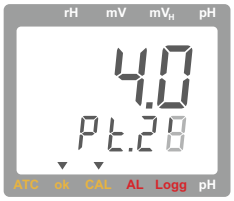
If the measured pH value is within the acceptable range and is stable, the device saves the value automatically for calibration point 1.



The display changes so that the temperature value (t.1) for the first buffer solution can be entered.

* Use the max and min keys to set the temperature value for the first buffer solution and then save by pressing the Store Quit key.

With 1 point calibration selected, the condition of the combination electrode is then briefly displayed and then the 1 point calibration is completed and the device returns to measurement mode.



The values "4.0" and "10.0" appear alternately on the main display of the device, "Pt.2" and a revolving symbol appear on the subsidiary display of the device to indicate that a buffer solution with either pH 4 or pH 10 is expected as the second buffer solution.

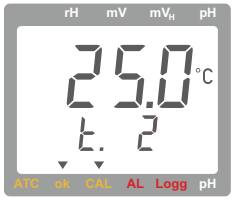
Rinsing

✱ Rinse the combination electrode with de-ionized (distilled) water and dry.

Calibration point 2

✱ Insert the combination electrode into the second buffer solution and gently stir.

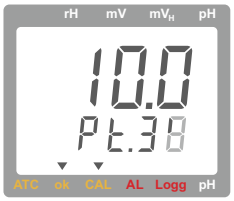
The device detects the selected buffer solution automatically and saves the measured pH value for calibration point 2 as soon as it is stable.



The display changes so that the temperature value (t.2) for the second buffer solution can be entered.

✱ Use the max and min keys to set the temperature value for the second buffer solution and then save by pressing the Store Quit key.

With 2 point calibration selected, the condition of the combination electrode is then briefly displayed and then the 2 point calibration is completed and the device returns to measurement mode.



The value of the third calibration point flashes on the main display of the device, "Pt.3" and a revolving symbol appear on the subsidiary display of the device.

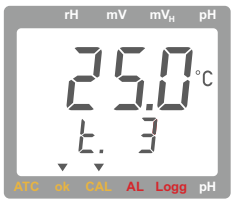
Rinsing

✱ Rinse the combination electrode with de-ionized (distilled) water and dry.

Calibration point 3

✱ Insert the combination electrode into the third buffer solution and gently stir.

The device detects the selected buffer solution automatically and saves the measured pH value for calibration point 3 as soon as it is stable.



The display changes so that the temperature value for the third buffer solution can be entered.

✱ Use the max and min keys to set the temperature value for the third buffer solution and then save by pressing the Store Quit key.

Finally, the condition of the combination electrode is briefly displayed and then the 3 point calibration is completed and the device returns to measurement mode.

6.4.2 Calibration with any buffers

NOTE!

For a sufficiently accurate reading of the slope, the pH values of the selected buffer solutions should not be too close together (minimum gap of 2 pH from the neutral buffer).

Calibration point 1

✱ Press the CAL key for at least 2 seconds to start the calibration.

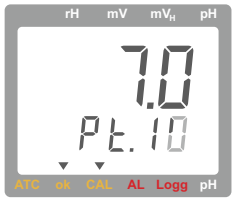
✱ Use the max and min keys to set the value for the neutral buffer solution.

✱ Insert the combination electrode into the first (neutral) buffer solution and gently stir.

NOTE!

If the **2 or 3 point calibration** has been selected as the calibration method, the device expects a neutral buffer solution within the range pH 6.5 to pH 7.5 for the first calibration point.

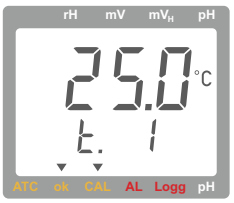
If the **1 point calibration** has been selected as the calibration method, any buffer solution with a known pH value can be employed.



The set value for the neutral buffer solution is on the main display of the device, "Pt.1" and a revolving symbol appear on the subsidiary display of the device.

✱ Press the Store Quit key when the measured value is stable (small triangle appears on the display above the yellow "ok" label).

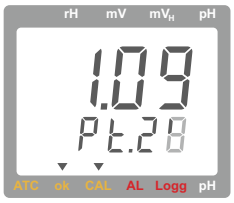
6 Calibration of the pH combination electrode



The display changes so that the temperature value (t.1) for the first buffer solution can be entered.

✱ Use the max and min keys to set the temperature value for the first buffer solution and then save by pressing the Store Quit key.

With 1 point calibration selected, the condition of the combination electrode is then briefly displayed and then the 1 point calibration is completed and the device returns to measurement mode.



The value on the main display of the device flashes, "Pt.2" and a revolving symbol appear on the subsidiary display of the device to indicate that the input of the pH value for the second buffer solution is expected.

✱ Use the max and min keys to set the value for the second buffer solution.

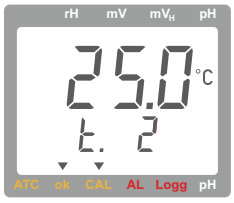
Rinsing

✱ Rinse the combination electrode and the temperature probe with de-ionized (distilled) water and dry.

Calibration point 2

✱ Insert the combination electrode and the temperature probe into the second buffer solution and gently stir.

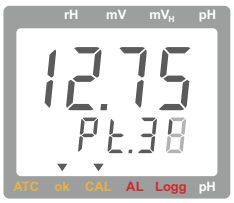
✱ Press the Store Quit key when the measured value is stable (small triangle appears on the display above the yellow "ok" label).



The display changes so that the temperature value (t.2) for the second buffer solution can be entered.

✱ Use the max and min keys to set the temperature value for the second buffer solution and then save by pressing the Store Quit key.

With 2 point calibration selected, the condition of the combination electrode is then briefly displayed and then the 2 point calibration is completed and the device returns to measurement mode.



The value on the main display of the device flashes, "Pt.3" and a revolving symbol appear in the subsidiary display of the device to indicate that the input of the pH value for the third buffer solution is expected.

✱ Use the max and min keys to set the value for the third buffer solution.

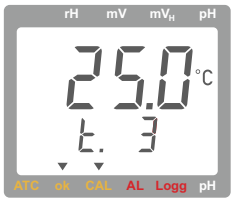
Rinsing

✱ Rinse the combination electrode with de-ionized (distilled) water and dry.

Calibration point 3

✱ Insert the combination electrode and the temperature probe into the third buffer solution and gently stir.

✱ Press the Store Quit key when the measured value is stable (small triangle appears on the display above the yellow "ok" label).



The display changes so that the temperature value (t.3) for the third buffer solution can be entered.

✱ Use the max and min keys to set the temperature value for the third buffer solution and then save by pressing the Store Quit key.

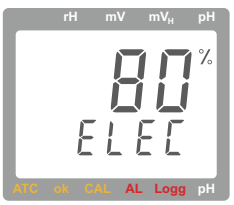
Finally, the condition of the combination electrode is briefly displayed and then the 3 point calibration is completed and the device returns to measurement mode.

6.5 Display of the condition of the pH combination electrode

NOTE!

After every calibration, the condition of the pH combination electrode is displayed for approximately 3 seconds.

✱ Briefly press the CAL key.



The condition of the pH combination electrode is displayed for approximately 3 seconds.

100 %:	The combination electrode is in very good condition
90 to 30 %:	The condition of the combination electrode is adequate

less than 30 %: The combination electrode is severely aged or contaminated.

If there is no improvement after cleaning (see chapter 11.2 "Cleaning", page 50) and subsequent calibration, the combination electrode must be replaced.

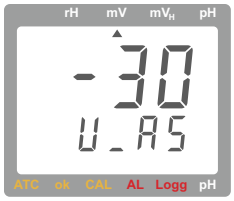
NOTE!

During the evaluation, both the asymmetry and the slope of the combination electrode are considered.

6.6 Displaying specifications of the combination electrode

Displaying asymmetry

✱ Press the CAL key twice in an interval of approx. 1 second.



The asymmetry of the pH combination electrode is displayed for approximately 3 seconds.

Example: asymmetry -30 mV

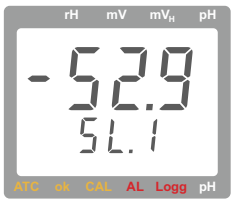
Admissible range:	±55 mV
Optimal:	0 mV

NOTE!

Contamination can cause the asymmetry of the combination electrode to deteriorate significantly.

Displaying slope at 25 °C

✱ Briefly press the CAL key three times in an interval of approx. 1 second.



The slope of the pH combination electrode is displayed for approximately 3 seconds.

Example: slope -52.9 mV/pH

Admissible range:	-62 to -45 mV/pH
Optimal:	-59.2 mV/pH

NOTE!

After prior 2 point calibration, the slope for the entire measuring range is displayed (SL.).
After prior 3 point calibration, the slope for the acidic range is displayed first (SL. 1). After pressing the CAL key again, the slope for the alkaline range (SL. 2) is displayed.

6.7 Error messages of the pH calibration

Display	Cause	Remedy
CAL- Err.1	The neutral buffer is not admissible:	
	• Combination electrode is defective	Clean combination electrode, recalibrate. If error reoccurs: replace combination electrode
	• Wrong buffer solution	Always use neutral buffer as first solution (exception: 1 point calibration)
	• Buffer solution used up	Use new buffer solution
CAL- Err.2	The slope is too low:	
	• Combination electrode is defective	Replace combination electrode
	• Buffer solution used up	Use new buffer solution
CAL- Err.3	The slope is too high:	
	• Combination electrode is defective	Replace combination electrode
	• Buffer solution used up	Use new buffer solution
CAL- Err.4	Wrong calibration temperature	Only carry out calibration between 0 and 60 °C

7 Calibration of the measuring inputs

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

A zero point correction or slope correction of both the voltage input and the temperature input can be carried out using the parameters "OFFS" (See page 42) and "SCAL" (See page 43).

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 voltage/temperature display

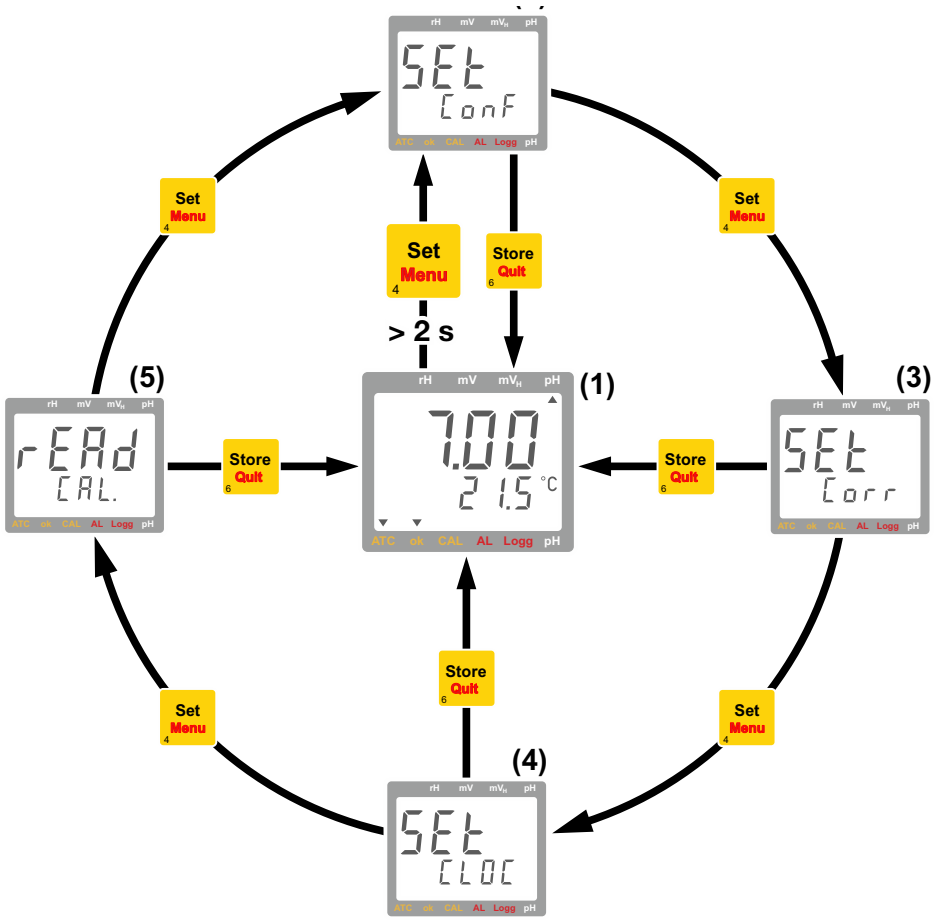
Correction type	**Device display**
Offset/zero point correction	Measured value – "OFFS"
Offset/zero point correction and slope correction	(measured value – "OFFS") × (1+ "SCAL"/100)

8.1 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 4 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 34
Parameterizing the device	**(3)** Offset/zero point correction and slope correction of the voltage input and the temperature input, See page 41
	(4) Settings for the real-time clock, See page 43
Providing information	**(5)** Read calibration data, See page 46

NOTE!

If no keys are pressed for over 2 minutes, the device setting is aborted. Any changes made up to this point will not be saved!

8 Device settings

8.2 Resetting to default settings

NOTE!

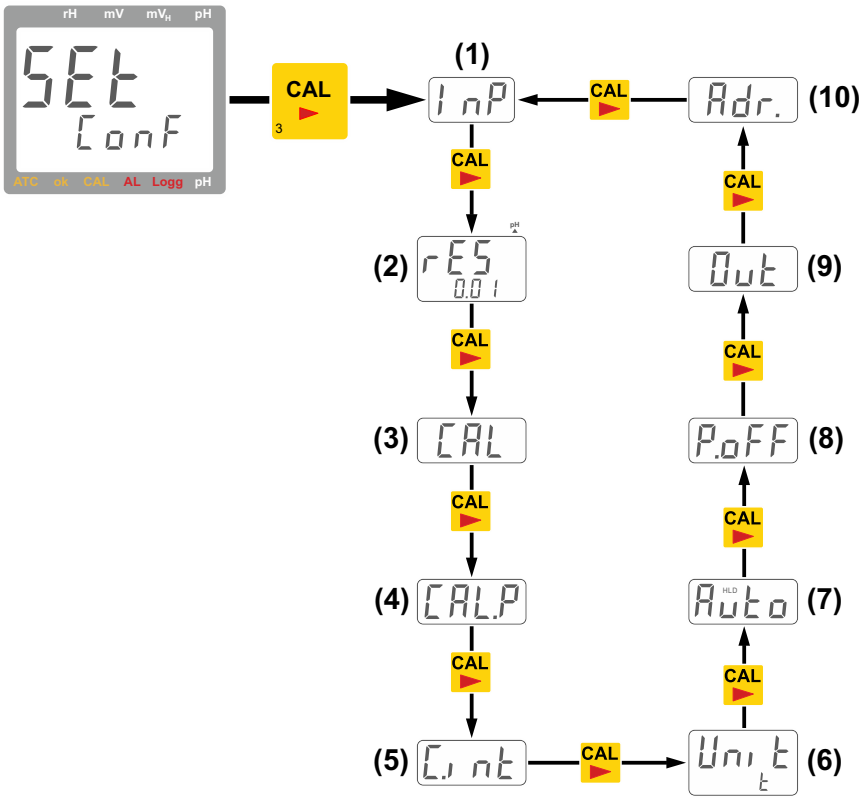
If the Set Menu and Store Quit keys are pressed simultaneously for over 2 seconds, the device is reset to the default settings.

8.3 Configuring the device

8.3.1 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 35
(2)	"rES pH": resolution of the pH display, See page 36
(3)	"CAL": selection of the number of calibration points, See page 36

	Parameters
(4)	"CAL.P": selection of the buffer series, See page 37
(5)	"C.int": calibration timer, See page 37
(6)	"Unit t": temperature unit °C/°F, See page 38
(7)	"Auto HLD": automatic saving of a measured value, See page 38
(8)	"P.oFF": automatic device switch-off, See page 39
(9)	"Out": universal output, See page 39
(10)	"Adr.": universal output

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
	Arrow "rH"	Measuring (detecting) the rH value
	Arrow "mV"	Measuring the redox potential
	Arrow "mV_H"	Measuring the redox potential with reference to the hydrogen system
	Arrow "pH"	**Measuring the pH value**

✱ 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.

8 Device settings

Parameter "rES pH": resolution of the pH display

The parameter "rES pH" can only be accessed when the "pH" measurand has been selected.

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

Menu/parameter	Setting option	Meaning
	0.1	Resolution in tenths pH
	0.01	**Resolution in hundredths pH**

✱ 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": selection of the number of calibration points

The parameter "CAL" can only be accessed when the "pH" measurand has been selected.

✱ Use the max and min keys to set the number of calibration points:

Menu/parameter	Setting option	Meaning
	1-Pt	1 point calibration (only offset, slope -59.2 mV/pH)
	2-Pt	**2 point calibration** **(neutral + one further buffer)**
	3-Pt	3 point calibration (neutral + one acidic + one alkaline buffer)

✱ 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.P": selection of the buffer series

The parameter "CAL.P" can only be accessed when the "pH" measurand has been selected.

✱ Use the max and min keys to select the desired buffer series:

Menu/parameter	Setting option	Meaning
	GPH	Technical buffer series (capsules), pH 4|7|10
	PHL	**Technical buffer series (liquid buffer), pH 4|7|10**
	din	DIN 19266 buffer series, pH 1.68(A)|4.01(C)|6.87(D)|9.18(F)|12.45(G)
	Edit	any buffer, manual setting

✱ 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 365	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**

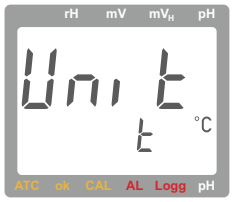
✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

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

8 Device settings

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 "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 13)**

✱ 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 **20** to 120	Switch-off delay in minutes. 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.

Parameter "Out": universal output

NOTE!

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

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

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!**
	dAC	

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

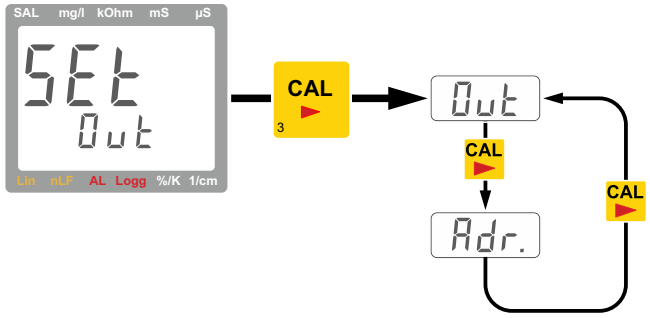
✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

8 Device settings

8.3.2 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**

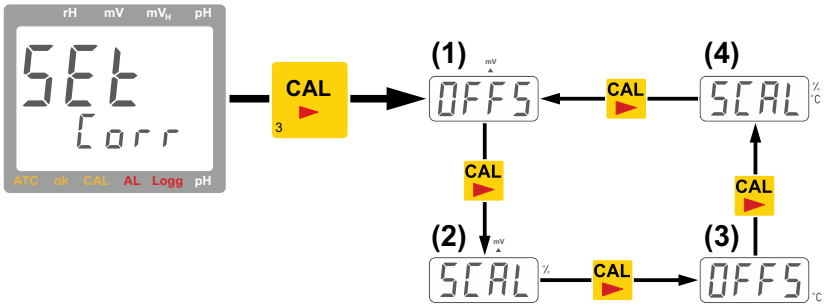
✱ press the Store Quit key to save the setting, quit the device settings, and return to measurement mode.

8.4 Parameterizing the device

8.4.1 Submenu "SEt Corr": offset/zero point correction and slope correction of the voltage and 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.

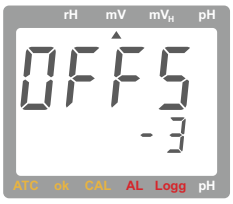


Parameters

(3)	"OFFS mV": offset/zero point correction of the voltage measurement, See page 41
(4)	"SCAL mV": slope correction of the voltage measurement, See page 42
(3)	"OFFS °C": offset/zero point correction of the temperature measurement, See page 42
(4)	"SCAL °C": slope correction of the temperature measurement, See page 43

Parameter "OFFS": offset/zero point correction of the voltage 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 voltage measurement**
	- 10.0 to +10.0 m V	zero point correction of the voltage measurement in mV

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

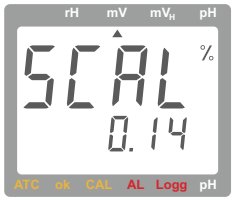
✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

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

8 Device settings

Parameter "SCAL": slope correction of the voltage measurement

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

Menu/parameter	Setting option	Meaning
	**oFF**	**no slope correction of the voltage measurement**
	-5.0 to 5.0	slope correction of the voltage measurement in %

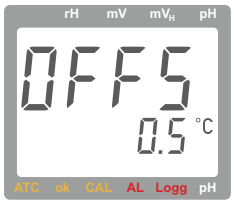
✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ 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.

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

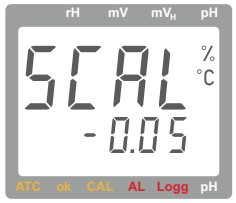
✱ Press the CAL key to save the setting and move to the next parameter **or**

✱ 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.

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**

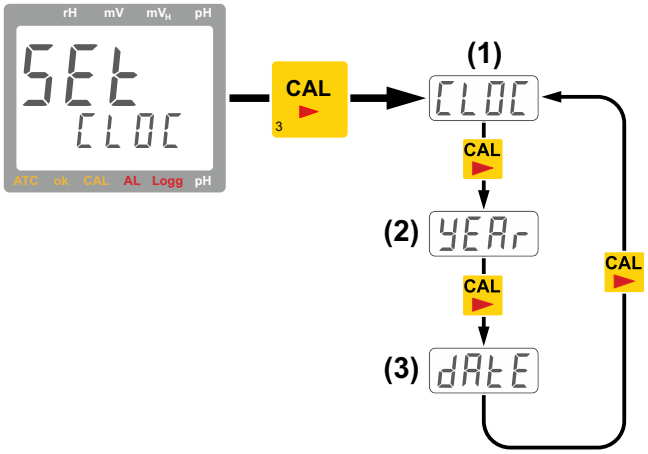
✱ press the Set Menu key to save the setting and move to the next submenu of the setting menu **or**

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

8.4.2 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.



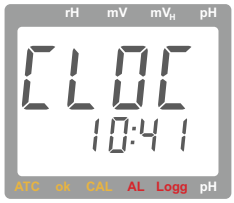
Parameters

(1)	"CLOC": setting the time, See page 44
(2)	"YEAr": setting the year, See page 44
(3)	"dAtE": setting the date, See page 45

8 Device settings

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) Press the ▲/▼ keys to set the time in increments of 1 minute 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.

8.4.3 Submenu "rEAd CAL.": reading the calibration data

The reading of the calibration data is described separately, see chapter 9.1.2 "Reading the calibration data ("rEAd CAL")", page 46.

9 Maintenance

9.1 Good laboratory practice (GLP)

Good laboratory practice involves regularly monitoring the device and the accessories. In the case of pH measurements, the correct pH calibration 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).

A prerequisite for applying the GLP functions is ensuring that the combination electrode is not changed. The data is saved in the device, but refers to the respective combination electrode.

9.1.1 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, see "Parameter "C.int": calibration timer", page 37.

The length of the interval depends on your application and the stability of the combination electrode.

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

9.1.2 Reading the calibration data ("rEAd CAL")

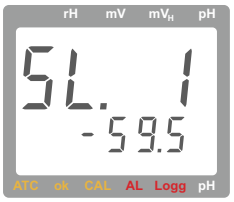
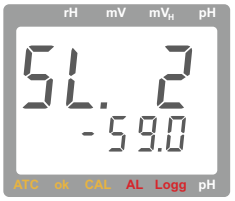
The last calibration is stored in the device with the date and calibration values and can be called up as follows.

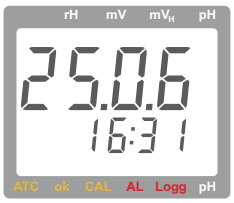
✱ Press the Set Menu key for at least 2 seconds.

"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 "U.ASY" are displayed alternately in the main display. The value of the asymmetry voltage in mV is shown in the subsidiary display.
	"Cal." and "SL.1" are displayed alternately in the main display. The slope in the acidic range in mV/pH is shown in the subsidiary display.[1]
	"Cal." and "SL.2" are displayed alternately in the main display. The slope in the alkaline range in mV/pH is shown in the subsidiary display.[1]



The date of the last calibration is shown in the main display.

The time of the last calibration is shown in the subsidiary display.

[1] With the 1 point calibration, the acidic slope = the alkaline slope = -59.16 mV/pH is assumed.
With the 2 point calibration, the acidic slope = the alkaline slope.
With the 3 point calibration, independent acidic and alkaline values are determined.

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

9.2 Real-time clock ("CLOC")

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

10 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 if the measured value is above the admissible measuring range of the combination electrode
	Combination electrode is defective	Send in device for repair
	Measuring range not reached	Check if the measured value is above the admissible measuring range of the combination electrode
	Combination electrode 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 admissible measuring range of the combination electrode
	Preset calibration interval elapsed	Calibrate device
	Last calibration invalid	

Error messages during calibration

Display	Cause	Remedy
	The neutral buffer is not admissible:	
	• Combination electrode is defective	Clean combination electrode, recalibrate. If error reoccurs: replace combination electrode
	• Wrong buffer solution	Always use neutral buffer as first solution (exception: 1 point calibration).
	• Buffer solution used up	Use new buffer solution
	The slope is too low:	
	• Combination electrode is defective	Replace combination electrode
	• Buffer solution used up	Use new buffer solution
	The slope is too high:	
	• Combination electrode is defective	Replace combination electrode
	• Buffer solution used up	Use new buffer solution
	Wrong calibration temperature	Only carry out calibration between 0 and 60 °C

NOTE!

pH combination electrodes are wearing parts that need to be replaced after chemical and mechanical exposure when the required values can no longer be obtained, even after thorough cleaning.

When in use, it is important to remember that various substances (for example, hydrofluoric acid (HF)) corrode glass in aqueous solutions. Chemicals can react with the KCl electrolyte in the combination electrode and/or cause a blockage of the diaphragm.

Problem cases

- with solutions containing protein, such as those used for measurements in the medical and biological sector, KCl can result in the denaturation of the protein
- coagulated coatings
- solutions that contain relatively high concentrations of silver ions
- ion-deficient solutions (de-ionized or ultra-pure water)
- solutions containing a solvent

If measurements are to be taken in these or similar solutions, we advise determining the pH value as quickly as possible so as to avoid unnecessary strain on the combination electrode.
After the measurement, the combination electrode must be cleaned and stored in either a KCl storage container or with a watering cap.

Substances that are deposited on the measuring membrane or the diaphragm have an effect on the measurement and must be removed regularly. This can be done, for example, using an automatic cleaning device.

11.1 pH combination electrodes for different areas of application

Area of application	**pH combination electrode - version, type, part no.**
Drinking water monitoring, aquariums, fish breeding, lake and sea water, etc.	Type 201005/65-18-45-2000-76-120/837, 2 m fixed cable connection and BNC connector, part no. 00417300
Generally aqueous media, beverage industry, company laboratory, chemistry, etc.	Type 201030/76-10-07-40-1000-76-120/000, KCl-filled, 1 m fixed cable connection and BNC connector part no. 00300196
In the food industry for insertion measurements in sausage, meat, cheese, fruit, pasta products, and other semi-solid food, soil measurements, small liquid samples, etc.	Type 201030/60-15-08-40-1000-76-120/052, insertion electrode, plastic version, solid electrolyte gel, 1 m fixed cable connection and BNC connector, part no. 00448527
Industrial and municipal wastewater, electroplating plants, paint shops, generally contaminated media, etc.	Type 201030/51-18-07-40-2000-76-120/052, 837, 2 m fixed cable connection and BNC connector, part no. 00532380

11 The pH combination electrode

11.2 Cleaning

The ion-sensitive glass membrane of the combination electrode can be rinsed under lukewarm water. More severe pollutants can be removed using a soft cloth and a mild household detergent.
Never clean combination electrodes with abrasive cleaning agents (scouring powder, scouring cream, etc.) or with a scouring pad!

Deposits containing protein on the sensor part of the combination electrode can be cleaned by being immersed in 0.1 molar of hydrochloric acid solution (HCl) for at least 5 minutes. A protein cleaning agent (pepsin solution) can also be employed.

11.3 Operating life

The operating life of combination electrodes depends on the operating conditions. Under normal conditions and with appropriate maintenance, the operating life is at least 6 months.

11.4 General handling of pH combination electrodes

Combination electrodes should be stored in a dry place at a temperature between 10 °C and 30 °C. Below 0 °C, the combination electrode can be destroyed due to freezing of the electrolyte!

The sensor part of the combination electrode should be protected against drying out by using a protective cap filled with 3 molar KCl solution or a storage holder. Lengthy storage in de-ionized (distilled) water will result in a depletion of the KCl within the combination electrode.

Air bubbles in the membrane ball can be removed by a sharp flicking action (like flicking a glass thermometer).

Filling up the electrolyte is not required or possible with these combination electrodes (low-maintenance).

Before measuring and after every measurement in different media, the combination electrode must be carefully rinsed with de-ionized (distilled) water.

Clean the combination electrode after use. For pollutants containing protein, pepsin hydrochloric acid solution (part no. 00307114) is recommended.

If the measuring function of the combination electrode has been impaired (for example, if the display reacts very slowly):

- Check the combination electrode for air bubbles
- Function test with a second reference combination electrode
- Replace combination electrode

Solutions for calibration, cleaning, and activation can be obtained from laboratory suppliers.

CAUTION!

The manual measuring device is designed for using electrodes with the Ag/ACl (silver/silver chloride) reference system.
If using other types, the measuring function mV_H will yield incorrect measurement results.

12.1 General handling

Combination electrodes should be stored in a dry place at a temperature between 10 °C and 30 °C. Below 0 °C, the combination electrode can be destroyed due to freezing of the electrolyte!

The sensor part of the combination electrode should be protected against drying out by using a protective cap filled with 3 molar KCl solution or a storage holder. Lengthy storage in de-ionized (distilled) water will result in a depletion of the KCl within the combination electrode.

Filling up the electrolyte is not required or possible with these combination electrodes (low-maintenance).

Before measuring and after every measurement in different media, the combination electrode must be carefully rinsed with de-ionized (distilled) water.

Clean the combination electrode after use. For pollutants containing protein, pepsin hydrochloric acid solution (part no. 00307114) is recommended.

The platinum tip of the sensor can be cleaned with ordinary scouring powder (rinse well afterward).

If the combination electrode malfunctions:

- Function test with a second reference combination electrode
- Replace combination electrode

Solutions for calibration, cleaning, and activation can be obtained from laboratory suppliers.

Recommended redox combination electrodes

Reference system: Ag/AgCl, electrolyte: KCl, 3 mol/l
Type: 201010/65-22-65-2000-76-120/837, 2 m fixed cable connection and BNC connector
Part no. 00424950
Use only this type when converting to hydrogen system "mV_H" and rH measurements!

Operating life

The operating life of combination electrodes depends on the operating conditions. Under normal conditions and with appropriate maintenance, the operating life is at least 6 months.

13 Returns and disposal

13.1 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.

13.2 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.

Measuring ranges

pH	0.00 to 14.00 pH
Redox voltage (mV) Redox voltage (mV_H)	-1999 to +2000 mV -1792 to +2207 mV_H (referring to hydrogen system, at 25 °C, DIN 38404)
rH	0.0 to 70.0 rH
Temperature	-5.0 to +150.0 °C, Pt1000
	23.0 to 302.0 °F

Accuracy

pH	±0.01 pH
Redox voltage	±0.1 % FS
Temperature	±0.2 K (in the range of -5 to +100 °C)

Connections

pH, redox	BNC socket Additional connection for reference electrode: banana socket (4 mm)
Temperature	Pt1000 via banana sockets (4 mm)

Input resistance

pH, redox	$>10^{12}\ \Omega$

pH calibration

Automatic	1, 2, or 3 point calibration, either DIN 19266 buffer or technical buffer GPH/PHL
Manual	1, 2, or 3 point calibration

Display

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

Additional functions

Calibration memory	Adjustable calibration intervals (1 to 365 days, CAL warning after expiry)
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
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)

Housing

Material	ABS, break-proof
Protection type	IP65 (front)
Dimensions	142 × 71 × 26 mm (L × W × H without BNC socket)
Ambient temperature	-25 to +50 °C; 0 to 95% relative humidity (non-condensing)
Storage temperature	-25 to +70 °C
Weight	approx. 170 g (including battery)

14 Technical data

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	<1 mA (with serial interface switched off)
Battery display	" ⚠ " and "bAt" displayed automatically when battery is used up

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

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产品组别 Product group: 202710 部件名称 Component Name	产品中有害物质的名称及含量 China EEP Hazardous Substances Information					
	铅 （Pb）	汞 （Hg）	镉 （Cd）	六价铬 （Cr(VI)）	多溴联苯 （PBB）	多溴二苯醚 （PBDE）
外壳 Housing (Gehäuse)	○	○	○	○	○	○
过程连接 Process connection (Prozessanschluss)	X	○	○	○	○	○
螺母 Nuts (Mutter)	○	○	○	○	○	○
螺栓 Screw (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.

15 China RoHS

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