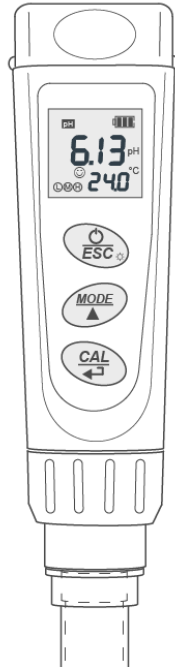


We understand water.



Accessories | Combined measuring device for
pH and conductivity

Operation manual

grünbeck

General Contact
Germany

Phone +49 9074 41--0
Fax +49 9074 41-120

Availability

Monday to Thursday
7:00 am - 6:00 pm

Friday
7:00 am - 12:00

We reserve the right to technical modifications.
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Original operation manual

Edition: December 2023

Order no.: 100066970000_en_035

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1 Introduction

This manual is intended for owners/operating companies, operators/users as well as qualified specialists and ensures the safe and efficient handling of the product. The manual is an integral part of the product.

- ▶ Carefully read this manual and the included manuals on the components before you operate your product.
- ▶ Adhere to all specified safety instructions and handling instructions of this manual.
- ▶ Keep this manual and all other applicable documents, so that they are available when needed.

Illustrations in this manual are for basic understanding and can differ from the actual design.

1.1 Validity of the manual

This manual applies to the product below:

- Combined measuring device for pH and conductivity
(type: PC 5)

1.2 Other applicable documents

- Quick reference manual, order no. 100060440000
- Safety data sheets for calibration solutions









1.3 Product identification

You can identify your product based on the product designation and the order no. indicated on the type plate.

- Check whether the products given in chapter 1.1 correspond to your product.

The type plate is located on the back of the product.

1.4 Symbols used

Symbol	Meaning
	Danger and risk
	Important information or requirement
	Useful information or tip
	Written documentation required
	Reference to further documents
	Work that must be carried out by qualified specialists only
	Work that must be carried out by qualified electricians only
	Work that must be carried out by technical service personnel only

1.5 Depiction of warnings

This manual contains information and instructions that you must obey for your personal safety. The information and instructions are highlighted by a warning symbol and are structured as shown below:






SIGNAL WORD

Type and source of hazard

- Possible consequences
- Preventive measures

The signal words below are defined subject to the degree of hazard and could be used in the present document.

Warning symbol and signal word		Consequences if the information/instructions are ignored
	DANGER	Death or serious injuries
	WARNING	Possible death or serious injuries
	CAUTION	Possible moderate or minor injuries
	NOTE	Possible damage to components, the product and/or its function or damage to an object in its vicinity

1.6 Demands on personnel

During the individual life cycle phases of the product, different people carry out activities on the product. The respective tasks require different skills.

1.6.1 Qualification of personnel

Personnel	Requirements
Operator/user	<ul style="list-style-type: none"> • No special expertise required • Knowledge of the tasks assigned • Knowledge of possible dangers in case of incorrect behaviour • Knowledge of necessary protective equipment and protective measures • Knowledge of residual risks
Owner/operating company	<ul style="list-style-type: none"> • Product-specific expertise • Knowledge of statutory regulations on work safety and accident prevention
Qualified specialist <ul style="list-style-type: none"> • Electrical engineering • Sanitary engineering (HVAC and plumbing) • Transport 	<ul style="list-style-type: none"> • Professional training • Knowledge of relevant standards and regulations • Knowledge of detection and prevention of possible dangers • Knowledge of statutory regulations on accident prevention
Technical service (Grünbeck's technical service/ authorised service company)	<ul style="list-style-type: none"> • Extended product-specific expertise • Trained by Grünbeck

1.6.2 Authorisations of personnel

The table below describes which activities can be carried out by whom.

	Operator/ user	Owner/ operating company	Qualified specialist
Transport and storage		X	X
Installation and mounting		X	X
Start-up/Commissioning		X	X
Operation and handling	X	X	X
Cleaning	X	X	X
Inspection	X	X	X
Maintenance		X	X
Troubleshooting		X	X
Repair		X	X
Decommissioning and restart/recommissioning		X	X
Dismantling and disposal		X	X

1.6.3 Personal protective equipment

- As an owner/operating company, make sure that the required personal protective equipment is available.

The components below fall under the heading of personal protective equipment (PPE):



Protective gloves



Protective footwear



Protective overall



Protective goggles

2 For your safety

2.1 Safety measures

- Do not use the product, if there are signs of damage on the sensor or on the combined measuring device.
- Obey and comply with technical specifications.
- Do not make any changes and/or alterations on your product.
- Only use genuine spare parts for maintenance or repair. If unsuitable spare parts are used, the warranty for the product will be void.
- The sensor is made of glass and is the most sensitive component of the combined measuring device. Handle the measuring device with care (refer to chapters Transport/Storage 4.2 and Cleaning 7.1).

2.1.1 Groups of persons in need of protection

- This product is not designed to be used by persons (including children) with reduced capabilities, lack of experience or lack of knowledge. Unless they are supervised, have been instructed on the safe use of the product and understand the resulting hazards.
- Children should be supervised to make sure that they do not play with the product.

3 Product description

3.1 Intended use

- The combined measuring device is used to analyse heating and cooling water.
- The following values can be measured with the combined measuring device:
 - pH
 - LF (Cond = conductivity)
 - TDS (Total sum of dissolved solids)
 - Temperature
 - Salt concentration

3.1.1 Foreseeable misuse

- Use outside the technical application limits (refer to chapter 10).
- Improper storage of the sensor.

3.2 Product components



	Designation	Function
1	Battery compartment	For 2 batteries, type: AAA 1.5 V
2	LCD display	With multi-coloured backlight to indicate the status: <ul style="list-style-type: none"> • Measuring mode (blue) = normal measurement • Calibration mode (green) = calibration • Alarm (red) = Fault on device or sensor The illumination changes subject to the mode and stays on for approx. 6 seconds upon briefly pressing the ON/OFF button.
3	ON/OFF and ESC button	ON/OFF = Switching the device on and off <ul style="list-style-type: none"> • After pressing and holding the button for approx. 5 seconds, the device switches off • Automatic switch-off 8 minutes after the last press of a button ESC = Abortion of the measuring step
4	Mode button	Mode change between the individual measurands: pH / Cond / TDS / salt
5	CAL button	Starting the calibration
6	Sensor cap	With O-ring for sealing
7	Electrode (sensor)	Replaceable (refer to chapter 7.7.1).
8	Screw cap	For the calibration of the pH-value and the protection of the sensor as well as proper storage
9	Battery status indicator	Three bars inform about the battery condition and replacement
10	Unit	Corresponding to measurand
11	Temperature indicator	Temperature measured at the electrode
12	Indicator of calibration point	Indication of the calibrated ranges (1, 2 or 3-point): L = Low, M = Medium, H = High
13	Smiling face (smiley)	Confirmation of a stable measuring value
14	Displayed value	Varies subject to mode
15	Measurand	pH, Cond (LF – conductivity), TDS (factor), salt (salt concentration)



The measurement is temperature-compensated up to 60 °C. This considerably shortens the cooling phase, for instance of heating water, and provides reliable measuring results.

3.3 Functional description

3.3.1 Requirements

According to VDI 2035-1 and -2 as well as DIN EN 14868, heating water must comply with certain water parameters, in order not to have a corrosive effect or promote furring. Furring has an adverse effect on the efficiency of the heating system. Corrosion can attack the entire heating system, which might require the replacement of individual or several parts of the system.

3.3.2 pH value

To prevent the risk of corrosion, the pH value must be measured 8 – 12 weeks after the initial filling of the heating system and then once a year. If additives to prevent furring or corrosion are added to the heating water, their concentration must be measured every year as well.

The pH value is defined as a negative, ten-base logarithm of the hydrogen ion concentration. The more acid a solution is, the lower its pH value. pH 7 indicates a neutral solution, whereas higher pH values indicate alkaline conditions.

acid	neutral	alkaline
0	7	14

pH value according to VDI 2035 for heating systems

pH value at 25 °C	
8.2 – 10.0	
8.2 – 8.5	for components made of aluminium or aluminium alloys
8.2 – 9.0	for components made of selected aluminium alloys according to the manufacturer's information

3.3.3 Conductivity measurement (Cond) and water hardness

Conductivity (LF or Cond) refers to the total of all minerals dissolved in the water. Water conducts electricity all the better, the more minerals it contains. By measuring the electrical conductivity, the ions of these dissolved minerals can be detected. They are given in the unit of measurement $\mu\text{S}/\text{cm}$.

3.3.4 Calibration




The device can be calibrated by way of 1, 2, or 3-point calibration.

Calibration ensures that the device keeps up the required high measurement accuracy.

- The pH value is calibrated by means of 2-point calibration with the calibration solution in the screw cap.
- The conductivity (LF/Cond) is calibrated by means of 1-point calibration in the 50 ml Griffin cup.

3.4 Accessories

Your product can be retrofitted with accessories. Please contact your local Grünbeck representative or Grünbeck's headquarters in Hoechststadt/Germany for details.

Illustration	Product	Order no.
	Griffin cup VIT-LAB, 50 ml, PP	88802315
	3 pieces as measuring cups and calibration cups for conductivity	
	O-Ring 9.00 x 1.50 mm (EPDM 70 KTW, W270)	87003021
	5 pieces to seal the sensor cap	
	Calibration solution pH 4 (50 ml)	203 627
	Calibration solution pH 7 (50 ml)	203 628
	Calibration solution Conductivity LF 1413 $\mu\text{S}/\text{cm}$ (50 ml)	203 624
	Potassium chloride solution KCL 3 mol/l (50 ml)	203 631
	As storage solution for electrode	

4 Transport and storage

4.1 Transport

- ▶ Transport the product in its original packaging only.
- ▶ Do not drop the product.
- ▶ Protect the product from vibrations and shocks.

4.2 Storage

NOTE

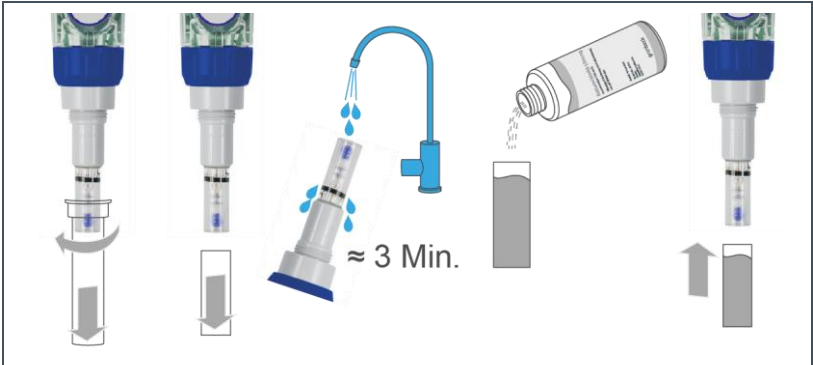
Risk of damage in case of frost and high temperatures

- The sensor contains chemicals and is damaged by frost and strong heat.
- ▶ Protect the product from the impacts below when storing it:
 - Dampness, moisture
 - Environmental impacts such as wind, rain, snow, etc.
 - Frost, direct sunlight, severe heat exposure
 - Chemicals, dyes, solvents and their vapours
- ▶ Store the product at a room temperature between 10 – 40 °C.

NOTE

Risk of crystallisation and drying out

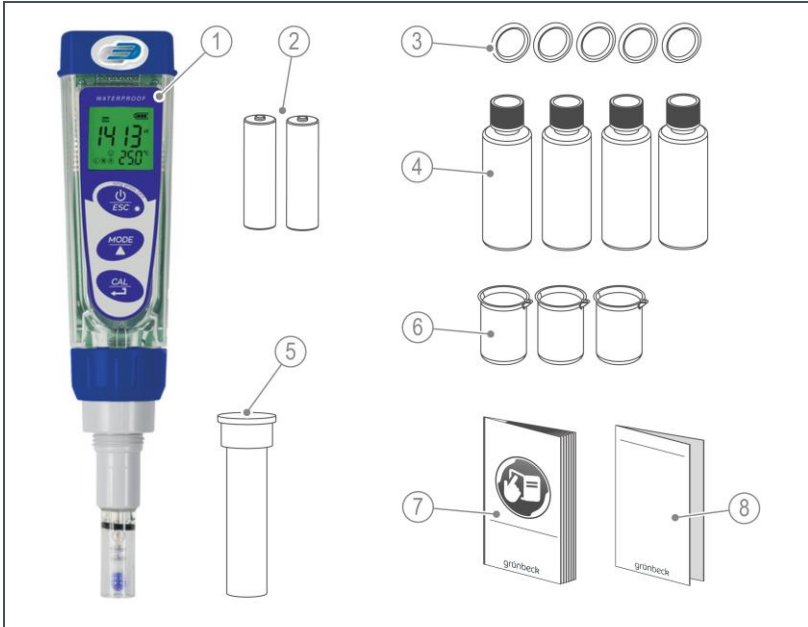
- In case of long periods of non-use (> 1 month), the sensor can dry out and the storage solution can crystallise.
- Proceed as follows to protect the sensor from drying out:



1. Unscrew the screw cap.
2. Pull off the sensor cap.
3. Rinse the sensor and the sensor cap under a water jet.
4. Fill the sensor cap with storage solution.
5. Place the sensor on the sensor cap.
 - a Check the O-ring for proper seating.
6. Screw on the screw cap.
 - » The sensor is protected from drying out.
- Carry out inspection and maintenance at regular intervals (refer to chapter 7).

5 Start-up/Commissioning

5.1 Checking the scope of supply



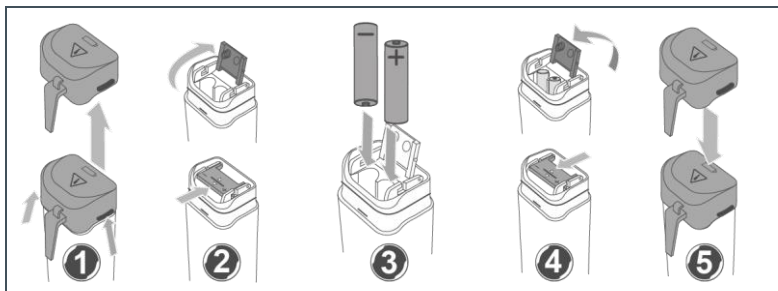
Designation	
1	Combined measuring device
2	Battery (2x)
3	O-rings (5x)
4	Calibration solutions (3x) and storage solution (1x)

Designation	
5	Screw cap
6	Measuring cups (3x)
7	Operation manual
8	Quick reference manual

► Check the scope of supply for completeness and damage.

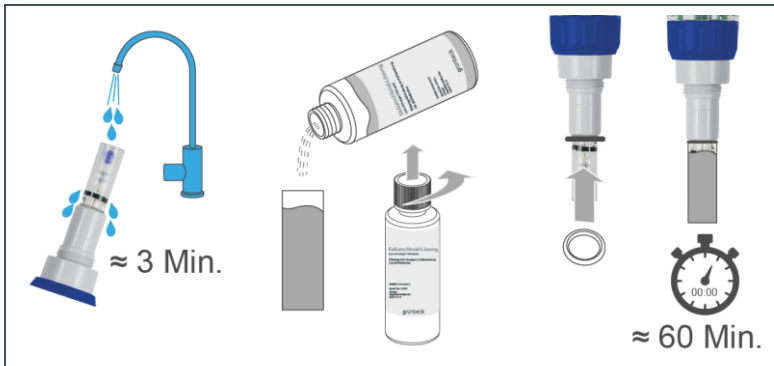
5.2 Inserting the batteries

- Take the two batteries (type: AAA, 1.5 V) out of the bag.



1. Pull off the cap upwards.
2. Unlock and open the battery compartment.
3. Insert the two batteries with the correct polarity.
4. Close the battery compartment.
5. Press the cap on firmly.

5.3 Preparing the combined measuring device



1. Pull off the sensor cap.
2. Rinse the sensor and the sensor cap under running water until the crystallised storage solution (KCL 3) is completely rinsed out.
3. Fill the new storage solution into the sensor cap.
4. Place the O-ring on the sensor.
5. Close the sensor with the sensor cap.
6. Allow the storage solution to react for about 1 hour.
7. Rinse the sensor under running water.

5.4 Calibrating



In case of infrequent use (> 1 week), the product must always be calibrated prior to a measurement.

In case of regular measurements (1x per week) calibration must be carried out at least once a month.

Proceed as follows to calibrate the pH and the conductivity value:

- pH value: 2-point calibration at least
- Conductivity value (Cond): 1-point calibration

Preparing the calibration solutions



The calibration solutions must only be used once.

Make sure, that the electrode is fully submerged into the calibration solution.


- For the calibration of the pH-value use the screw cap.






1. Open the bottle containing the calibration solution – obey the label.
2. Fill the calibration solution pH7 halfway into the screw cap.

3. Close the bottle containing the calibration solution.

pH value (2-point calibration)

- Switch on the device using the  button.
- Always hold the device in your hand during the calibration process.

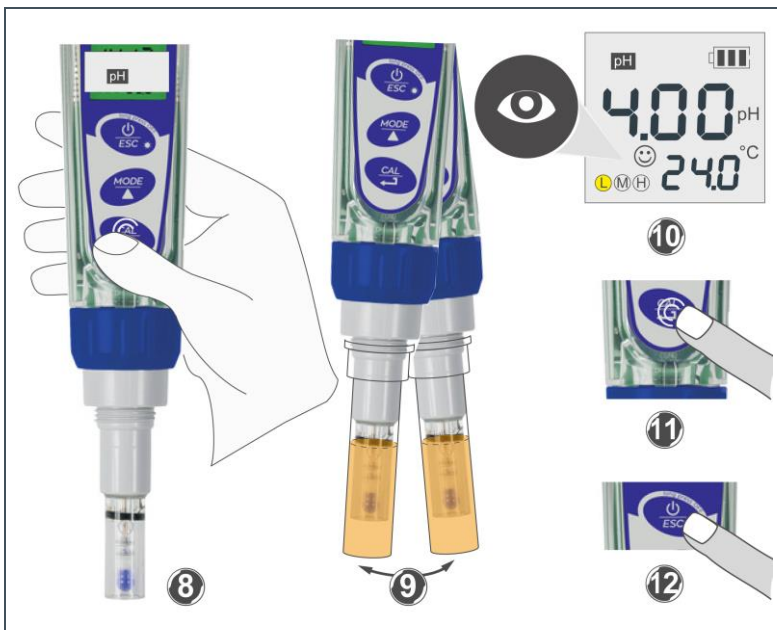


1. Press the  button.
 - » The device displays **CAL** for approx. 2 sec.
2. Immerse the electrode into the screw cap with the calibration solution pH 7.
 - a Briefly shake the device with the screw cap.
 - » The device now automatically detects the range and stabilises the measurement.
3. Hold the device steady in your hand and wait until the value is stable – a smiley  will appear on the display.
4. Press the  button once again.
 - » The electrode automatically calibrates to the first value.

5. To neutralise, dip the electrode briefly into deionised water or wipe off the solution with a cloth.



6. Rinse the screw cap with water.
7. Fill the screw cap halfway with calibration solution pH 4.



8. Press the  button

» The device displays **CAL** for approx. 2 sec.

9. Immerse the electrode into the screw cap with the calibration solution pH 4.

a Briefly shake the device with the screw cap.

10. Hold the device steady in your hand and wait until the value is stable – a smiley 😊 will appear on the display.

11. Press the  button again for confirmation.

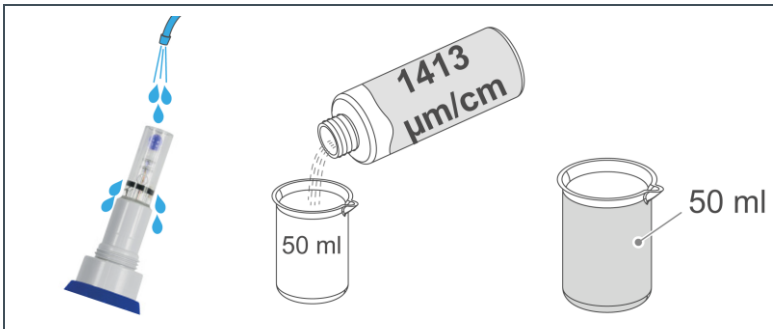
» The pH value is calibrated twice.

12. Press the  button.

» You leave the CAL mode and directly access the measuring mode.

Conductivity value **Cond** (1-point calibration)

► For the calibration of the conductivity value use the 50 ml Griffin cup.



1. To neutralise, dip the electrode briefly into deionised water or wipe off the solution with a cloth.

2. Fill 50 ml calibration solution for conductivity into the Griffin cup.



3. Press the button.
 - » The device switches to the measuring range **Cond**.
4. Press the button.
 - » The device displays **CAL** for approx. 2 sec.
5. Immerse the electrode into the Griffin cup with the calibration solution Conductivity LF 1413 $\mu\text{S}/\text{cm}$.
6. Wait until the value is stable – a smiley will appear on the display.
7. Press the button for confirmation.
 - » The pH value is calibrated.

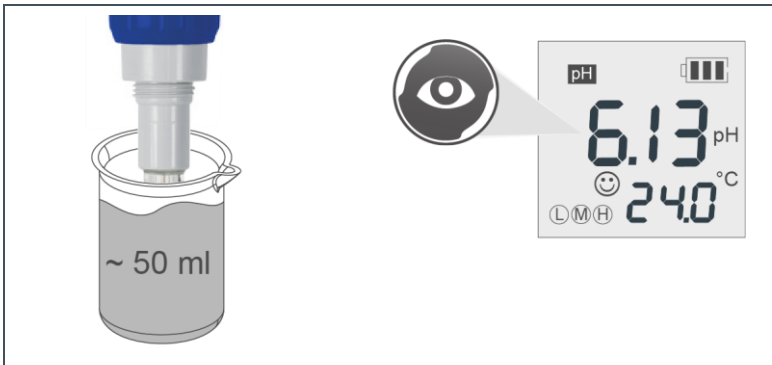
6 Operation/handling




6.1 Carrying out measurements

NOTE

Impurities on the water surface

- The electrode can be contaminated by non-water-soluble substances contained in the water which can cause inaccurate measurement results.
- Thoroughly rinse the electrode prior to the next measurement.
- For measuring use the Griffin cup with 50 ml capacity.



1. Switch on the device using the  button.
 - » In measuring mode, the display lights up blue.
2. Select the desired measurand using the  button.
3. Immerse the sensor in the liquid to be measured – wait briefly until the value has stabilised.
 - » A smiley  appears on the display.

4. Read the value on the display.



Recommendation: When switching between measurements, briefly hold the sensor into water to neutralise the sensor and not to falsify the measurements.

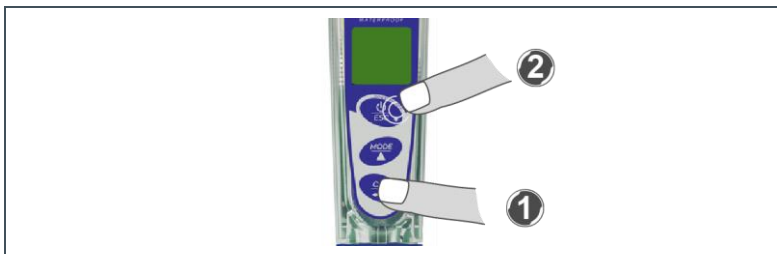
Changing the measuring units




- Switch between the measurands by pressing the button




6.2 Set-up mode

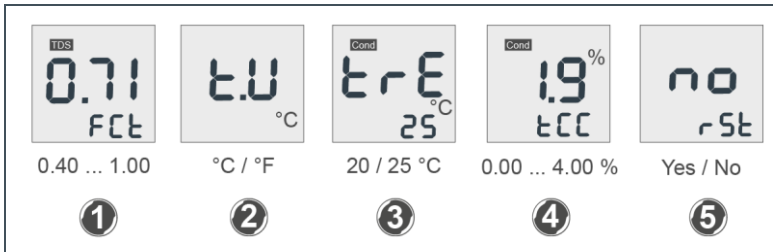
Requirement: The device is switched off.



1. Press and hold the  button.
2. Press the  button as well.
 - » A test pattern is displayed.
 - » After releasing the  button, the values below appear on the display for setting:

► Modify or change the values with .

► Confirm the values with .



1. Set the TDS factor (pre-set to: 0.71).
2. Set the temperature unit °C or °F.
3. Set the reference temperature for conductivity to 20 or 25 °C.



In general, the pre-set reference temperature of 25 °C is used.

4. Set the temperature coefficient between 0.00 and 4.00 % (pre-set to: 1.9 % per °C).
5. Keep the setting with “No” or reset to factory setting with “Yes”

► Quit the Set-up mode with .

7 Maintenance and repair

Maintenance and repair includes cleaning, inspection and servicing of the product.

Regular maintenance ensures trouble-free and hygienic operation.

- ▶ Only use genuine spare and wearing parts from Grünbeck.

7.1 Cleaning

NOTE:

Do not clean the product with cleaning agents containing alcohol/solvents

- These substances damage the plastic components.
 - ▶ Use a mild/pH-neutral soap solution.
- ▶ Wipe the product with a damp cloth.
- ▶ Do not use any strong or abrasive cleaning agents.
- ▶ Thoroughly rinse the sensor and the screw cap with water (preferable with distilled water) after every measurement.
- ▶ Store the device properly until the next use (refer to chapter 4.2).

7.2 Intervals



By way of regular inspections and maintenance, malfunctions can be detected in time and product failures might be prevented.

- As owner/operating company determine at which intervals the product must be inspected and maintained (load-dependent).

The interval table below shows the minimum intervals for the tasks to be carried out.

Task	Interval	Execution
Inspection	monthly	<ul style="list-style-type: none">• Visual check for damage on the outside• Check the batteries• Calibrate
Maintenance	6 months as needed - in case of impurities	<ul style="list-style-type: none">• Check the condition of the O-ring• Check the condition of the electrode• Replace the storage solution
Repair	as required	<ul style="list-style-type: none">• Replace the electrode

7.3 Inspection

- ▶ Carry out an inspection at least once a month and proceed as follows when doing so:
 1. Switch on the device and check the status of the batteries on the display.
 - a Replace dead batteries (refer to chapter 5.2).
 2. Check the device for damage on the outside.
 3. Calibrate the device (refer to chapter 5.3).

7.4 Maintenance

- ▶ In addition to the inspection work, carry out the tasks below:
 1. Check the electrode for damage and impurities.
 2. Check the O-ring of the sensor cap for damage and leaks.
 - a Replace the O-ring, if necessary.
 3. Clean the device and the sensor (refer to chapter 7.1).
 4. Replace the storage solution of the electrode.

7.5 Consumables

Product	Quantity	Order no.
Calibration solution pH 4	50 ml	203 627
Calibration solution pH 7	50 ml	203 628
Calibration solution Conductivity LF 1413 $\mu\text{S}/\text{cm}$	50 ml	203 624
Potassium chloride solution KCL 3 mol/l as storage solution for the electrode	50 ml	203 631

7.6 Spare parts

For an overview on the spare parts, go to our spare parts catalogue at www.grünbeck.com. You can obtain the spare parts from your local Grünbeck representative.

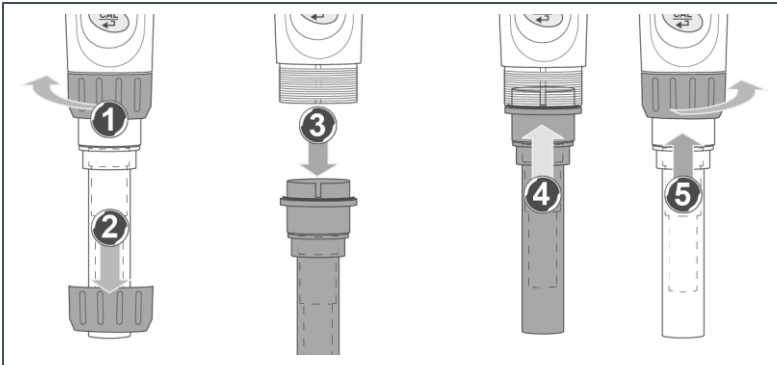
7.7 Wearing parts

Wearing parts are given below:

- Seals
- Replacement combined electrode,
order no. 100066020001

7.7.1 Replacing the electrode

Proceed as follows to completely replace a defective electrode:



1. Unscrew the cap.
 2. Remove the cap.
 3. Pull out the electrode.
 4. Insert the new electrode – pay attention to the position of the groove.
 5. Firmly screw on the cap.
- » The electrode is replaced.
- Dispose of the defective electrode (refer to chapter 9).

8 Troubleshooting

Error	Explanation	Remedy
Er 1	<ul style="list-style-type: none"> • Incorrect pH calibration solution used • Detection that the pH calibration solution is out of range 	<ul style="list-style-type: none"> ▶ Check shelf life of the calibration solution ▶ Check whether the electrode is in contact with the calibration solution ▶ Check whether the electrode is defective ▶ Replace defective electrode
Er 2	Measurement is not stable	<ul style="list-style-type: none"> ▶ Wait until the smiley 😊 appears on the display
Er 3	During the calibration, the measuring value was not stable for ≥ 3 min	<ul style="list-style-type: none"> ▶ Check whether there are air bubbles in the glass shaft of the electrode ▶ Replace defective electrode
Er 4	Range of application of the electrode undershot or exceeded (< -60 mV or > 60 mV)	<ul style="list-style-type: none"> ▶ Check whether there are air bubbles in the glass shaft of the electrode
Er 5	Range of application of the electrode slope undershot or exceeded (< 85 % or > 110 %)	<ul style="list-style-type: none"> ▶ Check whether the used solution can still be used (no turbidity, no expired shelf life, etc.) ▶ Replace defective electrode

9 Disposal

- ▶ Obey the applicable national regulations.

Packaging

- ▶ Dispose of the packaging in an environmentally sound manner.

Batteries

- ▶ Remove the batteries from the device.
- ▶ Take the batteries to the collection point for old batteries – do not dispose of with household waste.

Electrode

- ▶ Take the electrode to the collection point for electrical and electronic products - do not dispose of with household waste.



Product

If this symbol (crossed-out wheellie bin) is on the product this product or its electrical and electronic components must not be disposed of as household waste.

- ▶ Find out about the local regulations on the separate collection of electrical and electronic products.
- ▶ Make use of the collection points available to you for the disposal of your product.



For more information on take-back and disposal, go to www.gruenbeck.com.

10 Technical specifications

Dimensions and weights		
Dimensions (with screw cap)	mm	40 x 200 (40 x 220)
Weight	g	130
Connection data		
Voltage supply (batteries type: AAA)	V	2x 1.5
Service life of batteries	h	> 200
Protection class		IP 67
Measuring range		
pH		-2 – 16
	μS/cm	0 – 2000
	mS/cm	2 – 20
TDS	ppm (mg/l)	0.01 – 1000
(automatic switchover)	ppt (g/l)	1 – 199.9
Salt concentration	mg/l	0.01 – 1000
	g/l	1 – 100
Temperature	°C	0 – 60
TR reference temperature	°C	20/25
TC temperature coefficient	%/°C	0.00 – 4.00
Resolution/accuracy		
pH		0.01/± 0.01
LF (Cond)	–/%	automatic/± 1
TDS factor		0.4 – 1.00
Salt concentration		automatic
Temperature	°C	0.1/± 0.2
General data		
Ambient temperature (storage)	°C	10 – 40
Humidity (non-condensing)	%	≤ 70
Automatic switch-off (after the last press of a button)	min	8
Order no.		170000010000

11 Operation log



- ▶ Document the initial start-up/commissioning and all maintenance activities.
- ▶ Copy the maintenance report.

Combined measuring device type: _____

Serial no.: _____

11.1 Start-up/Commissioning log

Customer	
Name: _____	
Address: _____	
Operating values	
▶ Refer to set-up mode	
TDS factor	Fct
Temperature unit	<input type="checkbox"/> °C <input type="checkbox"/> °F
TR reference temperature	<input type="checkbox"/> 20 °C <input type="checkbox"/> 25 °C
TC temperature coefficient	% per °C
Remarks	
<div style="border-bottom: 1px solid black; height: 15px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-bottom: 5px;"></div>	
Start-up/Commissioning	
Installer/ Owner/Operating company:	_____
Company:	_____
Work time certificate (no.):	_____
Date/signature:	_____

11.2 Maintenance

[illegible]

[illegible]

Grünbeck Wasseraufbereitung GmbH
Josef-Grünbeck-Str. 1
89420 Hoechstädt
GERMANY



+49 9074 41-0



+49 9074 41-100

info@gruenbeck.com
www.gruenbeck.com



For more information go to
www.gruenbeck.com