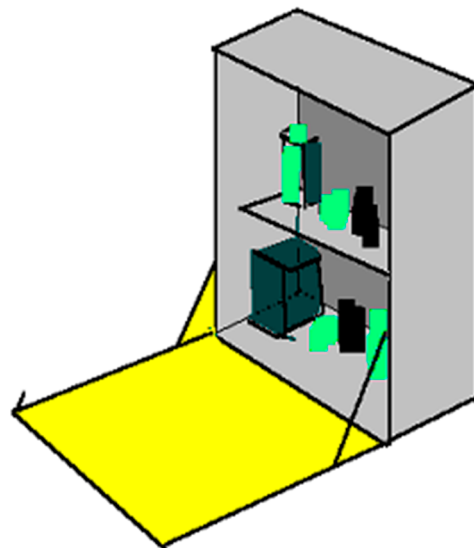


# Operation manual Analysis Cabinet Boiler Water



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in accordance with DIN EN ISO 9001,  
DIN EN ISO 14001 and SCC

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## A General

### 1 | Preface

Thank you for opting for a Grünbeck product. Backed by decades of experience in the area of water treatment, we provide customised solutions for all kind of processes.

Customer satisfaction is our prime objective. And providing customers with qualified advice is crucial. If you have any questions concerning the present product, possible extensions or general water and waste water treatment, our field staff, as well as the experts at our headquarters in Hoechstädt, are available to help you.

#### Advice and assistance

For advice and assistance please contact your local representative (see [www.gruenbeck.com](http://www.gruenbeck.com)). In case of emergency, please get in touch with our service hotline at +49 9074 41-333. We can connect you with the appropriate expert more quickly if you provide the required data for your system or this analysis case.

### 2 | How to use this operation manual

This operation manual is intended for users of our analysis case for steam boilers. It is divided into several chapters, which are listed in the “Table of contents” on page 2 in alphabetical order. In order to find the specific information you are looking for, check for the corresponding chapter on page 2.

The headers and page numbers with chapter information make it easier to find your way around in the manual.

### 3 | General safety information

#### 3.1 Symbols and notes

Important information in this operation manual is characterised by symbols. Please pay particular attention to this information to ensure the hazard-free, safe and efficient handling of the system.



**Danger!** Failure to adhere to this information will cause serious or life-threatening injuries, extreme damage to property or inadmissible contamination of the drinking water.



**Warning!** Failure to adhere to this information may cause injuries, damage to property or contamination of the drinking water.



**Attention!** Failure to adhere to this information may result in damage to the system or other objects.



**Note:** This symbol characterises information and tips that make your work easier.



Tasks with this symbol may only be performed by Grünbeck's technical service/authorised service company or by persons expressly authorised by Grünbeck.



Tasks with this symbol may only be performed by trained and qualified electrical experts according to the VDE guidelines or according to the guidelines of a similar local institution.



Tasks with this symbol may only be performed by water supply companies or approved installation companies. In Germany, the installation company must be registered in an installation directory of a water company as per §12(2) AVBWasserV (German Ordinance on General Conditions for the Supply of Water).

## 3.2 Operating personnel

Only persons who have read and understood this operation manual are permitted to work with the analysis case for steam boilers. The safety information in particular is to be strictly adhered to.

## 3.3 Intended use

The analysis case for steam boilers may only be used for the purpose outlined in the product description (chapter C). The instructions in this operation manual as well as the applicable local guidelines concerning drinking water protection, accident prevention and occupational safety must be adhered to. Intended use also includes that the analysis case for steam boilers and the devices and chemicals inside are only used when in proper condition. Any malfunctions must be repaired at once.

## 3.4 Indication of specific dangers

The analysis case for steam boilers contains chemicals that – if applied incorrectly - may be hazardous to the health and safety of the user or to the environment.

Always keep the analysis case for steam boilers or the parts contained therein away from children.

Keep all the components inside the case when they are not in use.

You should not eat, drink or smoke while working.

Properly rinse your devices after each analysis in order to avoid carry-over errors.

Never pour reagent samples back into the supply bottles, so as to avoid contamination.

## 4 | Shipping and storage



**Attention!** The analysis case for steam boilers and its content may be damaged by frost or high temperatures. In order to prevent damage of this kind:

Protect from frost during shipping and storage!

Do not install or store the analysis case for steam boilers next to objects which radiate a lot of heat.

## 5 | Disposal of used parts and materials

Used parts and materials are to be disposed of, or made available for recycling purposes, according to the applicable local guidelines.

If a material is subject to specific regulations, adhere to the instructions indicated on the packing.

If in doubt, contact your local waste disposal authority or the manufacturer for more information.

## B Basic information

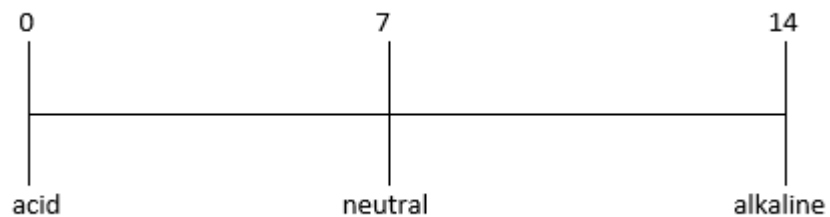
### 1 | Laws, regulations, standards

According to VDI 2035 sheet 1 and sheet 2 and DIN EN 14868, heating water has to comply with certain water parameters, so as not to have a corrosive effect or to promote furring. Furring has an adverse effect on the efficiency of the heating system. Corrosion may attack the entire heating system, which can make it necessary to replace individual or several parts of the system.

To avoid this risk, the regulations state that the pH value should be measured 8 - 12 weeks after the initial filling and then once a year. If additives are added to the heating water in order to prevent furring or corrosion, their concentration must be measured every year as well.

### 2 | pH value

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.



| pH value acc. 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 | Conductivity

Conductivity refers to the total of all salts dissolved in the water. It is well-known that water conducts electricity better the more salts it contains. The ions of these dissolved salts can only be determined by measuring the electrical conductivity, the measuring unit being [ $\mu\text{S}/\text{cm}$ ].

---

## 4 | Total hardness

Total hardness refers to the total of all alkaline earth ions (principally calcium and magnesium) dissolved in the water. The hardness is measured in German degrees of hardness (°dH) or mmol/l. The greater the hardness contained in the (heating) water, the more deposits can be formed.

## 5 | Phosphate

Products containing phosphates (e.g. GENO-phos no. 1) are added to the boiler water and boiler feed water in order to precipitate the residual hardness and to increase the pH value. With this water test kit, the phosphate can be monitored.

## 6 | Sulphite

Sulphite is added to the boiler water and boiler feed water to bind traces of surplus oxygen. With this water test kit, the necessary sulphite surplus can be monitored.



## C Product description

### 1 | Intended use

The analysis case is essential for correctly determining the parameters of the heating water and also the feed water.

By means of the combined measuring device, the pH value and the conductivity (temperature-compensated up to 60 °C) can be measured. Calibrate the device before use in order to ensure correct measurements at all times. The calibration solutions required to do so are included in the case as well. The corresponding measuring kits for the hardness determination and for the phosphate and sulphite measurements are contained in the case (refer to chapter E).



**Note:** If a system has been filled with fully demineralised water and then additives (e.g. GENO-phos no. 1) are mixed in, the conductivity will increase.

The purpose of the phosphate and sulphite measurements is to determine the surplus of GENO-phos no. 1 or sodium sulphite.

The case additionally contains measuring beakers to allow for the combined measuring device to be calibrated or for samples to be taken. All individual components can also be ordered separately. Hence, any parameter that is important for the trouble-free operation of a heating system can be determined quickly and easily by means of the analysis case.

Basically, the pH value, the conductivity, the total hardness, the phosphate and the sulphite content can be measured in any water. If there are suspended particles in the water, the sample must be filtered with suitable filter paper prior to the measurement.

### 2 | Application limits

The prescribed limit values of the various measuring devices and water test kits must be complied with.

## 3 | Scope of supply

### 3.1 Standard equipment

- Combined measuring device for pH value and conductivity
- Calibration solutions (3 small bottles)
- Storage solution for electrodes (1 small bottle)
- Water test kit total hardness
- Water test kit for total hardness for very soft water (0 – 2 °dH, 0 – 0.36 mmol/l)
- Water test kit to determine the p and m value; Duroval type CPM
- Ortho-phosphate water test kit
- Sulphite water test kit
- Griffin cup VIT-LAB, 50 ml, PP
- Measuring cylinder 100 ml
- Beaker 500 ml
- Beaker 100 ml
- Funnel
- 50 folded filters
- Operation manual



**Note:** It is possible to retrofit existing analysis cases with accessories. Please contact your local Grünbeck representative or Grünbeck's headquarters in Hoechstädt for more information.

### 3.2 Optional accessories

|                                  |            |
|----------------------------------|------------|
| • Spare electrode                | 170 605    |
| • Carbon filter paper            | 888 09 011 |
| • PE-funnel                      | 888 06 006 |
| • Measuring cylinder             | 888 05 053 |
| • Griffin cup VIT-LAB, 50 ml, PP | 888 02 315 |

### 3.3 Consumables

In order to ensure a reliable analysis, you should only use genuine consumables.

|  |               |         |
|--|---------------|---------|
| • Water test kit for total hardness                                  | 1 piece       | 170 187 |
|  | 10 pieces     | 170 100 |
| • Water test kit for total hardness for very soft water              |               | 170 149 |
| • Phosphate water test kit   |               | 170 554 |
| • Refill pack of sulphite reagents                                   | Small package | 170 520 |
|  | Large package | 170 525 |
| • Calibration solution for conductivity 1413 $\mu\text{S}/\text{cm}$ |               | 203 624 |
| • Calibration solution pH 4  |               | 203 627 |
| • Calibration solution pH 7  |               | 203 628 |
| • Storage solution for electrodes<br>50 ml KCl 3 mol/l               |               | 203 631 |

### 3.4 Spare parts and wearing parts

You may order spare parts and consumables from your local Grünbeck representative (see [www.gruenbeck.com](http://www.gruenbeck.com)).



**Note:** Also observe the general warranty conditions (see [www.gruenbeck.com](http://www.gruenbeck.com)).

pH electrodes and batteries (4 x button cell 357 A) are subject to a certain wear and tear.



**Note:** Although these parts are wearing parts, we grant a limited warranty period of 6 months.

## D Combined measuring device

### 1 | Product description

#### 1.1 Components of the measuring device

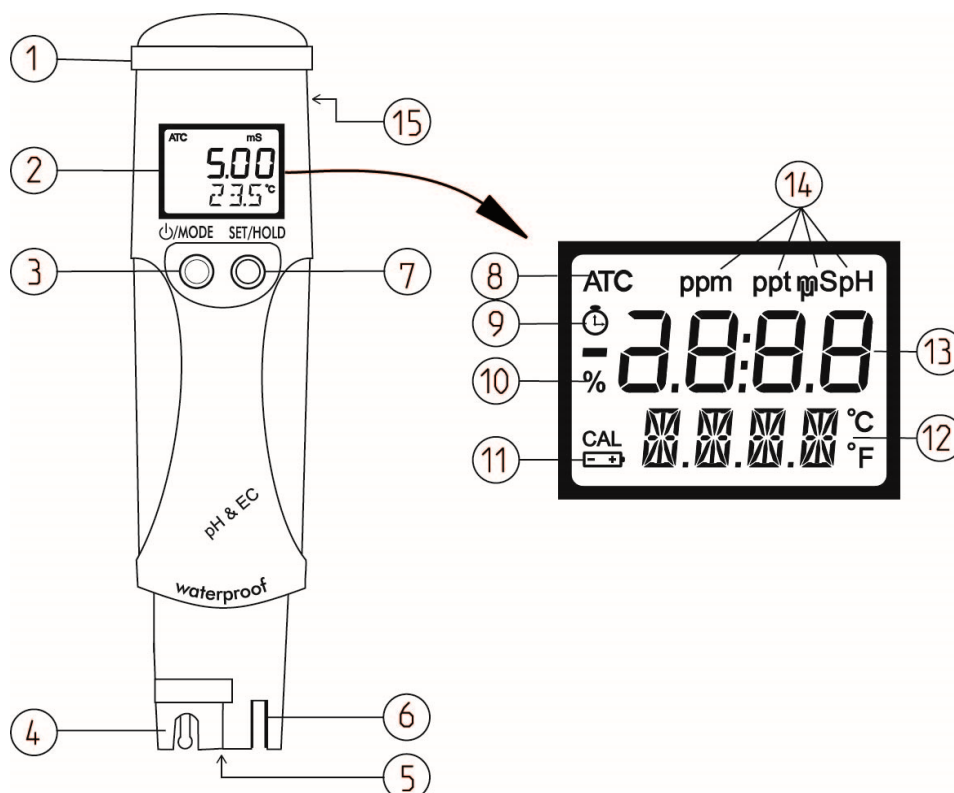


Abb. C-2: Components of the combined measuring device

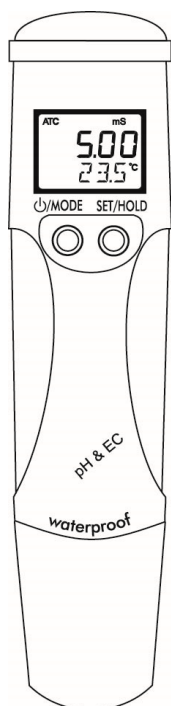
- |                             |  |  |
|-----------------------------|--|--|
| ① Battery compartment       | ⑥ Conductivity (EC/TDS) probe                      | ⑪ Indicator for flat batteries                     |
| ② LCD                       | ⑦ SET/Hold key                                     | ⑫ Secondary display                                |
| ③ On/Off key                | ⑧ Indicator for automatic temperature compensation | ⑬ Primary display (main display of measured value) |
| ④ Exchangeable pH electrode | ⑨ Stability indicator                              | ⑭ Units to indicate the measuring result           |
| ⑤ Temperature sensor        | ⑩ Battery charge indicator                         | ⑮ Type plate (rear of the device)                  |



**Warning!** Strictly observe the identification of hazards indicated on the individual components of the packaging!

| Table D-1: Technical specifications |                             | Combined measuring device                         |
|-------------------------------------|-----------------------------|---|
| <b>Measuring ranges</b>             |                             |   |
| pH                                  |                             | 0.0 – 14.0  |
| EC                                  | [ $\mu\text{S}/\text{cm}$ ] | 0 - 3999  |
| TDS                                 | [ppm(mg/l)]                 | 0 - 2000  |
| Temperature                         | [°C]                        | 0.0 – 60.0  |
| <b>Resolution</b>                   |                             |   |
| pH                                  |                             | 0.01  |
| EC                                  | [ $\mu\text{S}/\text{cm}$ ] | 1   |
| TDS                                 | [ppm(mg/l)]                 | 1   |
| Temperature                         | [°C]                        | 0.1   |
| <b>Accuracy (at 20 °C)</b>          |                             |   |
| pH                                  |                             | $\pm 0.01$  |
| EC                                  |                             | $\pm 2$ % of the value displayed                  |
| TDS                                 |                             | $\pm 2$ % of the value displayed                  |
| Temperature                         | [°C]                        | $\pm 0.5$   |
| <b>Temperature compensation</b>     |                             |   |
| pH                                  |                             | automatic   |
| EC                                  |                             | with $\beta=0.0 - 2.4$ %/°C reference temp.: 25°C |
| TDS                                 |                             | with $\beta=0.0 - 2.4$ %/°C reference temp.: 25°C |
| <b>Dimensions and weights</b>       |                             |   |
| Width                               | [mm]                        | 40  |
| Height                              | [mm]                        | 163   |
| Depth                               | [mm]                        | 26  |
| Weight                              | [g]                         | 100   |
| <b>General</b>                      |                             |   |
| Max. humidity                       | [%]                         | 100   |
| Batteries/service life              |                             | (4 x 1.5 V) / 100 operating hours                 |
| Automatic switch-off                |                             | after a measuring break of 8 min.                 |
| EC/TDS factor (CONV)                |                             | 0.45 - 1.00 (0.5 standard value)                  |
| Ambient temperature                 | [°C]                        | 0 - 50  |
| <b>Order no.</b>                    |                             | <b>170 178</b>                                    |

## 1.2 Operation



### Switching on the measuring device

Press and hold the MODE key until the display switches on. First, the display performs a self-test during which all display segments must light up briefly. After that, the charge level of the batteries is displayed in % (e.g. % 100 BATT).

### "Freezing" a measured value (HOLD function)

If measurements are carried out at locations with difficult access, and the measured value cannot be read off the display, the measured value can be frozen on the display by pressing a key.

To do so, press the SET/HOLD key at the end of the measurement and hold it until the secondary display shows the HOLD message.

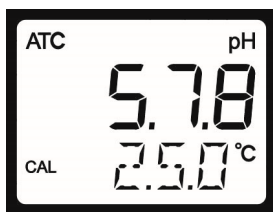
The measured value is now shown continuously on the display, allowing it to be read off.

Press a key to revert to measuring mode.

### Switching off the measuring device

Press the MODE key in measuring mode. OFF appears on the display. Now release the key. The device switches off.

## 1.3 pH measurement and calibration



### Performing a pH measurement

Call up the pH measuring mode by pressing the SET/HOLD key. Immerse the electrode in the measuring sample. The displayed measured value can be read off as soon as it is stable. The temperature-compensated pH measurement is shown on the primary display. The secondary display shows the temperature of the measuring sample.

Use the last decimal place for rounding up and down, and specify the measuring result in the format pH 5.8 (25 °C), for example.

#### Selection of the standard buffer series

The factory settings for the standard buffers are pH 4.01, pH 7.01 and pH 10.01. Only change these values if the buffers pH 4.01, pH 6.86 and pH 9.18 are required.

To do so, press and hold the MODE key in measuring mode (ignore the OFF and CAL displays) until TEMP and the current unit of temperature appear on the display, e.g. TEMP °C. Press the MODE key once again. The display shows the current buffer series: pH 7.01 BUFF (for the series 4.01/7.01/10.01) or pH 6.86 BUFF (for the series 4.01/6.86/9.18). Confirm the selection with the MODE key. The measuring device reverts to measuring mode.

#### pH calibration

Carry out the calibration regularly (at least 1 x month).

Switch on the measuring device. Press and hold the MODE key until CAL appears on the display. Ignore the OFF display in this case. Now release the key. The display shows pH 7.01 USE or pH 6.86 USE. The automatic buffer recognition is now active.

For a 1-point calibration, proceed as follows:

Immerse the electrode in the first buffer solution (e.g. pH 7.01, pH 4.01 or pH 10.01). The device automatically detects the buffer when the measured value does not deviate from that of the calibration buffer by more than  $\pm 0.4$  pH units. Clean or replace the probe if there are larger deviations.

If the pH 4.01 or pH 10.01 calibration solution is used, the device displays OK for about 1 second and then reverts to measuring mode.

If you are using the pH 7.01 solution, the device - on detection - requests the pH 4.01 buffer for a 2-point calibration. Press the MODE key to revert to measuring mode or continue the calibration with point 2 as described in the following.

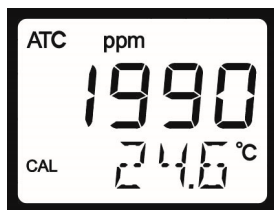


**Note:** A 2-point calibration guarantees higher accuracy over a wide pH range.

For a 2-point calibration, proceed as follows:

Immerse the electrode into the pH 7.01 (or 6.86) buffer solution. The device detects the buffer value and then displays pH 4.01 USE. Rinse the electrode thoroughly with fully demineralised water. Immerse the electrode in the second buffer solution (pH 4.01 or 10.01, pH 4.01 or 9.18). When the second buffer is detected, the display shows OK (for 1 second) and the device automatically reverts to measuring mode. The CAL symbol is now active.

## 1.4 Conductivity (EC/TDS) - measurement and calibration



### Performing a measurement

Call up EC or TDS measuring mode by pressing the SET/HOLD key. Immerse the probe in the measuring sample. The displayed measured value can be read off as soon as it is stable.

The temperature-compensated EC/TDS measurement is shown on the primary display. The measured value for the temperature shown on the display corresponds to the actual temperature of the measuring probe.

Setting the EC/TDS factor (CONV) and the temperature coefficient ( $\beta$ )  
The factory setting is 1.9 %/°C. This setting is ideal for many types of water.

Press and hold the MODE key in measuring mode (ignore the OFF and CAL displays) until TEMP appears on the display, e.g. TEMP °C.

Press the MODE key again to display the set factor e.g. 0.50 CONV.

Press the SET/HOLD key to change the factor.

Press the MODE key to display the set coefficient, e.g. 1.9  $\beta$ .

Press the SET/HOLD key to change the value.

Press the MODE key to revert to measuring mode.

### Calibration of conductivity/TDS

Call up EC or TDS measuring mode by pressing the SET/HOLD key.

The device can be calibrated in the  $\mu\text{S}$  or ppm measuring ranges. When the conductivity is calibrated, the TDS range is automatically calibrated as well. Rinse the probe and vessels thoroughly with distilled water. Press the MODE key. Keep it pressed until CAL appears in the secondary display (ignore the OFF display). The device requests the corresponding calibration solution, depending on the selected measuring mode and TDS factor:

Conductivity: Calibration solution 1413  $\mu\text{S}/\text{cm}$

203 624



Immerse the probe in the corresponding calibration solution and stir for a few seconds. Once the device has detected the calibration solution, the display shows OK for 1 second and the device reverts to measuring mode. The CAL symbol indicates that the device is calibrated.



**Note:** If a high measuring accuracy is required, the measuring device should be in calibrated condition.

An easy-to-do test in the calibration solution is of assistance: Immerse the sensor in the calibration fluid and check if a significant deviation from the measured value can be observed.

If you want to measure several samples in succession, initially rinse the electrode thoroughly with the next sample before you carry out the measurement.

Impurities floating on the water surface can contaminate the sensors, especially if such impurities are not soluble in water.

## 1.5 Electrode care

Thoroughly clean the electrode with tap water after each measurement.

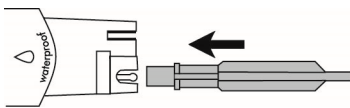


**Attention!** Do not keep the electrode in distilled or deionised water for indefinite periods!

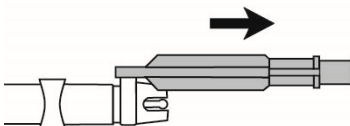
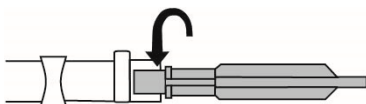
During measuring breaks, the pH electrode must always be wetted with a few drops of the storage solution for electrodes. To do this, soak the sponge in the cap with storage solution and put the cap back onto the measuring device.

Should the electrode have dried out inadvertently, soak it with storage solution for electrodes for 1 hour and recalibrate the tester.

Should it be necessary to replace the pH sensor, it can easily be exchanged using the supplied tool. Carefully guide the tool into the opening in the electrode, without touching the glass sensor.

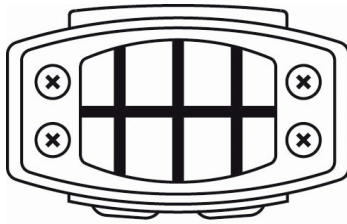


Turn the pH electrode counter-clockwise by means of the tool and remove it from the housing.



Install the new pH electrode by proceeding in reverse order.

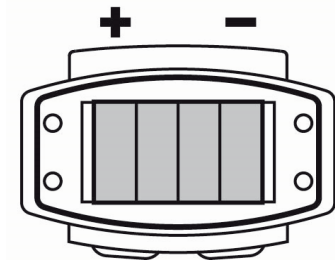
## 1.6 Replacing the batteries



When it is switched on, the device indicates the battery charge status in %. A battery change is required if 5 % and the battery symbol appear on the display. The device switches off automatically if the batteries are too low to ensure accurate measurements.

To replace the batteries, remove the four screws on the upper side of the housing.

Open the battery compartment and replace the batteries (4 x button cell 357 A). Observe correct polarity. Close the battery compartment again and screw the screws back in.



## E Water test kit to measure the total hardness

### 1 | Product description

#### 1.1 Components of the measuring device

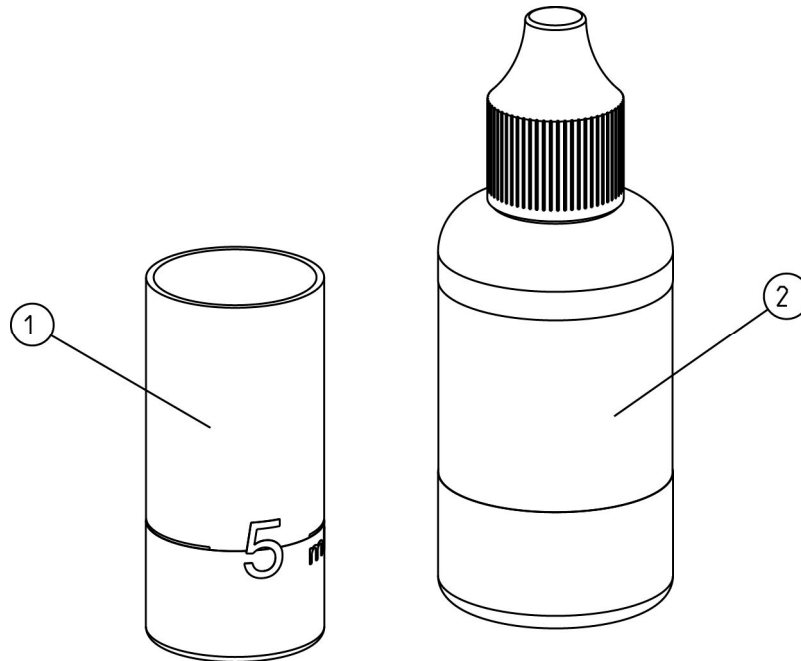


Abb. E-1: Components of the water test kit

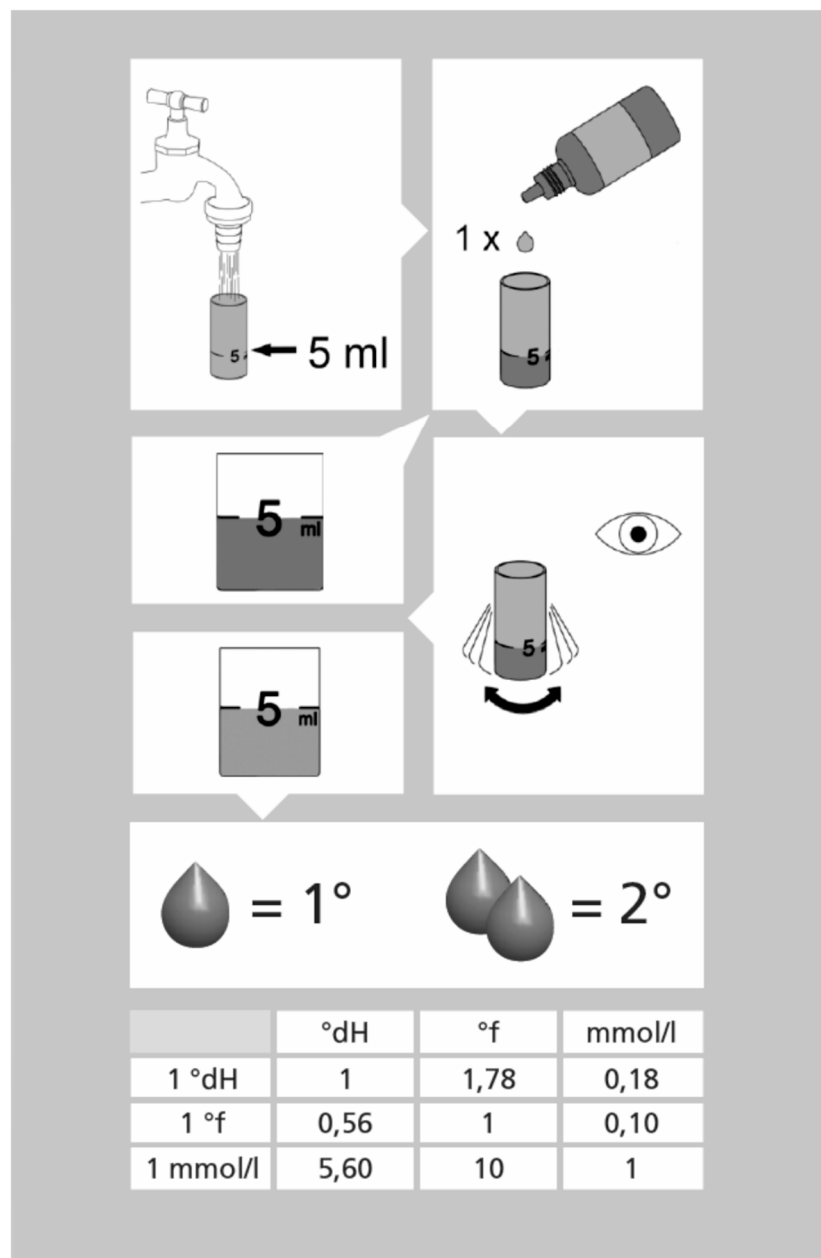
- ① Test tube      ② titration solution

#### 1.2 Intended use

The water test kit is designed for the quick check of the total hardness and covers the entire hardness range. Its accuracy is 1 °dH or 0.2 mmol/l.

Thanks to its easy handling without any additional equipment, this system is particularly suited for quick determinations.

### 1.3 Operation



## F Water test kit to measure the total hardness in very soft water

### 1 | Product description

#### 1.1 Components of the measuring device

Components of the water test kit

- |  |   |
|--|---|
| ① Measuring tube with 5 and 10 ml marking and plug | ④ Bottle of special buffer solution 8 ml                            |
| ② Measuring pipette                                | ⑤ 1 Bottle of titration solution 0 - 2 °dH (0 - 0.36 mmol/l); 50 ml |
| ③ Dropping bottle with indicator solution 8 ml     |   |



**Warning!** Strictly observe the identification of hazards indicated on the individual components of the packaging!

#### 1.2 Intended use

This water test kit is especially designed for the determination of the total hardness in very soft water, 0 - 2 °dH or 0 - 0.36 mmol/l.

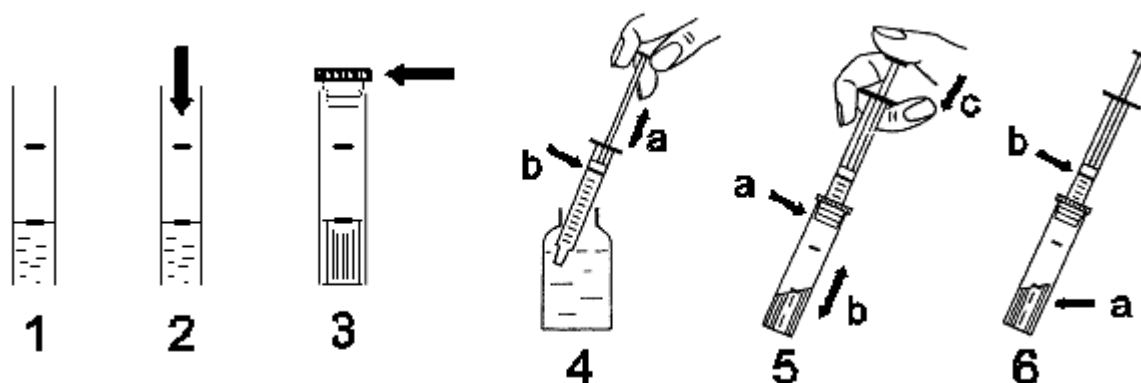
#### 1.3 Application limits

By adding special buffer solution (order no. 170533), this test kit can also be used for highly alkaline boiler water. Handling is easy and the measured values are accurate to 0.05 °dH (0.009 mmol/l).

#### 1.4 Operation

1. Rinse the measuring tube with the water sample and fill in the water sample up to the 5 ml mark (Fig. 1).
2. Add a drop of the indicator and dissolve by swaying the measuring tube (Fig. 2). If the solution's colour changes to green, no hardness is present.
3. If the colour changes to red, seal the measuring tube with the supplied plug (Fig. 3).
4. Draw titration solution from the supply bottle using the measuring pipette (Fig. 4 a) until the lowest edge of the black plunger ring matches the 0 mark (uppermost line on the scale) (Fig. 4 b).

5. The measuring pipette must be filled with titration solution up to the plunger ring (no air bubble), otherwise a correct titration result cannot be guaranteed. An air bubble in the measuring pipette can easily be removed by injecting the drawn up titration solution back into the supply bottle by forcefully pressing the plunger down as far as the stop, and then drawing up again to the 0 mark. When injecting the content of the measuring pipette back into the supply bottle, the tip of the measuring pipette must be immersed in the titration solution, too.
6. Insert the filled measuring pipette firmly into the hole in the plug on the measuring tube, turning the pipette slightly as you do so (Fig. 5 a). While shaking (Fig. 5 b), push the plunger of the measuring pipette down very slowly (Fig. 5 c) until there is a colour change from red to green (Fig. 6 a).
7. Read off the total hardness of the water sample on the scale of the measuring pipette at the level of the underside of the black plunger ring (Fig. 6 b). If one filling of the measuring pipette is not sufficient to cause a colour change, fill the measuring pipette with titration solution again according to paragraph 4 and complete the titration in the same water sample according to paragraphs 5 and 6. Take the previously consumed filling of the measuring pipette into account when making the determination.



## 1.5 Consumables

In order to ensure a reliable analysis, you should only use genuine consumables.

- Measuring tube with 5 and 10 ml marking and plug 888 05 510
- Measuring pipette 170 537
- Dropping bottle with indicator solution 8 ml 170 532
- Bottle of special buffer solution 8 ml 170 533
- 1 Bottle of titration solution 0 - 2 °dH (0 - 0.36 mmol/l); 50 ml 170 531

## G Water test kit to determine the p and m values; Duroval CPM

### 1 | Product description

#### 1.1 Components of the measuring device

Components of the water test kit

- |  |                               |
|--|-------------------------------|
| ① Measuring tube with 5 and 10 ml marking and plug | ④ Indicator "P" 8 ml          |
| ② Measuring pipette for Duroval-CPM                | ⑤ Titration solution C, 50 ml |
| ③ Indicator "C" 8 ml                               |                               |



**Warning!** Strictly observe the identification of hazards indicated on the individual components of the packaging!

#### 1.2 Intended use

The water test kit works according to the Duroval method. This CPM type is suitable for determining the p and m value quickly and reliably. The colourless P indicator changes the colour of a water sample containing OH ions to pink up to red-violet. The colour disappears from the water sample again by neutralisation of the OH ions with titration solution. The amount of titration solution consumed until the colour disappears represents the p value. The C indicator changes the colour of water samples containing OH and carbonate to blue-green. Following the complete neutralisation by means of titration solution, there is a colour change to orange. The total consumption of titration solution – i.e. including the amount required to determine the p value – represents the m value.

#### 1.3 Application limits

Handling is easy and the measured values can be read off in steps of 0.5 °dH or 0.25 mval.

#### 1.4 Operation

- 1 Rinse the measuring tube several times with the water to be examined and fill the water sample into the measuring tube up to the 5 ml mark.
- 2 Add 1 drop of indicator solution P and swirl the sample. If there is no colour change, continue with item 11.

- 3 If a change takes place to a pink to red-violet colour, close the measuring tube with the plug.
- 4 Draw titration solution from the supply bottle into the measuring pipette until the bottom edge of the black plunger ring is at the 0-mark.



**Note:** Make sure that there is no air bubble in the measuring pipette. Remove air bubbles by forcing the titration solution back into the supply bottle (the tip of the measuring pipette must be immersed in the solution) and then draw up again.

- 5 Insert the tip of the measuring pipette firmly into the hole in the plug on the measuring tube, turning the pipette slightly as you do so.
- 6 Press the plunger of the measuring pipette slowly downwards, while shaking the tube as you do so, until the reddish colouration has disappeared.
- 7 Read off the p value as shown on the mval scale at the bottom black edge of the plunger on the measuring pipette.



**Note:** If one filling of the measuring pipette is not sufficient, you can easily refill the pipette and carry out the titration according to 6 and 7. Take into account the previously consumed measuring pipette filling when determining the p value. The same applies to the determination of the m value.

8. To determine the m value, take off the plug with the still partially filled pipette and add 1 drop of indicator solution C.
9. Swirl the tube until the indicator has dissolved. If the colour of the sample changes to orange, this means there is no positive m value.
10. If a blue-green colouring occurs, close the measuring tube again. Do this using the plug with the pipette mounted in it.
11. Without prior refilling, press the plunger of the measuring pipette slowly downwards, continuously shaking it as you do so, until the colour changes to orange.
12. Read off the m value on the mval scale at the bottom edge of the black plunger on the pipette.



**Note:** If you read off the value shown on the scale in °dH in 12., this will give you the total alkalinity.



**Attention!** The m value always corresponds to the total amount of titration solution consumed, i.e. including the quantity that may have been used previously to determine the p value.

## 1.5 Consumables

In order to ensure a reliable analysis, you should only use genuine consumables.

- Measuring tube with 5 and 10 ml marking and plug 888 05 510



- Measuring pipette for Duroval-CPM 170 544
- Indicator "C" 8 ml 170 542
- Indicator "P" 8 ml 170 543
- Titration solution C, 50 ml 170 541

## H Ortho-phosphate water test kit

### 1 | Product description

#### 1.1 Components of the measuring device

Components of the water test kit

- |  |                        |
|--|------------------------|
| ① Colour comparison scale                  | ③ 2 test tubes, 1 plug |
| ② 1 bottle each of reagent A and reagent B | ④ Comparator           |



**Warning!** Strictly observe the identification of hazards indicated on the individual components of the packaging!

#### 1.2 Intended use

The amount of GENO-phos no. 1 contained must be checked by determining the  $\text{PO}_4$  content. This water test kit is used to monitor the phosphate surplus.

#### 1.3 Application limits

Phosphate contents between 1 and 20 mg/l can be measured using this water test kit. This involves a simple, on-the-spot measurement. A precise determination of the phosphate concentration can be carried out at Grünbeck's lab.

#### 1.4 Operation

1. Rinse both measuring tubes with the water sample.
2. Lay the colour comparison scale flat on a well illuminated surface (not in direct sunlight)
3. Add 5 ml of the water to be examined to both test tubes and insert one tube (dummy sample) into a hole in the colour comparator. The colour fields are then positioned under the test tube containing the dummy sample.
4. Add 4 drops of reagent A to the second tube and swirl it.
5. Add 4 drops of reagent B to that.



**Note:** When adding the reagents, always hold the dropping bottles in a vertical position. Make sure to always add complete drops.

6. Swirl the test tube and put it into the empty hole in the colour comparator.
7. After 5 minutes, the colours can be compared from the top by moving the comparator forward and back on the colour scale. Once the best possible colour match has been determined, you can read off the corresponding phosphate concentration.

## I Sulphite water test kit

### 1 | Product description

#### 1.1 Components of the measuring device

Components of the water test kit

- |                      |                      |
|----------------------|----------------------|
| ① Sulphite reagent 1 | ③ Sulphite reagent 1 |
| ② Sulphite reagent 1 | ④ 1 Test tube        |



**Warning!** Strictly observe the identification of hazards indicated on the individual components of the packaging!

#### 1.2 Intended use

Sodium sulphite is used to chemically combine oxygen in steam boiler operations as well as in warm and hot water systems. The sodium sulphite content in the sample can be checked using this water test kit.

#### 1.3 Application limits

Sodium sulphite can be measured in 2.5 mg increments using this water test kit. This involves a simple, on-the-spot measurement. The sulphite concentration can only be sensibly determined on site.

#### 1.4 Operation

1. Thoroughly rinse the titration vessel with the water sample to be tested
2. Fill the titration vessel up to the 10 ml mark with the water sample.
3. Add 3 drops of sulphite reagent 1.
4. Swirl until the reagent has mixed with the water.
5. Add 2 drops of sulphite reagent 2 and swirl again.
6. Drip in sulphite reagent 3 while continuously swirling the vessel (count the drops!) until a permanent blue colouring is developing.
7. Calculate the sodium sulphite concentration:  
1 added drop of sulphite reagent 3 corresponds to 5 mg of  $\text{Na}_2\text{SO}_3/\text{l}$



**Note:** You can increase the accuracy of the measurement by using a 20 ml sample. In that case, you also have to double the amount of reagents to be added. 1 drop of reagent 3 then corresponds to 2.5 mg of Na<sub>2</sub>SO<sub>3</sub>/l.

In case of p values exceeding 30 mval/l, the amount of reagent 1 to be added must be doubled.

The measured value refers to sodium sulphite. In case only the sulphite ion is to be indicated, multiply by the factor 0.64.

The index value of Na<sub>2</sub>SO<sub>3</sub> is 5 – 40 mg/l. Consequently, the reagents are sufficient for approx. 80 determinations.

## 1.5 Consumables

In order to ensure a reliable analysis, you should only use genuine consumables.

- |   |         |
|---|---------|
| • Sulphite reagent 1/2/3, small package | 170 520 |
| • Sulphite reagent 1/2/3, large package | 170 525 |