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## Water test kit for hardness, p and m value, negative p and negative m value

### ATTENTION!

This water test kit contains chemicals that – if applied incorrectly - may be hazardous to the health and safety of the user. Always keep and store this water test kit away from children. Prior to starting the work, carefully read the instructions indicated on the genuine containers and take suitable safety measures. For detailed information, please refer to the EC safety data sheets that we would be pleased to supply upon request.

### Content

3 Wide-neck Erlenmeyer flasks, 300 ml  
 2 Transparent measuring cylinders, 100 ml  
 3 Titration burettes with supply bottle

Indicator buffer tablets, 500 pcs  
 0.1 n hydrochloric acid, 1 l  
 0.1 n sodium hydroxide solution, 1 l  
 GENO®-plex B solution, 1 l  
 m solution, 250 ml  
 p solution, 250 ml  
 Ammonia solution 25 %, 250 ml  
 Operation manual for water test kit

### Designated application

The present water test kit is designated for the determination of the total hardness, the carbonate and non-carbonate hardness of the water as well as the determination of the p and m value. (boiler feed water) Furthermore, the negative m and the negative p value may be determined.

The measure for the total hardness is the sum of alkaline earths, which is determined by means of titration with the GENO®-plex B solution.

The p and the m values are a measure for the concentrations of bases, carbonates and hydrogen carbonates contained in the water. They are determined by the addition of p and m solution and titration with 0.1 n hydrochloric acid.

Upon addition of m solution to the acid sample, the negative m value is determined with 0.1 n sodium hydroxide solution. The negative m value is a measure for mineral acids present. Determination mainly downstream of highly acid cation exchanger or to check the regeneration in case of slightly acid cation exchanger.

The concentration of free CO<sub>2</sub> is determined by means of the negative p value ( $K_{B8,2}$ ) by adding p solution, followed by titration with 0.1 n sodium hydroxide solution.

### Preparation

Fill the supply bottles of the titration burettes with the indicated titration solutions. Firmly close the supply bottles and put the complete unit into the foot supplied with the kit.

### Analysis

#### Hardness determination

1. Measure 100 ml of the water sample and fill it into the Erlenmeyer flask.
2. Add an indicator buffer tablet and swirl the flask until the tablet has dissolved.

3. Add 10 - 20 drops of ammonia solution. A green colouring stands for 0 °dH and in case of a red colouring, the hardness needs to be determined.

4. To determine the hardness, fill the burette with GENO®-plex B solution by squeezing the burette bottle. The upper tip of the inlet sucks off the solution added in excess and automatically sets the column to zero.

**Make sure that there are no air bubbles in the lower part of the burette.**

5. By gently pressing the red button, add GENO®-plex B solution to the sample until the colour changes from red to green.
6. Read the value at the graduation of the burette. The consumption in ml corresponds to the total hardness in °dH.

#### Determination of carbonate and non-carbonate hardness

1. Fill 100 ml of the water to be analysed into the Erlenmeyer flask.
2. Add 2 - 3 drops of the m solution.
3. Then add 0.1 n hydrochloric acid drop by drop from the burette filled up to the zero mark while carefully swirling.
4. If the colour of the sample changes from yellow to onion red, read the consumption of 0.1 n hydrochloric acid.

The consumption of 0.1 n hydrochloric acid in ml corresponds to the m value, or Ks4.3 in mmol/l

**Carbonate hardness:**  
**m value x 2.8 = carbonate hardness in °dH**

**Non-carbonate hardness:**  
 Total hardness (°dH) - carbonate hardness (°dH) = non-carbonate hardness (°dH)

#### Determination of p and m value

1. Fill 100 ml of the water to be analysed into the Erlenmeyer flask.
2. Add 4 drops of the p solution.
3. If no colouring does occur, continue with item 5. If a reddish colouring is present, drop by drop add 0.1 n hydrochloric acid from the burette filled up to the zero mark - while continuously shaking - until the colouring disappears.
4. Read the consumption of hydrochloric acid. The value read in ml corresponds to the p value in mmol/l.
5. Now, add 2 - 3 drops of the m solution to the same sample.

Then, continue the titration with 0.1 n hydrochloric acid, **without** previously filling up the burette to zero.

7. If the colour of the sample changes from yellowish orange to onion red, read the total consumption of hydrochloric acid. The value read in ml corresponds to the m value in mmol/l.

#### Determination of the negative p value

1. Fill 100 ml of the water to be analysed into the Erlenmeyer flask.
2. Add 10 drops of the p solution.
3. If a reddish colouring occurs, you need to determine the p value as described above. If the solution remains colourless while the p solution is added, drop by drop add 0.1 n sodium hydroxide solution from the burette filled up to the zero mark - while continuously shaking - until a weak, red colouring occurs.
4. Read the consumption of sodium hydroxide solution. The value read in ml corresponds to the negative p value in mmol/l.
5. **Free carbon dioxide in mg/l negative p value (mmol/l)**  
**X 44 = free carbon dioxide**

#### Determination of the negative m value

1. Fill 100 ml of the water sample into an Erlenmeyer flask.
2. Add 3 drops of the m solution.

3. Then titrate with 0.1 n sodium hydroxide solution until the colour changes from onion red to yellowish orange.
4. Read the consumption of sodium hydroxide solution. The value read in ml corresponds to the m value in mmol/l.

#### Delivery

The water analysis kit is delivered as a complete kit. You may order individual spare parts and reagents with the order numbers indicated in the table below.

#### Storage

Store the reagents in a dry and well-ventilated location. Observe the information and shelf life indicated on the containers.

#### Information

Grünbeck Wasseraufbereitung GmbH  
 Josef-Grünbeck-Strasse 1  
 89420 Hoechstädt/Danube · GERMANY  
 Phone +49 9074 41-0 · Fax +49 9074 41-100  
 www.gruenbeck.com · info@gruenbeck.com

#### Conversions

m value in mmol/l × 2.8 = carbonate hardness in °dH  
 negative p value in mmol/l × 44 = free carbon dioxide in mg/l

#### Water test kit 170110; spare parts and reagents

Quick acting burette with measuring scale and supply bottle	88807050
Wide-neck Erlenmeyer flask, 300 ml	88808025
Transparent measuring cylinder, 100 ml	88805053
Indicator buffer tables, 500 pcs	170536
GENO®-plex B solution, 1 l	170706
0.1 n sodium hydroxide solution, 1l	170702
0.1 n hydrochloric acid, 1l	170701
Ammonia solution 25 %, 250 ml	170705
M solution, 250 ml	170703
P solution, 250 ml	170704
Operation manual	170951