

Test kit for the determination of total hardness**Method:**

Complexometric titration

Contents of test kit (*refill pack):

sufficient for 200 tests with an average hardness of 12.5 °e (10 °d)

15 mL indicator solution H 20 F*

100 mL titration solution TL H 20*

1 test tube with ring mark

1 titration syringe 0–20 °d resp. 0–3.6 mmol/L
(1 graduation mark \triangle 0.5 °d resp. 0.1 mmol/L)

2 plastic dropping tips

**Hazard warning:**

This test does not contain any harmful substances which must be specially labelled as hazardous.

Procedure:

1. Rinse test tube several times with the test sample and fill to ring mark.
2. Add **2 drops** indicator solution H 20 F and shake. The test sample turns **red**. If sample turns green, no hardness is present (< 0.5 °d).
3. Put dropping tip onto the titration syringe, press down plunger, dip the tip into the titration solution TL H 20 and draw up plunger slowly, until the lower rim of the black plunger O-ring agrees with value 0 on the barrel scale. The small air pocket below the plunger tip does not disturb the determination.
4. **Addition of the titration solution:** We recommend taking the syringe in the left hand and the test tube in the

right hand (see drawing) and adding titration solution dropwise while smoothly shaking the test tube. As soon as the red color turns lighter, drop more slowly until the solution turns completely **green**.

Read off total hardness in °d or mmol/L from the syringe barrel (lower rim of the black plunger O-ring). Color change is followed easily when holding test tube before a light background (e.g. sheet of white paper). **For the expression in °e, multiply the result in German degrees with 1.25.**

5. If the first syringe filling isn't enough to reach color change (hardness > 20 °d), fill syringe once more with titration solution TL H 20 and titrate to color change (as above). Read off total hardness and add for each used syringe filling 20 °d.

This method can also be applied for the analysis of sea water after dilution (1:29).

Disposing of the samples:

The used analysis specimens can be flushed down the drain with tap water and channelled off to the local sewage treatment works.

Interferences:

Copper(II) ions may delay the indicator change, or even block this change if higher levels are present. Therefore, in the case of copper pipes, let the water run for a sufficient amount of time before taking the sample.

Note:

For the determination of total hardness in the presence of copper ions, please contact MACHEREY-NAGEL for special working instructions.

$1\text{ °d} \triangleq 1.25\text{ °e} \triangleq 1.78\text{ °f} \triangleq 10\text{ mg/L CaO} \triangleq 17.8\text{ mg/L CaCO}_3$
 $1\text{ mmol/L} \triangleq 2\text{ mval/L} \triangleq 5.6\text{ °d}$

MACHEREY-NAGEL GmbH & Co. KG

Neumann-Neander-Str. 6–8 · 52355 Düren · Germany

Tel.: +49 24 21 969-0 · Fax: +49 24 21 969-199 · info@mn-net.com · www.mn-net.com

PD 06805 / A011639 / 915 005 / 0512