

Instruction Manual

HI 38035 Total Hardness and Calcium Test Kit



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Dear Customer,

Thank you for choosing a Hanna Product.

Please read the instruction sheet carefully before using the test kit. It will provide you with the necessary information for correct use of the kit. If you need additional information, do not hesitate to e-mail us at tech@hannainst.com.

Remove the chemical test kit from the packing material and examine it carefully to make sure that no damage has occurred during shipping. If there is any noticeable damage, notify your Dealer or the nearest Hanna office immediately.

Each kit is supplied with:

- Buffer Solution pH 10.2 ± 0.2 , 1 bottle with dropper (30 mL);
- Calmagite Indicator, 1 bottle with dropper (10 mL);
- EDTA Solution 0-20 gpg range, 1 bottle (100 mL);
- HI 38035A-0 Calcium Reagent, 1 bottle with dropper (10 mL);
- HI 38035B-0 Calcium Reagent, 1 bottle with dropper (10 mL);
- HI 38035C-0 Calcium Reagent, 1 bottle with dropper (15 mL);
- HI 38035D-0 Calcium Reagent, 1 bottle (100 mL);
- 1 calibrated plastic vessel (50 mL) with cap;
- 1 syringe (1 mL) with two tips.

Note: Any damaged or defective item must be returned in its original packing materials.

SPECIFICATIONS

Range	0 to 20 gpg CaCO_3 as total hardness 0 to 20 gpg CaCO_3 as Ca
Smallest Increment	0.2 gpg CaCO_3 as total hardness 0.2 gpg CaCO_3 as Ca
Analysis Method	EDTA titration
Sample Size	25 mL
Number of Tests	100 (Total Hardness), 100 (Calcium)
Case Dimensions	370x270x80 mm (14.6x10.6x3.1")
Shipping Weight	960 g (33.9 oz.)

SIGNIFICANCE AND USE

Water hardness has traditionally been defined as the capacity of water to precipitate soap. The ionic species in water causing the precipitation were later found to be primarily calcium and magnesium. At the present time, water hardness is a quantitative measure of these ions in the water sample. Now it is also known that certain other ion species, such as iron, zinc and manganese, contribute to the overall hardness of water. The measure and subsequent control of water hardness is essential to prevent scaling and clogging in water pipes. Calcium concentration in water depends on the source and on water treatment. Calcium contributes to the total hardness of water.

The Hanna total hardness and calcium test kit makes monitoring easy and quick. The compact size provides the versatility to use the kit anywhere and the design makes the kit easy to handle.

Note: 1 gpg (grains per gallon) CaCO_3 is equivalent to 17 ppm CaCO_3 (where ppm - parts per million - is equivalent to mg/L).

CHEMICAL REACTION

The total hardness level is determined by an EDTA (ethylene-diamine-tetraacetic acid) titration. The solution is first adjusted to a pH of 10 using a buffer solution. The indicator chelates with metal ions such as magnesium or calcium to form a red colored complex. As EDTA is added, metal ions complex with it. After all the free metal ions have been complexed, an excess EDTA removes the metal ions complexed with the indicator to form a blue colored solution. This color change from red to blue is the endpoint of the titration.

Calcium concentration is determined by an EGTA titration. Zincon indicator determines a blue color in the solution. The reaction endpoint is indicated by a change in color from blue to orange.

INSTRUCTIONS

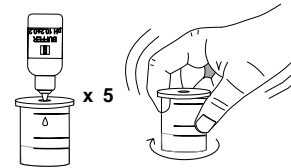
READ ALL THE INSTRUCTIONS BEFORE USING THE TEST KIT

Determination of Total Hardness

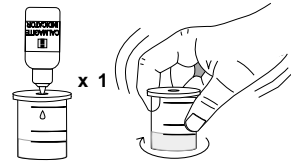
- Remove the cap from the plastic vessel. Rinse the plastic vessel with the water sample, fill to the 25 mL mark and replace the cap.



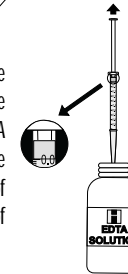
- Add 5 drops of Buffer Solution through the cap port and mix carefully swirling the vessel in tight circles.



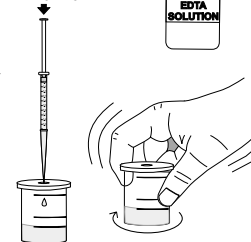
- Add 1 drop of Calmagite Indicator through the cap port and mix as described above. The solution becomes a red-violet color.



- Take the syringe and push the plunger completely down into the syringe. Insert tip into the EDTA solution gpg range and pull the plunger out until the lower edge of the seal is on the 0.0 mL mark of the syringe.



- Place the syringe tip into the cap port of the plastic vessel and slowly add the titration solution drop by drop, swirling after each drop.



- Continue adding the EDTA Solution until the solution in the vessel becomes purple. Then mix for 15 seconds after each additional drop until the solution in the vessel turns blue.
- Read off the milliliters of titration solution used from the syringe and multiply by 20 to obtain the hardness level of your sample as gpg CaCO_3 .

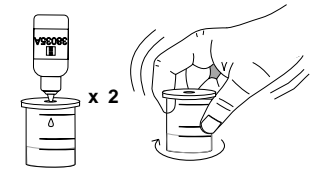
$$\text{mL of titrant} \times 20 = \text{gpg } \text{CaCO}_3$$

Determination of Calcium

- Remove the cap from the plastic vessel. Rinse the plastic vessel with the water sample, fill to the 25 mL mark and replace the cap.



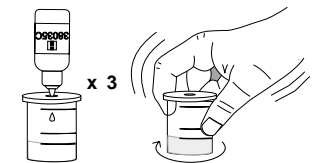
- Add 2 drops of HI 38035A-0 Calcium Reagent through the cap port and mix carefully by swirling the vessel in tight circles.



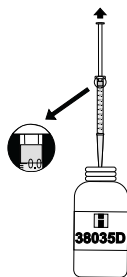
- Add 1 drop of HI 38035B-0 Calcium Reagent through the cap port and mix as described above.



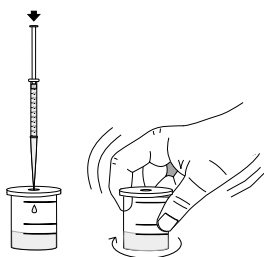
- Add 3 drops of HI 38035C-0 Calcium Reagent through the cap port and mix as described above. The solution will turn blue.



- Take the syringe and push the plunger completely down into the syringe. Insert tip into the HI 38035D-0 Calcium Reagent and pull the plunger out until the lower edge of the seal is on the 0.0 mL mark of the syringe.



- Slowly add the titration solution drop by drop, swirl after each drop and wait a few seconds.



- Continue adding HI 38035D-0 reagent until the solution in the vessel turns orange. Wait for 30 seconds and if the solution in the vessel becomes violet, add another drop of HI 38035D-0 reagent to turn it orange.
- Read off the milliliters of titration solution used from the syringe and multiply by 20 to obtain the calcium concentration as gpg CaCO_3 . Multiply the milliliters by 8 to obtain the calcium concentration as gpg Ca in your sample.

Calculate the calcium concentration as:

$$\text{mL of titrant} \times 20 = \text{gpg CaCO}_3$$

$$\text{mL of titrant} \times 8 = \text{gpg Ca}$$

- To obtain the magnesium concentration subtract calcium concentration from the total hardness:

$$\text{gpg Mg (as CaCO}_3\text{)} =$$

$$= \text{gpg Total Hardness (as CaCO}_3\text{)} - \text{gpg Ca (as CaCO}_3\text{)}$$

Interferences: interference may be caused by an excessive amount of heavy metals (Zn, Co, Cu, Ni, Hg).

REFERENCES

Standard Methods for the Examination of Water and Wastewater, 16th Edition, 1985, p. 210-214.

1987 Annual Book of ASTM Standard, vol. 11.01 Water (1), p. 212-215.

Adaptation of determination of calcium with zincon indicator.

HEALTH AND SAFETY

The chemicals contained in this test kit may be hazardous if improperly handled. Read the relevant Health and Safety Data Sheets before performing the test.