



# TOTAL, CALCIUM & MAGNESIUM HARDNESS TEST KIT

MODEL PHT-CM-DR-LT • CODE 4824-DR-LT

QUANTITY	CONTENTS	CODE
15 mL	*Sodium Hydroxide Reagent w/Metal Inhibitor	*4259-E
50	Calcium Hardness Indicator Tablets	T-5250-H
15 mL	*Hardness Reagent #5	*4483-E
100	Hardness Reagent #6 Tablets	4484-J
60 mL	Hardness Reagent #7	4487DR-H
1	Test Tube, 5-10-12.9-15-20-25 mL, glass, w/cap	0608
1	Direct Reading Titrator, 0-200 Range	0382
1	Pipet, 0.5 mL, plastic	0353

\*WARNING: Reagents marked with an \* are considered hazardous substances. To view or print a Material Safety Data Sheet (MSDS) for these reagents see MSDS CD or our web site. To obtain a printed copy, contact us by e-mail, phone or fax.

To order individual reagents or test kit components, use the specified code number.

**NOTE:** Read Direct Reading Titrator Manual before proceeding. The Titrator is calibrated in terms of hardness expressed as parts per million (ppm) Calcium Carbonate as  $\text{CaCO}_3$ . Each minor division on the Titrator scale equals 4 ppm  $\text{CaCO}_3$ .

# TOTAL HARDNESS TEST PROCEDURE

1.

Fill a test tube (0608) to the 12.9 mL line with the sample water.



2.

Add 5 drops of \*Hardness Reagent #5 (4483). Swirl to mix.



3.

Add one Hardness Reagent #6 Tablet (4484). Cap and swirl until tablet disintegrates. Solution will turn red.



4.

Fill Direct Reading Titrator (0382) with Hardness Reagent #7 (4487DR).



5.

Insert the Titrator into the center hole of the test tube cap.



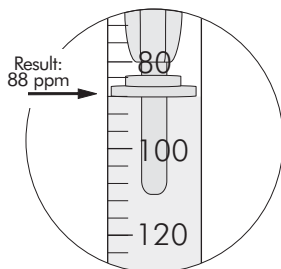
6.

While gently swirling the tube, slowly press the plunger to titrate until the red color changes to clear blue.



7.

Read the test result where the plunger meets the Titrator scale. Record as ppm Total Hardness as (CaCO<sub>3</sub>).



**EXAMPLE:**

Plunger tip is 2 minor divisions below line 80.

**Test result is:**

$$80 + (2 \text{ divisions} \times 4) = 88 \text{ ppm.}$$

**NOTE:**

If the plunger reaches the bottom line on the scale (200 ppm) before the endpoint color change occurs, refill the Titrator and continue the titration. When recording the test result, be sure to include the value of the original amount of reagent dispensed (200 ppm).

Parts per million CaCO<sub>3</sub> may be converted to grains per gallon (gpg) CaCO<sub>3</sub>:

$$\text{gpg CaCO}_3 = \text{ppm CaCO}_3 \times 0.058$$

## CALCIUM HARDNESS TEST PROCEDURE

1.

Fill a test tube (0608) to the 12.9 mL line with the sample water.



2.

Add 6 drops of \*Sodium Hydroxide w/Metal Inhibitor (4259). Cap and swirl to mix.



3.

Add one Calcium Hardness Indicator Tablet (T-5250). Cap and swirl until tablet disintegrates. Solution will turn red.



4.

Fill Direct Reading Titrator (0382) with Hardness Reagent #7 (4487DR).



5.

Insert the Titrator into the center hole of the test tube cap.



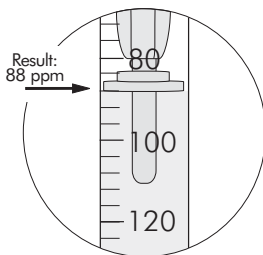
6.

While gently swirling the tube, slowly press the plunger to titrate until the red color changes to clear blue.



7.

Read the test result where the plunger meets the Titrator scale. Record as ppm Calcium Hardness as  $(\text{CaCO}_3)$ .



**EXAMPLE:**

Plunger tip is 2 minor divisions below line 80.

**Test result is**  
 $80 + (2 \text{ divisions} \times 4) = 88 \text{ ppm}$ .

**NOTE:**

If the plunger reaches the bottom line on the scale (200 ppm) before the endpoint color change occurs, refill the Titrator and continue the titration.

When recording the test result, be sure to include the value of the original amount of reagent dispensed (200 ppm).

## MAGNESIUM HARDNESS TEST PROCEDURE

Subtract Calcium Hardness from Total Hardness. Record as ppm Magnesium Hardness as  $\text{CaCO}_3$ .

$$\text{Magnesium Hardness (ppm CaCO}_3\text{)} = \text{Total Hardness} - \text{Calcium Hardness}$$

## **ANALYSIS OF HARDNESS IN SALT WATER**

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When sea and estuarine waters containing very high levels of mineral salts are to be tested, the sample must be diluted to a feasible concentration before titration. This test is supplied with a calibrated pipet for performing the kit dilutions described below.

### **TOTAL HARDNESS DILUTION (1 TO 25.8)**

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1. Use the 0.5 mL pipet (0353) to transfer 0.5 mL of the salt water to be tested to the test tube (0608).
2. Dilute to the 12.9 mL line with distilled water.
3. Follow Steps 2 through 7 under the Total Hardness Test Procedure. Multiply Titrator reading by 25.8. Record as ppm Total Hardness as CaCO<sub>3</sub>.

### **CALCIUM HARDNESS DILUTION (1 TO 12.9)**

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1. Use the 0.5 mL pipet (0353) to transfer 1.0 mL (two measures) of the salt water to be tested to the test tube (0608).
2. Dilute to the 12.9 mL line with distilled water.
3. Follow Steps 2 through 7 under Calcium Hardness test procedure. Multiply Titrator reading by 12.9. Record as ppm Calcium Hardness as CaCO<sub>3</sub>. To convert Calcium Carbonate to Calcium Chloride, multiply by 1.11. Record as ppm Calcium Chloride.

$$\text{ppm CaCl}_2 = \text{ppm CaCO}_3 \times 1.11$$

To convert Calcium Carbonate to Calcium, multiply by 0.4. Record as ppm Calcium.

$$\text{ppm Ca} = \text{ppm CaCO}_3 \times 0.4$$

### **MAGNESIUM HARDNESS OF SALT WATER**

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Subtract Calcium Hardness from Total Hardness. Record as ppm Magnesium Hardness as CaCO<sub>3</sub>.

$$\text{Magnesium Hardness (ppm CaCO}_3) = \text{Total Hardness} - \text{Calcium Hardness}$$

To convert Magnesium Hardness as CaCO<sub>3</sub> to Magnesium Chloride, multiply by 0.95. Record as ppm Magnesium Chloride.

$$\text{ppm MgCl}_2 = \text{ppm CaCO}_3 \times 0.95$$

To convert Magnesium Hardness to Magnesium, multiply by 0.24. Record as ppm Magnesium.

$$\text{ppm Mg} = \text{ppm CaCO}_3 \times 0.24$$

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