

# Determination of Calcium and Magnesium in Water

## Description

The determination of the Calcium and Magnesium next together in water is done by titration with the sodium salt of ethylene diamine tetraethanoic acid (EDTA) at pH 8 – 9. The detection is carried out with a Ca electrode. The result is calculated as mg/l Ca<sup>2+</sup> respectively mg/l Mg<sup>2+</sup>.

## Instruments

Titration	TL 7000 or higher
Exchangeable head	WA 10
Electrode	Ca 1100 PLH
Cable	L 1 A
Reference electrode	B 2920+
cable	L 1 N
Stirrer	Magnetic stirrer TM 235
Lab accessory	Glass beaker 150 ml
	Magnetic stirrer bar 30 mm

## Reagents

1	Na <sub>2</sub> EDTA 0.05 or 0.1 mol/l
2	Acetylacetone
3	Tris(hydroxymethyl)-aminomethane (TRIS)
4	Distilled Water
5	Electrolyte solution L300
All reagents should be of analytical grade or better.	

## Titration procedure

### Reagents

The titer determination of the EDTA solution is carried out as described in the application note "Titer determination of EDTA".

TRIS / Acetylacetone Buffer solution

Dissolve 20.4 g of TRIS in water, add 12 ml of Acetylacetone and make up to 1.0 liter with water.

### Cleaning of the electrode

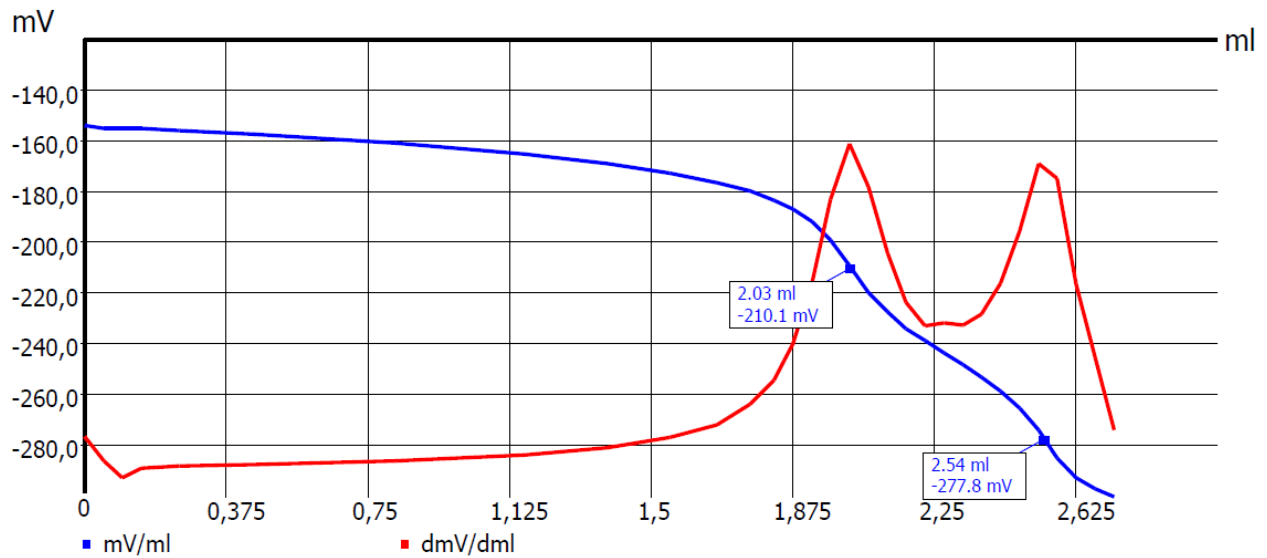
The electrodes are cleaned with distilled water. The Ca 1100 is stored clean and dry, for the storage of the reference electrode use electrolyte solution L300.

### Sample preparation

100.00 ml of sample are placed in a 150 ml beaker, 15 ml TRIS / Acetylacetone buffer solution are added. Then it is titrated with  $\text{Na}_2\text{EDTA}$  0.05 or 0.1 mol / l to 2 equivalence points. The first equivalence point corresponds to the  $\text{Ca}^{2+}$  content, the second to the  $\text{Mg}^{2+}$  content of the sample. The consumption should be about 5 - 15 ml. For very hard water samples, the amount of sample may be reduced, for very soft water samples, a lower concentration EDTA solution may be needed.

## Titration parameter

### Sample titration



Default method	Ca and Mg		
Method type	Automatic titration		
Modus	Dynamic		
Measured value	mV		
Measuring speed / drift	User defined	Minimum holding time	5 s
		Maximum holding time	12 s
		Measuring time	4 s
		Drift	3 mV/min
Initial waiting time	0 s		
Dynamic	flat	Max step size	0.5 ml
		Slope max ml	10
		Min. step size	0.05 ml
		Slope min. ml	120
Damping	none	Titration direction	decrease
Pretitration	off	Delay time	0 s
End value	off		
EQ	On (1)	Slope value	120
Max. titration volume	20 ml		
Dosing speed	100%	Filling speed	30 s

Calculation:

$$\text{Result } Ca^{2+} [mg/l] = \frac{(EQ1 - B) * T * M_{Ca} * F1}{V * F2}$$

$$\text{Result } Mg^{2+} [mg/l] = \frac{(EQ2 - EQ1) * T * M_{Mg} * F1}{V * F2}$$

B	0	Blank value
EQ1		Consumption of titrant at first Equivalence point
EQ2		Consumption of titrant at second Equivalence point
T	WA	Actual concentration of the titrant
M <sub>Ca</sub>	40,08	Molecular mass of Ca
M <sub>Mg</sub>	24,305	Molecular mass of Mg
V	man	sample volume [ml]
F1	1000	Conversion factor
F2	1	Conversion factor