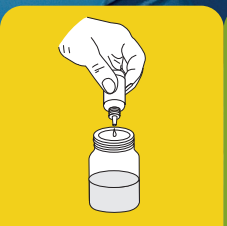
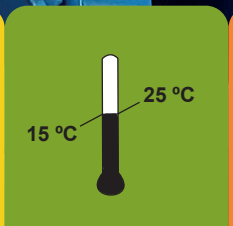
Lovibond® Water Testing

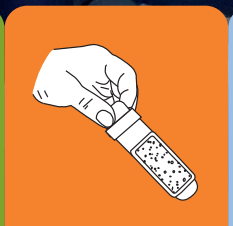
Tintometer® Group

Boiler Water Test Kit

56I701170







Boiler Water

Steam boilers require careful treatment in order to maintain efficiency, steam purity and to prevent scale and corrosion of pipework and heat exchangers. A phosphate/sulphite treatment program is a very effective way to treat medium pressure boiler systems to maintain efficiency.

The Boiler Water test kit contains a full suite of tests to monitor all aspects of this program.

Refer to the operation control parameters for the boiler or refer to your water treatment specialist for advice on control levels for the following:

Alkalinity (caustic)

Boiler water systems typically operate in alkaline conditions to prevent corrosion. The concentration of caustic (OH-) alkalinity can be determined using the drop test provided. It is possible to derive values for caustic and non-caustic alkalinity by measuring both P and OH alkalinities.

Chloride

Chloride will increase the corrosive nature of boiler water if the concentration is too high. Check regularly to ensure levels remain under control.

Conductivity (TDS) - SD Pocket Tester

Water conductivity increases with an increase in the concentration of ionic dissolved material. If dissolved solids are too high the boiler water is likely to foam and carry over impurities with the steam. Boilers should “blowdown” if dissolved solids are too high.

Total Dissolved Solids = Conductivity Reading x 0.7

Hardness

Hardness, in the form of calcium and magnesium is removed from boiler feedwater by the softening plant. However traces can still be carried over into the boiler and over time can from scales onto internal surfaces and reduce heat transfer efficiency. It is therefore important to regularly monitor the efficiency of the softening plant to ensure that it is functioning properly.

Phosphate (ortho)

Phosphate is added to boiler water as a scale conditioner. Any free hardness salts (calcium & magnesium) react with phosphate to form crystalline solids that do not plate onto surfaces. These solids fall to the bottom of the boiler and can be easily removed. As such, a phosphate reserve should always be maintained in the boiler water.

pH - SD Pocket Tester

It is easier to treat high pH water for the tendency to form scale than it is to treat acidic water for the tendency to corrode metal. Boiler water pH is therefore maintained at around pH 11 by the addition of caustic (OH-) treatments.

Regularly testing for pH is a quick way to confirm the presence of the alkaline treatment.

Sulphite

It is important to remove as much oxygen as possible from boiler feedwater as this reduces the possibility of corrosion. Deaerators will remove most of the dissolved oxygen, but traces will still be present and after time can cause problems in the boiler. Sulphite is added as an oxygen scavenger. Any traces of oxygen will react with sulphite to form sulphate. It is important to maintain a sulphite reserve at all times.

Note:

1. Carry out the tests on cooled boiler (feed)water as quickly as possible to prevent any reaction of the sampled water with atmospheric oxygen.
2. Filter the sample water before testing for phosphate using a GF/C filter paper. Crystalline phosphate salts will be removed by filtration in order to measure freely dissolved phosphate.
3. Boiler water samples must be neutralised before measuring conductivity (TDS) with the SD Pocket Tester. Add drops of 20% Acetic Acid to the sample until it turns from pink to colourless. The sample is then ready for testing.
4. pH and conductivity meters should be calibrated regularly using the standards provided. Failure to calibrate may result in inaccurate readings being made.
5. Further instructions can be found with the corresponding product.

Alkalinity (P, M, OH) 56I700130

50 - 2400 mg/L $CaCO_3$

EN

Material

Reagents	Packaging Unit	Part Number
Alkalinity 4.5 Indicator TA4	65 mL	56L013865
Alkalinity LR Titrant TA3	65 mL	56L013965
Alkalinity HR Titrant PA2/TA2	65 mL	56L013665
Acidity / Alkalinity P Indicator PA1	65 mL	56L013565
Alkalinity OH Reagent PA3	65 mL	56L013765

The following accessories are required.

Accessories	Packaging Unit	Part Number
Syringe, plastic, 20 mL	1 Pieces	56A006501
Titration jar with cap, plastic, 60 mL	1 Pieces	56A006701

Preparation

Alkalinity Relationships:

The separate contributions to alkalinity from free caustic, carbonate and bicarbonate can be estimated using the P & M alkalinity relationship in the table below.

If	OH	CO_3	HCO_3
P = 0	0	0	M
P < M/2	0	2P	M-2P
P = M/2	0	2P	0
P > M/2	2P-M	2(M-P)	0
P = M	M	0	0

Remarks

1. Alkalinity P: The P refers to phenolphthalein the indicator originally used for titrating P Alkalinity. The colour change occurs at pH 8.3. Less hazardous alternatives are now used.
2. Alkalinity M: The M refers to methyl orange, the indicator originally used for titrating Total Alkalinity. Nowadays 4.5 indicator is used but old M terminology has remained.
3. Alkalinity OH: Barium chloride precipitates with carbonate ions to produce a white precipitate in the test. the remaining alkalinity present in the same sample attributed to the presence of hydroxide ions (OH).

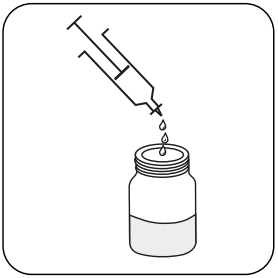
Sampling

Select the sample volume from the table according to the expected measuring range and read off the factor to calculate the result.

Expected Range	Titrant used	Sample Size	Factor
50-150 mg/L	Alkalinity LR Titrant TA3	40 mL	5
100-300 mg/L	Alkalinity LR Titrant TA3	20 mL	10
200-600 mg/L	Alkalinity LR Titrant TA3	10 mL	20
200-600 mg/L	Alkalinity HR Titrant PA2TA2	40 mL	20
400-1200 mg/L	Alkalinity HR Titrant PA2TA2	20 mL	40
800-2400 mg/L	Alkalinity HR Titrant PA2TA2	10 mL	80

EN

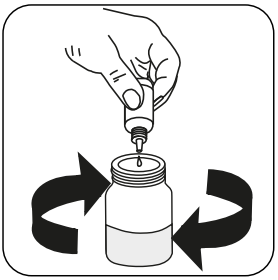
Determination of Alkalinity-P



Attention!Select the appropriate sample volume according to the instructions in the chapter Sampling.

Add drops of **Acidity / Alkalinity P Indicator PA1** to give a **pink** colour. Note: If sample remains colourless, report the P Alkalinity as zero.

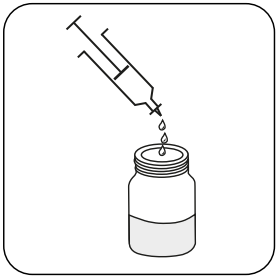
Attention! Record the number of drops that will be added.
Note: Make sure to swirl the jar after adding each drop!



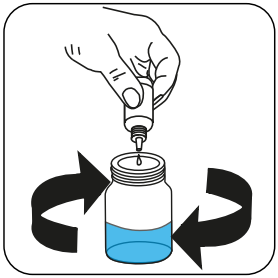
Add **Alkalinity LR Titrant TA3 or Alkalinity HR Titrant PA2/TA2** drop by drop to the sample until discolouration turns from **pink** to **colourless**.

Calculate test result: P Alkalinity (as $CaCO_3$) mg/L = Number of drops x factor (see table)

Determination of Alkalinity-M



Attention!Select the appropriate sample volume according to the instructions in the chapter Sampling.



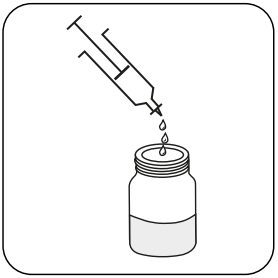
Add drops of **Alkalinity 4.5 Indicator TA4** to give a **pure blue** colour.

Attention! Record the number of drops that will be added.
Note: Make sure to swirl the jar after adding each drop!

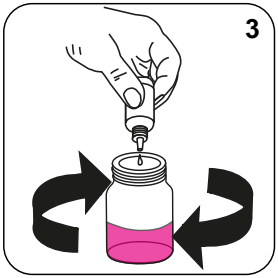
Add **Alkalinity LR Titrant TA3 or Alkalinity HR Titrant PA2/TA2** drop by drop to the sample until colouration turns from **blue** to **orange/yellow** .

Calculate test result: Total Alkalinity (as $CaCO_3$) mg/L = Number of drops x factor (see table)

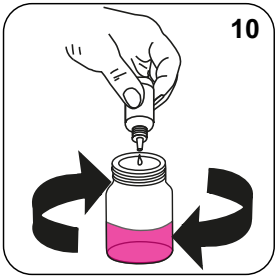
Determination of Alkalinity-OH



Attention!Select the appropriate sample volume according to the instructions in the chapter Sampling.

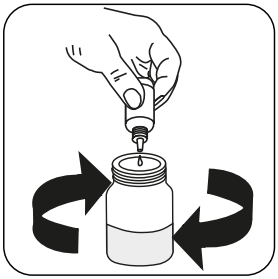


Add **3** drops of **Acidity / Alkalinity P Indicator PA1** to give a **pink** colour.



Add **10 drops Alkalinity OH Reagent**. Note: If sample remains colourless, report the P Alkalinity as zero.

Attention! Record the number of drops that will be added.
Note: Make sure to swirl the jar after adding each drop!



Add **Alkalinity LR Titrant TA3 or Alkalinity HR Titrant PA2/TA2** drop by drop to the sample until discolouration turns from **pink** to **colourless**.

Calculate test result: OH Alkalinity (as $CaCO_3$) mg/L = Number of drops x factor (see table)

Chloride 56I700190

20 - 12000 mg/L Cl^-

EN

Material

Reagents	Packaging Unit	Part Number
Chloride LR Titrant CC2	65 mL	56L014265
Chloride HR Titrant BC2	65 mL	56L014165
Chloride Indicator BC1/CC1	65 mL	56L714065

The following accessories are required.

Accessories	Packaging Unit	Part Number
Syringe, plastic, 20 mL	1 Pieces	56A006501
Titration jar with cap, plastic, 60 mL	1 Pieces	56A006701
Syringe, plastic, 5 mL	1 Pieces	56A008501

Remarks

1. Alkaline samples such as boiler water will require neutralisation prior to testing.
2. Colours may vary depending on sample and test conditions.
3. Dilute samples of less than 10 mL to approximately 10-20 mL with distilled or deionised (chloride free) water.

Sampling

Select the sample volume from the table according to the expected measuring range and read off the factor to calculate the result.

Expected Range	Titrant used	Sample Size	Factor
20-75 mg/L	Chloride LR Titrant CC2	40 mL	2.5
50-150 mg/L	Chloride LR Titrant CC2	20 mL	5
100-400 mg/L	Chloride LR Titrant CC2	10 mL	10
100-400 mg/L	Chloride HR Titrant BC2	40 mL	10
200-600 mg/L	Chloride HR Titrant BC2	20 mL	20
400-1000 mg/L	Chloride HR Titrant BC2	10 mL	40
800-3000 mg/L	Chloride HR Titrant BC2	5 mL [3]	80
2000-6000 mg/L	Chloride HR Titrant BC2	2 mL [3]	200
4000-12000 mg/L	Chloride HR Titrant BC2	1 mL [3]	400

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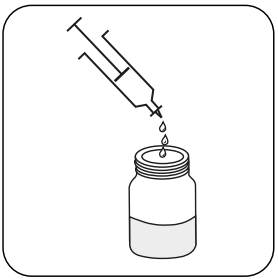


Attention!Select the appropriate sample volume according to the instructions in the chapter Sampling.

Add **10** drops of **Chloride Indicator BC1/CC 1 (Potassium Chromate)** to give a **yellow** colour.

Attention! Record the number of drops that will be added.
Note: Make sure to swirl the jar after adding each drop!

Add **Chloride LR Titrant CC2 or Chloride HR Titrant BC2** drop by drop to the sample until colouration turns from **yellow** to **orange/brown** .

Calculate test result: Chloride (as Cl^-) mg/L = Number of drops x factor (see table)

Hardness, total 56I700280

5 - 600 mg/L $CaCO_3$

EN

Material

Reagents	Packaging Unit	Part Number
Hardness Total Buffer TH2	65 mL	56L016065
Hardness Total Indicator TH1P	Powder / 40 g	56P028340
Hardness LR Titrant TH3	65 mL	56L016265
Hardness HR Titrant TH4	65 mL	56L014565

The following accessories are required.

Accessories	Packaging Unit	Part Number
Syringe, plastic, 20 mL	1 Pieces	56A006501
Titration jar with cap, plastic, 60 mL	1 Pieces	56A006701

Remarks

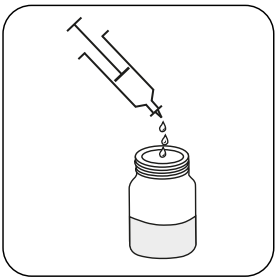
1. Colours may vary depending on sample and test conditions.
2. More than 1 ppm copper in the sample will prevent the pure blue endpoint from occurring.
3. To remove copper interference, add 1 drop of Iron Reagent FE6 before the addition of Hardness Total Buffer TH2. Iron Reagent FE6 is not supplied as standard in the hardness test pack, but can be purchased separately. (56L006365)

Sampling

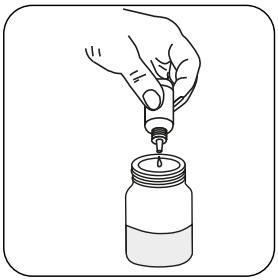
Select the sample volume from the table according to the expected measuring range and read off the factor to calculate the result.

Expected Range	Titrant used	Sample Size	Factor
5-15 mg/L $CaCO_3$	Hardness LR Titrant TH3	40 mL	0.5
10-30 mg/L $CaCO_3$	Hardness LR Titrant TH3	20 mL	1
20-60 mg/L $CaCO_3$	Hardness LR Titrant TH3	10 mL	2
50-150 mg/L $CaCO_3$	Hardness HR Titrant TH4	40 mL	5
100-300 mg/L $CaCO_3$	Hardness HR Titrant TH4	20 mL	10
200-600 mg/L $CaCO_3$	Hardness HR Titrant TH4	10 mL	20

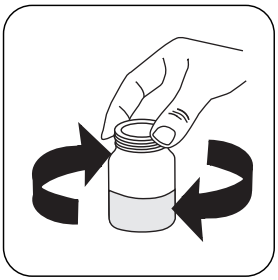
EN



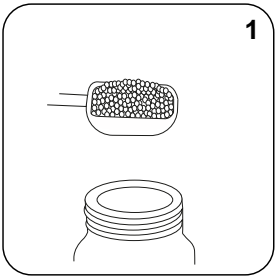
Attention!Select the appropriate sample volume according to the instructions in the chapter Sampling.



Add **4** drops of **Hardness Total Buffer TH2** per **10 mL** of sample.



Swirl to mix.

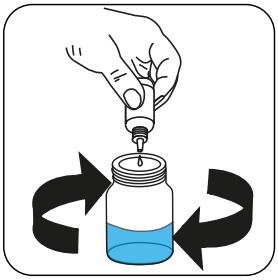


Add **1 measuring scoop(s) Hardness Total Indicator TH1P** .

Swirl to mix.

The sample will turn **wine red** .

Attention! Record the number of drops that will be added.
Note: Make sure to swirl the jar after adding each drop!



Add **Hardness LR Titrant TH3 or Hardness HR Titrant TH4** drop by drop to the sample until colouration turns from **wine red** to **blue**.

Calculate test result: Total Hardness (as $CaCO_3$) mg/L = Number of drops x factor (see table)

Sulphite 56I700360

25 - 150 mg/L Na_2SO_3

EN

Material

Reagents	Packaging Unit	Part Number
Sulphite Indicator S1	Powder / 40 g	56P018640
Sulphite Titrant S2	65 mL	56L018765

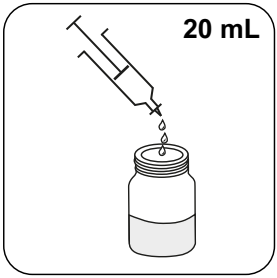
The following accessories are required.

Accessories	Packaging Unit	Part Number
Syringe, plastic, 20 mL	1 Pieces	56A006501
Titration jar with cap, plastic, 60 mL	1 Pieces	56A006701

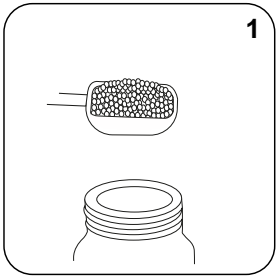
Remarks

1. Colours may vary depending on sample and test conditions.
2. Catalysed sulphite reacts quickly with atmospheric oxygen when hot, so the sample should be cooled during collection with the minimum of contact with air. It should be tested immediately after it has cooled. Care should be taken when obtaining samples.
3. Ignore any undissolved material after powder/tablet addition.
4. For concentrations of sodium sulphite above 150 mg/L take a 10 mL sample and use a factor of 10 (i.e. each drop of **Sulphite Titrant S2** used = 10mg/L Na_2SO_3).
5. Sulphite reserve may be expressed in different ways. To convert readings from sodium sulphite multiply the result obtained by the following factors.
   Sodium sulphite to sodium metabisulphite x 0.8
   Sodium sulphite to sulphite x 0.63

Determination of Sodium sulphite in boiler water



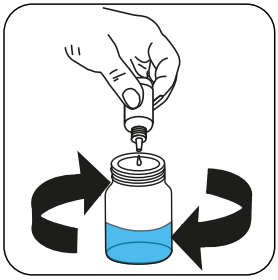
Fill the jar with **20 mL** of the cooled sample.



Add **1 measuring scoop(s) Sulphite Indicator S1** .

Swirl to mix.

Attention! Record the number of drops that will be added.
Note: Make sure to swirl the jar after adding each drop!



Add **Sulphite Titrant S2** drop by drop to the sample until colouration turns from **colourless** to **blue**.

Calculate test result: Sulphite (as Na_2SO_3) mg/L = Number of drops x 5

EN

Tannin 56I700370

50 - 300 mg/L Tannin

EN

Material

Reagents	Packaging Unit	Part Number
Tannin Indicator TN1	Powder / 50 g	56P014650
Tannin Titrant TN2	65 mL	56L019965

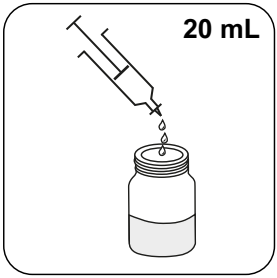
The following accessories are required.

Accessories	Packaging Unit	Part Number
Syringe, plastic, 20 mL	1 Pieces	56A006501
Titration jar with cap, plastic, 60 mL	1 Pieces	56A006701

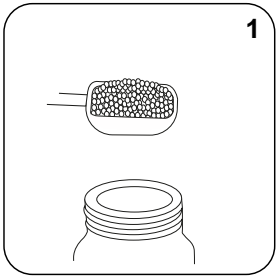
Remarks

1. Colours may vary depending on sample and test conditions.
2. Tannin is the name for lignin type compounds and therefore the factor in this method is of a general nature in line with the type of products in general use.
3. It is not necessary for all of the Tannin Indicator TN1 to dissolve.

Determination of Tannin in boiler water



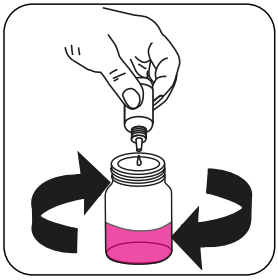
Fill the jar with **20 mL** of the cooled sample.



Add **1 measuring scoop(s) Tannin Indicator TN1** .

Swirl to mix.

Attention! Record the number of drops that will be added.
Note: Make sure to swirl the jar after adding each drop!



Add **Tannin Titrant TN2** drop by drop to the sample until colouration turns from **colourless** to **pink**.

The color should persist for at least **10** seconds.

Calculate test result: Tannin (as Tannin) mg/L = Number of drops x 10

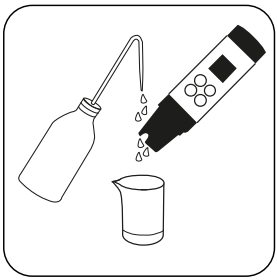
Conductivity SD / Con

0 - 20 mS/cm

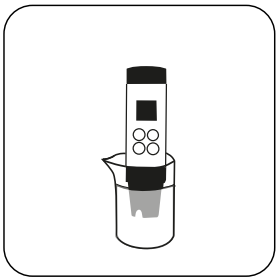
EN

Remarks

1. The description of the calibration and the device settings are described in the detailed operating instructions. Detailed operating instructions are enclosed with the device.



Rinse the electrode with distilled or deionised water and carefully wipe with a paper towel.



Hold the tester without protective cap in the sample water to be measured so that the electrode and temperature probe is immersed in the sample water not deeper than the seal ring.

The measurement result is displayed.

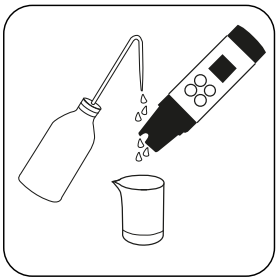
pH **SD / pH**

0 - 14

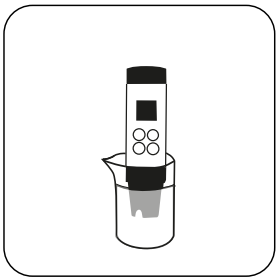
EN

Remarks

1. The description of the calibration, the preparation of the buffer solutions and the device settings are described in the detailed operating instructions. Detailed operating instructions are enclosed with the device.



Rinse the electrode with distilled or deionised water and carefully wipe with a paper towel.



Hold the tester without protective cap in the sample water to be measured so that the electrode and temperature probe is immersed in the sample water not deeper than the seal ring.

The measurement result is displayed.

Hardness (Yes/No) Y/N

8 - 20 mg/L $CaCO_3$

EN

Material

Reagents	Packaging Unit	Part Number
Hardness Yes/No	Tablet / 100	515360BT

Sampling

1. Let the sample water flow for 30 seconds before taking the sample.

Remarks

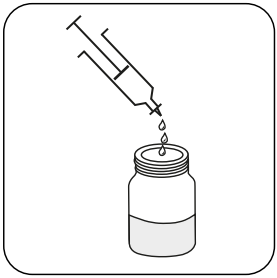
1. Colours may vary depending on sample and test conditions.
2. This test may be used to determine the performance of a softener unit by measuring the total hardness of softened water taken from the outlet. It is important to monitor hardness levels regularly as hardness breakthrough is indicative of exhausted resin and regeneration would be required.
3. Test result:
   Green Sample Colour : Hardness is less than the threshold level
   Red Sample Colour : Hardness is more than the threshold level

Sampling

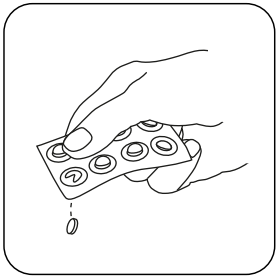
Select the sample volume from the table according to the expected measuring range and read off the factor to calculate the result.

Expected Range	Titrant used	Sample Size	Factor
10 mg/L	1 Tablette Hardness Yes/No	20 mL	
20 mg/L	1 Tablette Hardness Yes/No	10 mL	
16 mg/L	2 Tabletten Hardness Yes/No	25 mL	
8 mg/L	1 Tablette Hardness Yes/No	25 mL	

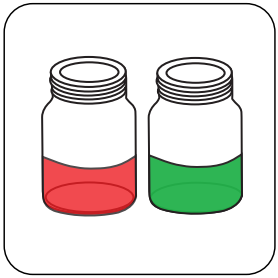
Determination of Hardness (Yes/No)



Attention!Select the appropriate sample volume according to the instructions in the chapter Sampling.



Add **x Hardness Yes/No tablet(s)**. **(See chapter Sampling under Titrant in the table.)**



The sample will turn **red or green (See chapter Notes.)**.

Read the test result: Note the color of the sample (red or green) (see Notes).

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