Safety precautions

⚠ CAUTION ⚠

Reagents are formulated exclusively for chemical analysis and must not be used for any other purpose. Reagents must not get into the hands of children. Some of the reagents contain substances which are not entirely harmless environmentally. Be aware of the ingredients and take proper care when disposing of the test solution.

⚠ CAUTION ⚠

Please read this instruction manual before unpacking, setting up or using the photometer. Please read the method description completely before performing the test. Be aware of the risks of using the required reagents by reading the MSDS (Material Safety Data Sheets). Failure could result in serious injury to the operator or damage to the instrument.

MSDS: www.tintometer.de

⚠ CAUTION ⚠

Use the charger unit only with rechargeable Ni-Cd batteries. Failure can result in serious injury to the operator or damage to the instrument.
Do not use charger with non rechargeables batteries.

⚠ CAUTION ⚠

The accuracy of the instrument is only valid if the instrument is used in an environment with controlled electromagnetic disturbances according to DIN 61326. Wireless devices, e.g. wireless phones, must not be used near the instrument.

Revision 6 01 / 2005

Table of contents

Part 1

Methods

Part 1 Methods

1.1 Table of Methods

No.	Analysis	Reagent	Range	Displayed as	Method	λ [nm]	Page
20	**Acid demand to pH 4.3 T**	tablet	0.1-4	mmol/l	Acid/ Indicator[1,2,5]	610	12
30	**Alkalinity, total T**	tablet	5-200	mg/l $CaCO_3$	Acid / Indicator[1,2,5]	610	14
35	**Alkalinity-p T**	tablet	5-500	mg/l $CaCO_3$	Acid/Indic. [1,2,5]	560	16
40	**Aluminium T**	tablet	0.01-0.3	mg/l Al	Eriochrome Cyanine R[2]	530	18
50	**Aluminium PP**	PP + liquid	0.01-0.25	mg/l Al	Eriochrome Cyanine R[2]	530	20
60	**Ammonium T**	tablet	0.02-1	mg/l N	Salicylate [2]	610	22
65	**Ammonium LR TT**	tube test	0.02-2.5	mg/l N	Salicylate [2]	660	24
66	**Ammonium HR TT**	tube test	1-50	mg/l N	Salicylate [2]	660	26
85	**Boron T**	tablet	0.1-2	mg/l B	Azomethine[3]	430	28
80	**Bromine T**	tablet	0.05-13	mg/l Br_2	DPD[5]	530	30
90	**Chloride T**	tablet	0.5 -25	mg/l Cl	Silver nitrate/turbidity	530	32
100	**Chlorine T ***	tablet	0.02-6	mg/l Cl_2	DPD[1,2,3]	530	34, 39
101	**Chlorine L ***	liquid	0.02-4	mg/l Cl_2	DPD[1,2,3]	530	40, 43
110	**Chlorine PP ***	PP	0.02-2	mg/l Cl_2	DPD[1,2]	530	44, 47
120	**Chlorine dioxide T**	tablet	0.05-11	mg/l ClO_2	DPD, Glycine[2]	530	48
105	**Chlorine HR (KI) T**	tablet	5-200	mg/l Cl_2	DPD [1,2]	530	54
130	**COD LR TT**	tube test	0 -150	mg/l O_2	Dichromate/H_2SO_4[1]	430	56
131	**COD MR TT**	tube test	0 -1500	mg/l O_2	Dichromate/H_2SO_4[1]	610	58
132	**COD HR TT**	tube test	0 -15	g/l O_2	Dichromate/H_2SO_4[1]	610	60
150	**Copper T ***	tablet	0.05-5	mg/l Cu	Biquinoline[4]	560	60
153	**Copper PP**	PP	0.05-5	mg/l Cu	Bicinchoninate	560	66
157	**Cyanide**	PP + liquid	0.01-0.5	mg/l CN	Pyridine-barbituric acid [1]	580	68
160	**Cyanuric acid T**	tablet	2-160	mg/l Cys	Melamine	530	70
165	**DEHA T**	tablet + liquid	20-500	µg/l DEHA	PPST[3]	560	72
167	**DEHA PP**	PP + liquid	20-500	µg/l DEHA	PPST[3]	560	74

* = free, combined, total; PP = powder pack; T = tablet;
L = liquid; TT = tube test; LR = low range; MR = middle range; HR = high range; Vacu-vial® is a registered trade mark of CHEMetrics Inc.

1.1 Methods

1.1 Table of Methods

No.	Analysis	Reagent	Range	Displayed as	Method	λ [nm]	Page
170	**Fluoride L**	liquid	0.05-2	mg/l F	SPADNS [2]	580	76
190	**Hardness, Calcium T**	tablet	50-900	mg/l $CaCO_3$	Murexide[4]	560	78
200	**Hardness, total T**	tablet	2-50	mg/l $CaCO_3$	Metallphthalein[3]	560	80
205	**Hydrazine P**	powder	0.05-0.5	mg/l N_2H_4	Dimethylamino-benzaldehyde	430	82
207	**Hydrazine C**	Vacu-vial	0.01-0.7	mg/l N_2H_4	PDMAB	430	84
210	**Hydrogen peroxide**	tablet	0.03-3	mg/l H_2O_2	DPD/catalyst [5]	530	86
215	**Iodine T**	tablet	0.05-3.6	mg/l I	DPD [5]	530	88
220	**Iron T**	tablet	0.02-1	mg/l Fe	PPST[3]	560	90
222	**Iron PP**	PP	0.02-3	mg/l Fe	1,10-Phenantroline [3]	530	92
223	**Iron (TPTZ) PP**	PP	0.02-1.8	mg/l Fe	TPTZ	580	94
240	**Manganese T**	tablet	0.2-4	mg/l Mn	Formaldoxime	530	96
242	**Manganese PP**	PP+liquid	0.01-0.7	mg/l Mn	PAN	560	98
250	**Molybdate T**	tablet	1-50	mg/l MoO_4	Thioglycolate[4]	430	100
265	**Nitrate TT**	tube test	1-30	mg/l N	Chromotropic acid	430	102
270	**Nitrite T**	tablet	0.01-0.5	mg/l N	N(1-Naphtyethyl-endiamine[2,3]	560	104
280	**Nitrogen, total LR TT**	tube test	0.5-25	mg/l N	Persulfate digestion method	430	106
281	**Nitrogen, total HR TT**	tube test	5-150	mg/l N	Persulfate digestion method	430	108
290	**Oxygen, active T**	tablet	0.1-10	mg/l O_2	DPD	530	110
292	**Oxygen, dissolved**	Vacu-vial	10-800	µg/l O_2	Rhodazine D™	530	112
300	**Ozone (DPD) T**	tablet	0.02-1	mg/l O_3	DPD/Glycine[5]	530	114
70	**PHMB T**	tablet	2-60	mg/l PHMB	Buffer/Indicator	560	120

* = free, combined, total; PP = powder pack; T = tablet;
L = liquid; TT = tube test; LR = low range; MR = middle range; HR = high range; Vacu-vial® is a registered trade mark of CHEMetrics Inc.

Part 1 Methods

1.1 Table of Methods

No.	Analysis	Reagent	Range	Displayed as	Method	λ [nm]	Page
320	**Phosphate, T ortho LR**	tablet	0.05-4	mg/l PO_4	Ammonium-molybdate[2,3]	660	122
321	**Phosphate, ortho HR T**	tablet	5-80	mg/l PO_4	Vanando-molybdate[2]	430	122, 126
323	**Phosphate, PP ortho**	PP	0.06-2.5	mg/l PO_4	Ascorbic acid[2]	660	122, 128
324	**Phosphate, ortho TT**	tube test	0.06-5	mg/l PO_4	Ascorbic acid[2]	660	122, 130
327	**Phosphate 1 C, ortho**	Vacu-vial	5-40	mg/l PO_4	Vanado-molybdate[2]	430	122, 132
328	**Phosphate 2 C, ortho**	Vacu-vial	0.05-5	mg/l PO_4	Stannous chloride[2]	660	122, 134
325	**Phosphate, hydr. TT**	tube test	0.02-1.6	mg/l P	Acid digestion Ascorbic acid[2]	660	122, 136
326	**Phosphate, total TT**	tube test	0.02-1.1	mg/l P	Acid persulf. digestion Ascorbic acid[2]	660	122, 138
329	**pH-Value LR T**	tablet	5.2-6.8	—-	Bromocresolpurple [5]	560	140
330	**pH-Value T**	tablet	6.5-8.4	—-	Phenolred[5]	560	142
331	**pH-Value L**	liquid	6.5-8.4	—-	Phenolred[5]	560	144
332	**pH-Value HR T**	tablet	8.0-9.6	—-	Thymolblue [5]	560	146
350	**Silica T**	tablet	0.05-4	mg/l SiO_2	Silicomolybdate[2,3]	660	150
351	**Silica LR PP**	PP	0.1-1.6	mg/l SiO_2	Heteropolyblue[2]	660	150
352	**Silica HR PP**	PP	1-90	mg/l SiO_2	Silicomolybdate[2]	430	152
355	**Sulfate T**	tablet	5-100	mg/l SO_4	Bariumsulfate-Turbidity	2	154
360	**Sulfate PP**	PP	5-100	mg/l SO_4	Bariumsulfate-Turbidity[2]	530	156
365	**Sulfide**	tablet	0.04-0.5	mg/l S	DPD/Catalyst[3,4]	660	158
370	**Sulfite T**	tablet	0.1-5	mg/l SO_3	DTNB	430	160
390	**Urea T**	tablet + liquid	0.1-3	mg/l Urea	Indophenol/ Urease	610	162
400	**Zinc T**	tablet	0.02 -1	mg/l Zn	Zincon [3]	610	164

* = free, combined, total; PP = powder pack; T = tablet;
L = liquid; TT = tube test; LR = low range; MR = middle range; HR = high range; Vacu-vial® is a registered trade mark of CHEMetrics Inc.

1.1 Methods

1.1 Table of Methods

Literature

The reagent formulations are based on internationally recognised test methods. Some are described in national and/or international guidelines.

1) Deutsche Einheitsverfahren zur Wasser-, Abwasser- und Schlammuntersuchung
2) Standard Methods for the Examination of Water and Wastewater; 18th Edition, 1992

3) Photometrische Analysenverfahren, Schwedt,
Wissenschaftliche Verlagsgesellschaft mbH, Stuttgart 1989
4) Photometrische Analyse, Lange / Vejdelek,
Verlag Chemie 1980
5) Colorimetric Chemical Analytical Methods,
9th Edition, London

Notes for searching:

Active Oxygen	->	Oxygen, activ
Alkalinity-m	->	Alkalinity, total
Alkalinity, total	->	Alkalinity, total
Biguanide	->	PHMB
Calcium Hardness	->	Hardness, Calcium
Total Hardness	->	Hardness, total
m-Value	->	Alkalinity, total
p-Value	->	Alkalinity-p
Silicon dioxide	->	Silica
total Alkalinity	->	Alkalinity, total
total Hardness	->	Hardness, total
Langelier Saturation Index (Water Balance)	->	Mode function 70

Method

2 0 Acid demand to pH 4.3 with tablet reagent

0.1 - 4 mmol/l

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one ALKA-M-PHOTOMETER tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.

6. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.

The result is shown in the display as

Acid demand to pH 4.3 in mmol/l.

Method

Notes:

1. The terms total Alkalinity, Alkalinity-m, m-Value and Acid demand to pH 4.3 are identical.
2. For accurate results exactly 10 ml of water sample must be taken for the test.

Reagents
Alka. M Photometer tablets pk 100 Ref: TT/51.32.10

Method

3 0 Alkalinity, total = Alkalinity-m = m-Value with tablet reagent

5 – 200 mg/l $CaCO_3$

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one ALKA-M-PHOTOMETER tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.

6. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.

   The result is shown in the display as total alkalinity in mg/l $CaCO_3$.

Method

Notes:

1. The terms total Alkalinity, Alkalinity-m, m-Value and Alkalinity to pH 4.3 are identical.
2. For accurate results exactly 10 ml of water sample must be taken for the test.
3. Conversion table:

	Acid demand to pH 4.3 DIN 38 409 ($Ks_{4.3}$)	German °d*	English °e*	French °f*
1 mg/l $CaCO_3$	0.02	0.056	0.07	0.1

*Carbonate hardness (reference = Bicarbonate-anions)

Example:
10 mg/l $CaCO_3$ = 10 mg/l x 0.056 = 0.56 mg/l °d
10 mg/l $CaCO_3$ = 10 mg/l x 0.02 = 0.2 mmol/l

4. ▲ $CaCO_3$
   °dH
   °eH
   °fH
   ▼ °aH

Reagents
Alka. M Photometer tablets pk 100 Ref: TT/51.32.10

Method

3 5

Alkalinity-p = p-value with tablet reagent

5 – 500 mg/l $CaCO_3$

1. Fill a clean vial (24 mm ø) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one ALKA-P-PHOTOMETER tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.

6. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.

   The result is shown in the display as Alkalinity-p in mg/l $CaCO_3$.

Method

Notes

1. The terms Alkalinity-p, p-Value and Alkalinity to pH 8.2 are identical.
2. For accurate test results exactly 10 ml of water sample must be taken for the test.
3. This method was developed from a volumetric procedure for the determination of Alkalinity-p. Due to undefined conditions, the deviations from the standardised method may be greater.
4. Conversion table:

	mg/l $CaCO_3$	°dH	°fH	°eH
1 mg/l $CaCO_3$	----	0.056	0.10	0.07
1 °dH	17.8	----	1.78	1.25
1 °fH	10.0	0.56	----	0.70
1 °eH	14.3	0.80	1.43	----

▲ $CaCO_3$
°dH
°eH
°fH
▼ °aH

5. By determining Alkalinity-p and Alkalinity-m it is possible to classify the alkalinity as Hydroxide, Carbonate and Hydrogen carbonate.
   The following differentiation is only valid if:
   a) no other alkalis are present and
   b) Hydroxide und Hydrogen are not present in the same water sample.
   If condition b) is not fulfilled please get additional information from "Deutsche Einheitsverfahren zur Wasser-, Abwasser- und Schlammuntersuchung, D 8".
   Case 1: Alkalinity-p = 0
   Hydrogen carbonate = m
   Carbonate = 0
   Hydroxide = 0

   Case 2: Alkalinity-p > 0 and Alkalinity-m > 2p
   Hydrogen carbonate = m – 2p
   Carbonate = 2p
   Hydroxide = 0

   Case 3: Alkalinity-p > 0 and Alkalinity-m < 2p
   Hydrogen carbonate = 0
   Carbonate = 2m – 2p
   Hydroxide = 2p – m

Reagents
Alka. P Photometer tablets pk 100 Ref: TT/51.32.30

1.1 Methods

4 0 Aluminium with tablet reagent

0.01 – 0.3 mg/l Al

1. Fill a clean vial (24 mm ø) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one ALUMINIUM No. 1 tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod (dissolve the tablet).

6. Add **one ALUMINIUM No. 2 tablet** straight from the foil to the same water sample and crush the tablet using a clean stirring rod.

7. Close the vial with the cap tightly and swirl the vial gently several times until the tablets are dissolved.

8. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.
Wait for a **reaction period of 5 minutes.**

Count-Down
5 : 00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in mg/l Aluminium

1.1 Methods

Notes:

1. Before using clean the vials and the measuring cub with Hydrochloric acid (approx. 20%). Rinse then tightly with deionized water.
2. To get accurate results the sample temperature must be between 20°C and 25°C.
3. A low test result may be given in the presence of Fluorides and Polyphosphates. The effect of this is generally insignificant unless the water has fluoride added artificially. In this case, the following table should be used:

Fluoride [mg/l F]	Displayed value: Aluminium [mg/l Al]					
	0.05	0.10	0.15	0.20	0.25	0.30
0.2	0.05	0.11	0.16	0.21	0.27	0.32
0.4	0.06	0.11	0.17	0.23	0.28	0.34
0.6	0.06	0.12	0.18	0.24	0.30	0.37
0.8	0.06	0.13	0.20	0.26	0.32	0.40
1.0	0.07	0.13	0.21	0.28	0.36	0.45
1.5	0.09	0.20	0.29	0.37	0.48	---

Example: If the result of Aluminium determination is 0.15 mg/l Al and the Fluoride concentration is known to be 0.4 mg/l F, the true concentration of Aluminium is 0.17 mg/l Al.

4. ▲ Al
   ▼ Al_2O_3

Reagents
Aluminium No1 tablets pk 100 Ref:TT/51.54.60
Aluminium No2 tablets pk 100 Ref:TT/51.54.70

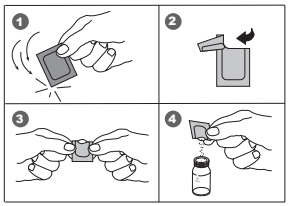
Method

5 **0**

Aluminium with Powder Pack (PP) reagent

0.01 – 0.25 mg/l Al

Use two clean vials (24 mm ∅) and mark one as blank for zeroing.



1. Fill **20 ml of water sample** in a 100 ml beaker.
2. Add **one Aluminum ECR powder pack** straight from the foil to the water sample.
3. Dissolve the powder using a clean stirring rod.

Countdown 1
0 : 30
start: press [↵]

4. Press [↵] key.
   Wait for a **reaction period of 30 seconds.**

After reaction period is finished proceed as follows:

5. Add **one Hexamine powder pack** straight from the foil to the same water sample.
6. Dissolve the powder using a clean stirring rod.
7. Add **1 drop of Aluminum ECR Masking Reagent** in the vial marked as blank.
8. Add 10 ml of the prepared water sample to the vial (this is the blank).
9. Add the remaining 10 ml of the prepared water sample in the second clean vial (this is the sample).
10. Close the vials with the caps tightly and swirl the vials several times to mix the contents.

Countdown 2
5 : 00
start: press [↵]

11. Press [↵] key.
    Wait for **a reaction period of 5 minutes**.

Method

After reaction period is finished proceed as follows:

12. Place the vial (the blank) in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

13. Press **ZERO** key.

14. Remove the vial from the sample chamber.

15. Place the vial (the sample) in the sample chamber making sure that the ⧗ marks are aligned.

Zero accepted
prepare Test
press TEST

16. Press **TEST** key.

The result is shown in the display in

mg/l Aluminium.

Notes:

1. Before using clean the vials and the measuring cub with Hydrochloric acid (approx. 20%). Rinse then tightly with deionized water.
2. To get accurate results the sample temperature must be between 20°C and 25°C.
3. A low test result may be given in the presence of Fluorides and Polyphosphates. The effect of this is generally insignificant unless the water has fluoride added artificially. In this case, the following table should be used:

Fluoride [mg/l F]	Displayed value: Aluminium [mg/l Al]					
	0.05	0.10	0.15	0.20	0.25	0.30
0.2	0.05	0.11	0.16	0.21	0.27	0.32
0.4	0.06	0.11	0.17	0.23	0.28	0.34
0.6	0.06	0.12	0.18	0.24	0.30	0.37
0.8	0.06	0.13	0.20	0.26	0.32	0.40
1.0	0.07	0.13	0.21	0.28	0.36	0.45
1.5	0.09	0.20	0.29	0.37	0.48	---

Example: If the result of Aluminium determination is 0.15 mg/l Al and the Fluoride concentration is known to be 0.4 mg/l F, the true concentration of Aluminium is 0.17 mg/l Al.

4. ▲ Al
   ▼ Al_2O_3

Reagents
Aluminium reagent set (100 tests) Ref: CW/53.50.00

Method

6 0

Ammonium with tablet reagent

0.02 - 1 mg/l N

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample,** close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one AMMONIA No. 1 tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.

6. Add **one AMMONIA No. 2 tablet** straight from the foil to the same water sample and crush the tablet using a clean stirring rod.

7. Close the vial with the cap tightly and swirl the vial several times until the tablets are dissolved.

8. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.
Wait for a **reaction period of 10 minutes.**

Countdown
10 : 00

After the reaction period is finished the reading starts automatically.

The result is shown in the display as Ammonium in mg/l N.

Method

Notes:

1. The tablets must be added in the correct sequence.
2. The AMMONIA No. 1 tablet will only dissolve completely after the AMMONIA No. 2 tablet has been added.
3. The temperature of the sample is important for full colour development. At a temperature below 20°C the reaction period is 15 minutes.
4. Sea water samples:
   Ammonia conditioning reagent is required when testing sea water or brackish water samples to prevent precipitations of salts.
   Fill the test tube with the sample to the 10 ml mark and add one level spoonful of Conditioning Powder. Mix to dissolve, then continue as described in the test instructions.
5. Conversion:
   mg/l NH_4 = mg/l N x 1.29
   mg/l NH_3 = mg/l N x 1.22
6. ▲ N
   NH_4
   ▼ NH_3

Reagents
Ammonia No1 tablets pk 100 Ref:TT/51.25.80
Ammonia No2 tablets pk 100 Ref:TT/51.25.90

Method

6 5 Ammonium LR (low range) Tube test

0.02 - 2.5 mg/l N

1. Open the white cap of one reaction vial and add **2 ml deionised water** (this is the blank).

2. Open the white cap of another reaction vial and add **2 ml water sample** (this is the sample).

3. Add **one AMMONIA Salicylate powder pack** straight from the foil into each vial.

4. Add **one AMMONIA Cyanurate powder pack** straight from the foil into each vial.

5. Close the vials with the caps tightly and swirl the vials several times to dissolve the powder.

Countdown
20 : 00
start: press [↵]

6. Press [↵] key.
   Wait for a **reaction period of 20 minutes**.
   After reaction period is finished proceed as follows:

7. Place the vial (the blank) in the sample chamber making sure that the marks are aligned.
   Place the cover on the adapter.

prepare Zero
press ZERO

8. Press **ZERO** key.

9. Remove the vial from the sample chamber.

10. Place the vial (the sample) in the sample chamber making sure that the marks are aligned.
    Place the cover on the adapter.

Zero accepted
prepare Test
press TEST

11. Press **TEST** key.
    The result is shown in the display as Ammonium in mg/l N.

Method

Notes:

1. Strong alkaline or acidic water samples must be adjusted to approx. pH 7 before analysis (use 1 mol/l Hydrochloric acid resp. 1 mol/l Sodium hydroxide).

2. If chlorine is known to be present, add one drop of 0.1 mol/l Sodium thiosulfate for each 0.3 mg/l Cl_2 in a one litre water sample.

3. Iron interferes with the test. The interferences will be eliminated as follows:
Determine the amount of total iron present in the water sample. To produce the blank add an iron standard solution with the same iron concentration to the vial (point 1) instead of deionised water

4. Conversion:
mg/l NH_4 = mg/l N x 1.29
mg/l NH_3 = mg/l N x 1.22

5. ▲ N
   NH_4
   ▼ NH_3

Reagents
Ammonia LR tube reagent set (100 tests) Ref: CW/53.56.00

Method

6 6 Ammonium HR (high range) Tube test

1 - 50 mg/l N

1. Open the white cap of one reaction vial and add **0.1 ml deionised water** (this is the blank).

2. Open the white cap of another reaction vial and add **0.1 ml water sample** (this is the sample).

3. Add **one AMMONIA Salicylate powder pack** straight from the foil into each vial.

4. Add **one AMMONIA Cyanurate powder pack** straight from the foil into each vial.

5. Close the vials with the caps tightly and swirl the vials several times to dissolve the powder.

Countdown
20 : 00
start: press [↵]

6. Press [↵] key.
   Wait for a **reaction period of 20 minutes**.
   After reaction period is finished proceed as follows:

7. Place the vial (the blank) in the sample chamber making sure that the marks are aligned.
   Place the cover on the adapter.

prepare Zero
press ZERO

8. Press **ZERO** key.

9. Remove the vial from the sample chamber.

10. Place the vial (the sample) in the sample chamber making sure that the marks are aligned.
    Place the cover on the adapter.

Zero accepted
prepare Test
press TEST

11. Press **TEST** key.
    The result is shown in the display as Ammonium in mg/l N.

Method

Notes:

1. Strong alkaline or acidic water samples must be adjusted to approx. pH 7 before analysis (use 1 mol/l Hydrochloric acid resp. 1 mol/l Sodium hydroxide).

2. If chlorine is known to be present, add one drop of 0.1 mol/l Sodium thiosulfate for each 0.3 mg/l Cl_2 in a one litre water sample.

3. Iron interferes with the test. The interferences will be eliminated as follows:
Determine the amount of total iron present in the water sample. Add an iron standard solution with the same concentration to the vial (point 1) instead of deionised water to produce the blank.

4. Conversion:
mg/l NH_4 = mg/l N x 1.29
mg/l NH_3 = mg/l N x 1.22

5. ▲ N
   NH_4
   ▼ NH_3

Reagents
Ammonia HR tube reagent set (100 tests) Ref: CW/53.56.50

1.1 Methods

8 5

Boron with tablet reagent

0.1 – 2 mg/l B

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.
2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.
4. Remove the vial from the sample chamber.
5. Add **one BORON No. 1 tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod and dissolve the tablet.
6. Add **one BORON No. 2 tablet** straight from the foil to the same water sample and crush the tablet using a clean stirring rod.
7. Close the vial with the cap tightly and swirl the vial several times until the tablets are dissolved.
8. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.

Countdown
20 : 00

Wait for a **reaction period of 20 minutes.**

After the reaction period is finished the reading starts automatically.

The result is shown in the display in mg/l Boron.

1.1 Methods

Notes:

1. The tablets must added in the correct sequence.
2. The sample solution should have a pH value between 6 and 7.
3. Interferences are prevented by the presence of EDTA in the tablets.
4. The rate of colour development depends on the temperature. The temperature of the sample must be 20°C ± 1°C.
5. ▲ B
   ▼ H_3BO_3

Reagents
Boron No1 tablets pk 100 Ref:TT/51.57.90
Boron No2 tablets pk 100 Ref:TT/51.58.00

Method

8 0

Bromine with tablet reagent

0.05 - 13 mg/l Br_2

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber, **empty the vial leaving a few drops in**.

5. Add **one DPD No. 1 tablet** straight from the foil and crush the tablet using a clean stirring rod.

6. Add water sample to the 10 ml mark.

7. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

8. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.

The result is shown in the display in mg/l Bromine.

Method

Notes:

1. Vial cleaning:

   As many household cleaners (e.g. dishwasher detergent) contain reducing substances, the subsequent determination of Bromine may show lower results. To avoid any measurement errors, only use glassware free of Chlorine consumption.

   Preparation: Put all applicable glassware into Sodium hypochlorite solution (0.1 g/l) for one hour, then rinse all glassware thoroughly with deionized water.

2. Preparing the sample:

   When preparing the sample, the escape of Bromine gases, e.g. by pipetting or shaking, must be avoided. The analysis must take place immediately after taking the sample.

3. The DPD colour development is carried out at a pH value of 6.3 to 6.5. The reagent tablet therefore contains a buffer for the pH adjustment.

   Strong alkaline or acidic water samples must be adjusted to between pH 6 and pH 7 before the reagent is added (use 0.5 mol/l Sulfuric acid resp. 1 mol/l Sodium hydroxide).

4. Exceeding of the measuring range:

   Concentrations above 22 mg/l Bromine can produce results within the measuring range up to 0 mg/l. In this event, the water sample must be diluted with water free of Bromine. 10 ml of the diluted sample will be mixed with the reagent and the measurement repeated.

   Oxidizing agents such as Chlorine, Ozone etc. interfere as they react like Bromine.

Reagents
DPD No1 tablets pk 100 Ref:TT/51.10.60

1.1 Method

9 **0**

Chloride with tablet reagent

0.5 - 25 mg/l Cl

1. Fill a clean vial (24 mm ø) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one CHLORIDE T1 tablet** straight from the foil to the water sample, crush the tablet using a clean stirring rod and dissolve the tablet.

6. Add **one CHLORIDE T2 tablet** straight from the foil to the same water sample and crush the tablet using a clean stirring rod.

7. Close the vial with the cap tightly and swirl the vial gently several times until the tablet is dissolved(Note 1).

8. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.

   Wait for a **reaction period of 2 minutes**.

Count-Down
2:00

   After the reaction period is finished the reading starts automatically.

   The result is shown in the display in mg/l Chloride.

1.1 Method

Notes:

1. Ensure that all particles of the tablet are dissolved – Chloride causes an extremely finely distributed turbidity with a milky appearance.
   Heavy shaking leads to bigger sized particles which can cause false readings.
2. High concentrations of electrolytes and organic compounds have different effects on the precipitation reaction.
3. Ions which also form deposits with Silver nitrate in acidic media, such as Bromides, Iodides and Thiocyanates, interfere with the analysis.
4. Highly alkaline water should - if necessary - be neutralised using Nitric acid before analysis.

Reagents
Chloride T1 tablets pk 100 Ref:TT/51.59.10
Chloride T2 tablets pk 100 Ref:TT/51.59.20

Method

1 0 0 **Chlorine with DPD tablets**

0.02 - 6 mg/l Cl_2

1 0 1 **Chlorine with DPD liquid reagent**

0.02 - 4 mg/l Cl_2

1 1 0 **Chlorine with Powder Pack (PP) reagent**

0.02 - 2 mg/l Cl_2

The following selection is shown in the display:

for the differentiated determination of free, combined and total Chlorine.

for the determination of free Chlorine.

for the determination of total Chlorine.

Select the desired determination with the arrow keys [▲] and [▼]. Confirm with [↵] key.

Method

Notes:

1. Vial cleaning:
   As many household cleaners (e.g. dishwasher detergent) contain reducing substances, the subsequent determination of Chlorine may show lower results. To avoid any measurement errors, only use glassware free of Chlorine consumption.
   Preparation: Put all applicable glassware into Sodium hypochlorite solution (0.1 g/l) for one hour, then rinse all glassware thoroughly with deionized water.
2. For individual testing of free and total Chlorine, the use of different sets of glassware is recommend (EN ISO 7393-2, 5.3)
3. Preparing the sample:
   When preparing the sample, the escape of Chlorine gases, e.g. by pipetting or shaking, must be avoided. The analysis must take place immediately after taking the sample.
4. The DPD colour development is carried out at a pH value of 6.3 to 6.5. The reagents therefore contain a buffer for the pH adjustment.
   Strong alkaline or acidic water samples must be adjusted to between pH 6 and pH 7 before the reagent is added (use 0.5 mol/l Sulfuric acid resp. 1 mol/l Sodium hydroxide).
5. Exceeding of the measuring range:
   Concentrations above
   10 mg/l Chlorine using tablets
   4 mg/l Chlorine using liquid reagents
   2 mg/l using powder packs
   can produce results within the measuring range up to 0 mg/l. In this event, the water sample must be diluted with water free of Chlorine. 10 ml of the diluted sample will be mixed with the reagent and the measurement repeated.
6. Turbidity (lead to errors):
   The use of the DPD No. 1 tablet (method 100) in samples with high Calcium ion content* and/or high conductivity* can lead to turbidity of the sample and therefore incorrect measurements. In this event, the reagent tablet DPD No. 1 High Calcium should be used as an alternative. Even if the turbidity does not occur until after the DPD No. 3 tablet has been added, this can be prevented by using the DPD No. 1 HIGH CALCIUM tablet.
   ** it is not possible to give exactly values, because the development of turbidity depends on nature and ingredients of the sample.*
7. If ??? is displayed at a differenciated test result see page 222.

Oxidizing agents such as Bromine, Ozone etc. interfere as they react like Chlorine.

Method

1 0 0

Chlorine, differentiated determination with DPD tablets

0.02 - 6 mg/l Cl_2

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample,** close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber, **empty the vial leaving a few drops in**.

5. Add **one DPD No. 1 tablet** straight from the foil and crush the tablet using a clean stirring rod.

6. Add water sample to the 10 ml mark.

7. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

8. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare T1
press TEST

9. Press **TEST** key.

10. Remove the vial from the sample chamber.

11. Add **one DPD No. 3 tablet** straight from the foil to the same water sample and crush the tablet using a clean stirring rod.

12. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

Method

13. Place the vial in the sample chamber making sure that the X marks are aligned.

T1 accepted
prepare T2
press TEST

14. Press **TEST** key.
Wait for a **reaction period of 2 minutes**.

Countdown
2:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in:

***,** mg/l free Cl**
***,** mg/l comb Cl**
***,** mg/l total Cl**

mg/l free Chlorine

mg/l combined Chlorine

mg/l total Chlorine

Notes:

See page 35.

Reagents
DPD No1 tablets pk 100 Ref:TT/51.10.60
DPD No3 tablets pk 100 Ref:TT/51.10.80
DPD No1 High Ca tablets pk 100 Ref:TT/51.57.40

Method

1 0 0

Chlorine, free with DPD tablets

0.02 - 6 mg/l Cl_2

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber, **empty the vial leaving a few drops in**.

5. Add **one DPD No. 1 tablet** straight from the foil and crush the tablet using a clean stirring rod.

6. Add water sample to the 10 ml mark.

7. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

8. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.

The result is shown in the display in

mg/l free Chlorine.

Notes:

See page 35.

Reagents
DPD No1 tablets pk 100 Ref:TT/51.10.60

Method

1 0 0

Chlorine, total with DPD-tablets

0.02 - 6 mg/l Cl_2

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber, **empty the vial leaving a few drops in**.

5. Add **one DPD No. 1 tablet** and **one DPD No. 3 tablet** straight from the foil and crush the tablets using a clean stirring rod.

6. Add water sample to the 10 ml mark.

7. Close the vial with the cap tightly and swirl the vial several times until the tablets are dissolved.

8. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.
Wait for a **reaction period of 2 minutes**.

Countdown
2:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in mg/l total Chlorine.

Notes:

See page 35.

Reagents
DPD No1 tablets pk 100 Ref:TT/51.10.60
DPD No3 tablets pk 100 Ref:TT/51.10.80

Method

1 0 1

Chlorine, differentiated determination with DPD liquid reagent

0.02 - 4 mg/l Cl_2

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.
2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.
4. Remove the vial from the sample chamber and **empty the vial**.
5. Fill the vial with drops of the same size by holding the bottle vertically and squeeze slowly:

   6 drops of DPD 1 buffer solution

   2 drops of DPD 1 reagent solution

6. Add water sample to the 10 ml mark.
7. Close the vial with the cap tightly and swirl the vial several times to mix the contents.
8. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare T1
press TEST

9. Press **TEST** key.
10. Remove the vial from the sample chamber.
11. **Add 3 drops of DPD 3 solution** to the same water sample.
12. Close the vial with the cap tightly and swirl the vial several times to mix the contents.

Method

13. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

T1 accepted
prepare T2
press TEST

14. Press **TEST** key.
Wait for a **reaction period of 2 minutes**.

Countdown
2:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in:

***,** mg/l free Cl**
mg/l free Chlorine

***,** mg/l comb. Cl**
mg/l combined Chlorine

***,** mg/l total Cl**
mg/l total Chlorine

Notes:

1. After use replace the bottle caps securely noting the colour coding.
2. **Store the reagent bottles in a cool, dry place ideally between 6°C and 10°C**.
3. Also see page 35.

Reagents
DPD 1 buffer solution 15ml Ref: TT/47.10.10
DPD 1 reagent solution 15ml Ref: TT/47.10.20
DPD 3 solution 15ml Ref: TT/47.10.30

Reagent set (one of each of the above) Ref: TT/47.10.56

Method

1 0 1

Chlorine, free with DPD liquid reagent

0.02 - 4 mg/l Cl_2

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.
2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.
4. Remove the vial from the sample chamber and **empty the vial**.
5. Fill the vial with drops of the same size by holding the bottle vertically and squeeze slowly:

   6 drops of DPD 1 buffer solution

   2 drops of DPD 1 reagent solution

6. Add water sample to the 10 ml mark.
7. Close the vial with the cap tightly and swirl the vial several times to mix the contents.
8. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.

   The result is shown in the display in

   mg/l free Chlorine.

Notes (free and total Chlorine):

1. After use replace the bottle caps securely noting the colour coding.
2. **Store the reagent bottles in a cool, dry place ideally between 6°C and 10°C.**
3. Also see page 35.

Reagents
DPD 1 buffer solution 15ml Ref: TT/47.10.10
DPD 1 reagent solution 15ml Ref: TT/47.10.20

Method

1 0 1

Chlorine, total with DPD liquid reagent

0.02 - 4 mg/l Cl_2

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber and **empty the vial**.

5. Fill the vial with drops of the same size by holding the bottle vertically and squeeze slowly:

   6 drops of DPD 1 buffer solution

   2 drops of DPD 1 reagent solution

   3 drops of DPD 3 solution

6. Add water sample to the 10 ml mark.

7. Close the vial with the cap tightly and swirl the vial several times to mix the contents.

8. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.
   Wait for a **reaction period of 2 minutes**.

Countdown
2:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in mg/l total Chlorine.

Reagents
DPD 1 buffer solution 15ml Ref: TT/47.10.10
DPD 1 reagent solution 15ml Ref: TT/47.10.20
DPD 3 solution 15ml Ref: TT/47.10.30

Method

1 1 0

Chlorine, differentiated determination with Powder Pack (PP) reagent

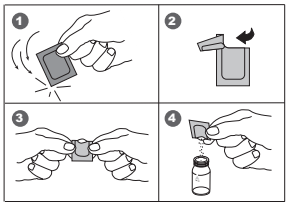
0.02 - 2 mg/l Cl_2

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.



4. Remove the vial from the sample chamber.

5. Add **one Chlorine FREE-DPD powder pack** straight from the foil to the water sample.

6. Close the vial with the cap tightly and swirl the vial several times to mix the contents (approx. 20 seconds).

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare T1
press TEST

8. Press **TEST** key.

9. Remove the vial from the sample chamber, empty the vial, rinse vial and cap several times and fill the vial with **10 ml of water sample**.

10. Add **one Chlorine TOTAL-DPD powder pack** straight from the foil to the water sample.

11. Close the vial with the cap tightly and swirl the vial several times to mix the contents (approx. 20 seconds).

Method

12. Place the vial in the sample chamber making sure that the X marks are aligned.

T1 accepted
prepare T2
press TEST

13. Press **TEST** key.
Wait for a **reaction period of 3 minutes.**

Countdown
3:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in:

***,** mg/l free Cl**
***,** mg/l comb. Cl**
***,** mg/l total Cl**

mg/l free Chlorine

mg/l combined Chlorine

mg/l total Chlorine

Notes:

See page 35.

Reagents
DPD free chlorine powder pack/100 Ref: CW/53.01.00
DPD total chlorine powder pack/100 Ref: CW/53.01.20

Method

1 1 0

Chlorine, free with Powder Pack (PP) reagent

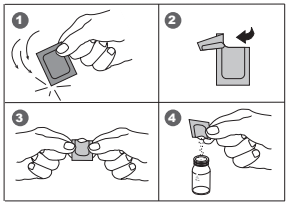
0.02 - 2 mg/l Cl_2

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.



4. Remove the vial from the sample chamber.

5. Add **one Chlorine FREE-DPD powder pack** straight from the foil to the water sample.

6. Close the vial with the cap tightly and swirl the vial several times to mix the contents (approx. 20 seconds).

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.

The result is shown in the display in mg/l free Chlorine.

Notes:

See page 35.

Reagents
DPD free chlorine powder pack/100 Ref: CW/53.01.00

Method

1 1 0

Chlorine, total with Powder Pack (PP) reagent

0.02 - 2 mg/l Cl_2

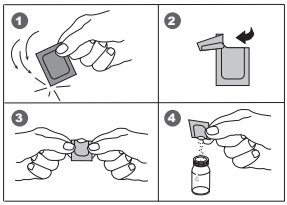
1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.



5. Add **one Chlorine TOTAL-DPD / F10 powder pack** straight from the foil to the water sample.

6. Close the vial with the cap tightly and swirl the vial several times to mix the contents (approx. 20 seconds).

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.
Wait for a **reaction period of 3 minutes**.

Countdown
3:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in

mg/l total Chlorine.

Notes:

See page 35.

Reagents
DPD total chlorine powder packs pk 100
Ref: CW/53.01.20

Method

1 2 0

Chlorine dioxide with tablet reagent

0.05 – 11 mg/l ClO_2

Chlorine dioxide
>> with Cl
without Cl

The following selection is shown in the display:

>> with Cl

for the determination of Chlorine dioxide in the presence of Chlorine.

>> without Cl

for the determination of Chlorine dioxide in the absence of Chlorine.

Select the desired determination with the arrow keys [▲] and [▼] Confirm with [↵] key.

Method

Notes:

1. Vial cleaning:
   As many household cleaners (e.g. dishwasher detergent) contain reducing substances, the subsequent determination of Chlorine dioxide may show lower results. To avoid any measurement errors, only use glassware free of Chlorine consumption.
   Preparation: Put all applicable glassware into Sodium hypochlorite solution (0.1 g/l) for one hour, then rinse all glassware thoroughly with deionized water.
2. Preparing the sample:
   When preparing the sample, the escape of Chlorine dioxide gases, e.g. by pipetting or shaking, must be avoided. The analysis must take place immediately after taking the sample.
3. The DPD colour development is carried out at a pH value of 6.3 to 6.5. The reagent tablet therefore contains a buffer for the pH adjustment.
   Strong alkaline or acidic water samples must be adjusted to between pH 6 and pH 7 before the tablet is added (use 0.5 mol/l Sulfuric acid resp. 1 mol/l Sodium hydroxide).
4. Exceeding of the measuring range:
   Concentrations above 19 mg/l Chlorine dioxide can produce results within the measuring range up to 0 mg/l. In this event, the water sample must be diluted with water free of Chlorine dioxide. 10 ml of the diluted sample will be mixed with the reagent and the measurement repeated.
5. If ??? is displayed at a differentiated test result see page 222.

Oxidizing agents such as Chlorine, Ozone etc. interfere as they react like Chlorine dioxide.

Method

1 2 0

Chlorine dioxide in the presence of Chlorine with tablet reagent

0.05 – 11 mg/l ClO_2

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber, **empty the vial leaving a few drops in**.

5. Add **one DPD No. 1 tablet** straight from the foil and crush the tablet using a clean stirring rod.

6. **Fill a second clean vial with 10 ml of water sample.**

7. Add **one DPD-GLYCINE tablet** straight from the foil and crush the tablet using a clean stirring rod.

8. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

9. **Transfer the content of the second vial into the prepared vial.**

10. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

Zero accepted
prepare T1
press TEST

11. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

12. Press **TEST** key.

Method

13. Remove the vial from the sample chamber, empty the vial, rinse vial and cap several times. Fill with **a few drops of water sample**.

14. Add **one DPD No. 1 tablet** straight from the foil and crush the tablet using a clean stirring rod.

15. Add water sample to the 10 ml mark.

16. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

17. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

T1 accepted
prepare T2
press TEST

18. Press **TEST** key.

19. Remove the vial from the sample chamber.

20. Add **one DPD No. 3 tablet** straight from the foil to the same water sample and crush the tablet using a clean stirring rod.

21. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

22. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

T2 accepted
prepare T3
press TEST

23. Press **TEST** key.
Wait for a **reaction period of 2 minutes**.

Countdown
2:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in:

***,** mg/l ClO_2 [Cl]**
***,** mg/l free Cl**
***,** mg/l comb. Cl**
***,** mg/l total Cl**

Chlorine dioxide in mg/l Chlorine

mg/l free Chlorine

mg/l combined Chlorine

mg/l total Chlorine

Notes:

See next page.

Method

Notes: (Chlorine dioxide in the presence of Chlorine)

1. The conversion factor to convert Chlorine dioxide as Chlorine to Chlorine dioxide as ClO_2 is approximately 0.4 (more exactly 0.38).
   mg/l ClO_2 = mg/l ClO_2 [Cl] x 0.38
   ▲ ClO_2[Cl]
   ▼ ClO_2
   (Chlorine dioxide displayed as Chlorine units ClO_2 [Cl] has its origin out of the swimming poolwater treatment according to DIN 19643.)
2. The total Chlorine result given includes the contribution by the Chlorine dioxide (as Chlorine) reading. For true total Chlorine value subtract the Chlorine dioxide (as Chlorine) reading from the quoted total Chlorine reading.
3. Also see page 49.

Reagents
DPD No 1 tablet pk 100 Ref: TT/51.10.60
DPD No 3 tablet pk 100 Ref: TT/51.10.80
Glycine tablet pk 100 Ref: TT/51.21.70

Method

1 2 0

Chlorine dioxide in absence of Chlorine with tablet reagent

0.05 – 11 mg/l ClO_2

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber, **empty the vial leaving a few drops in**.

5. Add **one DPD No. 1 tablet** straight from the foil and crush the tablet using a clean stirring rod.

6. Add water sample to the 10 ml mark.

7. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

8. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.

The result is shown in the display

***,** mg/l ClO_2 [Cl]**

as Chlorine dioxide in mg/l Chlorine,

***,** mg/l ClO_2**

or
as Chlorine dioxide in mg/l ClO_2.

Notes:

See page 49.

Reagents
DPD No 1 tablet pk 100 Ref: TT/51.10.60

Method

1 0 5

Chlorine HR (KI) with tablet reagent

5 - 200 mg/l Cl_2

1. Fill a clean vial (16 mm ø) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the marks are aligned. Place the cover on the adapter.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one CHLORINE HR (KI) tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.

6. Add **one ACIDIFYING GP tablet** straight from the foil to the same water sample and crush the tablet using a clean stirring rod.

7. Close the vial with the cap tightly and swirl the vial several times until the tablets are dissolved.

8. Place the vial in the sample chamber making sure that the marks are aligned. Place the cover on the adapter.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.
The result is shown in the display in mg/l Chlorine.

Method

Notes:

1. Oxidizing agents interfere as they react like Chlorine.

Reagents
Chlorine HR (KI) No 1 tablet pk 100 Ref: TT/51.30.00
Acidifying GP tablet pk 100 Ref: TT/51.54.80

Method

1 3 0

COD LR (low range) Tube test

0 - 150 mg/l O_2

1. Open the white cap of one reaction vial and add **2 ml deionised water** (this is the blank (Note 1)).

2. Open the white cap of another reaction vial and add **2 ml water sample** (this is the sample).

3. Close the vials with the cap tightly. Invert the vial gently several times to mix the contents.
(**CAUTION: The vial will became hot during mixing!**)

4. Heat the vials for **2 hours** in the reactor at a temperature of **148°C**.

5. (**CAUTION: The vials are hot!**)
Remove the tubes from the heating block and allow them to cool to 60°C or less. Mix the contents by carefully inverting each tube several times while still warm. Then allow the tubes to cool to ambient temperatures before measuring. (Note 2).

6. Place the vial (the blank (Note 3, 4)) in the sample chamber making sure that the marks are aligned. Place the cover on the adapter.

prepare Zero
press ZERO

7. Press **ZERO** key.

8. Remove the vial from the sample chamber.

9. Place the vial (the sample (Note 3, 4)) in the sample chamber making sure that the marks are aligned. Place the cover on the adapter.

Zero accepted
prepare Test
press TEST

10. Press **TEST** key.
The result is shown in the display in mg/l COD.

Method

Notes:

1. Run samples and blanks with the same batch of vials. The blank is stable when stored in the dark and can be used for further measurements with vials of the same batch.
2. Do not place the hot vials in the sample chamber. Cool the vials to room temperature for final measurements.
3. Suspended solids in the vial lead to incorrect measurements. For this reason it is important to place the vials carefully in the sample chamber. The precipitate at the bottom of the sample should be not suspended.
4. Clean the outside of the vials with a towel. Finger prints or other marks will be removed.
5. Samples can be measured when the Chloride content does not exceed 1000 mg/l.
6. In exceptional cases, compounds contained in the water cannot be oxidized adequate, what results in minimum findings, compared with the reference method.

Reagents
COD vial 0-150mg/L pk 25 Ref: CW/2.42.07.20

Method

1 3 1

COD MR (medium)
Tube test

0 - 1500 mg/l O_2

1. Open the white cap of one reaction vial and add **2 ml deionised water** (this is the blank (Note 1)).

2. Open the white cap of another reaction vial and add **2 ml water sample** (this is the sample).

3. Close the vials with the cap tightly. Invert the vial gently several times to mix the contents.
(**CAUTION: The vial will became hot during mixing!**)

4. Heat the vials for **2 hours** in the reactor at a temperature of **148°C**.

5. (**CAUTION: The vials are hot!**)
Remove the tubes from the heating block and allow them to cool to 60°C or less. Mix the contents by carefully inverting each tube several times while still warm.
Then allow the tubes to cool to ambient temperatures before measuring. (Note 2).

6. Place the vial (the blank (Note 3, 4)) in the sample chamber making sure that the marks are aligned.
Place the cover on the adapter.

prepare Zero
press ZERO

7. Press **ZERO** key.

8. Remove the vial from the sample chamber.

9. Place the vial (the sample (Note 3, 4)) in the sample chamber making sure that the marks are aligned.
Place the cover on the adapter.

Zero accepted
prepare Test
press TEST

10. Press **TEST** key.
The result is shown in the display in mg/l COD.

Method

Notes:

1. Run samples and blanks with the same batch of vials. The blank is stable when stored in the dark and can be used for further measurements with vials of the same batch.
2. Do not place the hot vials in the sample chamber. Cool the vials to room temperature for final measurements.
3. Suspended solids in the vial lead to incorrect measurements. For this reason it is important to place the vials carefully in the sample chamber. The precipitate at the bottom of the sample should be not suspended.
4. Clean the outside of the vials with a towel. Finger prints or other marks will be removed.
5. Samples can be measured when the Chloride content does not exceed 1000 mg/l.
6. In exceptional cases, compounds contained in the water cannot be oxidized adequate, what results in minimum findings, compared with the reference method.
7. For samples under 100 mg/l COD it is recommendable to repeat the test with the tube test for COD LR.

Reagents
COD vial 0-1500mg/L pk 25 Ref: CW/2.42.07.21

Method

1 3 2

COD HR (high range) Tube test

0 - 15 g/l O_2

1. Open the white cap of one reaction vial and add **0.2 ml deionised water** (this is the blank (Note 1)).

2. Open the white cap of another reaction vial and add **0.2 ml water sample** (this is the sample).

3. Close the vials with the cap tightly. Invert the vial gently several times to mix the contents.
(**CAUTION: The vial will became hot during mixing!**)

4. Heat the vials for **2 hours** in the reactor at a temperature of **148°C**.

5. (**CAUTION: The vials are hot!**)
Remove the tubes from the heating block and allow them to cool to 60°C or less. Mix the contents by carefully inverting each tube several times while still warm. Then allow the tubes to cool to ambient temperatures before measuring. (Note 2).

6. Place the vial (the blank (Note 3, 4)) in the sample chamber making sure that the marks are aligned. Place the cover on the adapter.

prepare Zero
press ZERO

7. Press **ZERO** key.

8. Remove the vial from the sample chamber.

9. Place the vial (the sample (Note 3, 4)) in the sample chamber making sure that the marks are aligned. Place the cover on the adapter.

Zero accepted
prepare Test
press TEST

10. Press **TEST** key.
The result is shown in the display in **g/l** COD.

Method

Notes:

1. Run samples and blanks with the same batch of vials. The blank is stable when stored in the dark and can be used for further measurements with vials of the same batch.
2. Do not place the hot vials in the sample chamber. Cool the vials to room temperature for final measurements.
3. Suspended solids in the vial lead to incorrect measurements. For this reason it is important to place the vials carefully in the sample chamber. The precipitate at the bottom of the sample should be not suspended.
4. Clean the outside of the vials with a towel. Finger prints or other marks will be removed.
5. Samples can be measured when the Chloride content does not exceed 1000 mg/l.
6. In exceptional cases, compounds contained in the water cannot be oxidized adequate, what results in minimum findings, compared with the reference method.
7. For samples under 1 g/l COD it is recommendable to repeat the test with the test kit for COD MR or for samples under 0,1 g/l COD with the tube test COD LR.

Reagents
COD vial 0-15000 mg/L pk 25 Ref: CW/2.42.07.22

Method

1 5 0 **Copper with tablet reagent**

0.05 - 5 mg/l Cu

Copper
>> diff
free
total

The following selection is shown in the display:

>> diff	for the differentiated determination of free, combined and total Copper.
>> free	for the determination of free Copper.
>> total	for the determination of total Copper.

Select the desired determination with the arrow keys [▲] and [▼] Confirm with [↵] key.

Note:

1. If ??? is displayed at the diffentiated test result see page 222.

Method

1 5 0

Copper, differentiated determination with tablet reagent

0.05 - 5 mg/l Cu

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.
2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.
4. Remove the vial from the sample chamber.
5. Add **one COPPER No. 1 tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.
6. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.
7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare T1
press TEST

8. Press **TEST** key.
9. Remove the vial from the sample chamber.
10. Add **one COPPER No. 2 tablet** straight from the foil to the same water sample and crush the tablet using a clean stirring rod.
11. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.
12. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

T1 accepted
prepare T2
press TEST

13. Press **TEST** key.

The result is shown in the display in:

***,** mg/l free Cu**
***,** mg/l comb Cu**
***,** mg/l total Cu**

mg/l free Copper

mg/l combined Copper

mg/l total Copper

Reagents
Copper No 1 tablet pk 100 Ref: TT/51.35.50
Copper No 2 tablet pk 100 Ref: TT/51.35.60

Method

1 5 0

Copper, free with tablet reagent

0.05 - 5 mg/l Cu

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one COPPER No. 1 tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.

6. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.

   The result is shown in the display in mg/l free Copper.

Reagents
Copper No 1 tablet pk 100 Ref: TT/51.35.50

Method

1 5 0

Copper, total with tablet reagent

0.05 - 5 mg/l Cu

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one COPPER No. 1 tablet and one COPPER No. 2 tablet** straight from the foil to the water sample and crush the tablets using a clean stirring rod.

6. Close the vial with the cap tightly and swirl the vial several times until the tablets are dissolved.

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.

   The result is shown in the display in mg/l total Copper.

Reagents
Copper No 1 tablet pk 100 Ref: TT/51.35.50
Copper No 2 tablet pk 100 Ref: TT/51.35.60

1.1 Methods

1 5 3

Copper, free (Note 1) with Powder Pack (PP) reagent

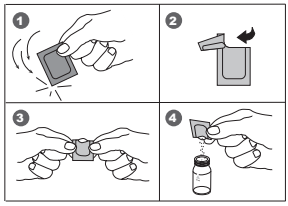
0.05 – 5 mg/l Cu

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample,** close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.



4. Remove the vial from the sample chamber.

5. Add **one Cu 1 powder pack** straight from the foil to the water sample.

6. Close the vial with the cap tightly and swirl the vial several times to mix the contents (Note 3).

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.

Count-Down
2:00

Wait for a **reaction period of 2 minutes**.

After the reaction period is finished the reading starts automatically.

The result is shown in the display in mg/l Copper

1.1 Methods

Notes:

1. For determination of total Copper digestion is required.
2. Extremely acid water samples (pH 2 or less) must be adjusted to between pH 4 and pH 6 before the reagent is added (with 8 mol/l Potassium hydroxide solution KOH).
3. Accuracy is not affected by undissolved powder.
4. Interferences:

Cyanide, CN^-	Cyanide prevents full colour development. Add 0.2 ml Formaldehyde to 10 ml water sample and wait for a reaction time of 4 minutes (Cyanide is masked). After this perform test as described. Multiply the result by 1.02 to correct the sample dilution by Formaldehyde.
Silver, Ag^+	If a turbidity remains and turns black, silver interferences is likely. Add 10 drops of saturated Potassium chloride solution to 75 ml of water sample. Filtrate through a fine filter. Use 10 ml of the filtered water sample to perform test.

Reagents
Cu 1 powder pack pk 100 Ref: CW/53.03.00

1.1 Methods

1 5 7 Cyanide with Powder Pack (PP) and liquid reagent

0.01 – 0.5 mg/l CN

1. Fill a clean vial (24 mm) with **2 ml of water sample and 8 ml of deionized water**, close the vial with the cap tightly.
2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.
4. Remove the vial from the sample chamber.
5. Add **two level grey (No.4) scoops Cyanide-11** to the prepared water sample, replace the cap tightly and invert the vial several times to mix the contents.
6. **Add two level grey (No.4) scoops Cyanide-12**, replace the cap tightly and invert the vial several times to mix the contents.
7. Fill the vial with drops of the same size by holding the bottle vertically and squeeze slowly:

   3 drops of Cyanide-13

8. Close the vial with the cap tightly and invert the vial several times to mix the contents.
9. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

10. Press **TEST** key.

    Wait for a reaction **period of 10 minutes.**

Count-Down
10:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in mg/l Cyanide.

1.1 Methods

Notes:

1. Only free Cyanide and Cyanides that can be destroyed by Chlorine are determined by this test.
2. In the present of Thiocyanate, heavy metal complexes, colorants or aromatic amines, the cyanide must be separated out by distillation before analysis is performed.
3. **Store the reagents in closed containers at a temperature of + 15°C to + 25°C.**

Reagents
Cyanide reagent set (130 tests) Ref: TT/2.41.88.75

Method

1 6 0

Cyanuric acid with tablet reagent

2 - 160 mg/l Cys

1. Fill a clean vial (24 mm ∅) with **5 ml water sample** and **5 ml deionised water (Note 1)**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add o**ne CYANURIC ACID tablet** straight from the foil to the prepared water sample and crush the tablet using a clean stirring rod.

6. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved (Note 2, 3).

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.

The result is shown in the display in mg/l Cyanuric acid.

Method

Notes:

1. Use deionised water or tap water free of Cyanuric acid.
2. Dissolve the tablet completely (therefore swirl the vial approx. 1 Minute).
3. If Cyanuric acid is present a cloudy solution will be given.

Reagents
Cyanuric acid tablet pk 100 Ref: TT/51.13.20

1.1 Methods

1 6 5

DEHA (N,N-Diethylhydroxylamine) with Tablet and Liquid reagent

20 – 500 µg/l DEHA

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample,** close the vial with the cap tightly (Note 2) .

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Fill the vial with drops of the same size by holding the bottle vertically and squeeze slowly:

   6 drops (0.25ml) of DEHA solution

6. Close the vial with the cap tightly and swirl the vial several times to mix the contents.

7. Add **one DEHA tablet** straight from the foil to the same water sample and crush the tablet using a clean stirring rod.

8. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

9. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

10. Press TEST key.

    Wait for a **reaction period of 10 minutes**.

Count-Down
10:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in µg/l DEHA.

1.1 Methods

Notes:

1. Application: Testing of residual corrosion inhibitors (Oxygen scavengers) in boiler feed water or condensate.
2. Before using clean the vials with Hydrochloric acid (approx. 20%). Rinse tightly with deionized water.
3. Keep the sample dark during colour development time. UV-light (sunlight) causes too high measurement results.
4. Ideal temperature for full colour development is 20°C ± 2°C.
5. Interferences:
   - Iron (II) interferes at all concentrations:
     Repeat the test procedure but without adding the VARIO DEHA Rgt 2 solution. If the displayed result is above 20 µg/l subtract this value from the DEHA test result.
   - Substances which reduce Iron (III) interfere. Substances which complex iron strongly may interfere also.
   - Substances which may interfere when present in concentrations at:

Borate (as $Na_2B_4O_7$)	500 mg/l
Cobalt	0.025 mg/l
Copper	8.0 mg/l
Hardness (as $CaCO_3$)	1000 mg/l
Lignosulfonates	0.05 mg/l
Manganese	0.8 mg/l
Molybdenum	80 mg/l
Nickel	0.8 mg/l
Phosphate	10 mg/l
Phosphonates	10 mg/l
Sulfate	1000 mg/l
Zinc	50 mg/l

Reagents
DEHA solution 100ml Ref: TT/46.11.81
DEHA tablet pk 100 Ref: TT/51.32.20

1.1 Methods

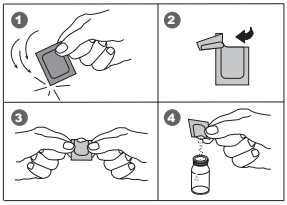
1 6 7

DEHA (N,N-Diethylhydroxylamin) with Powder Pack and Liquid reagent

20 – 500 µg/l DEHA

Use two clean vials (24 mm Ø) and mark one as blank for zeroing (Note 2).

1. Fill a clean vial with **10 ml deionized water** (this is the blank).



2. Fill the second clean vial with **10 ml water sample** (this is the sample).

3. Add **one OXYSCAV 1 Rgt powder pack** straight from the foil into each vial.

4. Close the vials with the caps tightly and swirl the vials several times to mix the contents.

5. Add **0.20 ml DEHA 2 Rgt Solution** to each vial (Note 4).

6. Close the vials with the caps tightly and swirl the vials several times to mix the contents.

Count-Down 1
10 : 00
Start: Press [↵]

7. Press [↵] key.

   Wait for a reaction **period of 10 minutes** (Note 5).

   After reaction period is finished proceed as follows:

8. Place the vial (the blank) in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

9. Press **ZERO** key.

10. Remove the vial from the sample chamber.

11. Place the vial (the sample) in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

12. Press **TEST** key.
    The result is shown in the display in µg/l DEHA.

1.1 Methods

Notes:

1. Application: Testing of residual corrosion inhibitors (Oxygen scavengers) in boiler feed water or condensate.
2. Before using clean the vials with Hydrochloric acid (approx. 20%). Rinse tightly with deionized water.
3. Ideally temperature for full colour development is 25°C ± 3 °C.
4. Volume should always be metered by using suitable pipette (class A).
5. Keep blank and sample dark during colour development time. UV-light (sunlight) causes too high measurement results.
6. Interferences:
   - Iron (II) interferes at all concentrations:
     Repeat the test procedure but without adding the DEHA Rgt 2 solution. If the displayed result is above 20 µg/l subtract this value from the DEHA test result.
   - Substances which reduce Iron (III) interfere. Substances which complex iron strongly may interfere also.
   - Substances who may interfere when present in concentrations at:

Borate (als $Na_2B_4O_7$)	500 mg/l
Cobalt	0.025 mg/l
Copper	8,0 mg/l
Hardness (as $CaCO_3$)	1000 mg/l
Lignosulfonates	0.05 mg/l
Manganese	0.8 mg/l
Molybdenum	80 mg/l
Nickel	0.8 mg/l
Phosphate	10 mg/l
Phosphonates	10 mg/l
Sulfate	1000 mg/l
Zinc	50 mg/l

Reagents
Oxyscav 1 reagent powder pack pk 100 Ref: 53.14.00
DEHA 2 reagent 100ml Ref: 53.14.10

1.1 Method

1 7 0

Fluoride

0.05 - 2 mg/l F

Regard notes!

1. Fill a clean vial (24 mm ø) with **exact 10 ml of water sample** (Note 4), close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero vorbereiten
ZERO drücken

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **exact 2 ml SPADNS reagent solution** (Note 4) to the water sample.
Caution: Vial is filled up to the top!

6. Close the vial with the cap tightly and swirl the vial several times to mix the contents.

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero akzeptiert
Test vorbereiten
TEST drücken

Press **TEST** key.

The result is shown in the display in mg/l Fluoride

1.1 Method

Notes:

1. The same batch of SPADNS reagent solution must be used for adjustment and test. The adjustment process needs to be performed for each new batch of SPANDS reagent solution (see Standard Methods 20th, 1998, APHA, AWWA, WEF 4500 F D., S. 4-82). The procedure is described in chapter 2.4.9 "Calibration Mode 40" on page 195.
2. During adjustment and test the same vial should be used for zeroing and test, as different vials may exhibit minor tolerances.
3. The calibration solution and the water samples to be tested should have the same temperature (± 1°C).
4. As the test result is highly dependent on exact sample and reagent volumes, the sample and reagent volumes should always be metered by using a 10 ml resp. 2 ml volumetric pipette (class A).
5. The accuracy of the test methods decreases above a level of 1.2 mg/l Fluoride. Although the results are sufficiently accurate for most applications, even more exact results can be achieved by 1:1 dilution of the sample prior to use and subsequent multiplication of the result by 2.
6. SPADNS reagent solution contains Arsenite. Chlorine concentrations up to 5 mg/l do not interfere.
7. Seawater and wastewater water samples must be distilled.

Reagents
SPADNS reagent 250ml Ref: TT/46.74.81

Method

1 9 0

Hardness, Calcium with tablet reagent

50 - 900 mg/l $CaCO_3$

1. Fill a clean vial (24 mm ∅) with **10 ml deionized water**.

2. Add **one CALCHECK tablet** straight from the foil to the deionised water and crush the tablet using a clean stirring rod.

3. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

4. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

5. Press **ZERO** key.
Wait for a **reaction period of 2 minutes**.
After the reaction period is finished the reading starts automatically.

Countdown
2:00

6. Remove the vial from the sample chamber.

7. Add **2 ml water sample** to the prepared vial.
Caution: Vial is filled up to the top!

8. Close the vial with the cap tightly and swirl the vial several times (5x) to mix the contents.

9. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

10. Press **TEST** key.

The result is shown in the display as Calcium Hardness in mg/l $CaCO_3$.

Method

Notes:

1. Strong alkaline or acidic water samples must be adjusted to between pH 4 and pH 10 before the tablet is added (use 1 mol/l Hydrochloric acid resp. 1mol/l Sodium hydroxide).
2. The tolerance of the method is increasing with higher concentrations. When diluting samples, this should be take in account, always measuring in the first third of the range.
3. This method was developed from a volumetric procedure for the determination of calcium. Due to undefined conditions, the deviations from the standardised method may be greater.
4. ▲ $CaCO_3$
   °dH
   °eH
   °fH
   ▼ °aH

Reagents
CALCHECK tablet pk 100 Ref: TT/51.56.50

Method

2 **0** **0**

Hardness, total with tablet reagent

2 - 50 mg/l $CaCO_3$

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one HARDCHECK P tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.

6. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.
Wait for a **reaction period of 5 minutes**.

Countdown
5:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display as total Hardness in mg/l $CaCO_3$.

Method

Notes:

1. Strong alkaline or acidic water samples must be adjusted to between pH 4 and pH 10 before the tablet is added (use 1 mol/l Hydrochloric acid resp. 1mol/l Sodium hydroxide).
2. Conversion table:

	mg/l $CaCO_3$	°dH	°fH	°eH
1 mg/l $CaCO_3$	---	0.056	0.1	0.07
1°dH	17.8	---	1.78	1.25
1°fH	10.0	0.56	---	0.70
1°eH	14.3	0.80	1.43	---

4. ▲ $CaCO_3$
   °dH
   °eH
   °fH
   ▼ °aH

Reagents
HARDCHECK P tablets pk 100 Ref: TT/51.56.60

1.1 Method

2 0 5

Hydrazine with powder reagent

0.05 - 0.5 mg/l N_2H_4

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample** (Note 1, 2), close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **1 g HYDRAZINE test powder** (Note 3) to the water sample .

6. Close the vial with the cap tightly and swirl the vial several times to mix the contents.

Count-Down
10:00
start: press [↵]

7. Press [↵] key.
   Wait for a **reaction period of 10 minutes.**

   After reaction period is finished proceed as follows:

8. The slight turbidity occurring when the reagent is added must be removed by filtration (Note 4).

9. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

10. Press **TEST** key.

    The result is shown in the display in mg/l Hydrazine.

1.1 Method

Notes:

1. If the water sample is cloudy, you must filter it before performing the zero calibration.
2. The temperature of the water sample should not exceed 21°C.
3. Using the Hydrazine spoon: 1 g is equivalent to one level spoon.
4. Qualitative folded filter papers for medium precipitates are recommend.
5. In order to check whether the reagent has aged (if it has been stored for a lengthy period), perform the test as described above using tap water. If the result is above the detection limit of 0.05 mg/l, you should only use the reagent with reservations (major result deviation).

Reagents
Hydrazine test powder 30g Ref: TT/46.29.10
Spoon Ref: TT/38.49.30

1.1 Methods

2 0 7

Hydrazin with Vacu-vials® K-5003 (see Notes)

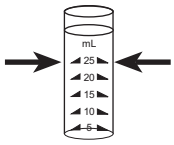
0.01 – 0.7 mg/l N_2H_4

Insert the adaptor for 13 mm Ø vials.

1. Place the blank in the sample chamber. The blank is part of the test kit.

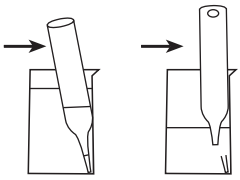
prepare Zero
press ZERO

2. Press **ZERO** key.



3. Remove the blank from the sample chamber.

4. Fill the sampler to the 25 ml mark with the water sample.



5. Place one Vacu-vial® in the sampler. Snap the tip by pressing the vial against the side of the sampler. The Vacu-vial® breaks at the neck and the vial fills automatically. A small volume of inert gas remains in the Vacu-vial®.

6. Mix the content of the Vacu-vial® by inverting it several times, allowing the bubble to move from one end to the other. Dry the outside of the vial.

7. Place the Vacu-vial® in the sample chamber.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.
Wait for a **reaction period of 10 minutes**.

Count-Down
10:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in mg/l Hydrazine.

1.1 Methods

Notes:

1. This method is adapted from CHEMetrics.
2. Read the original test instruction and the MSDS (delivered with the test) before performing the test. MSDS also at www.chemetrics.com available.
3. Vacu-vials® is a registered trade mark of the company CHEMetrics, Inc. / Calverton, U.S.A.

Method

2 1 0

Hydrogen peroxide with tablet reagent

0.03 – 3 mg/l H_2O_2

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⊼ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber, **empty the vial leaving a few drops in**.

5. Add **one HYDROGENPEROXIDE LR tablet** straight from the foil and crush the tablet using a clean stirring rod.

6. Add water sample to the 10 ml mark.

7. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

8. Place the vial in the sample chamber making sure that the ⊼ marks are aligned.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.
Wait for a **reaction period of 2 minutes**.

Countdown
2:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in mg/l Hydrogen peroxide.

Method

Notes:

1. Vial cleaning:

   As many household cleaners (e.g. dishwasher detergent) contain reducing substances, the subsequent determination of Hydrogen peroxide may show lower results. To avoid any measurement errors, only use glassware free of Chlorine consumption.

   Preparation: Put all applicable glassware into Sodium hypochlorite solution (0.1 g/l) for one hour, then rinse all glassware thoroughly with deionized water.

2. Preparing the sample:

   When preparing the sample, the escape of Hydrogen peroxide gases, e.g. by pipetting or shaking, must be avoided. The analysis must take place immediately after taking the sample.

3. The DPD colour development is carried out at a pH value of 6.3 to 6.5. The reagent tablet therefore contains a buffer for the pH adjustment.

   Strong alkaline or acid water samples must be adjusted to between pH 6 and pH 7 before the tablet is added (use 0.5 mol/l Sulfuric acid resp. 1 mol/l Sodium hydroxide).

4. Exceeding of the measuring range:

   Concentrations above 5 mg/l Hydrogen peroxide can produce results within the measuring range up to 0 mg/l. In this event, the water sample must be diluted with water free of Hydrogen peroxide. 10 ml of the diluted sample will be mixed with the reagent and the measurement repeated.

   Oxidizing agents such as Chlorine, Ozone etc. interfere as they react like Hydrogen peroxide.

Reagents
Hydrogen Peroxide LR tablet Ref: TT/51.23.80

1.1 Method

2 1 5

Iodine with tablet reagent

0.05 - 3.6 mg/l I

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.
2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.
4. Remove the vial from the sample chamber, **empty the vial leaving a view drops in.**
5. Add **one DPD No. 1 tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.
6. Add water sample to the 10 ml mark.
7. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.
8. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.

The result is shown in the display in mg/l Iodine.

1.1 Method

Notes:
Oxidising reagents, such as Chlorine, Bromine, etc. interfere as they react like Iodine.

Reagents
DPD No 1 tablet pk 100 Ref: TT/51.53.70

Method

2 **2** **0**

Iron (Note 1) with tablet reagents

0.02 - 1 mg/l Fe

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one IRON LR tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.

6. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.
   Wait for a **reaction period of 5** minutes.

Countdown
5:00

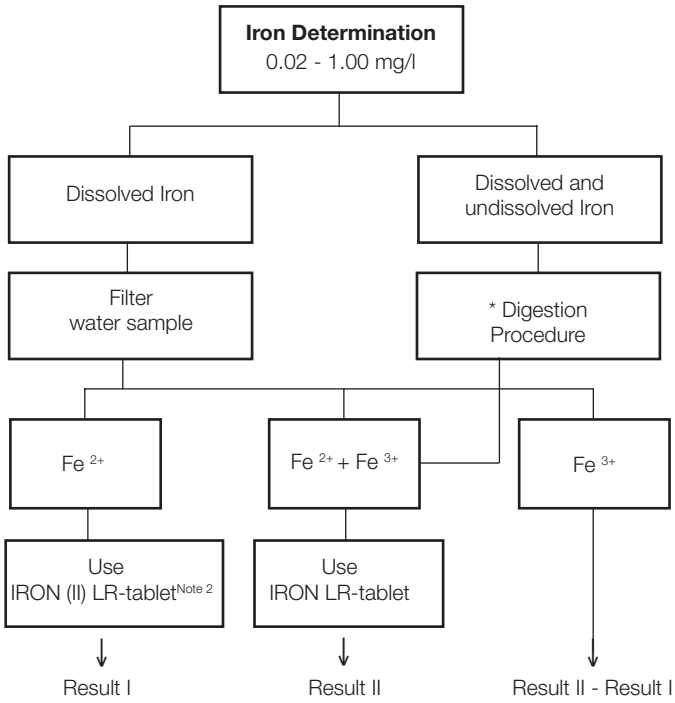
After the reaction period is finished the reading starts automatically.

The result is shown in the display in mg/l Iron.

Reagents
Iron LR tablet pk 100 Ref: TT/51.53.70

Notes:

1. This method determines the total dissolved Iron as Fe^{2+} and Fe^{3+}.
2. The IRON (II) LR tablet is used for differentiation – as described above – instead of the IRON LR tablet.
3. For the determination of the total dissolved and undissolved Iron proceed the described digestion procedure:



***Digestion Procedure**

Add 1 ml of concentrated sulphuric acid to 100 ml of the water sample. Heat and boil for 10 minutes or until all particles have dissolved. After cooling down the sample is set on a pH-value of 3 to 6 by using ammonia solution. Refill with destilled water to the previous volume of 100 ml. Mix well.

Pour into the vial and fill to the 10 ml mark. Add an IRON LR-tablet, crush and mix well to dissolve. Allow to stand for 5 minutes. Water which has been treated with organic compounds as corrosion inhibitors must be oxidised where necessary to break down the iron complexes - add 1 ml of concentrated sulphuric acid and 1 ml of concentrated nitric acid to a 100 ml sample and boil to approximately half volume. After cooling down proceed with the analysis as described above.

Method

2 2 2

Iron (Note 1) with Powder Pack (PP) reagent

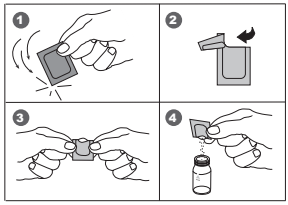
0.02 - 3 mg/l Fe

1. Fill a clean vial (24 mm ø) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the marks ⧖ are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.



4. Remove the vial from the sample chamber.

5. Add **one Ferro powder pack straight** from the foil to the water sample.

6. Close the vial with the cap tightly and swirl the vial several times to mix the contents (Note 4).

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.
   Wait for a **reaction period of 3 minutes (Note 5)**.
   After the reaction period is finished the reading starts automatically.

Countdown
3:00

The result is shown in the display in mg/l Iron.

Method

Notes:

1. The reagent reacts with all soluble iron and most insoluble forms of iron in the water sample.
2. Iron oxide requires a prior digestion, use mild, vigorous or Digesdahl digestion (e.g. for digestion with acid see page 91).
3. Very strong alkaline or acidic water samples must be adjusted to a ph-Value between 3 and 5 before analysis.
4. Accuracy is not affected by undissolved powder.
5. Water samples containing visible rust should be allowed to react at least five minutes.

Reagents
Ferro powders pack pk 100 Ref:: CW/53.05.60

1.1 Methods

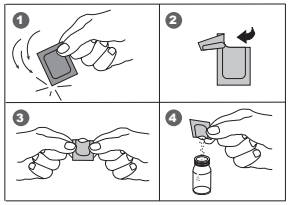
2 2 3

Iron, total (TPTZ, Note 1) with Powder Pack reagent

0.02 – 1.8 mg/l Fe

Use two clean vials (24 mm Ø) and mark one as blank for zeroing.

1. Fill a clean vial with **10 ml deionized water** (this is the blank).



2. Fill the second clean vial with **10 ml water sample** (this is the sample).

3. Add **one IRON TPTZ powder pack** straight from the foil into each vial.

4. Close the vials with the caps tightly and swirl the vials several times to mix the contents.

Count-Down
3:00
start: press [↵]

5. Press [↵] key.

   Wait for a reaction **period of 3 minutes.**

   After reaction period is finished proceed as follows:

6. Place the vial (the blank) in the sample chamber making sure that the ⋈ marks are aligned.

prepare Zero
press ZERO

7. Press **ZERO** key.

8. Remove the vial from the sample chamber.

9. Place the vial (the sample) in the sample chamber making sure that the ⋈ marks are aligned.

Zero accepted
prepare Test
press TEST

10. Press **TEST** key.

    The result is shown in the display in mg/l Iron.

1.1 Methods

Notes:

1. For determination of total Iron digestion is required.
   TPTZ reagent recovers most insoluble iron oxides without digestion.
2. Rinse all glassware with 1:1 Hydrochloric acid solution first and then rinse with deionised water to remove iron deposits that can cause slightly high results.
3. Strong alkaline or acidic water samples must be adjusted to between pH 3 and pH 8 before the reagent is added (use 0.5 ml Sulfuric acid resp. 1 mol/l Sodium hydroxide).
4. Interferences:
   When interferences occurred, the colour development was inhibited or a precipitate was formed.
   The values below refer to a standard with an iron concentration of 0.5 mg/l.
   The following substances do not interfere when present up to the levels given:

Substance	no inerference to
Cadmium	4,0 mg/l
Chromium$^{(3+)}$	0.25 mg/l
Chromium $^{(6+)}$	1,2 mg/l
Cobalt	0.05 mg/l
Copper	0.6 mg/l
Cyanide	2,8 mg/l
Manganese	50 mg/l
Mercury	0.4 mg/l
Molybdenum	4,0 mg/l
Nickel	1,0 mg/l
Nitrite Ion	0.8 mg/l

Reagents
Iron TPTZ pack pk 100 Ref: CW/53.05.50

1.1 Method

2 4 0

Manganese with tablet reagents

0.2 - 4 mg/l Mn

1. Fill a clean vial (24 mm ø) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one MANGANESE LR 1 tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod and dissolve the tablet.

6. Add **one MANGANESE LR 2 tablet** straight from the foil to the same water sample and crush the tablet using a clean stirring rod.

7. Close the vial with the cap tightly and swirl the vial several times until the tablets are dissolved.

8. Place the vial in the sample chamber making sure that the marks ⧖ are aligned.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.

   Wait for a **reaction period of 5 minutes.**

Count-Down
5:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in mg/l Manganese.

1.1 Methods

Note:

1. ▲ Mn
   MnO_4
   ▼ $KMnO_4$

Reagents
Manganese LR 1 tablet pk 100 Ref: TT/51.60.80
Manganese LR 2 tablet pk 100 Ref: TT/51.60.90

Method

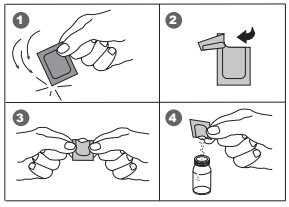
2 4 2

Manganese with Powder Pack (PP) reagent

0.01 - 0.7 mg/l Mn

Use two clean vials (24 mm ø) and mark one as blank for zeroing (Note 1).

1. Fill a clean vial with **10 ml of deionized water** (this is the blank).



2. Fill the second clean vial with **10 ml of water sample** (this is the sample).
3. Add **one Ascorbic Acid powder pack** straight from the foil into each vial. (Note 2)
4. Close the vials with the caps tightly and swirl the vials several times to mix the contents.
5. Fill each vial with drops of the same size by holding the bottle vertically and squeeze slowly (Note 3):
   15 drops of Alkaline Cyanide reagent solution
6. Close the vials with the caps tightly and swirl the vials several times to mix the contents.
7. Fill each vial with drops of the same size by holding the bottle vertically and squeeze slowly:
   21 drops of PAN Indicator solution
8. Close the vials with the caps tightly and swirl the vials several times to mix the contents.

Countdown
2 : 00
start: press [↵]

9. Press [↵] key.
   Wait for a **reaction period of 2 minutes** (Note 4).
   After reaction period is finished proceed as follows:
9. Place the vial (the blank) in the sample chamber making sure that the marks are aligned.

prepare Zero
press ZERO

10. Press **ZERO** key.
11. Remove the vial from the sample chamber.
12. Place the vial (the sample) in the sample chamber making sure that the marks are aligned.

Zero accepted
prepare Test
press TEST

13. Press **TEST** key.
    The result is shown in the display in mg/l Manganese.

Method

Notes:

1. Rinse all glassware with 1:1 Nitric acid solution first and then rinse with deionised water.
2. Water samples that contain more than 300 mg/l $CaCO_3$ hardness: After adding the Vario Ascorbic Acid powder pack add additionally 10 drops of Rochelle Salt Solution.
3. After addition of the reagent solution “Alkaline-Cyanide” a cloudy or turbid solution may form in some water samples. The turbidity should disappear after point 7.
4. Water samples containing more than 5 mg/l iron should be allowed to react at least 10 minutes.
5. Conversion:
   mg/l MnO_4 = mg/l Mn x 2.17
6. ▲ Mn
   MnO_4
   ▼ $KMnO_4$

Reagents
Manganese LR reagent set containing:
Ascorbic acid powder packs pk 100, Alkaline cyanide reagent 50ml and PAN Indicator 50ml. Ref: CW/53.50.90

1.1 Method

2 5 0

Molybdate with tablet reagent

1 - 50 mg/l MoO_4

1. Fill a clean vial (24 mm ø) with **10 ml of water sample,** close the vial with the cap tightly.
2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.
4. Remove the vial from the sample chamber and **empty the vial**.
5. Fill **20 ml water sample** in a 100 ml beaker.
6. Add **one MOLYBDATE HR No. 1 tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.
7. Add **one MOLYBDATE HR No. 2 tablet** straight from the foil to the same water sample and crush the tablet using a clean stirring rod.
8. Dissolve the tablets using a clean stirring rod.
9. Rinse out the vial with the prepared water sample and then fill to the 10 ml mark.
10. Close the vial with the cap tightly.
11. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

12. Press TEST key.

    The result is shown in the display in mg/l Molybdate.

1.1 Method

Notes:

1. The tablets must be added in the correct sequence.
2. Under test conditions (pH 3.8 – 3.9) iron does not interfere nor do other metals at levels likely to be found in industrial water systems.
3. Conversions:
   mg/l Mo = mg/l MoO_4 x 0.6
   mg/l Na_2MoO_6 = mg/l MoO_4 x 1.3
4. ▲ MoO_4
   Mo
   ▼ Na_2MoO_4

Reagents
Molybdate HR No 1 tablet pk 100 Ref: TT/51.30.60
Molybdate HR No 2 tablet pk 100 Ref: TT/51.30.70

Method

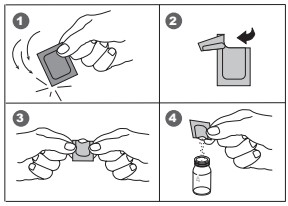
2 6 5

Nitrate Tube test

1 - 30 mg/l N

1. Open the white cap of one vial (Reagent A) and add **1 ml deionised water** (this is the blank).

2. Open the white cap of the other vial (Reagent A) and add **1 ml water sample** (this is the sample).



3. Add **one Nitrate Chromotropic powder pack straight** from the foil into each vial.

4. Close the vials with the caps tightly and invert the vials gently several times (10 x) to mix the contents (Note 1).

Countdown
5 : 00
start: press [↵]

5. Press [↵] key.
Wait for a **reaction period of 5 minutes**.

6. After reaction period is finished proceed as follows:

7. Place the vial (the blank) in the sample chamber making sure that the marks are aligned.
Place the cover on the adapter.

prepare Zero
press ZERO

8. Press **ZERO** key.

9. Remove the vial from the sample chamber.

10. Place the vial (the sample) in the sample chamber making sure that the marks are aligned.
Place the cover on the adapter.

Zero accepted
prepare Test
press TEST

11. Press **TEST** key.

The result is shown in the display as Nitrate in mg/l N.

Method

Notes:

1. Some solids may not dissolve.
2. Conversion:
   mg/l NO_3 = mg/l N x 4.43
3. ▲ N
   ▼ NO_3

Reagents
Nitrate tube set (50 tests) Ref: CW/53.55.80

Method

2 7 0

Nitrite with tablet reagent

0.01 - 0.5 mg/l N

1. Fill a clean vial (24 mm ø) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the marks ⊼ are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one NITRITE LR tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.

6. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

7. Place the vial in the sample chamber making sure that the marks ⊼ are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.
   Wait for a **reaction period of 10 minutes**.

Count-Down
10:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display as Nitrite in mg/l N.

Method

Notes:

1. The following ions can produce interferences since under the reaction conditions they cause precipitation:
   Antimony (III), Iron (III), Lead, Mercury (I), Silver, Chloroplatinate, Metavanadate and Bismuth.

   Copper (II)-ions may cause lower test results as they accelerate the decomposition of the Diazonium salt.

   It is improbable in practice that theses interfering ions will occur in such high concentrations that they cause significant reading errors.
2. Conversion:
   mg/l NO_2 = mg/l N x 3.29
3. ▲ N
   ▼ NO_2

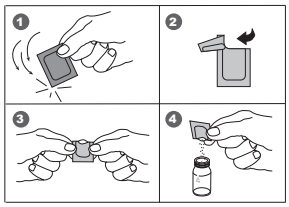
Reagents
Nitrate LR tablet pk 100 Ref: TT/51.23.10

1.1 Method

2 8 0

Nitrogen, total LR (low range) with tube test

0.5 - 25 mg/l N



1. **Open two TN Hydroxide LR digestion vials** and add **1 TN Persulfate Rgt. powder pack** (Note 2, 3).
2. Add **2 ml deionised water** to the prepared vial (this is the blank, Note 4, 5).
3. Add **2 ml water sample** to the other prepared vial (this is the sample).
4. Close the vials with the caps and shake to mix the contents (at least 30 seconds, Note 6).
5. Heat the vials for **30 minutes** in the preheated reactor at a temperature of **100°C** (Note 7).
6. After 30 Minutes remove the vials from the reactor. **(CAUTION: The vials are hot!)**
   Allow the vials to cool to room temperature.
7. Open the cooled down digestion vials and add **one TN Reagent A Powder Pack** to each vial (Note 2).
8. Close the vials with the caps and shake to mix the contents (at least 15 seconds).

Countdown
3 : 00
start: press [↵]

9. Press [↵] key.
   Wait for a **reaction period of 3 minutes.**

   After reaction period is finished proceed as follows:

10. Open the digestion vials and add **one Vario TN Reagent B powder pack** to each vial (Note 2).
11. Close the vials with the caps and shake to mix the contents (at least 15 seconds, Note 8).

Countdown
2 : 00
start: press [↵]

12. Press [↵] key.

    Wait for a **reaction period of 2 minutes**.

    After reaction period is finished proceed as follows:

13. Open **two TN Acid LR/HR (Reagent C) vials** and add **2 ml of the digested, treated blank** to one vial (this is the blank).
14. Add **2 ml of the digested, treated water sample** to the other TN Acid LR/HR vial (this is the sample).
15. Close the vials with the caps and swirl the vials gently several times to mix the contents (10 x, Note 9). **(CAUTION: Vials warm up).**

1.1 Method

prepare Zero
press ZERO

Count-Down
5:00

Zero accepted
prepare Test
press TEST

16. Place the vial (the blank) in the sample chamber making sure that the marks ⊻ are aligned.
17. Press **ZERO** key.
    Wait for a **reaction period of 5 minutes**.

    After the reaction period is finished the reading starts automatically.
18. Remove the vial from the sample chamber.
19. Place the vial (the sample, Note 10) in the sample chamber making sure that the marks ⊻ are aligned.
20. Press **TEST** key.
    The result is shown in the display in mg/l Nitrogen as N.

Notes:

1. Use appropriate safety precautions and a good lab technique should be used during the whole procedure.
2. Use a funnel to add the reagent.
3. Wipe off any Persulfate reagent that may get on the lid or the tube threads.
4. Volumes for samples and blank should always be metered by using 2 ml volumetric pipettes (class A).
5. One blank is sufficient for each set of samples.
6. The reagent may not dissolve completely.
7. It is very important to remove the vials from the reactor after exactly 30 minutes.
8. The reagent will not completely dissolve.
9. Hold the vial in a vertical position with the cap pointing up. Turn the vial upside-down. Wait for all of the solution to flow down to the cap. Return the vial to the upright position. Wait for all the solution to flow to the bottom of the vial. This process is one inversion; 10 inversions = approx. 30 seconds.
10. After zero calibration with the blank it is possible to measure several samples.
11. Great quantities of nitrogen free, organic compounds which are included in some water samples may reduce the effectiveness of the digestion by reacting with the Perulfate reagent. Samples which are well known to content great quantities of organic compounds must be diluted and digestion and measurement must be repeated for checking the effectiveness of the digestion.
12. Application: for water, wastewater and seawater
13. Interferences:
    Interfering substances that resulted in a concentration change of 10%.
    Bromide more than 60 mg/l and Chloride more than 1000 mg/l produce positive interferences.

    TN = Total Nitrogen
14. ▲ N
    NH_4
    ▼ NH_3

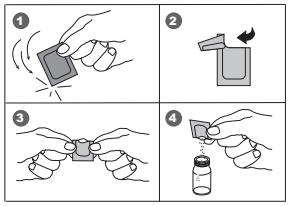
Nitrogen total LR tube reagent set (50 tests) Ref: CW/53.55.60

1.1 Method

2 8 1

Nitrogen, total HR (high range) with tube test

5 - 150 mg/l N



1. **Open two TN Hydroxide HR digestion vials** and add **1 TN Persulfate Rgt. powder pack** (Note 2, 3).
2. Add **0.5 ml deionised water** to the prepared vial (this is the blank, Note 4, 5).
3. Add **0.5 ml water sample** to the other prepared vial (this is the sample).
4. Close the vials with the caps and shake to mix the contents (at least 30 seconds, Note 6).
5. Heat the vials for **30 minutes** in the preheated reactor at a temperature of **100°C** (Note 7).
6. After 30 Minutes remove the vials from the reactor. **(CAUTION: The vials are hot!)**
   Allow the vials to cool to room temperature.
7. Open the cooled down digestion vials and add **one TN Reagent A Powder Pack** to each vial (Note 2).
8. Close the vials with the caps and shake to mix the contents (at least 15 seconds).

Countdown
3 : 00
start: press [↵]

9. Press [↵] key.
   Wait for a **reaction period of 3 minutes.** After reaction period is finished proceed as follows:
10. Open the digestion vials and add **one Vario TN Reagent B powder pack** to each vial (Note 2).
11. Close the vials with the caps and shake to mix the contents (at least 15 seconds, Note 8).

Countdown
2 : 00
start: press [↵]

12. Press [↵] key.
    Wait for a **reaction period of 2 minutes**.
    After reaction period is finished proceed as follows:
13. Open **two TN Acid LR/HR (Reagent C) vials** and add **2 ml of the digested, treated blank** to one vial (this is the blank).
14. Add **2 ml of the digested, treated water sample** to the other TN Acid LR/HR vial (this is the sample).
15. Close the vials with the caps and swirl the vials gently several times to mix the contents (10 x, Note 9).
    (CAUTION: Vials warm up).

1.1 Method

prepare Zero
press ZERO

Count-Down
5:00

Zero accepted
prepare Test
press TEST

16. Place the vial (the blank) in the sample chamber making sure that the ▼ marks are aligned.
17. Press **ZERO** key.
    Wait for a **reaction period of 5 minutes**.

    After the reaction period is finished the reading starts automatically.
18. Remove the vial from the sample chamber.
19. Place the vial (the sample, Note 10) in the sample chamber making sure that the ▼ marks are aligned.
20. Press **TEST** key.

    The result is shown in the display in mg/l Nitrogen as N.

Notes:

1. Use appropriate safety precautions and a good lab technique should be used during the whole procedure.
2. Use a funnel to add the reagent.
3. Wipe off any Persulfate reagent that may get on the lid or the tube threads.
4. Volumes for samples and blank should always be metered by using suitable pipettes (class A).
5. One blank is sufficient for each set of samples.
6. The reagent may not dissolve completely.
7. It is very important to remove the vials from the reactor after exactly 30 minutes.
8. The reagent will not completely dissolve.
9. Hold the vial in a vertical position with the cap pointing up. Turn the vial upside-down. Wait for all of the solution to flow down to the cap. Return the vial to the upright position. Wait for all the solution to flow to the bottom of the vial. This process is one inversion; 10 inversions = approx. 30 seconds.
10. After zero calibration with the blank it is possible to measure several samples.
11. Great quantities of nitrogen free, organic compounds which are included in some water samples may reduce the effectiveness of the digestion by reacting with the Perulfate reagent. Samples which are well known to content great quantities of organic compounds must be diluted and digestion and measurement must be repeated for checking the effectiveness of the digestion.
12. Application: for water, wastewater and seawater
13. Interferences:
    Interfering substances that resulted in a concentration change of 10%.
    Bromide more than 60 mg/l and Chloride more than 1000 mg/l produce positive interferences.
    TN = Total Nitrogen
14. ▲ N
    NH_4
    ▼ NH_3

Nitrogen total LR tube reagent set (50 tests) Ref: CW/53.55.60

Method

2 9 0 Oxygen, active with tablet reagent

0.1 – 10 mg/l O_2

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

prepare Zero
press ZERO

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one DPD No. 4 tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.

6. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

Zero accepted
prepare Test
press TEST

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Countdown
2:00

8. Press **TEST** key.
Wait for a **reaction period of 2 minutes**.

After the reaction period is finished the reading starts automatically.

The result is shown in the display in mg/l active Oxygen.

Method

Notes:

1. When preparing the sample, the escape of Oxygen gases, e.g. by pipetting or shaking, must be avoided.
2. The analysis must take place immediately after taking the sample.

Reagents
DPD No 4 tablet pk 100 Ref: TT/51.12.20

1.1 Methods

2 9 2

Oxygen, dissolved with Vacu-vials® K-7553 (see Notes)

10-800 µg/l O_2

Insert the adaptor for 13 mm Ø round vials.

1. Place the blank in the sample chamber. The blank is part of the test kit.

Zero vorbereiten
ZERO drücken

2. Press **ZERO** key.

3. Remove the blank from the sample chamber.

4. Water should flow through the special sampler for several minutes to remove any air bubbles sticking at the surface.

The water must flow from the bottom to the top.

5. When the sampler is bubble-free press one Vacu-vial® into the lower edge of the sampler. The Vacu-vial® breaks at the neck and the vial fills automatically.

A small volume of inert gas remains in the Vacu-vial®.

6. Remove the Vacu-vial® point downwards from the sampler immediately.

As the content of the vial has a higher density than water, it is important to remove the vial from the sampler within 5 seconds to prevent any loss of reagent.

7. The Vacu-vial® is closed with one finger (covered with a glove) to prevent entry of air. Invert the vial several times. Dry the outside of the vial.

8. Place the Vacu-vial® in the sample chamber.

Zero akzeptiert
Test vorbereiten
TEST drücken

9. Press **TEST** key.

The result is shown in the display in µg/l Oxygen.

1.1 Methods

Notes:

1. This method is adapted from CHEMetrics.
2. Read the original test instruction and the MSDS (delivered with the test) before performing the test. MSDS also at www.chemetrics.com available.
3. Vacu-vials® is a registered trade mark of the company CHEMetrics, Inc. / Calverton, U.S.A.

Method

3 0 0

Ozone

0.02 – 1 mg/l O_3

Ozon	
>>	with Cl
	without Cl

The following selection is shown in the display:

>>	with Cl

for the determination of Ozone in the presence of Chlorine.

>>	without Cl

for the determination of Ozone in the absence of Chlorine.

Select the desired method with the arrow keys [▲] and [▼] Confirm with [↵] key.

Method

Notes:

1. Vial cleaning:

   As many household cleaners (e.g. dishwasher detergent) contain reducing substances, the subsequent determination of Ozone may show lower results. To avoid any measurement errors, only use glassware free of Chlorine consumption.

   Preparation: Put all applicable glassware into Sodium hypochlorite solution (0.1 g/l) for one hour, then rinse all glassware thoroughly with deionized water.

2. Preparing the sample:

   When preparing the sample, the escape of Ozone gases, e.g. by pipetting or shaking, must be avoided. The analysis must take place immediately after taking the sample.

3. The DPD colour development is carried out at a pH value of 6.3 to 6.5. The reagent tablet therefore contains a buffer for the pH adjustment.

   Strong alkaline or acidic water samples must be adjusted to between pH 6 and pH 7 before the tablet is added (use 0.5 mol/l Sulfuric acid resp. 1 mol/l Sodium hydroxide).

4. Exceeding of the measuring range:

   Concentrations above 5 mg/l Ozone can produce results within the measuring range up to 0 mg/l. In this event, the water sample must be diluted with water free of Ozone. 10 ml of the diluted sample will be mixed with the reagent and the measurement repeated.

5. If ??? is displayed at the diffentiated test result see page 222.

Oxidizing agents such as Bromine, Chlorine etc. interfere as they react like Ozone.

Method

3 0 0

Ozone, in the presence of Chlorine with tablet reagent

0.02 – 1 mg/l O_3

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.
2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.
4. Remove the vial from the sample chamber, **empty the vial leaving a few drops in**.
5. Add **one DPD No. 1 tablet** and **one DPD No.3 tablet** straight from the foil and crush the tablets using a clean stirring rod.
6. Add water sample to the 10 ml mark.
7. Close the vial with the cap tightly and swirl the vial several times until the tablets are dissolved.
8. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare T1
press TEST

9. Press **TEST** key.
   Wait for a **reaction period of 2 minutes**.

Countdown
2:00

After the reaction period is finished the reading starts automatically.

10. Remove the vial from the sample chamber, empty the vial, rinse vial and cap several times. Fill the vial with **a few drops of water sample**.
11. Add **one DPD No. 1 tablet** and **one DPD No.3 tablet** straight from the foil and crush the tablets using a clean stirring rod.

Method

12. **Fill a second clean vial with 10 ml of water sample.**

13. Add **one DPD-GLYCINE tablet** straight from the foil and crush the tablet using a clean stirring rod.

14. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

15. **Transfer the content of the second vial into the prepare vial.**

16. Close the vial with the cap tightly and swirl the vial several times until the tablets are dissolved.

17. Place the vial in the sample chamber making sure that the ⊼ marks are aligned.

T1 accepted
prepare T2
press TEST

18. Press **TEST** key.
Wait for a **reaction period of 2 minutes**.

Count-Down
2:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in:

***,** mg/l O_3**
***,** mg/l total Cl**

mg/l Ozone

mg/l total Chlorine

Notes:

See page 115.

Reagents
DPD No 1 tablet pk 100 Ref: TT/51.10.60
DPD No 3 tablet pk 100 Ref: TT/51.10.80
Glycine tablet pk 100 Ref: TT/51.21.70

Method

3 0 0

Ozone, in absence of Chlorine with tablet reagent

0.02 – 1 mg/l O_3

1. Fill a clean vial (24 mm ∅) **with 10 ml of water sample**, close the vial with the cap tightly.
2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.
4. Remove the vial from the sample chamber, **empty the vial leaving a few drops in**.
5. Add **one DPD No. 1 tablet** and **one DPD No.3 tablet** straight from the foil and crush the tablets using a clean stirring rod.
6. Add water sample to the 10 ml mark.
7. Close the vial with the cap tightly and swirl the vial several times until the tablets are dissolved.
8. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.
   Wait for a **reaction period of 2 minutes**.

Countdown
2:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in

mg/l Ozone.

Notes:
See page 115.

Reagents
DPD No 1 tablet pk 100 Ref: TT/51.10.60
DPD No 3 tablet pk 100 Ref: TT/51.10.80

1.1 Methods

7 0 PHMB (Biguanide) with tablet reagent

2 - 60 mg/l PHMB

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.
2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.
4. Remove the vial from the sample chamber.
5. Add **one PHMB PHOTOMETER tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.
6. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.
7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.
   The result is shown in the display in mg/l PHMB.

Notes:

1. Clean vials with the brush after analysis directly.
2. Using vials and stirring rots for a longer time it is possible that they turn blue. In this case clean vials and stirring rods with a laboratory detergent (see chapter 1.2.2 Cleaning of vials and accessories for analysis). Rinse vials and caps thoroughly with tap water and than with deionized water.
3. The test result is influenced by Hardness and Total Alkalinity.
   The calibration of this method was done using water of the following concentration:

   Ca-Hardness: 200 mg/l $CaCO_3$
   Total Alkalinity: 120 mg/l $CaCO_3$

Reagents
PHMB Photmeter tablet pk 100 Ref: TT/51.61.00

1.1 Method

3 2 0

Phosphate, ortho LR with tablet

0.05 - 4 mg/l PO_4
Determination of ortho-Phosphate ions

3 2 1

Phosphate, ortho HR with tablet

5 - 80 mg/l PO_4
Determination of ortho-Phosphate ions

3 2 3

Phosphate, ortho with Powder Pack

0.06 - 2.5 mg/l PO_4
Determination of ortho-Phosphate ions

3 2 4

Phosphate, ortho with tube test

0.06 - 5 mg/l PO_4
Determination of ortho-Phosphate ions

3 2 7

Phosphat 1, ortho

with Vacu-vials® 5-40 mg/l PO_4
Determination of ortho-Phosphate ions

3 2 8

Phosphat 2, ortho

with Vacu-vials® 0.05-5 mg/l PO_4
Determination of ortho-Phosphate ions

3 2 5

Phosphate, acid hydrolizable with tube test

0.02 - 1.6 mg/l P
Determination of ortho-Phosphate ions + condensed, inorganic Phosphates

3 2 6

Phosphate, total with tube test

0.02 - 1.1 mg/l P
Determination of ortho-Phosphate ions + condensed, inorganic Phosphates + organically combined Phosphates

1.1 Method

Ortho-Phosphate ions react with the reagent to a intense blue colour.

Phosphate in organic and condensed inorganic forms (meta-, pyro- and polyphosphates) must be converted to ortho-Phosphate ions before analysis.

Pretreatment of the sample with acid and head provides the conditions for hydrolysis of the condensed inorganic forms. Organically combined phosphates are converted to ortho Phosphate ions by heating with acid and persulfate.

The amount of organically combined phosphates can be calculated:

mg/l Phosphate, organic = mg/l Phosphate, total – mg/l Phosphate, acid hydrolysable

Notes - only for tube tests and tests with powder packs:

1. Application: for water, wastewater and seawater.
2. Highly buffered samples or samples with extreme pH Values should be adjusted to between pH 2 and pH 10 before analysis (with 1 mol/l Hydrochloric acid or 1 mol/l Sodium hydroxide).
3. Interferences:

Large amounts of turbidity may cause inconsistent results.

Interfering substance	**Interference level:**
Aluminium	greater than 200 mg/l
Arsenate	at any level
Chromium	greater than 100 mg/l
Copper	greater than 10 mg/l
Iron	greater than 100 mg/l
Nickel	greater than 300 mg/l
Silica (Silicium dioxide)	greater than 50 mg/l
Silicate	greater than 10 mg/l
Sulfide	at any level
Zinc	greater than 80 mg/l

Method

3 2 0

Phosphate, ortho LR with tablet reagent

0.05 - 4 mg/l PO_4

1. Fill a clean vial (24 mm ø) with **10 ml of water sample**, close the cap tightly.

2. Place the vial in the sample chamber making sure that the marks ⊼ are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one PHOSPHATE No. 1 LR tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.

6. Add **one PHOSPHATE No. 2 LR tablet** straight from the foil to the same water sample and crush the tablet using a clean stirring rod.

7. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

8. Place the vial in the sample chamber making sure that the marks ⊼ are aligned.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.
Wait for a **reaction period of 10 minutes**.

Countdown
10:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display as ortho-Phosphate in mg/l PO_4.

Method

Notes:

1. Only ortho-Phosphate ions react.
2. The tablets must be added in the correct sequence.
3. The test sample should have a pH-Value of between 6 and 7.
4. Interferences:
   Higher concentrations of Cu, Ni, Cr (III), V (V) and W (VI) interfere due to their colour.
   Silicates doe not interfere (masked by Citric acid in the tablets).
5. Conversion:
   mg/l P = mg/l PO_4 x 0.33
   mg/l P_2O_5= mg/l PO_4 x 0.75
6. ▲ PO_4
   P
   ▼ P_2O_5

Reagents
Phosphate LR No 1 tablet pk 100 Ref: TT/51.30.40
Phosphate LR No 2 tablet pk 100 Ref: TT/51.30.50

1.1 Method

3 2 1

Phosphate HR, ortho with tablet reagent

5 - 80 mg/l PO_4

1. Fill a clean vial (24 mm ø) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⊼ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one PHOSPHATE HR P1 tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.

6. Add **one PHOSPHATE HR P2 tablet** straight from the foil to the same water sample and crush the tablet using a clean stirring rod.

7. Close the vial with the cap tightly and swirl the vial several times until the tablets are dissolved.

8. Place the vial in the sample chamber making sure that the ⊼ marks are aligned.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.

   Wait for a **reaction period of 10 minutes**.

Count-Down
10:00

   After the reaction period is finished the reading starts automatically.

   The result is shown in the display as ortho-Phosphate in mg/l PO_4.

1.1 Method

Notes:

1. Only Orthophosphate ions react.
2. Conversions:
   mg/l P = mg/l PO_4 x 0.33
   mg/l P_2O_5 = mg/l PO_4 x 0.75
3. ▲ PO_4
   P
   ▼ P_2O_5

Reagents
Phosphate HR No 1 tablet pk 100 Ref: TT/51.58.10
Phosphate HR No 2 tablet pk 100 Ref: TT/51.58.20

1.1 Method

3 2 3

Phosphate, ortho with Powder Pack (PP) Reagent

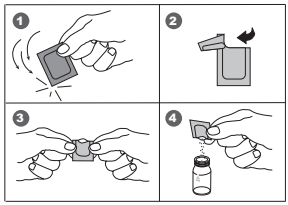
0.06 - 2.5 mg/l PO_4

1. Fill a clean vial (24 mm ø) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⊼ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.



4. Remove the vial from the sample chamber.

5. Add **Phosphate Rgt. F10 powder pack** straight from the foil to the water sample.

6. Close the vial with the cap tightly and swirl the vial several times to mix the contents (approx. 10-15 sec., Note 1).

7. Place the vial in the sample chamber making sure that the ⊼ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.

Count-Down
2:00

Wait for a **reaction period of 2 minutes**.

After the reaction period is finished the reading starts automatically.

The result is shown in the display as ortho-Phosphate in mg/l PO_4.

1.1 Method

Notes:

1. The reagent dissolves not completely.
2. see also page 123
3. Conversions:
   mg/l P = mg/l PO_4 x 0.33
   mg/l P_2O_5 = mg/l PO_4 x 0.75
4. ▲ PO_4
   P
   ▼ P_2O_5

Reagents
Phosphate reagent powder pack pk 100 Ref: CW/53.15.50

1.1 Method

3 2 4

Phosphate, ortho with tube test

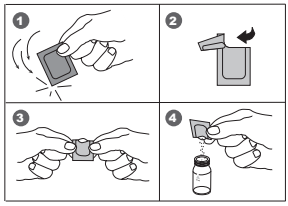
0.06 - 5 mg/l PO_4

1. Open the white cap of one **tube PO_4-P Dilution** and add **5 ml water sample.**

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.



4. Remove the vial from the sample chamber.

5. Add **one Phosphate Rgt. powder pack** straight from the foil to the water sample (Note 1).

6. Close the vial with the cap tightly and swirl the vial several times to mix the contents (approx. 10-15 sec., Note 2).

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.

Count-Down
2:00

Wait for a **reaction period of 2 minutes**.

After the reaction period is finished the reading starts automatically.

The result is shown in the display as ortho-Phosphate in mg/l PO_4.

1.1 Method

Notes:

1. Use a funnel to add the reagent.
2. The reagent dissolves not completely.
3. see also page 123
4. Conversions:
   mg/l P = mg/l PO_4 x 0.33
   mg/l P_2O_5 = mg/l PO_4 x 0.75
5. ▲ PO_4
   P
   ▼ P_2O_5

Reagents
Phosphate, ortho tube reagent set (50 tests) Ref: CW/53.52.00

1.1 Methods

3 2 7

Phosphate 1, ortho with Vacu-vials® K-8503 (see Notes)

5 - 40 mg/l PO_4

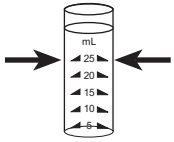
Insert the adaptor for 13 mm Ø vials.

1. Place the blank in the sample chamber. The blank is part of the test kit.

prepare Zero
press ZERO

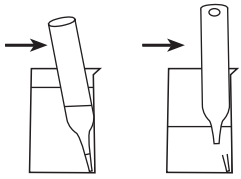
2. Press **ZERO** key.

3. Remove the blank from the sample chamber.



4. Fill the sampler to the 25 ml mark with the water sample.

5. Place one Vacu-vial® in the sampler. Snap the tip by pressing the vial against the side of the sampler.



The Vacu-vial® breaks at the neck and the vial fills automatically.

A small volume of inert gas remains in the Vacu-vial®.

6. Mix the content of the Vacu-vial® by inverting it several times, allowing the bubble to move from one end to the other. Dry the outside of the vial.

Zero accepted
prepare Test
press TEST

7. Place the Vacu-vial® in the sample chamber.

8. Press **TEST** key.
Wait for a **reaction period of 5 minutes**.

Count-Down
5:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display as ortho-Phosphate in mg/l PO_4.

1.1 Methods

Notes:

1. This method is adapted from CHEMetrics.
2. Read the original test instruction and the MSDS (delivered with the test) before performing the test. MSDS also at www.chemetrics.com available.
3. Vacu-vials® is a registered trade mark of the company CHEMetrics, Inc. / Calverton, U.S.A.
4. Only Orthophosphate ions react.
5. Sulfide, Thiosulfate und Thiocyanate cause low test results.
6. ▲ PO_4
   P
   ▼ P_2O_5

1.1 Methods

3 **2** **8**

Phosphate 2, ortho with Vacu-vials® K-8513 (see Notes)

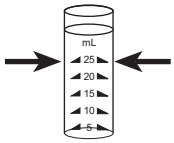
0.05 – 5 mg/l PO_4

Insert the adaptor for 13 mm Ø vials.

1. Place the blank in the sample chamber. The blank is part of the test kit.

Zero vorbereiten
ZERO drücken

2. Press **ZERO** key.



3. Remove the blank from the sample chamber.

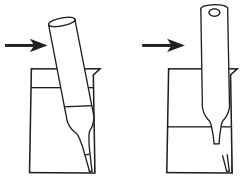
4. Fill the sampler to the 25 ml mark with the water sample.

5. Fill the sampler with drops of the same size by holding the bottle vertically and squeeze slowly:

   2 drops A-8500 Activator Solution

6. Close the sampler with the cap tightly and swirl several times to mix the contents.

7. Place one Vacu-vial® in the sampler. Snap the tip by pressing the vial against the side of the sampler. The Vacu-vial® breaks at the neck and the vial fills automatically. A small volume of inert gas remains in the Vacu-vial®.



8. Mix the content of the Vacu-vial® by inverting it several times, allowing the bubble to move from one end to the other. Dry the outside of the vial.

9. Place the Vacu-vial® in the sampler chamber.

Zero akzeptiert
Test vorbereiten
TEST drücken

10. Press **TEST** key.

Count-Down
3:00

Wait for a **reaction period of 3 minutes.**

After the reaction period is finished the reading starts automatically.

The result is shown in the display as ortho-Phosphate in mg/l PO_4.

1.1 Methods

Notes:

1. This method is adapted from CHEMetrics.
2. Read the original test instruction and the MSDS (delivered with the test) before performing the test. MSDS also at www.chemetrics.com available.
3. Vacu-vials® is a registered trade mark of the company CHEMetrics, Inc. / Calverton, U.S.A.
4. Only Orthophosphate ions react.
5. Sulfide, Thiosulfate und Thiocyanate cause low test results.
6. ▲ PO_4
   P
   ▼ P_2O_5

1.1 Method

3 2 5

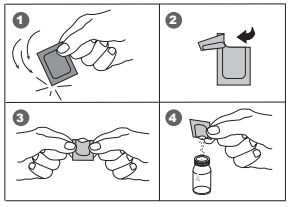
Phosphate, acid hydrolyzable with tube test

0.02 - 1.6 mg/l P (≙ 0.06 - 5 mg/l PO_4)

1. Open the white cap of one **digestion tube PO4-P Acid reagent** and add **5 ml water sample**.
2. Close the vial with the cap tightly. Invert the vial gently several times to mix the contents.

prepare Zero
press ZERO

3. Heat the vials for **30 minutes** in the preheated reactor at a temperature **of 100°C**.
4. After 30 minutes remove the vial from the reactor. **(CAUTION: The vials are hot!)**
   Allow the vials to cool to room temperature.
5. Open the cooled down digestion vial and add **2 ml 1.00 N Sodium hydroxide solution** to the vial.
6. Close the vial with the cap and invert the vial gently several times to mix the contents.
7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.
8. Press **ZERO** key.



9. Remove the vial from the sample chamber.
10. Add **one Phosphate Rgt. powder pack** straight from the foil to the vial (Note 2).
11. Close the vial with the cap tightly and swirl the vial several times to mix the contents (approx. 10-15 sec., Note 3).
12. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

13. Press **TEST** key.

Count-Down
2:00

Wait for a **reaction period of 2 minutes**.

After the reaction period is finished the reading starts automatically.

The result is shown in the display as acid hydrolyzable Phosphate in mg/l **P**.

1.1 Method

Notes:

1. Use appropriate safety precautions and a good lab technique should be used during the whole procedure.
2. Use a funnel to add the reagent.
3. The reagent dissolves not completely.
4. see also page 123
5. Conversions:
   mg/l PO_4 = mg/l P x 3.07
   mg/l P_2O_5 = mg/l P x 2.29
6. ▲ PO_4
   P
   ▼ P_2O_5

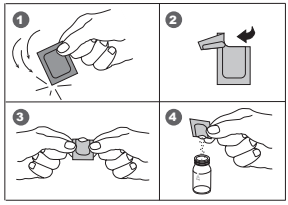
Reagents
Phosphate, acid hydrolyzable, tube reagent set (50 tests) Ref: CW/53.52.50

1.1 Method

3 2 6

Phosphate, total with tube test

0.02 - 1.1 mg/l P (≙ 0.06 - 3.5 mg/l PO_4)



1. Open the white cap of one **digestion tube PO4-P Acid reagent** and add **5 ml water sample**.
2. Add **one Potassium Persulfate powder pack** straight from the foil to the vial (Note 2).
3. Close the vial with the cap tightly. Invert the vial several times to mix the contents.
4. Heat the vials for **30 minutes** in the preheated reactor at a temperature **of 100°C**.
5. After 30 minutes remove the vial from the reactor. **(CAUTION: The vials are hot!)** Allow the vials to cool to room temperature.
6. Open the cooled down digestion vial and add **2 ml 1.54 N Sodium hydroxide solution** to the vial.
7. Close the vial with the cap and invert the vial gently several times to mix the contents.
8. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

9. Press **ZERO** key.
10. Remove the vial from the sample chamber.
11. Add **one Phosphate Rgt. powder pack** straight from the foil to the vial (Note 2).
12. Close the vial with the cap tightly and swirl the vial several times to mix the contents (approx. 10-15 sec., Note 3).
13. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

14. Press **TEST** key.

Count-Down
2:00

Wait for a **reaction period of 2 minutes**.

After the reaction period is finished the reading starts automatically.

The result is shown in the display as total Phosphate in mg/l **P**.

1.1 Method

Notes:

1. Use appropriate safety precautions and a good lab technique should be used during the whole procedure.
2. Use a funnel to add the reagent.
3. The reagent dissolves not completely.
4. see also page 123
   Conversions:
   mg/l PO_4 = mg/l P x 3.07
   mg/l P_2O_5 = mg/l P x 2.29
6. ▲ P
   PO_4
   ▼ P_2O_5

Reagents
Phosphate, total tube reagent set (50 tests) Ref: CW/53.52.10

1.1 Method

3 2 9 pH-Value LR 5.2 - 6.8 with tablet reagent

1. Fill a clean vial (24 mm ø) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one BROMOCRESOLPURPLE PHOTOMETER tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.

6. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.

The result is shown in the display as pH - Value.

1.1 Method

Notes:

1. For photometric determination of pH-Values only use BROMOCRESOLPURPLE tablets in black printed foil pack and marked with PHOTOMETER.
2. pH-Values below 5.2 and above 6.8 can produce results inside the measuring range. A plausibility test (pH meter) is recommend.
3. The accuracy of the colorimetric determination of pH-Value is depended on various boundary conditions (buffer capacity of the sample, salt content etc.).
4. Salt error
   Correction of test results (average values) for samples with salt content of:

Indicator	Salt content		
Bromcresolpurple	1 molar	2 molar	3 molar
	- 0.26	- 0.33	- 0.31

The values of Parson and Douglas (1926) are based on the use of Clark and Lubs buffers.

1 Mol NaCl = 58.4 g/l = 5.8 %

Reagents
Bromocresol purple photometer tablet pk 100 Ref: TT/51.57.00

1.1 Method

Notes:

1. For photometric determination of pH-Values only use BROMOCRESOLPURPLE tablets in black printed foil pack and marked with PHOTOMETER.
2. pH-Values below 5.2 and above 6.8 can produce results inside the measuring range. A plausibility test (pH meter) is recommend.
3. The accuracy of the colorimetric determination of pH-Value is depended on various boundary conditions (buffer capacity of the sample, salt content etc.).
4. Salt error
   Correction of test results (average values) for samples with salt content of:

Indicator	Salt content		
Bromcresolpurple	1 molar	2 molar	3 molar
	- 0.26	- 0.33	- 0.31

The values of Parson and Douglas (1926) are based on the use of Clark and Lubs buffers.

1 Mol NaCl = 58.4 g/l = 5.8 %

1.1 Method

Notes:

1. For photometric determination of pH-Values only use PHENOLRED tablets in black printed foil pack and marked with PHOTOMETER.
2. Water samples with low values of Alkalinity-m (below 35 mg/l $CaCO_3$) may give wrong pH readings.
3. pH-Values below 6.5 and above 8.4 can produce results inside the measuring range. A plausibility test (pH meter) is recommended.
4. The accuracy of the colorimetric determination of pH value is depended on various boundary conditions (buffer capacity of the sample, salt content etc.).
5. Salt error
   Correction of test results (average values) for samples with salt content of:

Indicator	Salt content		
Bromcresolpurple	1 molar	2 molar	3 molar
	- 0.21	- 0.26	- 0.29

The values of Parson and Douglas (1926) are based on the use of Clark and Lubs buffers. 1 Mol NaCl = 58.4 g/l = 5.8 %

Reagents
Phenol red tablets pk 100 Ref: TT/51.17.00

Method

3 **3** **1**

pH-Value 6.5 – 8.4 with liquid reagent

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Fill the vial with drops of the same size by holding the bottle vertically and squeeze slowly:

   6 drops of PHENOLRED solution

6. Close the vial with the cap tightly and swirl the vial several times to mix the contents.

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare TEST
press Test

8. Press **TEST** key.

   The result is shown in the display as pH-Value.

1.1 Method

Notes:

1. When testing chlorinated water the residual chlorine content can influence the colour reaction of the liquid reagent. This can be avoided (without interfering the pH measurement) by adding a small crystal of Sodiumthiosulfate ($Na_2S_2O_3$ x 5 H_2O) to the sample before adding the PHENOLRED solution. PHENOLRED tablets already contain Thiosulfate.
2. Due to differing drop size results can show a discrepancy in accuracy by comparison with tablets. This can be minimised by using a pipette (0.18 ml PHENOLRED solution is equivalent to 6 drops).
3. After use replace the bottle cap securely.
4. **Store the reagent in a cool, dry place ideally at between 6°C and 10°C.**

Reagents
Phenol red solution 15ml Ref: TT/47.10.40

1.1 Method

3 3 2

pH-Value HR 8.0 - 9.6

1. Fill a clean vial (24 mm ø) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one THYMOLBLUE PHOTOMETER tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.

6. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare TEST
press Test

8. Press **TEST** key.

The result is shown in the display as pH - Value.

1.1 Method

Notes:

1. For photometric determination of pH-Values only use THYMOLBLUE tablets in black printed foil pack and marked with PHOTOMETER.
2. pH-Values below 8.0 and above 9.6 can produce results inside the measuring range. A plausibility test (pH meter) is recommend.
3. The accuracy of the colorimetric determination of pH-Value is depended on various boundary conditions (buffer capacity of the sample, salt content etc.).
4. Salt error

   Correction of test results (average values) for samples with salt content of:

Indicator	Salt content		
Thymolblue	1 molar	2 molar	3 molar
	- 0.22	- 0.29	- 0.34

The values of Parson and Douglas (1926) are based on the use of Clark and Lubs buffers. 1 Mol NaCl = 58.4 g/l = 5.8 %

Reagents
Thymol blue tablets pk 100 Ref: TT/51.57.10

Method

3 5 0

Silica/Silicon dioxide with tablet reagent

0.05 - 4 mg/l SiO_2

1. Fill a clean vial (24 mm ø) with **10 ml of water sample**, close the vial with the cap tightly.
2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.
4. Remove the vial from the sample chamber.
5. Add **one SILICA No. 1 tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.
6. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

Countdown
5 : 00
start: press [↵]

7. Press [↵] key.
   Wait for a **reaction period of 5 minutes**.
   After reaction period is finished proceed as follows:
8. Add **one SILICA PR tablet** straight from the foil to the same water sample and crush the tablet using a clean stirring rod.
9. Add **one SILICA No. 2 tablet** straight from the foil to the same water sample and crush the tablet using a clean stirring rod.
10. Close the cap tightly and swirl the vial several times until the tablets are dissolved.
11. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

12. Press **TEST** key.
    Wait for a **reaction period of 1 minute**.

Countdown
1:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in mg/l Silicon dioxide.

Method

Notes:

1. The tablets must be added in the correct sequence.
2. Phosphate ions does not interfere under the given reaction conditions.
3. If Phosphate is known to be absent, the addition of the SILICA PR tablet may be omitted.
4. Conversion:
   mg/l Si = mg/l SiO_2 x 0.47
5. ▲ SiO_2
   ▼ Si

Reagents
Silica No 1 tablet pk 100 Ref: TT/51.31.30
Silica No 2 tablet pk 100 Ref: TT/51.31.40
Silica PR tablet pk 100 Ref: TT/51.31.50

1.1 Methods

3 5 1

Silica LR / Silicon dioxide LR with Powder Pack and liquid reagent

0.1 – 1.6 mg/l SiO_2

Use two clean vials (24 mm Ø) and mark one as blank for zeroing.

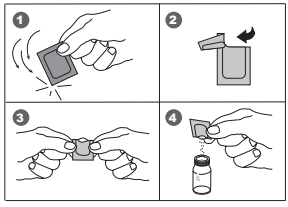
1. Fill each vial with **10 ml water sample**.
2. Add **0.5 ml Molybdate 3 reagent solution** into each vial.
3. Close the vials with the caps tightly and swirl the vials several times to mix the contents (Note 1).

Countdown
4 : 00
start: press [↵]

4. Press [↵] key.

   Wait for a **reaction period of 4 minutes** (Note 2).

   After reaction period is finished proceed as follows:



5. Add **one Silica Citric Acid Powder Pack** straight from the foil into each vial.
6. Close the vials with the caps tightly and swirl the vials several times to mix the contents.

Countdown
1 : 00
start: press [↵]

7. Press [↵] key.

   Wait for a **reaction period of 1 minute** (Note 3).

   After reaction period is finished proceed as follows:

8. Place the vial (the blank) in the sample chamber making sure that the ⧖ marks are aligned.
9. Add **one Silica Citric Acid Powder Pack** straight from the foil into the vial (the sample).
10. Close the vial with the cap tightly and swirl the vial several times to mix the contents.

1.1 Methods

prepare Zero
press ZERO

11. Press **ZERO** key (blank is already placed in the sample chamber-see point 8).

Count-Down
2:00

Wait for **a reaction period of 2 minutes**.

After the reaction period is finished the zero-reading starts automatically.

12. Remove the vial from the sample chamber.

13. Place the vial (the sample) in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

14. Press **TEST** key.

The result is shown in the display in mg/l Silica.

Notes:

1. Close the vials with the cap directly after adding the Vario Molybdate 3 reagent solution, otherwise it can result in minimum findings.
2. The given reaction time of 4 minutes refers to a water sample temperature of 20°C. At 30°C a reaction time of 2 minutes, at 10°C a reaction time of 8 minutes is required.
3. The given reaction time of 1 minute refers to a water sample temperature of 20°C. At 30°C a reaction time of 30 seconds, at 10°C a reaction time of 2 minutes is required.
4. Interferences:

Substance	Interference
Iron	large amounts interfere
Phosphate	does not interfere at concentrations less than 50 mg/l PO4 at 60 mg/l PO_4 the interference is approx. - 2% at 75 mg/l PO_4 the interference is approx. – 11 %
Sulfide	interfere at all levels

Occasionally water samples contain silica forms which reacts very slowly with Molybdate. The nature of these forms is not known.

A pre-treatment with Sodium bicarbonate and then with Sulfuric Acid will make these forms reactive to Molybdate (pre-treatment is given in “Standard Methods for the Examination of Water and Wastewater” under “ Silica-Digestion with Sodium Bicarbonate”).

5. ▲ SiO_2
   ▼ Si

Reagents
Silica reagent set (100 tests) Ref: CW/53.56.90

1.1 Methods

3 5 2

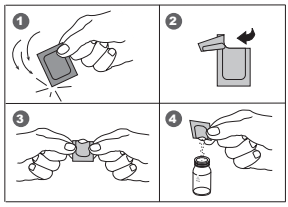
Silica HR / Silicon dioxide HR with Powder Pack

1 – 90 mg/l SiO_2

1. Fill a clean vial (24 mm Ø) with **10 ml of water sample** (Note 1), close the vial with the cap tightly.
2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.
4. Remove the vial from the sample chamber.



5. Add **one Silica Molybdate powder pack** straight from the foil to the water sample.
6. Close the vial with the cap tightly and swirl the vial several times to mix the contents.
7. Add **one Silica HR Acid Rgt. powder pack** straight from the foil to the same water sample (Note 2).
8. Close the vial with the caps tightly and swirl the vials several times to mix the contents.

Countdown
10 : 00
start: press [↵]

9. Press [↵] key.

   Wait for a **reaction period of 10 minutes**.

   After reaction period is finished proceed as follows:

10. Add **one Silica Citric Acid powder pack** straight from the foil to the water sample (Note 3).
11. Close the vial with the cap tightly and swirl the vial several times to mix the contents.

Zero accepted
prepare Test
press TEST

12. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.
13. Press **TEST** key.

Count-Down
2:00

Wait for a **reaction period of 2 minutes**.

After reaction period is finished the reading starts automatically.

The result is shown in the display in mg/l Silica.

1.1 Methods

Notes:

1. Temperature of the sample should be 15°C – 25°C.
2. If Silica or Phosphate is present a yellow colour is developed.
3. In this step any yellow colour due to Phosphate is removed.
4. Interferences:

Substance	Interference
Iron	large amounts interfere
Phosphate	does not interfere at concentrations less than 50 mg/l PO4 at 60 mg/l PO_4 the interference is approx. - 2% at 75 mg/l PO_4 the interference is approx. – 11 %
Sulfide	interfere at all levels

Occasionally water samples contain silica forms which reacts very slowly with Molybdate.
The nature of these forms is not known.
A pre-treatment with Sodium bicarbonate and then with Sulfuric Acid will make these forms reactive to Molybdate (pre-treatment is given in “Standard Methods for the Examination of Water and Wastewater” under “ Silica-Digestion with Sodium Bicarbonate”).

5. ▲ SiO_2
   ▼ Si

Reagents
Silica HR reagent set (100 tests) Ref: CW/53.57.00

1.1 Methods

3 5 5 Sulfate with tablet reagent

5-100 mg/l SO_4

1. Fill a clean vial (24 mm ø) with **10 ml of water sample,** close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one SULFATE T tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.

6. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.

The result is shown in the display in mg/l Sulfate.

1.1 Methods

Notes:

1. If Sulfate is present a cloudy solution will be given.

Reagents
Sulphate T tablet pk 100 Ref: TT/51.54.50

Method

3 6 0

Sulfate with Powder Pack (PP) reagent

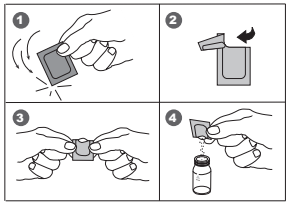
2 – 100 mg/l SO_4

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.



4. Remove the vial from the sample chamber.

5. Add **one Sulpha 4** powder pack straight from the foil to the water sample.

6. Close the vial with the cap tightly and swirl the vial several times to mix the contents.

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.
Wait for a reaction period of 5 minutes.

Countdown
5:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in mg/l Sulfate.

Method

Note:
If Sulfate ions are present a cloudy solution will be given.

Reagents
Sulpha 4 powder pack pk 100 Ref: CW/53.21.60

1.1 Methods

3 6 5

Sulfide with tablet reagent

0.04 – 0.5 mg/l S

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample,** close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⊼ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one SULFIDE No. 1 tablet** to the water sample and crush the tablet using a clean stirring rod and dissolve the tablet.

6. Add **one SULFIDE No. 2 tablet** to the same water sample and crush the tablet using a clean stirring rod.

7. Close the vial with the cap tightly and swirl the vial several times until the tablets are dissolved.

8. Place the vial in the sample chamber making sure that the ⊼ marks are aligned.

Zero accepted
prepare Test
press TEST

9. Press **TEST** key.

   Wait for a **reaction period of 10 minutes.**

Countdown
10:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in mg/l Sulfide.

1.1 Methods

Notes:

1. The tablets must added in the correct sequence.
2. Chlorine and other oxidizing agents which react with DPD do not interfere in the test.
3. To avoid loss of Sulfide collect the sample carefully with a minimum of aeration. It is essential to test the sample immediately after collection.
4. The temperature of test performance should be 20°C. Difference to this temperature can lead to higher or lower results.
5. Conversion:
   H_2S = mg/l S x 1.06
6. ▲ S
   ▼ H_2S

Reagents
Sulphide No 1 tablet pk 100 Ref: TT/50.29.30
Sulphide No 2 tablet pk 100 Ref: TT/50.29.40

1.1 Method

3 7 0

Sulfite with tablet reagent

0.1 – 5 mg/l SO_3

1. Fill a clean vial (24 mm ø) with **10 ml of water sample**, close the vial with the cap tightly.

2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **one SULFITE LR tablet** straight from the foil to the water sample and crush the tablet using a clean stirring rod.

6. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
prepare Test
press TEST

8. Press **TEST** key.

   Wait for a **reaction period of 5 minutes**.

Count-Down
5:00

   After the reaction period is finished the reading starts automatically.

   The result is shown in the display in mg/l Sulfite.

Reagents
Sulfite LR tablet pk 100 Ref: TT/51.80.20

Method

3 9 0

Urea
with tablet and liquid reagent

0.1 - 3 mg/l $(NH_2)_2CO$ / mg/l Urea

1. Fill a clean vial (24 mm ∅) with **10 ml of water sample**, close the vial with the cap tightly.
2. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

3. Press **ZERO** key.
4. Remove the vial from the sample chamber.
5. Add **2 drops of Urea reagent** to the water sample (Note 8).
6. Close the vial with the cap tightly and swirl the vial several times to mix the contents.
7. Add **1 drop of Urea Reagent 2** (Urease) to the same water sample (Note 8).
8. Close the vial with the cap tightly and swirl the vial several times to mix the contents.

Countdown
5:00
Start: press [↵]

9. Press [↵] key.
   Wait for a **reaction period of 5 minutes**.

   After reaction period is finished proceed as follows:

10. Add **one AMMONIA No. 1 tablet** straight from the foil to the prepared water sample and mix to dissolve with a clean stirring rod.
11. Add **one AMMONIA No. 2 tablet** straight from the foil to the same water sample and mix to dissolve with a clean stirring rod.

Method

12. Close the vial with the cap tightly and swirl the vial several times until the tablets are dissolved.

13. Place the vial in the sample chamber making sure that the X marks are aligned.

Zero accepted
press ZERO
press TEST

14. Press **TEST** key.
Wait for a **reaction period of 10 minutes**.

Countdown
10:00

After the reaction period is finished the reading starts automatically.

The result is shown in the display in mg/l Urea.

Notes:

1. The sample temperature should be between 20°C and 30°C.
2. Determination at the latest one hour after sample taking.
3. Always adhere to the sequence of tablet addition.
4. **Store reagent 2 (Urease) in the refrigerator at a temperature of 4°C to 8°C.**
5. The AMMONIA No. 1 tablet will only dissolve completely after the AMMONIA No. 2 tablet has been added.
6. Ammonium and chloramines are also measured during urea measurement.
7. Before analysing seawater samples, a measuring spoon of Ammonia Conditioning Powder must be added to the sample and swirled to dissolve before AMMONIA No. 1 tablet is added.
8. Fill the vial with drops of the same size by holding the bottle vertically and squeeze slowly.

Reagents
Urea Reagent 1 15ml Ref: TT/45.93.00
Urea Reagent 2 15ml Ref: TT/45.94.00
Ammonia No 1 tablets pk 100 Ref: TT/51.25.80
Ammonia No 2 tablets pk 100 Ref: TT/51.25.90

1.1 Method

4 0 0

Zinc
with tablet reagent

0.02 - 1 mg/l Zn

1. Fill a clean vial (24 mm ø) with **10 ml of water sample**.

2. Add **one COPPER / ZINC LR tablet** straight from the foil to the water sample, crush the tablet using a clean stirring rod.

3. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

4. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

prepare Zero
press ZERO

5. Press **ZERO** key.

   Wait for a **reaction period of 5 minutes**.

Count-Down
5:00

   After the reaction period is finished the reading starts automatically.

6. Remove the vial from the sample chamber.

7. Add **one EDTA tablet** straight from the foil to the prepared vial and crush the tablet using a clean stirring rod.

8. Close the vial with the cap tightly and swirl the vial several times until the tablet is dissolved.

9. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
press ZERO
press TEST

10. Press **TEST** key.

    The result is shown in the display in mg/l Zinc.

1.1 Method

Notes:

1. The tablets must be added in the correct sequence.
2. In the case of high levels of residual chlorine, perform the analysis with a dechlorinated water sample. To dechlorinate add one DECHLOR tablet (point 1) to the water sample. Crush and mix to dissolve the tablet. Then add the COPPER / ZINC LR tablet (point 2) and continue with the test procedure as described above.

Reagents
Copper/zinc LR tablet pk 100 Ref: TT/51.26.20
EDTA table pk 100 Ref: TT/51.23.90
Dechlor tablet Ref: TT/51.23.50

1.2 Important notes

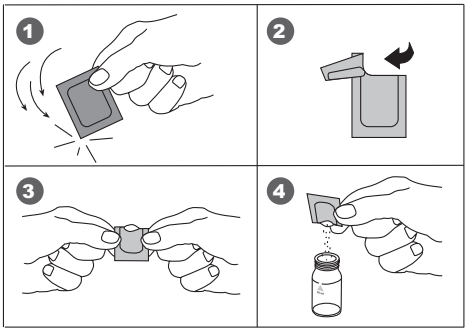
1.2.1 Correct use of reagents

The reagents must be added in the correct sequence.

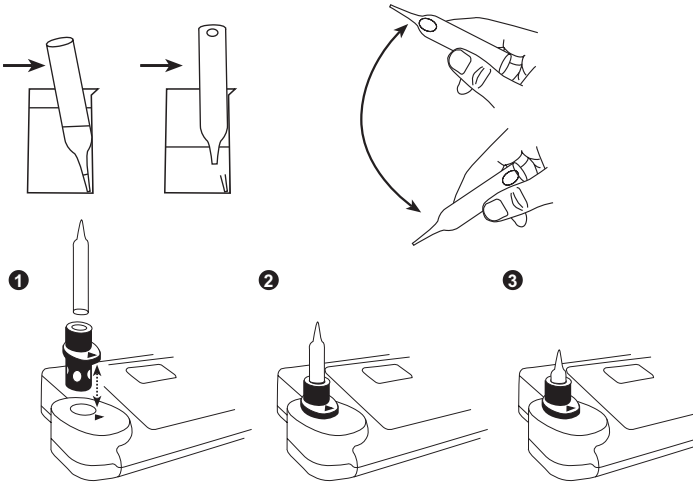
Tablet reagents:
The tablet reagents should be added to the water sample straight from the foil without touching them with the fingers.

Liquid reagents:
Add drops of the same size to the water sample by holding the bottle vertically and squeezing slowly.
After use replace the bottle caps securely noting the colour coding.
Note recommendation for storage (e.g. cool and dry).

Powder Packs:



Vacu-vials® of CHEMetrics:
Vacu-vials® should be stored dark and at room temperature.
For further information see MSDS.



1.2.2 Cleaning of vials and accessories for analysis

Vials, caps and stirring rods should be cleaned thoroughly **after each analysis** to prevent influences.

Procedure:

Clean vials and accessories after each analysis as soon as possible.

a. Clean vials and accessories with laboratory detergent (e.g. Extran® MA 02 (neutral, phosphatic), Extran® MA 03 (alkaline, phosphate-free) from Merck KGaA).

b. Rinse with tap water thoroughly.

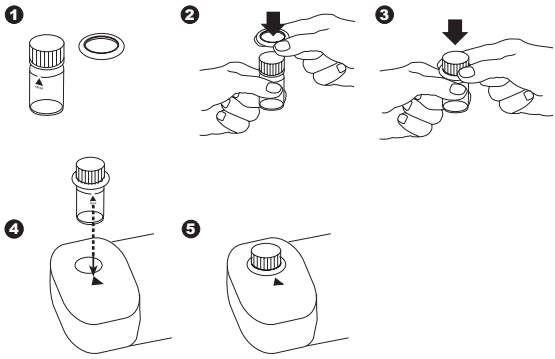
c. On demand (see Notes) perform special cleaning at this point, e.g.: rinse with diluted Hydrochloric acid solution.

d. Rinse with deionized water thoroughly.

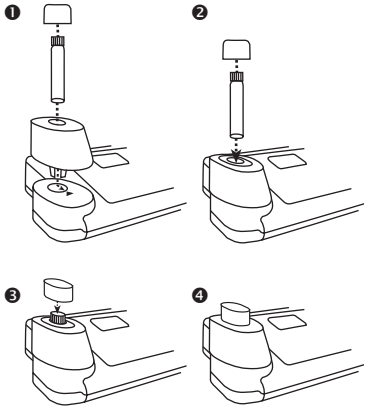
1.2.3 Guidelines for photometric measurements

1. Vials, caps and stirring rods should be cleaned thoroughly after each analysis to prevent influences. Even minor reagent residues can cause errors in the test result.
2. The outside of the vial must be clean and dry before starting the analysis. Clean the outside of the vials with a towel. Fingerprints or other marks will be moved.
3. If there is no defined vial for the blank, the zeroing and the test must be carried out with the same vial as there may be slight differences in optical performance between vials.
4. The vials must be positioned in the sample chamber for zeroing and test with the ⧖ mark on the vial aligned with the ⧖ mark on the instrument.

Correct position of the vial (ø 24 mm):

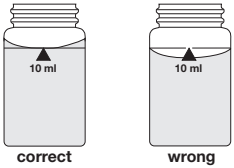


Correct position of the vial (ø 16 mm):



5. Always perform zeroing and test with closed vial cap. Only use cap with sealing ring.
6. Bubbles on the inside of the vial may also lead to errors. In this case replace the cap tightly and remove bubbles by swirling the contests before starting test.
7. Avoid spillage of water in the sample chamber. If water should leak into the instrument housing, it can destroy electronic components and cause corrosion.
8. Contamination of the lens in the sample chamber can result in errors. Check at regular intervals – and if necessary – clean the light entry surfaces of the sample chamber using a moist cloth or cotton buds.
9. Large temperature differences between the instrument and the environment can lead to errors – e.g. due to the formation of condensation in the area of the lens or on the vial.
10. To avoid errors caused by stray-light do not use the instrument in bright sunlight.

Correct filing of the vial:



1.2.4 Sample dilution techniques

Proceed as follows for accurate dilutions:

Pipette the water sample (see table) into a 100-ml volumetric flask and fill up to 100 ml-mark with deionized water. Swirl to mix the contents.

Water sample [ml]	Multiplication factor
1	100
2	50
5	20
10	10
25	4
50	2

Pipette the required volume of the diluted sample into the vial and proceed as described in the test methods.

Caution:

1. Dilution increases in accuracy.
2. Do not dilute water samples for measurement of pH-Values. This will lead to incorrect test results. If there is displayed “Overrange” use another instrument (e.g. pH-meter).

1.2.5 Correcting for volume additions

If a larger volume of acid or base is used to pre-adjust the pH-Value, a volume correction of the displayed result is necessary.

Example:

For adjusting the pH value of a 100 ml water sample 5 ml of acid had to be added. The corresponding displayed result is 10 mg/l.

Total volume = 100 ml + 5 ml = 105 ml

Correction factor = 105 ml / 100 ml = 1.05

Corrected result = 10 mg/l x 1.05 = 10.5 mg/l

Part 2

Operating manual

2.1 Operation

2.1.1 Commissioning

Before working with the photometer insert the rechargeable batteries and the Lithium battery (content of delivery). The rechargeable batteries are not charged. See chapter 2.1.2 Saving data – Important Notes, 2.1.3 Replacement of rechargeable batteries resp. Lithium battery. and 2.1.4 Charging the rechargeable batteries.
Before using the photometer select language (mode 10), select mode 34 and perform "Delete Data". Set date and time (see chapter 2.4 Photometer settings).

2.1.2 Saving data – Important Notes

The Lithium battery saves data (stored results and photometer setting) if there is no power from the power supply from the rechargeable batteries or the mains adapter.
Recommendation: Exchange of the lithium battery every 5 years.
Note: When neither mains adapter nor batteries supply energy to the instrument, all stored data and settings will be lost, if the lithium battery is taken out.
Recommendation: Keep the instrument connected to mains adapter supply while changing the lithium battery.

2.1.3 Replacement of rechargeable batteries resp. Lithium-battery

1. Switch the instrument off.
2. If necessary remove vial from the sample chamber.
3. Place the instrument upside down on a clean and even surface.
4. Unscrew the two screws (A) of the battery compartment cover (B).
5. Lift battery compartment cover off.
6. If necessary remove old rechargeable batteries (C) and/or the Lithium-battery (D) (See 2.1.4).
7. Place 7 new rechargeable batteries and/or the Lithium-battery. **Ensuring the correct polarity!**
8. Replace the battery compartment cover.
9. Tighten the screws carefully.

CAUTION
Dispose of used rechargeable batteries and Lithium-batteries in accordance with all federal, state and local regulations.

2.1.4 Charging the rechargeable batteries

The rechargeable batteries are charged in the instrument. As soon the photometer is connected with the mains adapter to the mains the rechargeable batteries are charged.
Empty rechargeable batteries should be charged in the instrument for at least 5 days. 10 charging and discharging cycles are necessary before the rechargeable batteries obtain their full capacity.

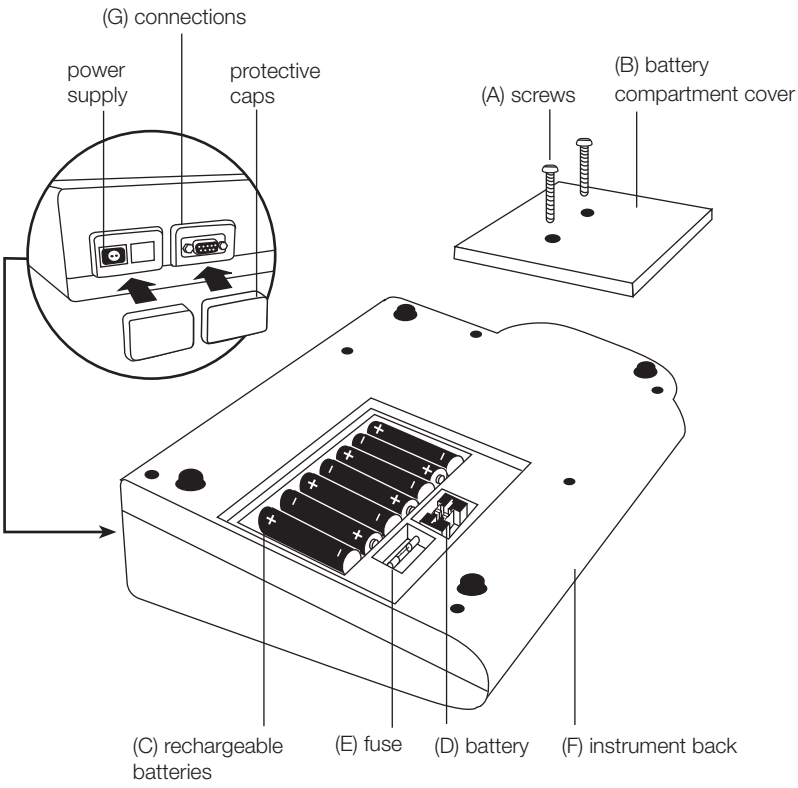
2.1.5 Fuse

The instrument contains a fuse (E) (type: 1 A, inert, 20 mm).
If an replacement is necessary proceed as described in " Replacement of rechargeable batteries resp. Lithium-battery). If the instrument can be operated with the mains adapter but not with the recharcheable batteries, the fuse could be defect (try new recharcheable batteries first).

2.1.6 Protective caps:

If not used protect the two connections against damage (e.g. corrosion) caused by environmental influences (e.g. dust or splashing) keep the protective caps in place (G).

(A) screws
(B) battery compartment cover
(C) rechargeable batteries — 7 Nickel-Cadmium-cells (Type AA, 750 mAh)
(D) battery — Lithium-battery (Type CR 2032, 3V)
(E) fuse — 1 A, inert, 20 mm
(F) instrument



2.2 Overview of function keys

Attention:
With the software-update V012.002.3.003.001 an "ESC-function" is implemented. If your keypad doesn't show an [Esc]-key please note that the grey key without a print (lowest key on the left) has the "ESC-function".

2.2.1 Overview

ON / OFF	Switching the photometer on or off
Esc	Returning to selection of methods or previous menu
F1	Function key: description in the text if key available
F2	Function key: description in the text if key available
F3	Function key: description in the text if key available
↵	Confirming
Mode	Menu of photometer settings and further functions
[▲] [▼]	Moving the cursor ">>" up resp. down
Store	Storing of displayed test result
Zero	Performing Zero
Test	Performing Test
🕒	Displaying date and time / user-countdown

2.2.2 Displaying time and date:

🕒	Press ["clock"] key.
19:30:22 2003-06-15	The display shows: After 15 seconds the photometer reverts to the previous display automatically
↵ Esc	or press [↵] key or [ESC].

2.2.3 User-countdown

With this function the operator is able to define his own countdown.

Press [“clock”] key.

19.30.20 2003-06-15

The display shows time and date:

Press [“clock”] key.

Count-Down
mm : ss
99 : 99

The display shows:

Either press [↲] key to accept the last used user-countdown

or

press one number key to start entering a new value

The entering comprises two digits each.
Enter minutes and seconds
e.g.: 2 minutes, 0 seconds = [0][2][0][0]
Confirm with **[↲]** key.

Count-Down
02:00
Start "↲ "

The display shows:

Start count down with **[↲]** key.

After countdown has finished the photometer reverts to the previous display automatically.

2.3 Operation mode

Switch the photometer on by pressing the ON/OFF key.

Autotest ...

The photometer performs an electronic self-test.

2.3.1 Automatic switch off

The instrument switches off automatically after 20 minutes. This is indicated 30 seconds before by a beeper. Press any key to avoid the instrument switching off.
As long as the instrument is working (for example countdown or printing) the automatic switch off is inactive.

2.3.2 Selecting a method

```
>>   30 Alkalität-m
     35 Alkalität-p
     40 Aluminium
```

The display shows a selection:

There are two possibilities to select the required method:

a) enter method-number directly

e.g.: [8] [0] to select Bromine

b) press arrow key [▼] or [▲] to select the required method from the displayed list.

Confirm with [↵] key.

2.3.2.1 Method-Information (F1)

Use F1 key to switch between the compact and the detailed list for method selection.

```
100 Chlorine
0.02-6 mg/l Cl2
Tablet
24 mm
DPD No 1
DPD No 3
```

Example:

Line 1: Method number, Method name
Line 2: Range
Line 3: Kind of reagent
Line 4: Vial
Line 5-7: Used regents
tub=: reagent vial contained in tube test

2.3.7 Changing chemical species

For some methods there is a possibility to change the chemical species of the test result. If the test result is displayed press arrow key [▲] or [▼].

Example:

320 Phosphate LR T -----[▼]----> 320 Phosphate LR T <---- [▼] ----- 320 Phosphate LR T
0.05-4 mg/l PO_4 0.02-1.3 mg/l P 0.04-3 mg/l P_2O_5
<---- [▲] ----- ------ [▲] ---->
1.00 mg/l PO_4 0.33 mg/l P 0.75 mg/l P_2O_5

If the special species of a test result is changend the displayed range is adjusted automatically. For an already stored result ist is not possible to change the chemical species. The last displayed chemical species is kept by the instrument and will be displayed if this method is used the next time. If there is the possibility to change the chemical species for a method it is described in the manual. The arrows with the possible chemical species are printed below the notes of the method:

▲ PO_4
P
▼ P_2O_5

2.3.8 Storing results

Store

Press **STORE** during the test result is displayed.

Code-No.:
_ _ _ _ _ _

The display shows:

1 0 0 0 0 6

- We advise you to enter a numeric code (up to 6 places). (A Code-No. can contain references to the operator or the sample-taking place.)

After entering confirm with [↲] key.

- If a code number is not necessary confirm by pressing [↲] directly. (The assignment for the Code-No. is then 0 automatically.)

The entire data set is stored with date, time, Code-No., method and test result.

Stored!

The display shows:

The test result is then shown again.

Note:

Storage: 900
free records left

The display shows the number of free data sets.

Storage: only 29
free records left

If there are less than 30 data sets free the display shows:

Clear the memory as soon as possible (see “Deleting stored results”). If memory capacity is used up it would be impossible to save additional test results.

2.3.9 Printing results

If a printer is installed and switched on, it is possible to print out the test results (without saving it before).

F3

Press F3 key.

The entire data set is printed with date, time, Code-No., method and test result. Printing example:

100 Chlor T
0.02-6 mg/l Cl_2
Profi-Mode: no
2003-07-01 14:53:09
Test No.: 1
Code-Nr.: 007
4.80 mg/l Cl_2

The test No. is an internal number that is set automatically if a test result is stored. It appears only at the print out.

2.3.10 Perform additional measurements

Test

To perform additional tests using the same method:

Zero accepted
prepare Test
press TEST

- Press TEST key

The display shows:

Test

Confirm with TEST key

or

Zero

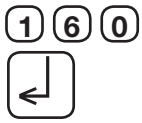
- Press ZERO key to perform a new zero calibration.

prepare Zero
press ZERO

The display shows:

2.3.11 Selecting a new method

Press ESC key to return to method selection.



Or enter the required method number directly,

e.g. [1] [6] [0] for Cyanuric acid.

2.3.11 Measure absorbance

Range: –2600 mAbs to +2600 mAbs

Method-No.	Title
900	mAbs 430 nm
910	mAbs 530 nm
920	mAbs 560 nm
930	mAbs 580 nm
940	mAbs 610 nm
950	mAbs 660 nm

Select the desired wavelength from the method list or by entering the corresponding method-number directly.

The display shows e.g.:

900 mAbs 430 nm
-2600 mAbs - + 2600 mAbs
prepare Zero
press ZERO

Perform zeroing always with a filled (e.g. deionised water) vial.

The display shows:

Zero accepted
prepare Test
press TEST

Perform measurement of the sample.

The display shows e.g.:

500 mAbs

TIP: To ensure reaction times the User-Countdown may be helpful (chapter 2.2.3, page 174).

2.4 Photometer settings <MODE-Menu>

Table of Mode-Functions

MODE-Function	No.	Description	Page
Calibration	40	Performance of fluoride calibration	196
User calibration	45	Storage user calibration	200
Clear calibration	46	Deleting user calibration	201
Clock	12	Setting date and time	185
Countdown	13	Switching the countdown on/off to ensure reaction times	186
Delete data	34	Deleting all stored results	196
Key beep	11	Switching the acoustic signal on/off to indicate key-pressing	184
Langelier	70	Calculation of Langelier saturation Index (Water Balance)	207
Temperature	71	Selection of °C or °F for Langelier Mode 70	208
Language	10	Selecting language	183
LCD contrast	80	Setting the display contrast	209
Method list	60	User method list, adaption	204
Method list all on	61	User method list, switching on all methods	205
Method list all off	62	User method list, switching off all methods	205
Print	20	Printing all stored results	187
Print code-Nr.	22	Print only results of a selected Code-No. range	189
Print date	21	Print only results of a selected time period	188
Print method	23	Print only results of one selected method	190
Printing parameters	29	Setting of printing options	191
Profi-Mode	50	Switching the detailed operator instructions on/off	202
Signal beep	14	Switching the acoustic signal on/off to indicate end of reading	184
Storage	30	Displaying all stored results	192
Storage Code-Nr.	32	Displaying only results of a selected Code-No. range	194
Storage date	31	Displaying only results of a selected time period	193
Storage method	33	Displaying only results of one selected method	195
System-info	91	Information about the instrument e.g. current software-version	209

The selected settings are kept by the photometer also after it was switched off. To change photometer settings a new setting is required.

Selecting a Mode-Function

Press MODE key.

<Mode Menu>

The display shows:

enter the number of the required function
e.g.: [1] [0] for language, or

press arrow key [▼] or [▲] to select the required function from the displayed list.

Confirm with [↲] key.

Perform settings as mentioned below

Finish with ESC key.

2.4.1 Selecting a language

Press [MODE] [1] [0] keys.

Confirm with [↲] key.

<Language>
Deutsch
>> English
Francais

The display shows:

Press arrow key [▼] or [▲] to select the required language from the displayed list.

Confirm with [↲] key.

2.4.2 Acoustic signals (Beeper)

2.4.2.1 Key-beep

Press [MODE] [1] [1] keys.

Confirm with [↵] key.

<Key-Beep>
ON: 1 OFF: 0

The display shows:

- Press [0] key to switch the key beep off.

- Press [1] key to switch the key beep on.

Confirm with [↵] key.

Note:
In the case of methods with reaction periods, an acoustic signal still sounds during the last 10 seconds of the countdown even if the key-beep is switched off.

2.4.2.2 Signal-beep

Performing a zero or a measurement takes 8 seconds. The photometer indicates the end of zeroing or measuring by a short beep.

Press [MODE] [1] [4] keys.

Confirm with [↵] key.

<Signal-Beep>
ON: 1 OFF: 0

The display shows:

- Press [0] key to switch the signal-beep off.

- Press [1] key to switch the signal-beep on.

Confirm with [↵] key.

Note:
In the case of methods with reaction periods, an acoustic signal still sounds during the last 10 seconds of the countdown even if the key-beep / signal-beep is switched off.

2.4.3 Setting Date and time

Press [MODE] [1] [2] keys.

Confirm with [↵] key.

<clock>	
yy-mm-tt	**hh:mm**
_ _-_ _-_ _	_ _:_ _

The display shows:

The entering comprises two digits each.

yy-mm-tt	**hh:mm**
03-05-14	_ _:_ _

Enter year, month and day,

e.g.: 14. Mai 2003 = [0][3][0][5][1][4]

The display shows:

JJ-MM-TT	**hh:mm**
03-05-14	**15:07**

Enter hours and minutes

e.g.: 3.07 p.m. = [1][5][0][7]

Confirm with [↵] key.

Note:
While conforming date and time with [↵] key the seconds are adjusted to zero automatically.

2.4.4 Countdown (Ensuring reaction periods)

Some methods require a reaction period. This reaction period is incorporated in the method as standard by the countdown function.
It is possible to switch the countdown off for all methods:

Press [MODE] [1] [3] keys.

Confirm with [↵] key.

<Countdown>
ON: 1 OFF: 0

The display shows:

- Press [0] key to switch the countdown off.

- Press [1] key to switch the countdown on.

Confirm with [↵] key.

Note:
It is possible to finish the working countdown by pressing the [↵] key (application e.g. serial analysis).
The “user-countdown” is also available if the countdown is switched off.

NOTE
If the countdown function is switched off, the operator is responsible for ensuring the necessary reaction period by himself. **Non-compliance with reaction periods lead to incorrect test results.**

2.4.5 Printing results

2.4.5.1 Printing all results

Press MODE [2] [0] keys.

Confirm with [↲] key.

```
<Printing>
Print all Data
      Start:  ↲
      end:    ESC
```

The display shows:

Press [↲] key for printing out all stored test results.

The display shows e.g.:

```
Test No.:
```

After printing the photometer goes back to <Mode-Menu> automatically.

Note:
All stored data are printed out.

2.4.5.2 Printing results of a selected time period

Press MODE [2] [1] keys.

Confirm with [↲] key.

<Print>
sorted: date
from yy-mm-dd
__-__-__

The display shows:

Enter year, month and day for the first day of the required period, e.g.: 14 Mai 2003 = [0][3][0][5][1][4]

Confirm with [↲] key.

from yy-mm-dd
__-__-__

The display shows:

Enter year, month and day for the last day of the required period, e.g.: 19 Mai 2003 = [0][3][0][5][1][9]

Confirm with [↲] key.

from 2003-05-14
to 2003-05-19
Start: ↲
cancel: ESC

The display shows:

Press [↲] key and all stored results in the selected date range are printed.

After printing the photometer goes back to mode menu automatically.

Note:
It is possible to cancel the entering by [ESC].
If you want to print only results of one day enter the same date twice to characterise the period.

2.4.5.3 Printing results of a selected Code-No. range

Press MODE [2] [2] keys.

Confirm with [↲] key.

<Print>
sorted: Code-No.
_ _ _ _ _ _

The display shows:

Enter numeric code number (up to 6 places) for the first required Code-No., e.g.: [1].

Confirm with [↲] key.

to _ _ _ _ _ _

The display shows:

Enter numeric code number (up to 6 places) for the last required Code-No., e.g.: [1] [0].

The display shows:

from 000001
to 000010
Start: ↲
cancel: ESC

Press [↲] key and all stored results in the selected Code-Number range are printed.

After printing the photometer goes back to mode menu automatically.

Note:
It is possible to cancel the entering by [ESC].
If you want to print only results of one Code-Number enter the same Code-Number twice.
If you want to print all results without Code-No. (Code-Nr. is 0) enter Zero [0] twice.

2.4.5.4 Printing results of one selected method

Press MODE [2] [3] keys.

Confirm with [↲] key.

```
<Print>
>>20 Acid demand
   30 Alkalinity-total
   40 Aluminium T
```

The display shows:

Select the required method from the displayed list or enter the method-number directly.

Confirm with [↲] key.

In case of differentiated methods select the required kind of determination and confirm with [↲] key.

The display shows:

```
<Print>
method
30 Alkalinity-total
Start:    ↲
cancel: ESC
```

Press [↲] key and all stored results of the selected method are printed.

After printing the photometer goes back to mode menu automatically.

2.4.6 Printing Parameter

Press MODE [2] [9] keys.

Confirm with [↲] key.

```
<printing parameter>
1: Flow control
2: Baud rate

end:                ESC
```

The display shows:

Press [1] key to select "Protocol".

```
<Flow Control>
is: Hardware
select:   [▲] [▼]
save:               ↲
end:                ESC
```

The display shows:

Press arrow key [▼] or [▲] to select the required Protocol (Xon/Xoff, Hardware, no control)

Confirm with [↲] key.

Finish with ESC key.
Flow Control will be set to the selection displayed at "is".

Press [2] key to select "Baudrate".

```
<Baud rate>
is: 19200
select:   [▲] [▼]
save:               ↲
end:                ESC
```

The display shows:

Press arrow key [▼] or [▲] to select the required Baudrate. (600, 1200, 2400, 4800, 9600, 14400, 19200)

Confirm with [↵] key.

Finish with ESC key.

Back to Mode-Menu with ESC key.

Back to Method selection with ESC key.

Note:
Select “Hardware” as Protocol and “19200” as Baudrate if you use the printer DP 1012. For setting of the printer see chapter 2.5.1 Connection to a printer.

2.4.7 Recall stored results

2.4.7.1 Recall all stored results

Press [MODE] [3] [0] keys.

Confirm with [↵] key.

```
<Storage>
display all data
          Start:
↵         cancel:   ESC
```

The display shows:

The stored data sets are displayed in chronological order, started with the latest stored test result.

- Press [↵] key and all stored results in the selected date range are displayed.
- Press [F3] key to print the displayed result.
- Press [F2] key to print all selected results.
- End with [ESC].

- Press arrow key [▼] to display the following test result.

- Press arrow key [▲] to display the previous test result.

```
no data
```

If there are no test results in memory the display shows:

2.4.7.2 Recall results of a selected time period

Press MODE [3] [1] keys.

Confirm with [↲] key.

<Storage>
sorted: date
from yy-mm-dd
__-__-__

The display shows:

Enter year, month and day for the for the first day of the required period, e.g.: 14 Mai 2003 = [0][3][0][5][1][4]

Confirm with [↲] key.

from yy-mm-dd
__-__-__

The display shows:

Enter year, month and day for the last day of the required period, e.g.: 19 Mai 2003 = [0][3][0][5][1][9]

Confirm with [↲] key.

from 2003-05-14
to 2003-05-19
Start: ↲ cancel: ESC
print: F3
print all: F2

The display shows:

- Press [↲] key and all stored results in the selected date range are displayed.
- Press [F3] key to print the displayed result.
- Press [F2] key to print all selected results.
- End with [ESC].

Note:
It is possible to cancel the entering by [ESC].
If you want to recall only results of one day enter the same date twice to characterise the time period.

2.4.7.3 Recall results of a selected Code-No. range

Press MODE [3] [2] keys.

Confirm with [↲] key.

```
<Storage>
sorted: Code-No.
_ _ _ _ _ _
```

The display shows:

Enter numeric code number (up to 6 places for the first required Code-No., e.g.: [1].

Confirm with [↲] key.

```
to _ _ _ _ _ _
```

The display shows:

Enter numeric code number (up to 6 places) for the last required Code-No., e.g.: [1] [0].

Confirm with [↲] key.

```
from    000001
to      000010
Start:  ↲ cancel: ESC
print: F3
print all: F2
```

The display shows:

- Press [↲] key and all stored results in the selected Code-No. range are displayed.
- Press [F3] key to print the displayed result.
- Press [F2] key to print all selected results.
- End with [ESC].

Note:
It is possible to cancel the entering by [ESC].
If you want to recall only results of one Code-Number enter the same Code-Number twice.
If you want to recall all results without Code-No. (Code-Nr. is 0) enter Zero [0] twice.

2.4.7.4 Recall results of one selected method

Press MODE [3] [3] keys.

Confirm with [↲] key.

<Storage>
>>20 Acid demand
30 Alkalinity-total
40 Aluminium T

The display shows:

Select the required method from the displayed list or enter the method-number directly.

Confirm with [↲] key.

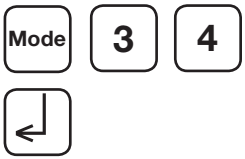
In case of differentiated methods select the required kind of determination and confirm with [↲] key.

The display shows:

<Storage>
method
30 Alkalinity-total
Start: ↲ cancel: ESC
print: F3
print all: F2

- Press [↲] key and all stored results of the selected method are displayed.
- Press [F3] key to print the displayed result.
- Press [F2] key to print all selected results.
- End with [ESC].

2.4.8 Delete stored results



Press MODE [3] [4] keys.

Confirm with [↲] key.

The display shows:

<Delete data>
Delete all data?
YES : 1 NO : 0

- Press [0] key to retain the data sets in memory.

- After pressing key [1] the following acknowledgment is displayed:

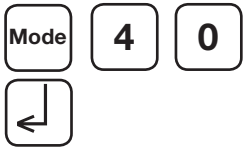
<Delete data>
Delete data ↲
Do not delete: ESC

Press [↲] key to delete.

ATTENTION:
All stored test results are deleted.
or cancel without deleting data by pressing [ESC] key.

Note:
All stored test results are deleted.

2.4.9 Calibration (Fluoride)



Regard notes!

Press MODE [4] [0] keys.

Confirm with [↲] key.

The display shows:

<Calibration>
170 Fluoride
Zero: deionised water
press ZERO

1. Fill a clean vial (24 mm ø) with exact **10 ml of deionised water**, close the vial with the cap tightly.
2. Place the vial in the sample chamber making sure that the marks ⧖ are aligned.

3. Press **ZERO** key.

4. Remove the vial from the sample chamber.

5. Add **exact 2 ml SPADNS reagent solution** to the water sample. **Caution: Vial is filled up to the top!**

6. Close the vial with the cap tightly and swirl the vial gently several times to mix the contents.

7. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Zero accepted
T1: 0 mg/l F
press TEST

8. Press **TEST** key.

9. Remove the vial from the sample chamber, empty the vial, rinse vial and cap several times and fill the vial with exact **10 ml Fluoride standard** (Concentration 1 mg/l F).

10. Add **exact 2 ml SPADNS reagent solution** to the Fluoride standard.
Caution: Vial is filled up to the top!

T1 accepted
T2: 1 mg/l F
press TEST

11. Place the vial in the sample chamber making sure that the ⧖ marks are aligned.

Calibration accepted
↵

12. Press **TEST** key.

The display shows:

Confirm with [↵] key.

Back to Method selection with ESC key.

Select Method Fluoride with keys [1][7][0] und [↵].

Note:

The same batch of SPADNS reagent solution must be used for adjustment and test. The adjustment process needs to be performed for each new batch of SPANDS reagent solution (see Standard Methods 20th, 1998, APHA, AWWA, WEF 4500 F D., S. 4-82).

As the test result is highly dependent on exact sample and reagent volumes, the sample and reagent volumes should always be metered by using a 10 ml resp. 2 ml volumetric pipette (class A).

Error, absorbance
T2>T1
↵

If there appears an error message please repeat adjustment.

2.4.10. User-Calibration

If a test method is user calibrated the method name is displayed inverse.

Procedure:

- Prepare a standard of known concentration and use this standard instead of the sample according to the test procedure.
- It is recommend to use well known standards which are formulated according to DIN EN, ASTM or other international norms or to use certified standards which are commercially available.
- After measuring this standard solution it is possible to change the displayed results to the required value.
- If a method use a mathematic equation for the calculation of the result, it is only possible to calibrate the basic tests since all the other tests use the same polynom.
- The same applies for some test procedures which use a polynom of another test procedure.

Return to factory calibration:

If the user calibration is deleted the factory calibration is automatically activated.

Remarks:

The method "Fluoride" cannot be calibrated with mode 45 since the test requires a calibration related to the batch of the liquid reagent (SPADNS) (mode 40, chapter "calibration (fluoride)").

Table

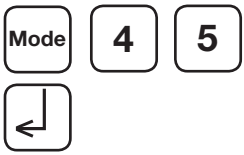
No.	Method	Recommended range for user user-calibration
20	Acid demand	1-3 mmol/l
35	Alkalinity-p	100-300 mg/l $CaCO_3$
30	Alkalinity-total	50-150 mg/l $CaCO_3$
40	Aluminium T	0.1-0.2 mg/l Al
50	Aluminium PP	0.5-1 mg/l Al
60	Ammonium T	0.3-0.5 mg/l N
65	Ammonium LR TT	1 mg/l N
66	Ammonium HR TT	20 mg/l N
85	Boron	1 mg/l B
80	Bromine	Calibration with basic test 100 Chlorine free
90	Chloride	10-20 mg/l Cl
100	Chlorine T	0.5-1.5 mg/l Cl
101	Chlorine L	Calibration with basic test 100 Chlorine free
110	Chlorine PP	0.5-1 mg/l Cl_2
105	Chlorine (KI) HR	70-150 mg/l Cl
120	Chlorine dioxide	Calibration with basic test 100 Chlorine free
130	COD LR	100 mg/l O_2
131	COD MR	900 mg/l O_2
132	COD HR	9 g/l O_2
150	Copper T	0.5-1.5 mg/l Cu

No.	Method	Recommended range for user user-calibration
153	Copper PP	2 mg/l Cu
157	Cyanide	0.1-0.3 mg/l CN
160	Cyanuric acid	30-60 mg/l Cys
165	DEHA T	200-400 µg/l DEHA
167	DEHA PP	200 µg/l DEHA
170	Fluoride	Calibration with 0 und 1 mg/l F through Mode 40
190	Hardness, Calcium	100-200 mg/l $CaCO_3$
200	Hardness, total	15-25 mg/l $CaCO_3$
205	Hydrazine P	0.2-0.4 mg/l N_2H_4
207	Hydrazine C	0.2-0.4 mg/l N_2H_4
210	Hydrogen peroxide	Calibration with basic test100 Chlorine free
215	Iodine	Calibration with basic test 100 Chlorine free
220	Iron T	0.3-0.7 mg/l Fe
222	Iron PP	1 mg/l Fe
223	Iron (TPTZ) PP	1 mg/l Fe
240	Manganese T	1-2 mg/l Mn
242	Manganese PP	0.2 mg/l Mn
265	Nitrate TT	10 mg/l N
270	Nitrite LR	0.2-0.3 mg/l N
280	Nitrogen, total LR	10 mg/l N
281	Nitrogen, total HR	50-100 mg/l N
300	Ozone (DPD)	Calibration with basic test 100 Chlorine free
290	Oxygen, active	Calibration with basic test 100 Chlorine free
292	Oxygen, dissolved	possible against meter for dissolved oxygen
280	Nitrogen, total LR	10 mg/l N
281	Nitrogen, total HR	50-100 mg/l N
329	pH- Value LR	6.0-6.6
330	pH- Value T	7.6-8.0
331	pH- Value L	7.6-8.0
332	pH- Value HR	8.6-9.0
70	PHMB	15-30 mg/l
320	Phosphate LR T	1-3 mg/l PO_4
321	Phosphate HR T	30-50 mg/l PO_4
323	Phosphate, ortho PP	0.3 mg/l PO_4
324	Phosphate, ortho TT	3 mg/l PO_4
327	Phosphate 1, ortho C	20-30 mg/l PO_4
328	Phosphate 2, ortho C	1-3 mg/l PO_4
325	Phosphate, total TT	0.3-6 mg/l P
326	Phosphate, hydr. TT	0.3-0.6 mg/L P
350	Silica	0.5-1.5 mg/l SiO_2
351	Silica LR PP	1 mg/l SiO_2
352	Silica HR PP	50 mg/l SiO_2
360	Sulfate PP	50 mg/l SO_4
355	Sulfate T	50 mg/l SO_4
365	Sulfide	0.2-0.4 mg/l S
370	Sulfite	3-4 mg/l SO_3
390	Urea	1-2 mg/l CH_4N_2O
400	Zinc	0.2-0.4 mg/L Zn

2.4.10.1 Store user-calibration

100 Chlorine T
0.02-6 mg/l Cl2
0.90 mg/l free Cl2

Perform the required method as described in the manual using a standard of know concentration instead of the water sample.



If the test result is displayed press MODE [4] [5] keys and confirm with [↲] key.

The display shows:

<user calibration>
100 Chlorine T
0.02-6 mg/l Cl2
0.90 mg/l free Cl2
up: ↑, down: ↓
save: ↲

Pressing the arrow key [▲] once increases the displayed result.

Pressing the arrow key [▼] once decreases the displayed result.

Press keys as long as the displayed result corresponds to the value of the standard.

Confirm with [↲] key to store the new calibration factor.

Cancel user calibration by pressing [ESC] key.

Jus Factor
saved

The display shows:

100 Chlorine T
0.02-6 mg/l Cl2
1.00 mg/l free Cl2

Now the method name is displayed inverse and the test result is calculated with the new calibration factor.

2.4.10.2 Delete user-calibration

100 Chlorine T
0.02-6 mg/l Cl2

This chapter only applies for methods which can be user-calibrated.

prepare ZERO
press ZERO

Select the required method.

Mode **4** **6**

Instead of zeroing the instrument press [MODE] [4] [6] keys and confirm with [↲] key.

The display shows:

<user calibration>
100 Chlorine T
0.02-6 mg/l Cl2
clear user
calibration?
YES: 1, NO: 0

1

Press [1] key to delete user-calibration.

0

Press [0] key to keep the valid user-calibration.

The instrument goes back to Zero-query automatically.

2.4.11 Lab function (Profi-Mode)

This function may be used for routine analyses with many samples of one method.
The following information is always stored in the methods:

a) Method
b) Range
c) Date and time
d) Differentiation of results
e) Detailed operator instruction
f) Compliance with reaction periods

If the Profi-Mode is active, the photometer provides only a minimum of operator instructions.
The criteria specified above d, e, f are not longer included.

Press [MODE] [5] [0] keys in succession.

Confirm with [↵] key.

<Profi-Mode>
ON : 1 OFF : 0

The display shows:

- Press [0] key to switch the Profi-Mode off.

- Press [1] key to switch the Profi-Mode on.

switched off

The display shows:

or

switched on

Confirm with [↵] key.

Note:

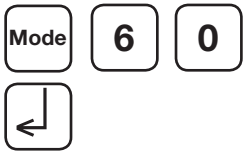
Storage of test results is possible. In case of stored test results the display shows “Profi-Mode” additionally.
The selected settings are kept by the photometer also after it was switched off. To change photometer setting a new setting is required.

2.4.12 Blank Page because of technical requirements

2.4.13 User-method list

After switching on the instrument a scroll list of all available methods is automatically shown in the display. To shorten this list according to the requirements of the user it is possible to create a user defined scroll list.
The program structure requires that this list must have at least one active (switched on) method. For this reason it is necessary to activate first all the required methods and than to switch off the automatic activated one if this one is not required.

2.4.13.1 User-method list, adaption



Press MODE [6] [0] keys.

Confirm with [↲] key.

```
<method list>
selected: •
toggle: F2
save: ↲
cancle: ESC
```

The display shows:

Start with [↲] key.

```
<method list>
>> 30•Alkalinity-tot
   40•Aluminium
   50•Ammonium
....
```

The complete method list is displayed.

Methods with a point [•] behind the method number will be displayed in the method selection list. Methods without a point will not be displayed in the method selection list.

```
>> 30•Alkalinity-tot
          [F2]
>> 30 Alkalinity-tot
          [F2]
>> 30•Alkalinity-tot
```

Press key [▲] or [▼] to select the required method from the displayed list.

Switch with [F2] key between “active” [•] und “inactive” [ ].

Select next method, activate or inactivate it and so on.

Confirm with [↲] key.

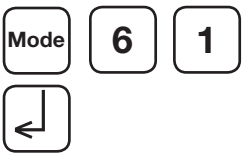
Cancel without storing by pressing [ESC] key.

Recommendation:

If only a few methods are required it is recommendable to perform Mode 62 first, followed by Mode 60.

2.4.13.2 User-method list, switch all methods on

This mode function activates all methods. After switching on the instrument a scroll list of all available methods is automatically shown in the display.

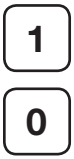


Press MODE [6] [1] keys.

Confirm with [↵] key.

<Mlist all on>
switch on all
methods
YES: 1, NO: 0

The display shows:

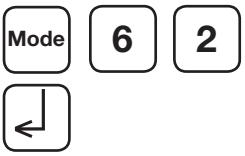


- Press [1] key to display all methods in the method selection list.
- Press [0] key to keep the valid method selection list.

The instrument goes back to mode-menu automatically.

2.4.13.3 User-method list, switch all methods off

The program structure requires that the method list must have at least one active (switched on) method. For this reason the instrument activates one method automatically.



Press MODE [6] [2] keys.

Confirm with [↵] key.

<Mlist all off>
switch off all
methods
YES: 1, NO: 0

The display shows:

- Press [1] key to display only one method in the method selection list.
- Press [0] key to keep the valid method selection list.

The instrument goes back to mode-menu automatically.

2.4.14 Blank Page because of technical requirements

2.4.15 Langelier Saturation Index (Water Balance)

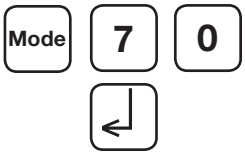
For calculation the following tests are required:

- pH Value
- Temperature
- Calcium hardness
- Total Alkalinity
- TDS (Total Dissolved Solids)

Run the test separately and note the results.
Calculate the Langelier Saturation Index as described:

2.4.15.1 Calculation of Langelier Saturation Index

With Mode 71 (see below) it is possible to select between degree Celsius or degree Fahrenheit.



Press MODE [7] [0] keys.

Confirm with [↵] key.

<Langelier>
temperature °C:
3°C <=T<=53°C
+_ _ _ _

The display shows:

Enter the temperature value (T) in the range between 3 and 53°C and confirm with [↵] key.
If °F was selected, enter the temperature value in the range between 37 und 128°F.

calcium hardness
50<=CH<=1000
+_ _ _ _

The display shows:

Enter the value for Calcium hardness (CA) in the range between 50 and 1000 mg/l $CaCO_3$ and confirm with [↵] key.

tot. alkalinity
5<=TA<=800
+_ _ _ _

The display shows:

Enter the value for Total Alkalinity (TA) in the range between 5 and 800 mg/l $CaCO_3$ and confirm with [↵] key.

total dissol. solids
0<=TDS<=6000
+_ _ _ _

The display shows:

Enter the value for TDS (Total Dissolved Solids) in the range between 0 und 6000 mg/l and confirm with [↵] key.

pH value **0<=pH<=12** **+_ _ _ _**	The display shows:
	Enter the pH Value in the range between 0 and 12 and confirm with [↲] key.
<Langelier> **Langelier** **saturation index** **0.00** **Esc ↲**	The display shows the Langelier Saturation Index. Press [↲] key to start new calculation. Return to mode menu by pressing [ESC] key.

Examples:

Operating error:

Values out of defined range:

CH<=1000 mg/l CaCO3!	The entered value is to high.
CH>=50 mg/l CaCO3!	The entered value is to low.
	Confirm display message with [↲] key and enter a value in the defined range.

Notes:

If the index is zero the water is in perfect balance.

If the index is minus the water is aggressive and tends to be corrosive.

If the index is positive the water is non aggressive but has the ability of scale-forming.

2.4.15.2 Selection of temperature unit

Entering the temperature value is possible in degree Celsius or degree Fahrenheit. Therefore the following preselection is (once) required.

Mode **7** **1**	Press MODE [7] [1] keys.
	Confirm with [↲] key.
<temperature> **1: °C 2: °F**	The display shows:
1	Press [1] key to select degree Celsius.
2	Press [2] key to select degree Fahrenheit.
	The instrument goes back to mode menu automatically.

2.4.16 Adjusting display contrast

Press [MODE] [8] [0] keys.

Confirm with [↵] key.

<LCD contrast>
[▲] [▼]

The display shows:

- Press arow key [▲] to increase contrast of the LCD display.

- Press arrow key [▼] to decrease contrast of the LCD display.

Confirm with [↵] key.

2.4.17 Photometer-Information

Press [MODE] [9] [1] keys.

Confirm with [↵] key.

<System-Info>
Software:
V012.002.3.003.002
mains power:
yes
more: ▼, cancel: Esc

This method informs you about the current software version, about the current detected mains power supply, about the number of performed tests and free memory capacity.

[▼]

<Sysem-Info>
Number of Tests:
139
free records left
999
cancel: Esc

Finish with ESC key.

2.5 Data transfer

Switch the photometer and the personal computer or printer off. Connect the photometer (RS232 interface) and the serial interface of the personal computer or printer using a cable in line with the specified assignment (see technical data). The cable for connection to a personal computer is included in delivery contents.

2.5.1 Connection to a printer

Printer with a serial connection are suitable for connection with the photometer (see chapter 3.4 Technical data interface).

A suitable paper tabel printer is the printer DP 1012.

Before using the printer DP 1012 with the Photometer you should change the following standard adjustments:
(Detailed information of changing the adjustment you will find in the printer manual).

Data bits:	**8**
Parity:	**None**
Baud-rate:	**19200**
Country:	**UK**
Print mode:	**Text**
Auto-off :	**5 Min.**
Emulation:	**Standard**
DTR:	**Normal**

Note: The printer must be connected and switched on before printing.

Caution: Adjust printing parameter in Mode 29. See chapter 2.4.6 Printing Parameter.

2.5.2 Data transfer to a personal computer

Transferring test results from the photometer to a personal computer requires a transfer program, e.g. HyperTerminal.
Please find detailed information at our homepage on the download-area.

2.5.3 Internet-Updates

It is possible to update new software applications and additional languages via internet. Please find detailed information at our homepage on the download-area.

Remark:
To prevent loss of stored test results store or print out them before performing an Update.

2.6 Blank Page because of technical requirements

2.6 Blank Page because of technical requirements

2.6 Blank Page because of technical requirements

2.6 Blank Page because of technical requirements

Part 3 Enclosure

3.1 Unpacking

Carefully inspect all items to ensure that every part of the list below is present and no visible damage has occurred during shipment. If there is any damage or something is missing, please contact your local distributor immediately.

3.2 Delivery content

Standard content of CW3000 Colorimeter

☑

- ❑ 1 Photometer in plastic case
- ❑ 1 Adapter for 16 mm ø vials
- ❑ 1 Cap for adapter
- ❑ 2 Protective caps for connections
- ❑ 1 Rechargeable battery set (7 Nickel Cadmium cells; Type AA)
- ❑ 1 Lithium battery (CR 2032; 3V)
- ❑ 1 Mains adapter, 100 – 240 V, 50 – 60 Hz
- ❑ 1 Cable for connection to PC
- ❑ 3 Round vials with cap, height 48 mm, ø 24 mm
- ❑ 3 Round vials with cap, height 90 mm, ø 16 mm
- ❑ 1 Beaker cup, plastic, 100 ml
- ❑ 1 Cleaning brush
- ❑ 1 Stirring rod, plastic
- ❑ 1 Syringe, plastic, 2 ml
- ❑ 1 Syringe, plastic, 5 ml
- ❑ 1 Syringe, plastic, 10 ml
- ❑ 1 Instruction manual
- ❑ 1 Guarantee declaration

Reagent sets are not part of the standard scope of delivery. Please see the General Catalogue for details of available reagent sets.

3.3 Blank Page because of technical requirements

3.4 Technical data

Display	Graphic-Display (7-line, 21-characters)
Serial Interface	serial RS232 for printer- and PC-connection; 9-pin D-sub-mail connector, data format ASCII, 8-bit Data, no parity, 1 start-bit, 1 stop-bit, baud rate and protocol: adjustable Pin assignation: Pin 1 = free — Pin 6 = free Pin 2 = Rx Data — Pin 7 = RTS Pin 3 = Tx Data — Pin 8 = CTS Pin 4 = free — Pin 9 = free Pin 5 = GND
Light source	LEDs and photo sensor amplifier in protected cell compartment. Wave length ranges: λ1 = 530 nm IF Δλ = 5 nm λ2 = 560 nm IF Δλ = 5 nm λ3 = 610 nm IF Δλ = 6 nm λ4 = 430 nm IF Δλ = 5 nm λ5 = 580 nm IF Δλ = 5 nm λ6 = 660 nm IF Δλ = 5 nm IF = Interference filter
Photometric accuracy*	0.100 Abs ± 0.008 Abs 1.000 Abs ± 0.020 Abs
Operation	Acid and solvent resistant touch-sensitive keyboard with integral beeper as acoustic indicator.
Power supply	7 Nickel Cadmium cells (Type AA with 750 mAh); external main adapter (Input: 100-240 V, 50-60 Hz; Output: 15V=/530 mA) Lithium battery (CR 2032, 3V); for keeping data if there is no power supply from the rechargeable batteries or the main adapter
Auto off	20 minutes after last function, 30 seconds acoustical signal before switch off
Charging time	approx. 10 hours
Dimensions	approx. 265 x 195 x 70 mm (unit) approx. 440 x 370 x 140 mm (case)
Weight (unit)	approx. 1000 g (with main adapter and rechargeable batteries)
Working condition	5 – 40°C at max. 30-90% relative humidity (without condensation)
Language options	English, German, French; Spanish, Italian further languages via Internet-Update
Storage capaity	ca. 1000 data sets

Subject to technical modification!

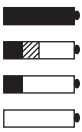
* measured with standard solutions

3.4 Blank Page because of technical requirements

3.5 Abbreviations

Abbreviation	Definition
°C	degree Clelsius (Centigrade)
°F	degree Fahrenheit °F = (°C x 1.8) + 32
° dH	degree German Hardness
° fH	degree French hardness
°eH	degree English Hardness
°aH	degree American Hardness
Abs	Absorbtion unit
µg/l	(= ppb) Micro gramme per liter
mg/l	(= ppm) Mili gramme per liter
g/l	(= ppth) Gramme per liter
$K_{S4.3}$	Acid demand to pH 4.3 – this method is similar to the Total Alkalinity but converted into the unit “mmol/l”, as the German DIN 38409 demand.
TDS	Total Dissolved Solids
LR	Low Range
MR	Medium Range
HR	High Range
C	Reagents of Chemetrics©
L	Liquid reagent
P	Powder (-reagent)
PP	Powder Pack
T	Tablet
TT	Tube Test
DEHA	N,N-Diethylhydroxylamine
DPD	Diethyl-p-phenylendiamine
DTNB	Ellmans reagent
PAN	1-(2-Pyridylazo)-2-napthol
PDMAB	Paradimethylaminobenzaldehyde
PPST	3-(2-Pyridyl)-5,6-bis(4-phenylsulfonic acid)1,2,4-triazine
TPTZ	2,4,6-Tri-(2-Pyridyl)-1,3,5-triazine

3.6 Troubleshooting
3.6.1 Operating messages in the display / error display

Display	Possible Causes	Elimination
Overrange	reading is exceeding the range water sample is too cloudy to much light on the photo cell	if possible dilute sample or use other measuring range filtrate water sample seal on the cap? Repeat measurement with seal on the cap of the vial.
Underrange	result is under the detection limit	indicate result with lower x mg/l x = low end of measuring range; if necessary use other analytical method
Storage- system error use Mode 34	mains power fails or is not existing	insert or change Lithium battery Delete Data with Mode 34.
capacity of recharge- able battery 	full capacity warning signal every 3 minutes warning signal every 12 seconds warning signal, the instrument switches itself off	capacity of the rechargeable battery is too low charge the rechargeable battery; operate instrument with mains adapter
Jus Overrange E4	The user calibration is out of the accepted range	Please check the standard, reaction time and other possible faults. Repeat the user calibration.
Jus Underrange E4		
Overrange E1	The concentration of the standard is too high/too low, so that during user-calibration the limit of the range was exceeded	Perform the test with a standard of higher/lower concentration
Underrange E1		
E40 user calibration not possible	If the display shows Overrange/ Underrange for a test result a user calibration is not possible	Perform the test with a standard of higher/lower concentration

Display	Possible Causes	Elimination
Zero not accepted	Light absorption is too great or too low	Refer to chapter 2.3.4 Performing Zero (page 178) Clean sample chamber. Repeat zeroing.
??? Example 1 0.60 mg/l free Cl ??? comb Cl 0.59 mg/l total Cl Example 2 Underrange ??? comb Cl 1.59 mg/l total Cl Example 3 0.60 mg/l free Cl comb Cl Overrange	The calculation of a value (e.g. combined Chlorine) is not possible	**Test procedure correct?** If not --- repeat test Example 1: The readings for free and total Chlorine are different, but considering the tolerances of each reading they are the same. For this reason the combined Chlorine is most likely zero. Example 2: The reading for free Chlorine is under the detection limit. The instrument is not able to calculate the combined Chlorine. In this case the combined Chlorine is most likely the same as the total Chlorine. Example 3: The reading for total chlorine is exceeding the range. The instrument is not able to calculate the combined chlorine. The test should be repeated with a diluted sample.
Error absorbance e.g.: T2>T1	calibration of Fluoride was	Repeat calibration
Printer “timeout”	printer switched off; no connection	Connect printer Check connections Switch printer on

3.6.2 General problems

Problem	Possible Causes	Elimination
Test result deviates from the expected	Chemical species not as required	Press arrow keys to select the required chemical species.
No differentiation: e.g. for the test Chlorine there is no selection between differentiated, free or total.	Profi-Mode is switched on	Switch Profi-Mode off with Mode 50.
The pre-programmed countdown is not displayed.	Countdown is not activated and/or the Profi-Mode is activated.	Switch the countdown on with Mode 13 and/or switch the Profi-Mode off with Mode 50.
It seems that a method is not available.	Method is not activated in the user method list.	Activate the required method in the user method list with Mode 60.
Instrument can be operated with the mains adapter but not with the rechargeable batteries.	Rechargeable batteries are not charged or defect. Fuse (Type A, inert, 20 mm) may be defect.	Charge rechargeable batteries or change them. If the problem still exists change fuse.

Choice, Service and Trust

camlab

Camlab Limited , Camlab House, Norman Way, Over
Cambridge CB4 5WE
Tel: 01954 233110 • Fax: 01954 233101
www.camlab.co.uk