DINKOTEST

Manual of Photometer Methods for Water Analysis

Photometer *DINKO* D-101	Digital reader AB - T% - PPM
Photometer *DINKO* D-100	Digital reader T% - PPM direct - Memory
Photoanalyzer *DINKO* D-105	Digital reader AB - T% - PPM direct Accessible memory

Kits for quick analysis of water

The analysis of industrials and drinkable waters had today a great importance because the incessant increase of the consumption and the growing demands in the control of their quality.
The Dinkotest system contributes precision, speed and the necessary simplicity for this purpose. The photometric kits for analysis of waters and the Photometers *DINKO* constitutes the system *DINKOTEST* for the analysis of waters.
A Photometer is used to identify substances and concentrations.
Let us consider the following: The matter absorbs energy when it is in front of an energy source, just as sound or light. Due to their different atomic structure each substance only absorbs energy among certain levels, and the energy is proportional to the wavelength ,

$E = hc / \lambda$, where

h = constant of Plank
c = speed of the light
λ = wavelength of the light
The Photometer measures the quantity of light absorbed to different wavelengths of the incident light . With the results you can trace a graph with light absorbed in front of the wavelength to know which wavelength absorbs the investigated substance. Using this wavelength you can determinate the concentration of the substance. When light beam impacts in a sample, a quantity is absorbed and another transmitted.

The transmittance (T) is defined as the proportion between the transmitted intensity of the light beam (Lt) and the initial intensity of the light beam (Lo):

$$T = Lt / Lo$$

The absorbance (A) is defined as : $A = \log (1 / T)$

Therefore the Absorbancia is directly proportional to the concentration.

$$A = e\ b\ C$$

where

A = Absorbance
C = Concentration in mol /l.
b = it is the width of the sample cuvette in cm.
e = constant proportional called molar absorbance (1 / mol - cm).

This lineal relationship is known as the “Law of Beer", see fig. 2.
Therefore if we have a standard sample with an absorbance and well-known the concentration will be easy to establish the concentration of an unknown sample of the same substance applying the law of Beer.

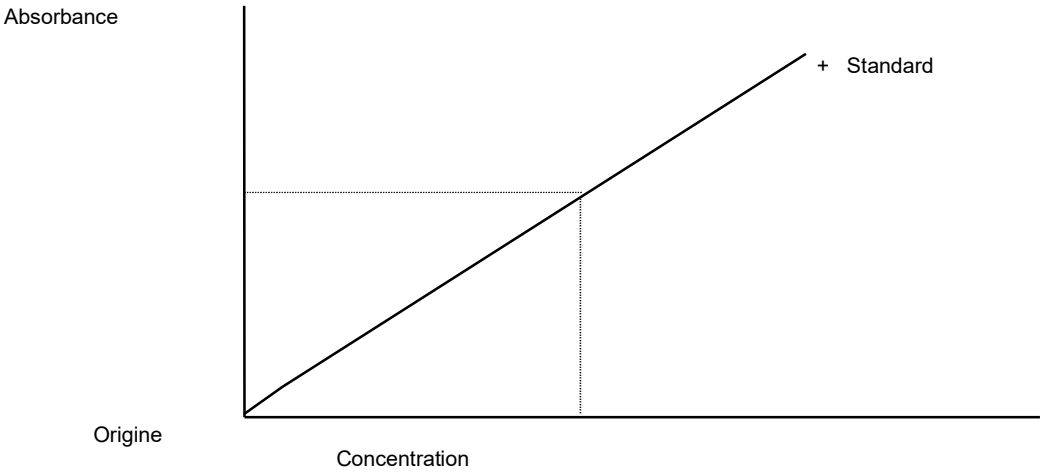

Fig. 2 “ Law of Beer “

The straight line are theoretical and in the reality they spread to be curved by what becomes necessary to determine experimentally and for each parameter their calibration curves.
The *DINKO* Photometer offers these calibration curves in combination with the kits of *DINKO*.
The reagents of the kits are presented in tablets with aluminium blister to facilitate the use, the stability, exact dosage and the biggest possible compactness.

The test is carried out adding tablets to the sample of water and reading the absorbance or concentrations directly in the Photometer.
The available Photometers contributes different ways to obtain the looked concentration. With the Photometer D-101 the reading of absorbance of the parameter is gotten and with the help of the calibration charts ABS – mg/L, included with each kit, the corresponding concentration.

Range: 0- 5.0 mg / L Fe **Iron** **520 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0			0,03	0,11	0,18	0,26	0,33	0,41	0,48	0,56
0,1	0,64	0,71	0,79	0,86	0,94	1,02	1,11	1,20	1,29	1,39
0,2	1,48	1,57	1,66	1,75	1,84	1,94	2,03	2,11	2,20	2,28
0,3	2,37	2,45	2,54	2,62	2,71	2,79	2,88	2,97	3,06	3,17
0,4	3,27	3,38	3,48	3,58	3,69	3,79	3,90	4,00	4,11	4,22
0,5	4,32	4,43	4,54	4,65	4,75	4,86	5,00			

If Photometer reading of 0,35 absorbance is obtained at wavelength of 520 nm, then the iron concentration in the sample is 2,79 mg/L. The first column offers us the units and tenth of absorbance (0,3) and the first line the absorbancia hundredth (0,05). The intersection shown in color gives us the reading of 2,79 mg/L.

The Photometer D-100 and Photoanalizer D-105 avoids the use of charts, because has them memorized and, also, improves the selectivity of the methods, because using filters of high resolution.

The kits is manufactured in two sizes, 50 and 250 test, while the kits " Test Tube " that incorporate the necessary reagents in tubes of 16 mm of diameter, is presented in box of 25 tubes. It is the case of the kits for the test of the Chemical Oxygen Demand (COD) and others as the Total Phosphorous or the Total Nitrate that require a previous digestion of the sample in the same tubes of the kit.
The incubation of the tubes is carried out with the Heater D-65 with thermal block for 24 tubes or the Heater D-64D with block of 12 tubes.

The instructions are included in the boxes of the kits and in this manual you will be able to find details about the chemical method, their traceability and associate uncertainties.

Dilutions and ranges

The analyses are carried out directly in the cuvettes, included with the photometers, provided of an 10 ml. mark that is the quantity of sample usually employee.

To assure the accuracy of the results obtained in the tests it is very important that the cuvette stay under good conditions. The cuvette should clean and to dry off carefully once used. The dirt can be eliminated by immersion in a weak solution of soap. All spotted or grated cuvette should be eliminated.

Sometimes the concentration of the parameter is very high and it surpasses the range of the kit. It will be necessary to make a previous dilution of the sample to make the test in the like conditions in those that the calibration curves were obtained.

If the measure range is surpassed in small proportion the Photometers give reading " Error " or Out of Range" . However if the range is surpassed in big proportions false readings can be obtained, especially in the technical based on the turbidity.
Some dilution examples can avoid confusions.

If we want to carry out an extension of the range of 10 times, it will be enough to add 1ml of sample in the tube and to complete with water distilled until the mark of 10 ml. The found concentration will multiply for 10.

Bigger dilutions would be:

100 times. Pour 1ml of sample in appraised flask of 100 ml and to complete with water distilled until the 100 ml mark. Fill the cuvette with 10 ml of this solution. Multiply the concentration found by 100.

Equal for 1000 times with 1ml of sample in flask of 1L and to complete with water. The multiplication would be for 1000.

The dilution factors can be introduced in the Photoanalyzer D-105 and Photometer D-100 so that the apparatus indicates the final concentration directly.

The parameters for those that we have kits are related in the following chart.

The ranges are indicated, the wavelength in which are carried out the readings, the tests number for box and the corresponding order codes.

Other parameters can incorporate for the user in the Photoanalyzer D-105 that has space to program 140 new calibration curves, apart from the 60 for the *DINKO* kits installed.

Name	ppm	Nm	50 T	250 T	Name	ppm	Nm	50 T	250 T
Alkalinity M	0-500	580	9404	9467	Magnesium	0-100	520	9440	9487
Alkalinity P	0-500	520	9405	9468	Manganese	0-0.03	630	9441	9488
Alkalinity T	0-500	580	9403	9466	Manganese	0-5	550	9447	
Aluminium	0-0.5	580	9401	9469	Molybdate	0-20	420	9442	
Ammonia (N)	0-1.0	620	9408	9470	Molybdate	0-100	420	9446	9480
Ammonia Nessler	0-15 (N)	420	9002+		Nickel	0-10	520	9448	
					Nitrate(N)	0-20	580	9450	9491*
Bromine	0-10.0	520	9409	9472	Nitrate (N)	0-30	420	9010+	
Calcium, Hardness	0-500	580	9406	9473	Nitrite(N)	0-0.5	520	9454	9492
Chlorine Dioxide	0-5.0	520	9415	9451	Nitrite(SodiumNitr)	0-1500	490	9455	9501
Chlorine DPD F&C	0-5.0	520	9412	9474	Nitrogen Total (N)	0-30	420	9012+	
Chlorine	0-250	490	9413	9483	Organphosphonate	0-20	620	9414	9502
Chloride	0-50000	520	9419	9475	Ozone	0-2.0	520	9445	9449
					pH	6.8-8.4	520	9417	9504
COD (25 test)	10-150	440	9429+		Phenol	0-5.0	520	9418	
COD (25 test)	100-2000	580	9430+		PHMB	0-100	620	9420	
COD (25 test)	1000-20000	580	9431+		Phosphate	0-4.0	620	9432	9482*
Copper,F&Comb.	0-5.0	520	9422	9476	Phosphate	0-100	490	9426	9462
Colour	10-500Pt-Co	420	9423		Phosphorous T (P)	0-12	620	9007+	
Cyanuric Acid	0-200	520	9410	9465	Potassium	0-12	520	9456	9494
DEHA	0-500 ppb	550	9439		Silica	0-4.0	620	9457	9495*
Fluoride	0-1.5	580	9433	9481*	Silica	0-150	420	9421	9453*
Hardness Total	0-500	580	9434	9479	Sulphate	0-200	520	9458	9496
Hydrazine	0-0.5	440	9435◊		Sulphite	0-500	580	9459	9497
Hydrogen Peroxide	0-2.0	520	9436	9485	Sulphide	0-0.5	620	9460	
Hydrogen Peroxide	0-100	490	9437	9452	Surfactants anionic	0.05-4.00	620	9371	
Iron	0-5.0	520	9443	9500	Turbidity	5-400 NTU	520	9444	
Iron	0-10	580	9438		Zinc	0-4.0	620	9411	9499

*200 tests. + 25 test tubes The kits of 25 test-tubes, it incorporate all the necessary reagents in each tube of 16 mm. diameter. Only is necessary to add the sample. The incubation of COD tubes is led to end up with the Heater *DINKO* D-65 or D-64D
◊ 30 tests
◊◊ 150 tests

* 200 tests. +25 tubes to 25 tests. (1) To be used with Nitrate Test code 1.9010.00.

The Photometer D-101 include the filters, 420, 440, 490, 520, 580, 620 and 680 nm.

The Photometer D-100 and Photoanalyzer D-105 include one filter to be chosen between the following: 415, 450, 490, 520, 577 and 630 nm

Photometric Standards , with certificate of analysis. Complements

Code	Article
1.9982.02	Ammonia, 1ppm, 60 ml
1.9982.01	Ammonia, 15ppm, 60 ml
1.9984.00	Cationic 1000ppm, 100 ml(Al-Ca-Cu-Cr-Fe-Mg-Mn-Ni-Zn...) to indicate metal
2.4684.00	Chloride, concentrated solution 3.545g Cl^-
1.9983.00	Colour 500 units. Hazen-APHA, Pt / Co, 60 ml
1.9424.00	Conditioner reagent for ammonia test in brackish water (kit 9408)
1.9971.00	DQO 50ppm, 60 ml.
1.9972.00	DQO, 100ppm, 60 ml.
1.9974.00	DQO, 500ppm, 60 ml.
1.9977.00	DQO, 1500ppm, 60 ml.
1.9978.00	DQO, 5000ppm, 60 ml.
1.9980.00	DQO, 15000ppm, 60 ml.
1.9982.09	Nitrate, 2ppm N, 60 ml
1.9982.07	Nitrate, 30ppm N, 60 ml
1.9982.08	Nitrate, 75ppm N, 60 ml
1.9982.10	Nitrite, 0.5ppm N, 60 ml.
8.0011.13	Phosphate, 200 ppm, 60 ml
2.4788.01	Potassium, concentrated solution, 1000 ppm
1.9427.01	Powder reagent for Chrom III, 50 tests
2.6939.01	Silicium, 1000 ppm, 100 ml
1.9371.01	Solvent reagent for surfactants kit, 50 tests.
1.9982.15	Sulphate, solution 200ppm SO_4, 60 ml
1.9371.03	Surfactants, anionic, 4ppm, 60 ml
1.9779.00	Turbidity, concentrated , Formazine, 4000 NTU, 125 ml

DESCRIPTION OF METHODS

ALKALINITY M. Code 1.9404.00 (50t) **Photometer Method 577-580 nm**
Test for Alkalinity M in boiler water and other industrial waters 0 - 500 mg / l $CaCO_3$

The alkalinity of the water is fruit of the presence of alkaline substances as hydroxides, bicarbonates, carbonates and in smaller measure, silicates and phosphates. Quantitatively the alkalinity is the capacity of the water to react with acid until a fixed value of pH. The obtained value will depend on the indicator pH used. Conventionally two measures of alkalinity are applied. The alkalinity M of methyl orange and the alkalinity P of phenolphthalein.
The alkalinity is an important parameter for the industrial waters, especially for boilers or generating plants of vapour. In these cases very alkaline waters are used to diminish the corrosion.
The test of alkalinity M and P of *DINKO* contribute a simple method to check both alkalinities in the range of 0-500 mg / l of CaCO3.
The alkalinities specifically due to carbonates, bicarbonates and hydroxides can be calculated starting from the obtained data.
The test *DINKO* uses a colorimetric method that covers the range of 0 - 500 mg / l CaCO3. The test is very appropriate to boiler and industrial waters

METHOD

The test *DINKO* is based on a colorimetric method that offers considerable advantages on the traditional titrimetric methods. It consists on a tablet that contains the exact quantity of acid and the indicator. A tablet is added to the sample of water. A range of colours takes place from the yellow, going by the green toward the blue for the case of the alkalinity M and of the colourless one to the purple for the alkalinity P. The colour taken place in each one of the tests indicates the alkalinity of the water and it is measured with a *DINKO* Photometer

REAGENTS AND EQUIPMENT

Alkaphot M Tablet / Round cuvette 16 mm. Ø (4pcs). Code 1.9365.00. (cuvette used in the chart)
Photometer *DINKO* D-101, use calibration chart. Filter 580 nm.
Photoanalyzer *DINKO* D-105 or D-100, select program nr. 1

PROCEDURE

1. - To filter the sample if it is necessary to obtain a clear solution.
2. - Fill the sample tube until the mark of 10 ml with sample.
3. - Add a Alkaphot M tablet. Crush and to mix.
4. - Select filter of 580 nm filter with D-101 Photometer. With D-105 Photoanalyzer and D-100 Photometer select nr.1 program
5. - Make zero with sample without tablet. Insert tube sample. Take photometer readings.
6. - Consult Alkaphot M calibration chart for Photometer D-101. Select program nr. 1, for Photometers D-100 and D-105

ALKALINITY RELATIONSHIPS

Starting from the results obtained in previous procedures it is possible to classify the samples in three main forms chemical present in most of waters, such as hydroxides, carbonates and bicarbonates. In the calculated relationships they are supposed the absence of weak forms of alkalinity and that the hydroxides and bicarbonates are incompatible in the same sample. The chemical forms of alkalinity expressed as mg / l of $CaCO_3$ is calculated with the following equations:

1.- If Alkalinity P = 0

Then, Bicarbonate = M
Carbonate = 0
Hydroxide = 0

2. - If Alkalinity P > 0 and M > 2P

Then, Bicarbonate = M -2P
Carbonate = 2P
Hydroxide = 0

2. – If Alkalinity P > 0 and M < 2P

Then, Bicarbonate = 0
Carbonate = 2M - 2P
Hydroxide = 2P - M

Where M and P represent the values of alkalinity M and alkalinity P respectively.

Range: 0 - 500 mg / L $CaCO_3$ **Alkalinity M** **580 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0,0					0	2	11	20	29	38
0,1	46	53	59	64	69	74	80	85	90	96
0,2	101	106	112	117	122	128	133	138	144	149
0,3	154	158	163	167	172	176	181	185	190	195
0,4	199	204	208	213	217	222	226	231	235	240
0,5	245	249	255	262	269	276	282	289	296	303
0,6	309	316	323	330	336	343	350	362	374	386
0,7	398	410	423	435	447	459	470	485	500	

Note
The form in that the results of alkalinity are indicated sometimes causes confusion. The result is usually expressed as mg/l of CaCO3 (calcium carbonate). It is a form that allows the comparison with different results, and it doesn't indicate that the alkalinity is necessarily of calcium carbonate.

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 8,565 mg/L $CaCO_3$

Traceability: The traceability of the method settles down with Standards Methods"

ALKALINITY P. Code 1.9405.00 (50t) **Photometer Method 520 nm**
Test for alkalinity P in boiler water and other industrials waters **0 - 500 mg / l $CaCO_3$**

The Alkalinity of water is caused by the presence of alkaline substances such as hydroxides, carbonates , bicarbonates and, to a lesser extent, silicates and phosphates. Quantitatively alkalinity is the capacity of the water to react with acid to a specified pH end point. The value obtained will depend on the pH indicator used. Two measures of alkalinity are conventionally applied-Alkalinity M(alkalinity to methyl orange) and Alkalinity P(alkalinity to phenolphthalein)

Alkalinity is an important test parameter in a number of industrial water uses, notably in boiler water treatment. Boilers and steam raising plant are normally operated under conditions of high alkalinity in order to minimise corrosion.

The Alkalinity *DINKO* test provide a simple means of checking alkalinity P levels over the range 0-500 mg / l of $CaCO_3$. The alkalinities specifically due to carbonates, bicarbonates and hydroxides can be calculated from the various data obtained.

METHOD

The *DINKO* Alkalinity P test is based on a colorimetric method. These method offer considerable advantages over the titrimetric methods traditionally used.
The test is based on the use of a single tablet reagent containing a precisely standardised amount of acid with a colour indicator. The test is carried out by adding the tablet to a sample of water. A distinctive series of colours is produced- from colourless to purple . The colour produced is indicative of alkalinity and is measured using a *DINKO* Photometer

REAGENTS AND EQUIPMENT

Alkaphot P Tablets / Round cuvette 16 mm Ø with cap.(4pcs). Code: 1.9365.00. (cuvette used in the chart)
Square cuvette 10 mm with cap. (100pcs). Code: 1.9363.00
Photometer *DINKO* D-101, use the calibration chart.
Photoanalyzer *DINKO* D-105 and D-100 select program nr.2

PROCEDURE

1. – Filter sample if necessary to obtain a clear solution.
2. – Fill the test tube to the 10 ml mark with the sample.
3. – Add one Alkaphot P tablet, crush and mix to dissolve. Stand two minutes to allow colour development.
4. – Select wavelength 520 nm. on the Photometer.
5. – Make zero with the sample without tablets. Take Photometer reading immediately (see Photometer Instructions)..
6. – Consult Alkalinity P calibration chart (D-101). Select program nr.2 (D-105 and D-100)

ALKALINITY RELATIONS

From the results obtained from the foregoing procedures it is possible to classify the sample into the three main chemicals forms of alkalinity present in most waters, namely hydroxides, carbonates and bicarbonates. This calculated relations assumes the absence of other weak forms of alkalinity and also assumes that hydroxides and bicarbonates are not compatible in the same sample. The chemical forms of alkalinity, expressed as mg / l de $CaCO_3$ are calculated by the following equations:

1.- If Alkalinity P = 0

Then, Bicarbonate = M
Carbonate = 0
Hydroxide = 0

2. – If Alkalinity P > 0 and M > 2P

Then, Bicarbonate = M -2P
Carbonate = 2P
Hydroxide = 0

3. - If Alkalinity P > 0 and M < 2P

Then, Bicarbonate = 0
Carbonate = 2M - 2P
Hydroxide = 2P - M

Where M and P are the results of the Alkalinity M and Alkalinity P test.

Range: 0 - 500 mg / L $CaCO_3$ **Alkalinity P** **520 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0,0				6	20	35	49	64	78	93
0,1	103	110	117	124	131	137	144	151	158	165
0,2	171	178	185	192	199	205	211	218	224	230
0,3	236	243	249	255	262	268	274	281	287	293
0,4	299	304	309	314	319	324	328	333	338	343
0,5	348	352	357	362	367	372	376	381	386	391
0,6	396	401	407	413	419	425	432	438	444	450
0,7	457	463	469	475	481	488	494	500		

The expression of alkalinity results sometimes causes confusion. It is normal practice to express the results as mg / l de $CaCO_3$ (calcium carbonate). This is merely a convention to allow the comparison of different results and does not necessarily indicate that the alkalinity is present in the water in this form. The different chemical forms of alkalinity have been referred to in the test instructions.

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 8,565 mg/L CaCO3

Traceability: The traceability of the method settles down with Standards Methods"

ALKALINITY TOTAL. Code 1.9403.00 (50t) - 1.9466.00 (250t) **Photometer Method 577-580 nm**
Test for total alkalinity in boiler water and other industrials waters **0- 500 mg / l $CaCO_3$**

The Alkalinity of water is caused by the presence of alkaline substances such as hydroxides, carbonates , bicarbonates and, to a lesser extend, borates, silicates and phosphates. In water at pH neutral the alkalinity derives mainly from the presence of bicarbonates.

Alkalinity is an important test parameter in a number of industrial water uses, notably in boiler water treatment. Boilers and steam raising plant are normally operated under conditions of high alkalinity in order to minimise corrosion; if the total alkalinity is high the water may more readily promote scale formation.

The Alkalinity *DINKO* test provide a simple means of checking total alkalinity levels over the range 0-500 mg / l of $CaCO_3$.

METHOD

The *DINKO Total* Alkalinity test is based on a colorimetric method. These method offer considerable advantages over the titrimetric methods traditionally used.
The test is based on the use of a single tablet reagent containing a precisely standardised amount of a colour indicator. The test is carried out by adding the tablet to a sample of water. A distinctive series of colours is produced- from yellow, through green, to blue. The colour produced is indicative of alkalinity and is measured using a *DINKO* Photometer

REAGENTS AND EQUIPMENT

Alkaphot Tablets / Round cuvette 16mm Ø with cap.(4pcs). Code: 1.9365.00. (cuvette used in the chart)
Square cuvette 10 mm with cap.(100pcs). Code: 1.9363.00
Photometer *DINKO* D-101, use the calibration chart. Filter 580nm
Photoanalyzer *DINKO* D-105 and D-100 select program nr.3.

PROCEDURE

1. – Fill the test tube to the 10 ml mark with the sample.
2. – Add one Alkaphot tablet, crush and mix to dissolve.
3. – Select wavelength 580nm (D-101). With Photoanalyzer D-105 and D-100 select nr. 3 program.
4. – Make zero with sample without tablets. Take Photometer reading immediately (see Photometer Instructions)..
5. – Consult Alkalinity calibration chart (D-101). Select program nr. 3 (D-105 and D-100)

Range: 0 - 500 mg / L $CaCO_3$ **Alkalinity Total** **580 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0,0					0	7	15	22	30	37
0,1	45	52	60	67	75	82	90	97	103	107
0,2	112	117	121	126	131	136	140	145	150	154
0,3	159	164	168	173	178	182	187	192	196	201
0,4	206	211	216	221	226	231	236	241	246	250
0,5	255	260	265	270	275	280	285	290	295	300
0,6	308	317	325	334	342	350	359	367	376	384
0,7	392	401	410	418	427	436	444	453	462	470
0,8	479	488	500							

The expression of alkalinity results sometimes causes confusion. It is normal practice to express the results as mg / l de $CaCO_3$ (calcium carbonate). This is merely a convention to allow the comparison of different results and does not necessarily indicate that the alkalinity is present in the water in this form.
To convert Total Alkalinity as $CaCO_3$ to Total Alkalinity as HCO_3^- multiply result by 1,22.

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 8,565 mg/L $CaCO_3$

Traceability: The traceability of the method settles down with Standards Methods"

ALUMINIUM. Code 1.9401.00 (50t) - 1.9469.00 (250t) **Photometer Method 580-577 nm**
Test for Aluminium in natural and drinking water **0-0,5 mg / l Al**

Aluminium sulphate is used as a coagulant in drinking water treatment. The determination of aluminium is usually required for the control of alum coagulation and filtration process at water works.

Aluminium salts are found in natural waters; levels are reported to increasing particularly in areas affected by acid rain. High aluminium levels can be toxic to fish and aquatic life. Aluminium determination is necessary for environmental control and for testing water used for fish farms, etc.
The *DINKO* test provides a simple method of measuring aluminium levels in natural and drinking waters over the range 0 – 0,5 mg / l.

METHOD

Aluminium reacts with eriochrome cyanine R indicator in slightly acid solution to produce a pink-red coloured complex. The presence of ascorbic acid eliminates interference from iron and manganese. In the *DINKO* test the reagents are incorporated into two tablets. The test is carried out by adding one of each tablet to a sample of water. The first tablet acidifies the sample to bring any colloidall aluminium into solution and the second tablet buffers the solution to provide the correct conditions for the test.
The intensity of colour produced in the test is proportional to the aluminium concentration and is measured using a *DINKO* Photometer

REAGENTS AND EQUIPMENT

Aluminium nr. 1 Tablets / Aluminium nr. 2 Tablets /Round cuvette 16 mm Ø with cap. (4pcs). Code: 1.9365.00. (cuvette used in the chart)
Square cuvette 10 mm with cap. (100pcs). Code: 1.9363.00 /Photometer *DINKO* D-101, use the calibration chart. Filter 580 nm Photoanalyzer *DINKO* D-105 and D-100 select program nr. 26.

SAMPLE COLLECTION

Aluminium is readily absorbed on to the surfaces of sample containers, particularly glass containers. To avoid loss of aluminium collect samples in plastic bottles and test as soon as possible after collection. Sample bottles should be acid-rinsed and thoroughly washed out with deionised water before re-use.

PROCEDURE

1. - Fill the test tube to the 10ml mark with the sample.
2. - Add one Aluminium nr. 1 tablet, crush and mix to dissolve.
3. - Add one Aluminium nr. 2 tablet, crush and mix gently to dissolve. Avoid vigorous agitation.
4. - Stand for five minutes to allow full colour development.
5. - Select wavelength 580 nm.(D-101) or select program nr. 26 with D-100 and D-105.
6. - Make zero with the sample without tablets.Take Photometer reading immediately (see Photometer Instructions)
7. - Consult Aluminium calibration chart (D-101). Select program nr. 26 (D-105 and D-100)

INTERFERENCES

The presence of polyphosphate or fluoride can lead to low aluminium readings. Polyphosphate is unlikely to be present in significant quantities in normal water samples. Fluoride will only be significant for control samples from waters works where fluoridation is practised. In such cases samples should preferably be taken before the final fluoridation stage.

For samples taken after fluoridation such as those from water distribution systems, or samples containing natural fluoride, the aluminium concentration should be corrected. To obtain the corrected aluminium concentration multiply the calibration chart value by the factor (1+ 0.4 F) where F is the Fluoride concentration as mg/l F. The fluoride concentration should be determined separately by normal test procedure.

Range: 0- 0,5 mg/L **Al** **580 nm**

ABS	0	5	ABS.	0	5
0,06	0,00	0,01	0,13	0,23	0,24
0,07	0,03	0,04	0,14	0,26	0,27
0,08	0,06	0,08	0,15	0,29	0,31
0,09	0,09	0,11	0,16	0,33	0,35
0,10	0,12	0,14	0,17	0,38	0,40
0,11	0,16	0,18	0,18	0,45	0,50
0,12	0,19	0,21			

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,043 mg/L Al

Traceability: The traceability of the method settles down with E.B. Sandell Chemical Analysisi Volume III, USA.

AMMONIA (Nessler).Code 1.9002.00 (25t) **Photometer Method 420- 415 nm**
Test for ammonia in natural sea and waste water **0- 15 mg / l N**

The ammonia appears as a result of the degradation of nitrogenous material contained in the waters. It is also in the domestic effluents and in certain waste waters of the industry.
The ammonia is noxious for the fish and other forms of aquatic life. Their level should be controlled carefully in fish farms waters and aquariums.

The *DINKO* test is a simple method of measuring ammonia (ammonia nitrogen)over the range 0-15 mg/ l N.

METHOD

The *DINKO* test is based on the method Nessler. The reagent of Nessler (Potassium tetraiodomercurate(II)) reacts quickly with the ammonia under alkaline conditions to form an orange-brown product. Before adding to the sample the reagent of Nessler a solution of Rochelle salt it is added to avoid the turbidity that would take place due to the hardness.
The intensity of the produced colour is proportional to the ammonia concentration and it is measured with a *Dinko* Photometer.

REAGENTS AND EQUIPMENT

Reaction tubes, 25 u
Nessler Reagent / Pasteur pipette or Syringe
Round cuvettes 16 mm Ø w/cap. (4pcs). Code 1.9365.00
Photometer *DINKO* D-101, use the calibration chart, filter 420 nm.
Photoanalyzer *DINKO* D-105 and Photometer D-100, select the program nr. 58

PROCEDURE

1. - Remove the cap of the reaction tube and add 5,0 sample ml with the Pasteur pipette. Close the tube and invert three times to mix.
2. - Add 12 drops of Nessler Reagent to the reaction tube. Close and to invert several times to mix.
3. - Wait one minute so that the colour is developed.
4. - Select the 420 nm. filter on the D-101 and select program nr. 58 on the D-105 or D-100 photometers.
5. - Make the zero using a reaction tube without to use. Can be also used a tube with distilled water.
   Take the Photometer reading in the usual way.
6. - Consult the calibration chart (D-101). Select program nr. 58 in the D-105 and D-100

Notes
1. - The Nessler Reagent is toxic. Use it with caution. It will only be used professionally in the analysis of waters.
2. - The Nessler Reagent is sensitive to air. Cover it once used.
3. - The ammonia concentrations can be expressed in different ways:

To convert from N to NH_4 ---- multiply by 1,3 / To convert from N to NH_3---- multiply by 1,2

4. - Interferences. It has been added enough Rochelle Salt to avoid the turbidity in hardness until 1000 mg/L. The test can be used on seawater without a pre-treatment of the sample.

RANGE: 0 - 15 mg/L N **Ammonia Nitrogen mg/L N** **420/415 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0		0.00	0.08	0.20	0.32	0.43	0.55	0.67	0.78	0.90
0.1	1.02	1.13	1.25	1.37	1.49	1.61	1.73	1.84	1.96	2.08
0.2	2.20	2.32	2.44	2.55	2.67	2.79	2.91	3.03	3.14	3.26
0.3	3.38	3.50	3,62	3.74	3.85	3.97	4.09	4.21	4.33	4.45
0.4	4.55	4.61	4,67	4.73	4.79	4.84	4.90	4.96	5.02	5.08
0.5	5.14	5.20	5,25	5.31	5.37	5.43	5.49	5.55	5.60	5.66
0.6	5.72	5.78	5.84	5.90	5.96	6.01	6.07	6.13	6.19	6.25
0.7	6.32	6.52	6.73	6.93	7.13	7.33	7.54	7.74	7.94	8.14
0.8	8.35	8.55	8.75	8.96	9.16	9.36	9.56	9.77	9.97	10.2
0.9	10.4	10.6	10,8	11.0	11.2	11.4	11.6	11.8	12.00	12.2
1.0	12.4	12.5	12.6	12.8	12.9	13.0	13.1	13.2	13.3	13.5
1.1	13.6	13.7	13.8	13.9	14.0	14.2	14.3	14.4	14.5	14.6
1.2	14.8	14.9	15.0							

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,297 mg/L N

Traceability: The traceability of the method settles down with "Standards Methods" SM 4500-NH_3C y USEPA 350.2

AMMONIA. Code 1.9408.00 (50t) - 1.9470.00 (250t) **Photometer Method 620- 630 nm**
Test for Ammonia in natural, drinking and waste water **0- 1,0 mg / l N**

Ammonia occurs as a breakdown product of nitrogenous material in natural waters. It is also found in domestic effluents and certain industrial waste waters. Ammonia is harmful to fish and other forms of aquatic life, and the ammonia level must be careful controlled in water used for fish farms and aquariums. Ammonia tests are routinely applied for pollution control on effluents and waste waters, and for the monitoring of drinking water supplies.
The *DINKO* Ammonia Test provides a method of measuring ammonia over the range 0-1,0 mg / l N.

METHOD

The *DINKO* Ammonia test is based on an indophenol method. Ammonia reacts with alkaline salicylate in presence of chlorine to form a green-blue indophenol complex. Catalyst are incorporated to ensure complete and rapid colour development. The reagents are provided in form of two tablets for maximum convenience. The test is simply carried out by adding one of each tablet to sample of the water. The intensity of colour produced in the test is proportional to the ammonia concentration and is measured using a *DINKO* Photemeter

REAGENTS AND EQUIPMENT

Ammonia nr. 1 Tablet
Ammonia nr.2 Tablet
Round cuvette 16mm Ø with cap. (4pcs). Code 1.9365.00.
Photometer *DINKO* D-101 use the calibration chart. Filter 620 nm
Photoanalyzer *DINKO* D-105 and D-100 select program nr.4.

TEST PROCEDURE

1. - Fill test tube with sample to the 10ml mark.
2. - Add one Ammonia nr. 1 and one Ammonia nr. 2 tablet, crush and mix to dissolve.
3. - Stand for ten minutes to allow colour development.
4. - Select wavelength 620 nm. on Photometer.
5. - Make zero with sample without tablets. Take Photometer reading (see Photometer instructions)..
6. - Consult Ammonia calibration chart (D-101). Select program nr. 4 (D-105 and D-100).

SEA WATERS SAMPLES

Ammonia Conditioning Reagent code 1.9424.00 is required when testing sea water or brackish water samples to prevent precipitation of salts. The reagents is supplied in a special “spoon pack” to aid measuring out the powder.
Fill the test tube with sample to the 10 ml mark, and add two level spoonful of conditioning reagent. Mix to dissolve reagent then continue the test as described in the above test instructions.

Notes

1. - At low temperatures the rate of colour development in the test may be slower. If the sample temperature is below 20ºC, allow 15 minutes for the colour development.
2. - Ammonia concentration can be expressed in a number of different ways. The following factors may be used for the conversion of readings: To convert from N to NH_4 multiply by 1,3. / To convert from N to NH_3 multiply by 1,2.

RANGE: 0-1.0 mg / L N **PPM AMMONIA N** **620 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.1		0.00	0.02	0.03	0.05	0.06	0.08	0.09	0.11	0.12
0.2	0.14	0.16	0.17	0.19	0.20	0.21	0.23	0.24	0.26	0.27
0.3	0.28	0.30	0.31	0.32	0.34	0.35	0.36	0.38	0.39	0.40
0.4	0.42	0.43	0.44	0.45	0.46	0.48	0.49	0.50	0.51	0.52
0.5	0.54	0.55	0.56	0.57	0.58	0.60	0.61	0.62	0.63	0.64
0.6	0.65	0.66	0.67	0.68	0.69	0.70	0.71	0.72	0.73	0.74
0.7	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.83	0.84	0.85
0.8	0.87	0.88	0.89	0.91	0.92	0.93	0.94	0.96	0.97	0.98
0.9	1.00									

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,014 mg/L N

Traceability: The traceability of the method settles down with Cli. Chim. Acta., 14 403 (1966)

BROMINE. Code 1.9409.00 (50t) - 1.9472.00(250t)

Photometer Method 520nm
Test for free, combined and total bromine in water
0- 10,0 mg / l

Bromine and bromine-release compounds are used for the disinfection of swimming pool water, and many other water treatment systems. The measurement of the bromine residual is essential for the control of these processes.
The bromine concentration can be expressed in terms of free bromine, combined bromine or total bromine. However free and combined bromine are both considered powerful disinfectants and it is not normally necessary to differentiate between these two forms. For the majority of applications therefore the measurement of total residual is sufficient. DPD Bromine method is a simple means of measuring bromine residuals over the range 0 - 10.0 mg/l.

METHOD

The *DINKO* bromine test uses the DPD method developed by Dr. A T Palin now internationally recognised as the standard method of testing for disinfectant residuals. In the DPD method the reagents are provided in tablet form for maximum convenience and simplicity of use.
Bromine reacts with diethyl-p-phenylenediamine (DPD) in buffered solution to produce a pink coloration. The intensity of colour is proportional to the total bromine concentration and is measured using a *DINKO* Photometer.
For the separate determination of free and combined bromine, a supplementary procedure using sodium nitrite is used. The nitrite destroys the free bromine in the sample and the colour produced in the DPD test then corresponds to the combined bromine only. The free bromine content is thus obtained by difference between the total bromine and combined bromine results.

REAGENTS AND EQUIPMENT

DPD Nº 1 Clear Tablet / DPD Nitrite Tablet / Round cuvette 16 mm Ø with cap. (4pcs). Code: 1.9365.00. (cuvette used in the chart)
Square cuvette 10 mm with cap. (100pcs). Code: 1.9363.00
DINKO D-101 Photometer use calibration chart.
DINKO D-105 Photoanalyzer and D-100 Photometer select program nr. 28.

PROCEDURE

1. - Rinse test tube with sample leaving two to three drops of sample in the tube.
2. - Add one DPD nr.1 tablet, crush tablet and then fill the tube test with sample to the 10ml mark.
3. - Select wavelength 520 nm on the Photometer.
4. - Take Photometer reading (see Photometer instructions). Make zero with the sample without tablets.
5. - Consult Bromine calibration chart. The value corresponding to the observed absorbance reading represents the Total Bromine residual as milligrams per litre. For most purposes the test can be terminated at this stage.
   If it is desired to measure free and combined bromine proceed as indicated in the following section.

TEST PROCEDURE-FREE AND COMBINED BROMINE

1. - Fill test tube with sample to the 10 ml mark. Add one DPD Nitrite tablet, crush and mix to dissolve.
2. - Take a second clean test tube and add two to three drops of solution from the first tube. Add one DPD nr. 1 tablet, crush and then add the remainder of the solution to make up to the 10 ml mark. Mix to dissolve tablet.
3. - Select wavelength 520 nm on Photometer.
4. - Take Photometer reading. Consult Bromine calibration chart (D-101). Select program nr. 28 (D-105 and D-100)
5 .- The value corresponding to the observed absorbance reading represents the combined bromine residual as mg/l.
6. - The free bromine residual is obtained by subtracting the combined bromine residual result from the total bromine residual result.

Free Bromine = Total Bromine - Combined Bromine

Range: 0-10,0 mg / L **Bromine** **520 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0	0.00	0.07	0.15	0.23	0.31	0.39	0.47	0.54	0.62	0.70
0.1	0.78	0.86	0.93	1.01	1.09	1.17	1.25	1.32	1.40	1.48
0.2	1.56	1.63	1.71	1.79	1.87	1.95	2.03	2.12	2.21	2.31
0.3	2.40	2.50	2.59	2.68	2.78	2.87	2.96	3.06	3.15	3.24
0.4	3.34	3.43	3.52	3.62	3.71	3.80	3.90	3.99	4.08	4.16
0.5	4.25	4.34	4.42	4.51	4.59	4.68	4.77	4.85	4.94	5.03
0.6	5.11	5.20	5.28	5.37	5.46	5.54	5.63	5.72	5.80	5.89
0.7	5.97	6.13	6.31	6.49	6.67	6.85	7.03	7.21	7.39	7.57
0.8	7.75	7.93	8.05	8.12	8.20	8.28	8.35	8.43	8.51	8.58
0.9	8.66	8.74	8.81	8.89	8.97	9.04	9.12	9.20	9.27	9.35
1.0	9.43	9.50	9.58	9.66	9.73	9.81	9.89	10.00		

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0.128 mg/L Br

Traceability: The traceability of the method settles down with "Standards Methods" SM

CALCIUM, HARDNESS. Code 1.9406.00 (50t) -1.9473.00 (250t) **Photometer Method 577-580nm**
Test for Calcium Hardness in natural and treated water **0-500 mg / l $CaCO_3$**

Calcium hardness is caused by the presence of Calcium ions in the water. Calcium salts can be readily precipitated from water and high levels of calcium hardness tend to promote scale formation in water systems. Calcium hardness is an important control test in industrial water systems such as boilers and steam raising plants and for swimming pool waters.

METHOD

The Calcium Hardness test is based on the orange coloration produced by Calcicol indicator reagent with calcium ions in alkaline solution method. The reagent itself gives a violet colour in solution. Thus at different Calcium levels a distinctive range of colours from violet to orange is produced.
The reagents for the method are provided in form of two tablets. The test is carried out simply by adding one of each tablets to a sample of the water. The colour produced is indicative of the Calcium hardness and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Calcicol nº 1Tablet / Calcicol nr. 2 Tablet / Round cuvette 16 mm Ø with cap. (4pcs). Code 1.9365.00. (cuvette used in the chart)
Square cuvette 10 mm with cap.(100pcs). Code 1.9363.00
Photometer *DINKO* D-101, use calibration chart. Filter 580 nm.
Photoanalyzer *DINKO* D-105 and D-100 select program nr, 5

PROCEDURE

1. - Filter sample if necessary to obtain a clear solution.
2. - Fill the test tube with sample to the 10ml mark.
3. - Add one Calcicol nr. 1 tablet, crush and mix to dissolve.
4. - Add one Calcicol nr. 2 tablet, crush and mix to dissolve.
5. - Stand for two minutes to allow full colour development.
6. - Select wavelength 580 nm on the Photometer D-101.Select program nr.5 with D-100 and D-105 Photometers
7. - Take Photometer reading (see Photometer instructions). Make zero with the sample without tablets.
8. - Consult Calcicol calibration chart(D-101). Select program nr. 5 (D-105 and D-100) .

INTERFERENCES

1. - Magnesium hardness(up 200 mg / l as $CaCO_3$) does not interfere with the test.
2. - Iron at levels above 10 mg / l may cause low results. Zinc above 1 mg / l may cause high results.
3. -The pH required in the test is closely controlled by buffer mixture included in the tablet formulation.
   However, avoid exceeding the buffer capacity, strongly acid or alkaline samples should be adjusted to the pH range 4 to 10, before start test.

Notes

1. - The expression of hardness results sometimes causes confusion. It is normal practice to express the results of hardness test as mg/l de $CaCO_3$ (Calcium carbonate). This is merely a convention to allow the comparison of different results and does not indicate that the hardness is present in the water in this form.

   Results may also be expressed as mg/l Ca. To convert mg/l $CaCO_3$ to mg/l Ca multiply by 0,4

2. - Some relations of interest are the following: 1º dH = 1,25º eH = 1,8 fH = 17,8 mg / l $CaCO_3$

   where dH = german hardness ; eH = english hardness ; fH = french hardness.

Water below 90mg in Calcium carbonate have a light hardness, between 90 and 180 normal hardness, between 180 and 270 mg moderate hardness, and between 270 and 500 mg high hardness.

3. -The Magnesium hardness can be determinate using Magnesium kit or by taking the difference between the Total Hardness kit and Calcium Hardness kits results.

RANGE: 0- 500 mg/L Ca CO_3 **Calcium, Hardness** **580 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.1							500	464	423	382
0.2	343	311	278	246	213	193	181	170	158	147
0.3	135	123	112	100	95	89	84	78	73	68
0.4	62	57	52	48	45	42	40	37	34	31
0.5	28	26	23	20	17	15	12	9	6	3
0.6	0									

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 5,671 mg/L $CaCO_3$ for values below 100 mg/L and ± 20,09 mg/L $CaCO_3$ for values up to 100 mg/L

Traceability: The traceability of the method of settles down with "Standards Methods" SM

CHLORIDE. Code 1.9419.00(50t) - 1.9475.00 (250t)

Photometer Method 520 nm

Test for Chloride salt in water.

0-50 mg/l Cl to 0-50,000 mg/NaCl

The *DINKO* Chloride test provides a simple method to measuring chloride salt levels. There are many applications in water technology that require determination of chlorides. These include the measurement of low levels of chloride to determinate the extent of carry-over in boiler condensates; chloride determination to assess salt build-up in swimming pools or boiler water; and measurement of high chlorides levels for testing sea water or determining the saltiness of brackish waters. A further application is for checking swimming pools where salt has been artificially added to simulate sea water bathing, or where this is necessary for the operation of certain types of electrolytic hypochlorite generator.
The test can be used for measuring these widely different chloride concentrations by varying the sample size selected. These ranges covered are: 0 - 50 mg/l Cl, 0 - 500 mg / l Cl, 0 - 10,000 mg/l NaCl, 0 - 50,000 mg / l NaCl.

METHOD

The Chloride test is based on a tablet reagent containing silver nitrate. Chlorides react with the silver nitrate to produce insoluble silver chloride. At the chloride levels encountered in the test, the insoluble silver chloride is observed as turbidity in the test sample. The degree of turbidity is proportional to the chloride concentration and is measured using a *DINKO* Photometer.
The test is carried out under acidic and oxidising conditions so as to prevent interference from complexing agents such as EDTA and polyphosphates, and from any reducing substances which may be present in the water. Polyacrylates do however interfere and the test should not be used on industrial waters using polyacrylate-based treatments.

REAGENTS AND EQUIPMENT

Acidifying CD Tablets/ Chloridol Tablets/ Measuring Syringe 1 ml
Round cuvette 16 mm Ø with cap. (4pcs). Code 1.9365.00. (cuvette used in the chart)
Square cuvette 10 mm with cap. (100pcs). Code 1.9363.00 / *DINKO* D-101 Photometer use calibration chart.
DINKO D-105 Photoanalyzer and D-100 select program 7-54-55 or 56 according selected range.

PROCEDURE

For Testing Boiler Condensate and Softened Waters
Range 0 -50 mg / l Cl.
Fil test tube with sample to the 10 ml mark.

For Testing Natural Waters, Swimming Pools and Boiler Waters
Range 0 - 500 mg / l Cl.
Using the measuring syringe, take 1 ml of sample. Transfer to the test tube and make-up to the 10 ml mark with deionised water.

For Testing Salt Chlorinator Treated Swimming Pools
Range 0 – 10,000 mg / l NaCl.
Using the measuring syringe, take 0,5 ml of sample. Transfer to a 100 ml volumetric flask then make-up to the 100 ml mark with deionised water. Cap flask and mix. Fill test tube to the 10 ml mark with solution from the flask.

For Testing Sea Water and Brackish Waters
Range 0 – 50,000 mg / l NaCl.
Using the measurement syringe, take 0,1 ml of sample. Transfer to the 100 ml volumetric flask, then make-up to the 100 ml mark with deionised water. Cap de flask and mix. Fill test tube to the 10 ml mark with solution from the flask

2. - Add one Acidifying CD tablet, crush and mix to dissolve.
3. - Add one Chloride tablet, allow the tablet to disintegrate for one minute then crush any remaining particles and mix. A cloudy solution indicates the presence of chloride.
4. - Select wavelength 520 nm on photometer.
5. - Take the photometer reading in usual manner(see Photometer instructions). Make blank without tablet.
6. - Consult the Chloride calibration chart (D-101). Select program 7, 54, 55 or 56 (D-105 and D-100).

CONVERSION FACTORS

To convert mg / l of	to mg / l of	multiply by
Cl	NaCl	1,65
NaCl	Cl	0,61
Cl	$CaCO_3$	1,41
NaCl	$CaCO_3$	0,85

Range : 0 - 40 mg / L Cl **Chloride** **520 nm**

ABS	0	2	4	6	8	ABS	0	2	4	6	8
0.0				0	0.4	1.1	21.6	22.0	22.4	22.8	23.2
0.1	0.8	1.2	1.6	1.9	2.4	1.2	23.6	24.0	24.4	24.8	25.2
0.2	2.8	3.2	3.6	4.0	4.4	1.3	25.7	26.1	26.6	27.0	27.5
0.3	4.8	5.2	5.7	6.2	6.6	1.4	27.9	28.4	28.8	29.3	29.7
0.4	7.1	7.5	8.0	8.4	8.9	1.5	30.2	30.6	31.1	31.5	32.0
0.5	9.3	9.8	10.2	10.6	11.0	1.6	32.5	32.9	33.4	33.8	34.3
0.6	11.4	11.8	12.2	12.6	13.0	1.7	34.8	35.2	35.6	36.1	36.6
0.7	13.4	13.9	14.3	14.7	15.1	1.8	37.0	37.5	37.9	38.4	38.8
0.8	15.5	15.9	16.3	16.7	17.1	1.9	39.3	40			
0.9	17.5	17.9	18.3	18.7	19.1						
1.0	19.5	19.9	20.3	20.7	21.1						

Range : 0 - 400 mg / L Cl **Chloride** **520 nm**

ABS	0	2	4	6	8	ABS	0	2	4	6	8
0.0				0	4	1.1	216	220	224	228	232
0.1	8	12	16	19	24	1.2	236	240	244	248	252
0.2	28	32	36	40	44	1.3	257	261	266	270	275
0.3	48	52	57	62	66	1.4	279	284	288	293	297
0.4	71	75	80	84	89	1.5	302	306	311	315	320
0.5	93	98	102	106	110	1.6	325	329	334	338	343
0.6	114	118	122	126	130	1.7	347	352	356	361	366
0.7	134	139	143	147	151	1.8	370	375	379	384	388
0.8	155	159	163	167	171	1.9	393	400			
0.9	175	179	183	187	191						
1.0	195	199	203	207	211						

Rango : 0 - 10000 mg / L **NaCl** **520nm**

ABS	0	2	4	6	8	ABS	0	2	4	6	8
0.0				0	130	1.1	7100	7250	7400	7500	7650
0.1	260	390	520	650	790	1.2	7800	7900	8050	8200	8300
0.2	920	1050	1190	1320	1450	1.3	8500	8600	8750	8900	9050
0.3	1590	1730	1880	2030	2180	1.4	9200	9350	9500	9650	9800
0.4	2330	2480	2630	2780	2930	1.5	9950	10100			
0.5	3080	3220	3350	3500	3630						
0.6	3770	3900	4050	4170	4300						
0.7	4450	4550	4700	4850	4950						
0.8	5100	5250	5350	5500	5650						
0.9	5800	5900	6050	6200	6300						
1.0	6450	6600	6700	6850	7000						

Range: 0- 50000 mg/ L NaCl 520nm

ABS	0	2	4	6	8
0.0				0	630
0.1	1290	1960	2630	3300	3950
0.2	4600	5300	5950	6620	7280
0.3	7950	8650	9400	10150	10900
0.4	11600	12400	13100	13900	14600
0.5	15400	16100	16800	17500	18200
0.6	18800	19500	20200	20800	21500
0.7	22200	22900	23500	24200	24900
0.8	25500	26200	26900	27500	28200
0.9	28900	29500	30200	30900	31500
1.0	32200	32900	33600	34200	38200
1.1	35600	36200	36900	37600	38200
1.2	38900	39600	40200	40900	41600
1.3	42400	43100	43800	44600	45300
1.4	46100	46800	47600	48300	49000
1.5	49800	50500			

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,284 mg/L Cl^-

Traceability:The traceability of the DPD Chlorine method settles down with "Chim. anal. , 31, 32(1949)" adapted.

CHLORINE (DPD). Code 1.9412.00 (50t) - 1.9474.00 (250t) **Photometer Method 520 nm**
Test for free, combined and total Chlorine in water **0- 5 mg / l**

Chlorine and chlorine-release compounds are widely used for the disinfection of drinking water and swimming pools, for the control of micro-biological growth in cooling water, and in many other water treatment systems. Accurate measurement of the chlorine residual is an essential aspect of the control of these chlorination processes.
The chlorine level can be expressed in terms of the free chlorine, combined chlorine or total chlorine. For the majority of applications measurement of the free chlorine is most important. The *DINKO* DPD method provides a simple means of measuring free, combined and total chlorine over the range 0 - 5 mg / l.

METHOD

This *DINKO* test uses the DPD method developed by Dr. A T Palin and now internationally recognised as the standard method of testing for Chlorine and other disinfectant residuals. In the DPD method the reagents are provided in tablet form for maximum convenience and simplicity of use.
Free Chlorine reacts with diethyl-p-phenylene diamine (DPD) in buffered solution to produce a pink coloration. The intensity of colour is proportional to the free Chlorine concentration. Subsequent addition of excess potassium iodide induces a further reaction with any combined chlorine present. The colour intensity is now proportional to the total Chlorine concentration; the increase in intensity represents the combined chlorine concentration. So, it is possible to know the free and combined Chlorine concentration in the sample.
The colour intensities are measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

DPD nº 1 Tablets / DPD nº 3 Tablets / Round cuvette 16 mm Ø with cap. (4pcs). Code 1.9365.00 (cuvette used in the chart).
Square cuvette 10 mm with cap. Pk. (100). Code 1.9363.00
Photometer *DINKO* D-101, use the calibration chart / Photoanalyzer *DINKO* D-105 or D-100 Photometer select program Nr.6.

PROCEDURE

1. - Rinse test tube sample leaving two or three drops of sample in the tube .
2. - Add one DPD nr. 1 tablet, crush tablet and then fill the test tube with sample to the 10ml mark. Mix to dissolve tablet.
3. - Select wavelength 520 nm on Photometer.
4. - Take Photometer reading immediately. Make zero with sample without tablet.
5. - The result represents the free Chlorine as milligrams per litre test.
6. - If it is desired to measure combined or total Chlorine continue the test on the same test portion.
7. - Add one DPD nr. 3 tablet, crush and mix to dissolve.
8. - Stand for two minutes to total colour development.
9. - Take Photometer reading. Consult Chlorine chart(D-101). Photoanalyzer D-105 and D-100 select program nr. 6.
10. - The result represents the total Chlorine residual as milligrams per litre.
11. - The combined Chlorine is obtained by subtracting the free Chlorine result from the total Chlorine result.

Combined Chlorine = Total Chlorine - Free Chlorine

Range: 0 - 5 mg / L **Chlorine** **520 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0	0.00	0.03	0.06	0.09	0.13	0.16	0.20	0.24	0.27	0.31
0.1	0.34	0.37	0.41	0.44	0.48	0.51	0.54	0.58	0.61	0.65
0.2	0.69	0.71	0.75	0.78	0.82	0.85	0.88	0.92	0.95	0.99
0.3	1.03	1.07	1.12	1.17	1.21	1.26	1.30	1.35	1.40	1.44
0.4	1.49	1.53	1.58	1.63	1.67	1.72	1.76	1.81	1.86	1.90
0.5	1.95	1.99	2.03	2.08	2.12	2.15	2.19	2.23	2.27	2.31
0.6	2.35	2.39	2.43	2.47	2.51	2.55	2.59	2.63	2.67	2.71
0.7	2.75	2.79	2.82	2.87	2.91	2.95	2.99	3.03	3.08	3.13
0.8	3.18	3.23	3.27	3.32	3.37	3.42	3.47	3.51	3.56	3.61
0.9	3.66	3.71	3.75	3.80	3.85	3.90	3.95	3.99	4.06	4.14
1.0	4.21	4.28	4.35	4.42	4.49	4.57	4.64	4.71	4.78	4.86
1.1	4.93	5.00								

Note
A too high Chlorine level (above 10 mg / l) can cause bleaching of the pink coloration formed in the DPD test and give a false negative result. If a colourless test solution is obtained when Chlorine is known to be present, check for the possibility of bleaching by repeating the test on a sample diluted with Chlorine-free water.

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,057 mg/L Chlorine

Traceability: The traceability of the method settles down with Standard Method 4500-CIG and USEPA 330.5"

CHLORINE. Code 1.9413.00 (50t) - 1.9483.00 (250t) **Photometer Method 490 nm**
Test for high levels of Chlorine in disinfecting and sterilizing solutions **0- 250 mg / l**

Chlorine and chlorine release compounds are widely used for disinfection or sterilizing of water distribution systems and pipe work, plant and equipment in food processing and pharmaceutical factories. The Chlorine levels used in these applications are higher than those applied for the simple disinfection of water. Accurate measurement of the Chlorine level is necessary to ensure the intended use.
The *DINKO* test provides a simple means of measuring the total Chlorine over the range 0 - 250 mg / l.

METHOD

The *DINKO* test is based on an iodine release method. Chlorine reacts with Potassium iodide in acid solution to release iodine which is brown in colour. The reagents for test are provided in the form of two tablets for maximum convenience and simplicity of use.
The intensity of the colour produced is proportional to the Chlorine concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Acidifying GP Tablet / Chlorine HR Tablet
Round cuvette 16 mm Ø with cap. (4pcs). Code 1.9365.00 (cuvette used in the chart).
Square cuvette 10 mm with cap. (100pcs). Code: 1.9363.00
Photometer *DINKO* D-101, use the calibration chart / Photoanalyzer *DINKO* D-105 or D-100 Photometer select program nr. 31

PROCEDURE

1. - Fill test tube with sample to the 10 ml mark.
2. - Add one Acidifying GP tablet and one Chlorine HR tablet and Chlorine HR tablet. Crush tablets and mix to dissolve.
3. - Select 490 nm. filter of Photometer. Take Photometer reading. Make zero whit sample without tablet.
4. - Consult Chlorine chart (D-101). Photoanalyzer D-105 and D-100 select program nr. 31

Range: 0 - 250 mg / L **Chlorine** **490 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0	0	2	4	6	8	10	12	14	16	18
0.1	20	22	24	26	28	30	32	34	36	39
0.2	41	43	45	47	50	52	55	58	60	63
0.3	65	68	70	73	75	78	81	83	86	88
0.4	91	94	97	100	102	105	108	111	114	117
0.5	119	122	125	128	131	134	136	139	142	145
0.6	148	151	153	157	160	163	166	170	173	176
0.7	179	183	186	189	192	196	199	202	205	209
0.8	212	215	218	221	224	228	231	234	237	240
0.9	244	247	250							

Note:

For precise determination of lower levels of Chlorine, up to 5 mg/l, Chlorine (DPD) method should be used.

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 4,260 mg/L Chlorine

Traceability: The traceability of the method settles down with "Standard Method" SM

CHLORINE DIOXIDE and CHLORITE Code 1.9415.00 (50t) - 1.9451.00 (250t) **Photometer Method 520 nm**
Test for Chlorine Dioxide and others residuals in water **0- 10,0 mg / l**

Chlorine dioxide is used for the disinfection of water in a variety of different applications. Chlorine dioxide is generated by reacting Chlorine with Sodium chlorite solution. So, water treated with Chlorine dioxide also contain Chlorine and chlorite. Will be necessary to determine and differentiate between these residuals species.
The *DINKO* Chlorine dioxide test provide a method of determining Chlorine dioxide, Chlorine free and combined Chlorine, and chlorite, in treated water.

METHOD

Chlorine dioxide reacts with diethyl-p-phenylenediamine (DPD) in buffered solution to produce a pink colouration. Glycine is used to prevent the reaction with Chlorine so as to give specific determination of chlorine dioxide.
In the supplementary part of the test the glycine is omitted and it is then possible, by difference, to measure the free chlorine content. Subsequent addition of potassium iodide induces a further reaction with any combined Chlorine present. Continuation of the test using an acidification and neutralisation procedure produces a further reaction and in this way the chlorite concentration can be determinate.
The colour intensities at each stage of the test are measured using a *DINKO* Photometer. It is normal practice to express the concentration of each component as equivalent Chlorine concentration.

REAGENTS ANDY EQUIPMENT

DPD nr. 1 Tablet / DPD nr. 3 Tablet / DPD Glycine Tablet / DPD Acidifying Tablet / DPD Neutralising Tablet
Round cuvette 16 mm Ø with cap. (4pcs). Code 1.9365.00 (cuvette used in the chart).
Square cuvette 10 mm with cap. (100pcs). Code 1.9363.00
Photometer *DINKO* D-101, use the calibration chart / Photoanalyzer *DINKO* D-105 or D-100 Photometer select program nr. 30

PROCEDURE CHLORINE

1. - Rinse a test tube with sample leaving two or three drops. Add one DPD nr. 1 tablet and crush.
2. - Fill a second test tube with sample to 10 ml mark. Add one DPD Glycine tablet, crush and mix.
3. - Add the contents of the second test tube to the first test tube and mix.
4. - Select wavelength 520 nm on photometer. Select program nr.6 whit D-100 and D-105 photometers. Take photometer reading immediately. Make zero whit the sample without tablets.
5. - Consult the calibration chart (D-101) and note the value (Result G) corresponding to the absorbance reading.

Multiply Result G by 5 to obtain the Chlorine dioxide residual in terms of mg/l Chlorine.
To obtain the Chlorine dioxide residual as mg/l Chlorine Dioxide multiply Result G by 1.9.

Range: 0- 5,0 mg / L **520 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0	0.00	0.03	0.06	0.09	0.13	0.16	0.20	0.24	0.27	0.31
0.1	0.34	0.37	0.41	0.44	0.48	0.51	0.54	0.58	0.61	0.65
0.2	0.69	0.71	0.75	0.78	0.82	0.85	0.88	0.92	0.95	0.99
0.3	1.03	1.07	1.12	1.17	1.21	1.26	1.30	1.35	1.40	1.44
0.4	1.49	1.53	1.58	1.63	1.67	1.72	1.76	1.81	1.86	1.90
0.5	1.95	1.99	2.03	2.08	2.12	2.15	2.19	2.23	2.27	2.31
0.6	2.35	2.39	2.43	2.47	2.51	2.55	2.59	2.63	2.67	2.71
0.7	2.75	2.79	2.82	2.87	2.91	2.95	2.99	3.03	3.08	3.13
0.8	3.18	3.23	3.27	3.32	3.37	3.42	3.47	3.51	3.56	3.61
0.9	3.66	3.71	3.75	3.80	3.85	3.90	3.95	3.99	4.06	4.14
1.0	4.21	4.28	4.35	4.42	4.49	4.57	4.64	4.71	4.78	4.86
1.1	4.93	5.00								

PROCEDURE – FREE AND COMBINED CHLORINE, AND CHLORITE

1. - Rinse a test tube with sample leaving two or three drops. Add one DPD nr. 1 tablet, and then fill the test tube with sample to the 10 ml mark. Mix to dissolve tablet
2. - Take the photometer reading immediately(see photometer instructions). Make zero whit the sample without tablets. Consult the calibration chart and note the value (Result A).
3. - Continue the test by adding one DPD nr. 3 tablet. Crush, mix to dissolve and stand for two minutes.
4. - Take photometer reading immediately. Use the same blank of step 2. Consult calibration chart and note the value(Result C) corresponding to the observed absorbance reading.
5. - Continue the test by adding one DPD Acidifying tablet. Crush and mix to dissolve and stand for two minutes.
6. - Add one DPD Neutralising tablet, crush and mix to dissolve.
7. - Take the photometer reading in the usual manner and consult calibration chart. Note the value(Result D) corresponding to the observed absorbance reading. Use the same zero of 2 and 4 steps.

The results of the tests, in terms of mg/l Chlorine, are calculated from the observed results as follows:

Chlorine Dioxide	= 5G
Free Chlorine	= A – G
Combined Chlorine	= C – A
Chlorite	= D – (C + 4G)
Total Oxidising Capacity	= D

Uncertainty:
The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,057mg/L Chlorine

Traceability :
The traceability of the DPD Chlorine method settles down with Standard Methods 4500-CIG and USEPA 330.5”

COLOUR. Code1.9423.00 (50t) **Photometer Method 415 - 420 nm**
Test for colour in natural and treated waters **10- 500 mg/l Pt (Hazen units)**

Pure water exhibits a light blue colour when viewed in depht. This colour may be modified by the presence of organic material, typically to a yellow or brown colour. An estimate of this colour intensity is used as a simple means of monitoring natural and treated water.

METHOD

The colour of the water is determinate using a *DINKO* Photometer. The sample should be filtered to remove suspended solids before analysis to determine the “true colour” due to dissolved matter.
The colour is expressed using the Platinum/Cobalt colour scale(Pt/Co scale). Each unit is equivalent to the colour produced by 1 mg/l Platinum in the form of Chloroplatinic Acid in the presence of 2 mg/l cobaltous chloride hexahydrate. These units are identical with “Hazen” or APHA units which have been traditionally used to express results from the visual estimation of water colour.

REAGENTS AND EQUIPMENT

Syringe Filter
Round cuvette 16 mm Ø with cap. (4 pcs). Code: 1.9365.00. (cuvette used in the chart)
Square cuvette 10 mm with cap. (100pcs). Code: 1.9363.00
DINKO D-101 Photometer use the calibration chart
DINKO D-105 Photoanalyzer and D-100 Photometer select program nr. 52.

PROCEDURE

1. - Filter 10 ml of sample using the syringe filter system.
2. - Fill a test tube with filtered sample to the 10 ml mark.
3. - Fill a test tube with deionised water to the 10 ml mark and retain for use as the ZERO tube
4. - Select the filter 420 nm on Photometer D-101. Photometers D-105 and D-100 select program nr. 52
5. - Take photometer reading using the deionised water as the zero. Consult Colour calibration chart (D-101 Photometer)). Select program nr. 52 (Photoanalyzer D-105 and D-100 Photometer).

Range: 0 - 500 mg / L				**Pt**			**420 nm**
ABS	0	4	8	**ABS**	0	4	8
0.00	0	10	20	0.11	286	297	313
0.01	25	35	45	0.12	321	337	353
0.02	50	60	70	0.13	361	376	392
0.03	75	85	95	0.14	400	410	419
0.04	100	110	119	0.15	424	433	443
0.05	124	134	144	0.16	448	454	459
0.06	148	158	168	0.17	462	468	473
0.07	173	182	192	0.19	489	495	500
0.08	197	206	216				
0.09	221	231	240				
0.10	245	258	274				

Samples which contain metallic impurities, dyestuffs or other industrial pollutants may exhibit a different colour to the natural yellow-brown coloration. This test may not be suitable of samples of this type.

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 3,406 mg/L Pt / Hazen, APHA units

Traceability: The traceability of the Colour method settles down with "Standard Methods of Water and Wastewater, APHA - AWWA - WPOC F , Edición 16 y 17.

COPPER. Code 1.9422 (50t) - 1.9476.00 (250t)

Photometer Method 520 nm
0- 5,0 mg / l Cu

Test for free, chelated and total copper in natural and treated water.

Copper occurs naturally in many waters and also result from corrosion of pipes and fittings. The presence of copper in drinking water can give rise to discoloration or an astringent taste.

Chelate copper compounds are extensively used as algicides in swimming pool water, home aquariums and other waters. Electrolytic devices which generate copper and silver ions are used in the purification of swimming pool water. The *DINKO* Copper test provides a simple means of measuring copper over the range 0 - 5 mg / l. The test is particularly useful since it can be used to measure specifically the concentrations of free and chelated Copper present in the water.

METHOD

In the method Copper salts are reduced to the cuprous form and then react with a 2,2-Biquinoline-4,4-dicarboxilic salt to form a purple coloured complex. This provides a measure of the free copper ions present in the sample. In the second stage of the test, a decomplexing agent is introduced and this induces a further reaction with any chelated copper compounds which might be present.

The reagents are provided in tablet form and the test is simply carried out by adding tablets to a sample of the water. The intensity of colour produced in the test is proportional to the Copper concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Coppercol nº 1 Tablets / Coppercol nr. 2 Tablets
Round cuvette 16 mm Ø with cap. (4pcs). Code: 1.9365.00. (cuvette used in the chart)
Square cuvette 10 mm with cap. (100pcs). Code 1.9363.00
DINKO D-101 Photometer use the calibration chart.
DINKO D-105 Photoanalyzer and D-100 Photometer select program nr. 12.

TEST PROCEDURE

1. - Fill test tube sample to the 10 ml mark.
2. - Add one Coppercol nr. 1 tablet, crush and mix to dissolve.
3. - Select wavelength 520 nm on Photometer. Make zero with sample without tablets.
4. - Take Photometer reading in usual manner. Consult the Copper calibration chart(D-101). Select program nr. 12 (D-105 and D-100).
5. - The result represents the free Copper concentration. Stop the test at this stage if only free copper determination is required.
6. - If it is desired to measure chelated or total Copper continue the test on the same test portion.
7. - Add one Coppercol nr. 2 tablet, crush and mix to dissolve.
8. - Take Photometer reading like in the 4 stage.
9. -The result represents the total Copper concentration.
10. -The chelated copper concentration is obtained by subtracting the free Copper concentration from the total copper concentration.

Chelated Copper = Total Copper- Free Copper.

Range: 0 - 5,0 mg / L Cu					Copper					520 nm
ABS	0	1	2	3	4	5	6	7	8	9
0.0	0	0.06	0.13	0.21	0.28	0.35	0.42	0.49	0.56	0.63
0.1	0.69	0.76	0.83	0.90	0.97	1.04	1.11	1.18	1.26	1.33
0.2	1.40	1.47	1.54	1.61	1.68	1.75	1.82	1.89	1.96	2.04
0.3	2.11	2.18	2.25	2.32	2.39	2.46	2.53	2.60	2.67	2.74
0.4	2.81	2.88	2.95	3.02	3.09	3.16	3.22	3.29	3.36	3.43
0.5	3.50	3.56	3.63	3.70	3.77	3.84	3.90	3.97	4.04	4.12
0.6	4.19	4.26	4.33	4.41	4.48	4.55	4.62	4.70	4.77	4.84
0.7	4.91	5.00								

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,099 mg/L Cu

Traceability: The traceability of the Copper method settles down with USEPA (United States Environmental Protection Agency)

CHEMICAL OXYGEN DEMAND - COD/ 150. **Photometer Method 440-450 nm**
Code 1.9429.00 **10-150 mg/l O_2**
Evaluation of the contamination degree of residual waters

Chemical Oxygen demand is a vital test for assessing the quality of effluents and waste waters prior to discharge. The Chemical Oxygen Demand (COD) test predicts the oxygen requirement of the effluent and is used for monitoring and control of discharges, and for assessing treatment plant performance. The COD test is therefore performed as routine in laboratories of water utilities and industrial companies and comply with the ISO 15705.

METHOD

In the *DINKO* COD method, the water sample is oxidised by digesting in a sealed reaction tube with Sulphuric acid and Potassium dichromate in the presence of a Silver sulphate catalyst. The amount of dichromate reduced is proportional to the chemical Oxygen demand (COD). A reagent blank is prepared for each batch of tubes so as to compensate for the Oxygen demand of the reagent itself.

Over the range of the test a series of colours from yellow through green to blues are produced. The colours is indicative of the chemical Oxygen demand and is measured using a *DINKO* Photometer. The results are expressed as milligrams of Oxygen consumed per litre of sample.

REAGENTS AND EQUIPMENT

Kit COD 25 tubes. Range 10 -150 ppm. Code 1.9429.00
Heater block D-65. Code 1.8082.00
Block 24 tubes of 16 mm. Ø. Code 1.8085.00 and Safety-bell. Code: 1.8089.00 for D-65 Heater block
Heater block D-64D, with block of 12 tubes. Code 1.8081.10
Photoanalyzer D-105. Code 1.9336.00 and Photometer D-100. Code 1.9301.00. Select program nr. 9
Photometer D-101. Code 1.9333.00. Use the calibration chart

WORKING PRACTICE

COD test reagents are light sensitive. Store tubes in the original container and keep the box closed when not in use. Inspect tubes before use, do not use any show green discoloration. The *DINKO* COD test should be carried out in accordance with good laboratory working practice. The reagent tubes contain 84% Sulphuric acid and must be handled with care. The use of appropriate protective clothing, gloves and safety spectacles is recommended. In the event of skin or eye contact, or spillage, wash immediately with large amounts of water. Special care should be taken when opening the reagent tubes to add the water sample as heat will be produced and gases may be evolved. Samples containing cyanide or sulphide will release toxic fumes and for such samples the test must always be carried out in a fume cupboard. It is recommended that the test be conducted using safety-bell. Reagent tubes should not be opened whilst hot as pressure build-up may cause acid spillage.

BLANK REAGENT

In this test a reagent ZERO is used instead of Water Zero referred to in the general photometer operating instructions. The reagent zero is prepared by adding deionised or distilled water to the reagent tube (see Test Procedure, Step 4) and then digesting the tube in the same manner as for the sample.
It is not necessary to prepare a reagent zero each time the test is carried out. The reagent zero tube may be prepared weekly and use repeatedly with all samples prepared from the same batch of reagent tubes. The reagent zero should be stored in the dark.

SAMPLE PREPARATION

Some water samples may contain undissolved or particulate material. Such samples may be homogenised in prior to the test in order to improve accuracy and reproducibility.

TEST PROCEDURE

1.- Turn on Heater block D-65, set the control to the 150º C. Allow the heater up to temperature.
2.- Remove the cap of the COD tube and add 2 ml of sample using a measuring syringe or a standard laboratory pipette.
3.- Replace the cap tightly and invert tube gently to mix contents. The tube will become hot on mixing. Label the tube using the labels provided and place the tube in the Heater block. Place the safety-bell in position.
4.- Prepare a Reagent Zero by repeating steps 2 and 3 using 2 ml of deionised or distilled water in place of the sample.
5.- Put the COD tubes in the Heater for two hours then turn off the Heater.
6.- Carefully remove each tube, and then transfer to a test tube rack.
7.- Allow the tube to cool to room temperature.
8.- Select the filter 440 nm on Photometer D-101. On Photoanalyzer D-105 and D-100 select program nr. 9

9.- Insert the Reagent Zero tube in the Photometer D-101 and adjust to read 1.000 Abs. Remove the Reagent Zero tube and insert the sample COD tubes. Take the photometer reading.

For the Photoanalyzer D-105 and D-100 the usual photometer operating sequence is reversed. Take the reading as follows:

Firstly insert the Sample Tube and use this to set the instrument (Zero Adjust).
Then insert the Reagent Zero and use this to take the photometer reading.

10.- For the Photometer D-101 use the calibration table of instruction manual. For the Photoanlayzer D-105 and Photometer D-100 select programme nr. 9.

INTERFERENCES

Every COD tubes have mercuric sulphate that suppress interference of chlorides from up 2,500 mg / l. in the sample. Samples containing above this level should be diluted.

RANGE: 10 - 150 mg / L O_2 **PPM Oxygen** **440 nm**

ABS.	0	1	2	3	4	5	6	7	8	9
0,5						150	148	145	142	139
0,6	135	132	128	125	122	118	115	111	108	105
0,7	101	98	95	91	88	84	81	78	74	71
0,8	68	64	61	57	54	51	47	44	41	37
0,9	34	30	27	24	20	17	14	10	7	3
1,0	0									

For the instrument periodical verification or realization of calibration charts for other photometers can be used to the following COD standards:
Packing of 60 ml: 50 ppm. Cod. 9971 / 100 ppm. Cod. 9972 / 500 ppm. Cod. 9974 / 1500 ppm Cod. 9977 / 5000 ppm. Cod. 9978 / 15000 ppm. Cod. 9980

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 5,673 mg/L O_2

Traceability: The traceability of COD method settles down with " Standard Methods of Water and Wastewater, APHA - AWWA – WPOC F", 19th Edition, which has been classified by the " American Library of Congress " like IBSN 0 - 87553 – 207-1. Also traceability with ISO 15705, EPA 410-4 and 5220D.

CHEMICAL OXYGEN DEMAND - COD/ 2000. Code 1.9430.00 **Photometer Method 577- 580 nm**
Evaluation of the contamination degree of residual waters **100 - 2000 mg/l O_2**

Chemical oxygen demand is a vital test for assessing the quality of effluents and waste waters prior to discharge. The Chemical Oxygen Demand (COD) test predicts the oxygen requirement of the effluent and is used for monitoring and control of discharges, and for assessing treatment plant performance. The COD test is therefore performed as routine in laboratories of water utilities and industrial companies and comply with the ISO 15705.

METHOD

In the Dinko COD method, the water sample is oxidised by digesting in a sealed reaction tube with sulphuric acid and potassium dichromate in the presence of a Silver sulphate catalyst. The amount of dichromate reduced is proportional to the chemical oxygen demand (COD). A reagent blank is prepared for each batch of tubes so as to compensate for the oxygen demand of the reagent itself. Over the range of the test a series of colours from yellow through green to blues are produced. The colours is indicative of the chemical oxygen demand and is measured using a *DINKO* Photometer. The results are expressed as milligrams of Oxygen consumed per litre of sample.

REAGENTS AND EQUIPMENT

Kit COD 25 tubes. Range 100 - 2000 ppm. Code 1.9430.00
Heater block D-65. Code:1. 8082.00. Block 24 tubes of 16 mm. Ø . Code 1.8085.00. Safety-bell. Code 1.8089.00
Heater Block, with block of 12 tubes. Code 1.8081.10
Photoanalyzer D-105. Code 1.9336.00 / Photometer D-101. Code 1.9333.00/ Photometer D-100. Code 1.9301.00

WORKING PRACTICE

COD test reagents are light sensitive. Store tubes in the original container and keep the box closed when not in use. Inspect tubes before use, do not use any show green discoloration. The *DINKO* COD test should be carried out in accordance with good laboratory working practice. The reagent tubes contain 84% sulphuric acid and must be handled with care. The use of appropriate protective clothing, gloves and safety spectacles is recommended. In the event of skin or eye contact, or spillage, wash immediately with large amounts of water. Special care should be taken when opening the reagent tubes to add the water sample as heat will be produced and gases may be evolved. Samples containing cyanide or sulphide will release toxic fumes and for such samples the test must always be carried out in a fume cupboard. It is recommended that the test be conducted using safety-bell. Reagent tubes should not be opened whilst hot as pressure build-up may cause acid spillage.

BLANK REAGENT

In this test a reagent blank is used instead of Water Zero referred to in the general photometer operating instructions. The reagent blank is prepared by adding deionised or distilled water to the reagent tube (see Test Procedure, Step 4) and then digesting the tube in the same manner as for the water sample.
It is not necessary to prepare a reagent zero each time the test is carried out. The reagent zero tube may be prepared weekly and use repeatedly with all samples prepared from the same batch of reagent tubes. The reagent zero should be stored in the dark.

SAMPLE PREPARATION

Some water samples may contain undissolved or particulate material. Such samples may be homogenised prior to the test in order to improve accuracy and reproducibility.

TEST PROCEDURE

1.- Turn on Heater block D-65, set the control to the 150º C. Allow the heater up to temperature.
2.- Remove the cap of the COD tube and add 2 ml of sample using a measuring syringe or a standard laboratory pipette.
3.- Replace the cap tightly and invert tube gently to mix contents. The tube will become hot on mixing. Label the tube using the labels provided and place the tube in the Heater block. Place the safety-bell in position.
4.- Prepare a Reagent Zero by repeating steps 2 and 3 using 2 ml of deionised or distilled water in place of the sample.
5.- Put the COD tubes in the Heater for two hours then turn off the Heater.
6.- Carefully remove each tube and then transfer to a test tube rack.
7.- Allow the tube to cool to room temperature.
8.- Select the filter 580 nm on the Photometer D-101. On Photoanalyzer D-105 and D-100 select program nr.10
9.- Take the photometer reading in the usual manner (see photometer instructions)
10.- Consult chart (Photometer D-101). Select programme nr. 10 in the Photoanalyzer D-105 and D-100

INTERFERENCES

Every COD tubes have mercuric sulphate that suppress interference of chlorides from up 2,500mg / l. in the sample. Samples containing above this level should be diluted.

RANGE: 100 - 2000 mg / L O_2 **PPM Oxygen** **577 - 580nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0		28	55	83	110	140	170	195	225	255
0.1	285	315	345	375	405	435	465	495	525	555
0.2	580	610	640	670	700	730	760	790	820	850
0.3	880	910	940	970	1000	1030	1060	1090	1125	1155
0.4	1185	1215	1245	1280	1310	1340	1370	1400	1430	1465
0.5	1495	1530	1565	1595	1630	1665	1700	1735	1770	1805
0.6	1840	1875	1910	1945	1980	2000				

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 42,58mg/L O_2

Traceability:

The traceability of COD method settles down with " Standard Methods of Water and Wastewater, APHA - AWWA - WPOC F", 19th Edition, which has been classified by the " American Library of Congress " like IBSN 0 - 87553 - 207 – 1. Also traceability with ISO 15705, EPA 410-4 and 5220D.

For the instrument periodical verification or realization of calibration charts for other photometers can be used to the following COD standards:
Packing of 60 ml: 50 ppm. Cod. 9971 / 100 ppm. Cod. 9972 / 500 ppm. Cod. 9974 / 1500 ppm. Cod. 9977 / 5000 ppm. Cod. 9978 / 15000 ppm. Cod. 9980

CHEMICAL OXYGEN DEMAND - COD / 20000. Code 1.9431.00 **Photometer Method 577- 580 nm**
Evaluation of the contamination degree of residual waters **1000-20000mg/l O_2**

Chemical Oxygen demand is a vital test for assessing the quality of effluents and waste waters prior to discharge. The Chemical Oxygen Demand (COD) test predicts the oxygen requirement of the effluent and is used for monitoring and control of discharges, and for assessing treatment plant performance. The COD test is therefore performed as routine in laboratories of water utilities and industrial companies and comply with the ISO 15705.

METHOD

In the Dinko COD method, the water sample is oxidised by digesting in a sealed reaction tube with sulphuric acid and potassium dichromate in the presence of a Silver sulphate catalyst. The amount of dichromate reduced is proportional to the chemical Oxygen demand (COD). A reagent blank is prepared for each batch of tubes so as to compensate for the oxygen demand of the reagent itself. Over the range of the test a series of colours from yellow through green to blues are produced. The colours is indicative of the chemical oxygen demand and is measured using a *DINKO* Photometer. The results are expressed as milligrams of Oxygen consumed per litre of sample.

REAGENTS AND EQUIPMENT

Kit COD 25 tubes. Range 1000 - 20000 ppm. Code 1.9431.00
Heater block D-65. Code 1.8082.00 / Block 24 tubes of 16 mm. Ø. Code 1.8085.00 / Safety-bell for D-65. Code 1.8089.00
Heater block with block of 12 tubes D-64D. Code 1.8081.10
Photoanalyzer D-105. Code 1.9336.00 / Photometer D-101. Code 1.9333.00 / Photometer D-100. Code 1.9301.00

WORKING PRACTICE

COD test reagents are light sensitive. Store tubes in the original container and keep the box closed when not in use. Inspect tubes before use, do not use any show green discoloration. The *DINKO* COD test should be carried out in accordance with good laboratory working practice. The reagent tubes contain 60% sulphuric acid and must be handled with care. The use of appropriate protective clothing, gloves and safety spectacles is recommended. In the event of skin or eye contact, or spillage, wash immediately with large amounts of water. Special care should be taken when opening the reagent tubes to add the water sample as heat will be produced and gases may be evolved. Samples containing cyanide or sulphide will release toxic fumes and for such samples the test must always be

carried out in a fume cupboard. It is recommended that the test be conducted using safety-bell. Reagent tubes should not be opened whilst hot as pressure build-up may cause acid spillage.

BLANK REAGENT

In this test a reagent ZERO is used instead of Water Zero referred to in the general photometer operating instructions. The reagent blank is prepared by adding deionised or distilled water to the reagent tube (see Test Procedure, Step 4) and then digesting the tube in the same manner as for the water sample.
It is not necessary to prepare a reagent zero each time the test is carried out. The reagent zero tube may be prepared weekly and use repeatedly with all samples prepared from the same batch of reagent tubes. The reagent cero should be stored in the dark.

SAMPLE PREPARATION

Some water samples may contain undissolved or particulate material. Such samples may be homogenised in a blender prior to the test in order to improve accuracy and reproducibility.

TEST PROCEDURE

1.- Turn on Heater block D-65, set the control to the 150º C. Allow the heater up to temperature.
2.- Remove the cap of the COD tube and add 0,2 ml of sample using a measuring syringe or a laboratory pipette.
3.- Replace the cap tightly and invert tube gently to mix contents. The tube will become hot on mixing. Label the tube using the labels provided and place the tube in the Heater block. Place the safety-bell in position.
4.- Prepare a Reagent Zero by repeating steps 2 and 3 using 2ml of deionised or distilled water in place of the sample.
5.- Put the COD tubes in the Heater for two hours then turn off the Heater.
6.- Carefully remove each tube and then transfer to a test tube rack.
7.- Allow the tube to cool to room temperature.
8.- Select the filter 580 nm on Photometer D-101. On Photoanalyzer D-105 and D-100 select program nr.11
9.- Take the photometer reading in the usual manner (see photometer instructions)
10.- Consult calibration chart (Photometer D-101). Select programme nr. 11 for D-105 and D-100.

INTERFERENCES

Every COD tubes mercuric sulphate that suppress interference of chlorides from up 25,000mg / l. in the sample. Samples containing above this level should be diluted.

RANGE: 1000 - 20000 mg / L O_2 **PPM Oxygen** **577- 580 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0		280	550	830	1100	1400	1700	1950	2250	2550
0.1	2850	3150	3450	3750	4050	4350	4650	4950	5250	5550
0.2	5800	6100	6400	6700	7000	7300	7600	7900	8200	8500
0.3	8800	9100	9400	9700	10000	10300	10600	10900	11250	11550
0.4	11850	12150	12450	12800	13100	13400	13700	14000	14300	14650
0.5	14950	15300	15650	15950	16300	16650	17000	17350	17700	18050
0.6	18400	18750	19100	19450	19800	20000				

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 425,7 mg/L O_2

Traceability:
The traceability of COD method settles down with " Standard Methods of Water and Wastewater, APHA - AWWA - WPOC F", 19th Edition, which has been classified by the " American Library of Congress " like IBSN 0 - 87553 - 207 – 1. Also traceability with ISO 15705, EPA 410-4 and 5220D.

For the instrument periodical verification or realization of calibration charts for other photometers can be used to the following COD standards:
Packing of 60 ml: 50 ppm. Cod. 9971 / 100 ppm. Cod. 9972 / 500 ppm. Cod. 9974 / 1500 ppm. Cod. 9977 / 5000 ppm. Cod. 9978 / 15000 ppm. Cod. 9980

CYANURIC ACID. Code 1.9410.00 (50t) - 1.9465.00 (250t) **Photometer Method 520 nm**
Test for Cyanuric Acid in swimming pool water **0 - 200 mg / l**

Cyanuric Acid is used as Chlorine stabiliser in swimming pool water. The recommended Cyanuric Acid level is about 30 to 200 mg/l or less in some countries. The use of chloroisocyanurate based chlorine donors increase the Cyanuric Acid level.
The *DINKO* test is a simple method of measuring Cyanuric Acid.

METHOD

The test is based on a single tablet reagent containing Melamine and buffer. The Cyanuric Acid reacts with Melamine in buffered solution to produce an insoluble complex. This is observed as a turbidity in the test sample. The degree of turbidity is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Cyanuric Acid Tablets / Round cuvette 16 mm Ø (4pcs). Code 1.9365.00
Photometer *DINKO* model D-101, use calibration chart. *DINKO model* D-105 or D-100 select program nr.13.

PROCEDURE

1. - Fill test tube with sample to the 10 ml mark.
2. - Add one Cyanuric Acid tablet , crush and mix to dissolve. A cloudy solution indicate the presence of Cyanuric Acid.
3. - Stand for two minutes then mix again
4. - Select the filter 520 nm on Photometer.
5. - Take the Photometer reading. Make the zero with the sample without tablet.
6. - Consult the Cyanuric Acid calibration chart. Select the program 13 for photometers D-105 or D-100.

The range of the test is 0 - 200 mg / l. However when a test result of 100 mg/L or over is obtained, the following dilution technique is recommended in order to obtain a more accuracy.

1. - Fill the tube sample to 10ml mark with sample.
2. - Pass the 10 ml from the tube sample to an flask of 100 ml and to complete to 100ml mark with distilled water. Mix.
3. - Fill a sample tube to 10ml mark with the above solution.
4. - Repeat test with this sample. The obtained result should multiply for 10 to obtain the concentration of Cyanuric Acid.

Range: 0 - 200 mg / L **Cyanuric Acid** **520 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0		0	1.1	2.0	3.0	3.9	4.9	5.9	6.8	7.8
0.1	8.8	9.7	10.7	116	12.6	13.6	14.6	15.5	16.4	17.4
0.2	18.4	19.3	20.3	21	22	23	24	25	26	27
0.3	28	29	30	31	32	33	34	35	36	37
0.4	38	39	40	41	42	44	45	46	48	49
0.5	51	52	53	55	56	58	59	60	62	63
0.6	65	66	68	69	70	72	73	75	76	77
0.7	79	80	82	83	84	86	87	88	90	91
0.8	92	94	95	96	98	99	100	102	103	104
0.9	106	107	108	110	111	112	114	115	116	118
1.0	119	120	122	125	127	129	131	133	135	137
1.1	139	141	143	145	147	149	152	154	156	158
1.2	160	162	164	166	168	170	171	173	175	177
1.3	179	181	183	185	187	189	190	192	194	196
1.4	198	200								

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 2,835 mg/L Cyanuric Acid.

Traceability: The traceability of the method settles down with Standards Methods"

DEHA (N,N-Diethylhydroxylamine). Code 1.9439(50t)-1.9505.00(250t) **Photometric Method 550 nm.**
Test for boiler and cooler water systems in natural and treated water **0.01- 0,500 mg / l DEHA**

METHOD

The Dinko test is based on N,N-Diethylhydroxylamine (DEHA) or other oxygen scavengers present in the sample reacting with Ferric Iron to produce Ferrous Iron. The Ferrous Iron concentration then forms a purple colour proportional to the concentration of the oxygen scavenger. Ferrous Iron already present in the sample will interfere, hence the method is defined as DEHA + Fe(II). To correct for any Ferrous Iron not introduced during the method use the Correction Fe II Procedure. This will remove any offset and present the 'true' DEHA result as mg/l DEHA.

REAGENTS AND EQUIPMENT

DEHA Tablets / DEHA Solution / DEHA Iron Correction Solution / Two 1 ml Syringes
Photometer D-100, D-101 and D-105 / Round Test Tubes, 10 ml glass code 1.9365.00

TEST PROCEDURE DEHA + Fe(II)

1 - Fill test tube with sample to the 10 ml mark.
2 - Add one DEHA tablet, crush and mix until completely dissolved.
3 - Add 0,5 ml of DEHA test solution with the first syringe, mix the solution and cap the photometer tube.
4- The solution is photosensitive. In order to prevent inaccurate results, place the tube in the photometer with the light cap in place.

5- Stand for 10 minutes to allow full colour development.
6- Select 550 nm filter on the photometer and take the reading in the usual manner. The result is displayed in mg/l DEHA for the programmed test on Photometer D-100 and D-105 or absorbance to read on ppm/absorbance table calibration below.

The test may be terminated at this stage if the sample is known to contain no Ferrous Iron.

TEST PROCEDURE – Fe(II) Correction

1- Fill test tube with the same sample to the 10 ml mark.
2- Add one DEHA tablet, crush and mix until completely dissolved.
3- Add 0,5 ml of DEHA Iron Correction solution with the second syringe, mix the solution and cap the photometer tube.
4- The solution is photosensitive. In order to prevent inaccurate results, place the tube in the photometer with the light cap in place.
5- Stand for 10 minutes to allow full colour development.
6- Select 550 nm filter and take the reading in the usual manner. Deduce the mg/l DEHA from the first result.

INTERFERENCES

This method reacts with similar oxygen scavengers (carbohydrazide, DEHA, hydroquinone, iso-ascorbic acid [ISA], methylethyl ketoxime [MEKO]) and does not differentiate samples containing more than one type of oxygen scavenger.
During colour development the samples must be protected from light.

The test has been calibrated at 18°C, sample temperature during the test should be maintained as close to this temperature as possible. Samples of a temperature lower than 18°C will give a low response; samples of a higher temperature will give a high response.
For a standard in the region of 0,2 mg/l the result will drift by approximately 0.017 mg/l for every 5°C away from 18°C (ie at 23°C the instrument would give a result of 0,217 mg/l).
For a result in the region of 0,4 mg/l the result will drift by approximately 0.03 mg/l for every 5°C away 18°C (ie at 23°C the instrument would give a result of 0,43 mg/l).
Any chemical that will reduce ferric iron, or that will complex with iron strongly, will interfere. The species below will interfere at the levels indicated:
Borate >500 mg/l, Cobalt >0,025 mg/l, Copper >8 mg/l, Hardness >1000 mg/l, Manganese >0,8 mg/l, Molybdenum >80 mg/l, Nickel >0,8 mg/l, Phosphate >10 mg/l, Phosphonates >10 mg/l, Sulphate >1000 mg/l, Zinc >50 mg/l.

Notes
1- If carrying out the correction procedure for ferrous iron and on addition of the DEHA tablet no colour is produced, this indicates there is no ferrous iron in the sample and the correction procedure isn't necessary.
2- To convert a mg/l reading into ppb, multiply the result by 1000.

Range: 0,01- 0,500 mg/ L **DEHA** **550 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0				0.005	0.012	0.019	0.026	0.032	0.039	0.046
0.1	0.053	0.059	0.066	0.073	0.080	0.087	0.093	0.100	0.107	0.114
0.2	0.120	0.127	0.134	0.141	0.147	0.154	0.162	0.169	0.176	0.183
0.3	0.190	0.197	0.204	0.212	0.219	0.226	0.234	0.241	0.248	0.256
0.4	0.263	0.270	0.277	0.285	0.292	0.299	0.307	0.314	0.321	0.329
0.5	0.336	0.343	0.351	0.358	0.365	0.372	0.380	0.386	0.393	0.400
0.6	0.407	0.414	0.420	0.427	0.434	0.441	0.448	0.454	0.461	0.468
0.7	0.475	0.482	0.488	0.495						

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,099 mg/L DEHA

Traceability: The traceability of the method settles down with Ishii and Koh, Bunseki Kagaku, 28 473 (1979)

FLUORIDE. Code 1.9433.00 (50t) - 1.9481.00 (200t) **Photometer Method 580 - 577nm**
Test for fluoride in natural and treated water. **0-1,5 mg / l**

Fluoride occurs naturally in some ground waters and is often introduced into drinking water for the prevention of tooth decay. Excessive amounts of fluoride are however objectionable and can cause tooth discolouration. The *DINKO* Fluoride test provides a simple method to monitoring fluorides in natural waters, and for the control of fluoridation plant at water works.

METHOD

Zirconyl Chloride and Eriochrome Cyanine R are reacted in acid solution to form a red coloured complex. This colour is destroyed by fluoride ions to give the pale yellow colour of the Eriochrome Cyanine. Differing amounts of fluoride thus produce a range of colours from red to yellow.
This method is substantially free from interferences wich normally beset chemical methods of fluoride testing. The interference from aluminium, iron and complexes is eliminated by making the solution alkaline in the first stage of the test procedure. Interferences from calcium, phosphates and sulphates should not be significant at the levels normally encountered in natural and drinking waters.
In the Fluoride test two tablet reagents are used. The test is simply carried out by adding one of each tablet to a sample of the water. The colour produced in the test is indicative of fluoride concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Fluoride Nº 1 Tablet / Fluoride nr. 2 Tablet
Round cuvette 16 mm Ø with cap. (4pcs). Code: 1.9365.00. (cuvette used in the chart)
Square cuvette 10 mm with cap. (100pcs). Code: 1.9363.00
DINKO D-101 Photometer use the calibration chart / *DINKO* D-105 Photoanalyzer and D-100 Photometer select program nr. 33.

PROCEDURE

1. - Fill test tube with sample to 10 ml mark.
2. - Add one Fluoride nr. 1 tablet, crush and mix to dissolve.
3. - Add one Fluoride nr. 2 tablet, crush and mix to dissolve.
4. - Stand for 5 minutes to allow full colour development.
5. - Take Photometer reading(see Photometer Instructions). Make zero with sample without tablets.
6. - Consult Fluoride chart (D-101, 580 nm). Select program nr. 33 (D-105 and D-100)

Range: 0 -1,5 mg / l **Fluoride** **580 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.2				1.50	1.48	1.43	1.39	1.35	1.30	1.26
0.3	1.21	1.16	1.10	1.03	0.97	0.91	0.85	0.79	0.73	0.70
0.4	0.66	0.62	0.58	0.54	0.51	0.47	0.44	0.41	0.38	0.35
0.5	0.33	0.30	0.26	0.22	0.18	0.14	0.10	0.06	0.02	0.00

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,057mg/L F

Traceability: The traceability of Zirconyl Chloride method settles down with SM

HARDNESS, TOTAL. Code1.9434.00 (50t) - 1.9479.00 (250t) **Photometric Method 577-580 nm**

Test hardness in natural and treated water 0 - 500 mg / l $CaCO_3$

Water hardness is caused by the presence of calcium and magnesium salts. High levels of hardness prevent the formation of lather with soap, and can cause scaling in water systems, particularly boilers, heat exchangers and steam generating plant.
The Hardness test provides a simple method of checking water hardness over the range 0 - 500 mg / l $CaCO_3$

METHOD

The Hardness test is based on a unique colorimetric method. The reagents are provided in tablet form and the test is carried out simply by adding the appropriate tablets to a sample of the water.
Under the controlled conditions of the test calcium and magnesium ions react with Hardicol indicator to produce a purple coloration. The intensity of the colour is proportional to the total hardness of the water and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Hardicol nº 1 Tablet / Hardicol nº 2 Tablet
Round cuvette 16 mm Ø with cap.(4pcs). Code 1.9365.00. (cuvette used in the chart)
Square cuvette 10 mm with cap. (100pcs). Code 1.9363.00
DINKO D-101 Photometer use calibration chart. Filter 580 nm.
DINKO D-105 Photoanalyzer and D-100 Photometer select program nr. 25.

PROCEDURE

1. - Filter sample if necessary to obtain a clear solution.
2. - Fill test tube with sample to the 10ml mark..
3. - Add one Hardicol nr. 1 tablet, crush and mix to dissolve..
4. - Add one Hardicol nr. 2 tablet, crush and mix to dissolve. Ensure all particles are completely dissolved.
5. - Stand for two minutes to allow full colour development.
6. - Select the filter 580 nm on the Photometer D-101. On the Photoanalyzer D-105 and D-100 select program nr. 25.
7. -Take Photometer reading in the usual manner. Make zero with sample without tablets.
8. - Consult Hardness calibration chart(D-101). Select program nr. 25 (D-105 and D-100).

INTERFERENCES

1. - Unusually high levels of iron, above 10 mg/l, will cause low results for total hardness.
2. - The pH required in the test is closely controlled by buffer mixture included in the tablet formulation.
   However, to avoid exceeding the buffer capacity strongly acid or alkaline samples should be adjusted to within the pH range 4 to 10, prior to the start of the test.

Notes

1 - The expression of hardness results sometimes causes confusion. It is normal practice to express the results of hardness test as mg /l de $CaCO_3$ (calcium carbonate). This is merely a convention to allow the comparison of different results and does not necessarily indicate that the hardness is present in the water in this form.

Results may also be expressed as mg/l Ca. To convert $CaCO_3$ mg/l to mg/l Ca multiply by 0,4

2 - Some relations of interest are the following: 1º dH = 1.25º e H = 1.8 f H = 17.8 mg / $CaCO_3$

where dH = German hardness ; eH = English hardness ; f H = French hardness.

Water below 90 mg in Calcium carbonate have a light hardness, between 90 and 180 normal hardness, between 180 and 270 mg moderate hardness, and between 270 and 500 mg high hardness.

3 - This test measure the total hardness. The specific hardness of Calcium or Magnesium can be determinate using the Calcium and Magnesium kits.

Total Hardness			$CaCO_3$		580 nm
ABS	0	5	ABS	0	5
0.08	0	4	0.23	162	169
0.09	9	14	0.24	176	183
0.10	19	24	0.25	190	197
0.11	28	33	0.26	206	216
0.12	38	42	0.27	227	237
0.13	47	52	0.28	247	257
0.14	57	61	0.29	267	278
0.15	66	71	0.30	288	298
0.16	75	80	0.31	314	332
0.17	85	90	0.32	350	368
0.18	94	99	0.33	386	404
0.19	106	113	0.34	425	446
0.20	120	127	0.35	467	485
0.21	134	141	0.36	500	
0.22	148	155			

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 14,18mg/L $CaCO_3$

Traceability: The traceability of Hardicol method settles down with Dr. A T Palin.

HYDRAZINE. Code 1.9435.00 (50t)
Test for Hydrazine in industrial water

Photometer Method 450- 420 nm.
0- 0,5 mg / l N_2H_4

Hydrazine is used as an oxygen scavenger in high pressure boilers and steam raising plant. Hydrazine is particularly advantageous in that it does contribute solids to the boiler water. The Hydrazine test provides a simple means of measuring levels in boiler feed water and boiler water over the range 0 - 0,5 mg/l.

METHOD

The Hydrazine test uses a special reagent powder containing p-Dimethylaminebenzaldehyde in acidic formulation that react with Hydrazine to produce a yellow coloration. The intensity of colour produced is proportional to the hydrazine concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Hydrazine Test Powder / Scoop, 1g approx. / Round cuvette 16mm Ø with cap. (4pcs). Code 1.9365.00. (cuvette used in the chart)
Square cuvette 10 mm with cap. (100pcs). Code 1.9363.00
DINKO D-101 Photometer use the calibration chart / *DINKO* D-105 Photoanalyzer and D-100 Photometer select program nr.34.

PROCEDURE

1. - Filter sample if necessary to obtain clear solution.
2. - Take two test tubes A and B.
3. - To each tube add one level scoop(1g) of Hydrazine Test Powder.
4. - Fill test tube A with sample to 10 ml mark. Tap and mix to dissolve.
5. - Fill test tube B with deionised water to 10 ml mark. Tap and mix to dissolve.
6. - Stand for two minutes to allow full colour development.
7. - Select the filter 420 nm on photometer D-101.On Photoanalyzer D-105 and D-100 select program nr. 34
8. - Take Photometer reading(see Photometer instructions). Use Tube B as the zero to set the instrument.
9. - Consult the Hydrazine calibration chart (D-101). Select program nr. 34(D-105 and D-100)

Range: 0 - 0, 5 mg / L	N_2H_4			Hydrazine					420 nm
ABS	0	1	2	3	4	5	6	7	8	9
0.0	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.04
0.1	0.05	0.05	0.05	0.06	0.07	0.07	0.08	0.08	0.09	0.09
0.2	0.10	0.10	0.11	0.11	0.12	0.12	0.13	0.13	0.14	0.14
0.3	0.15	0.16	0.16	0.17	0.17	0.18	0.18	0.19	0.19	0.20
0.4	0.20	0.21	0.21	0.22	0.22	0.23	0.23	0.24	0.24	0.25
0.5	0.25	0.26	0.26	0.27	0.27	0.28	0.28	0.29	0.29	0.30
0.6	0.30	0.31	0.31	0.32	0.32	0.33	0.33	0.34	0.34	0.35
0.7	0.35	0.35	0.36	0.36	0.37	0.37	0.38	0.38	0.39	0.39
0.8	0.40	0.40	0.41	0.41	0.42	0.42	0.43	0.43	0.44	0.44
0.9	0.45	0.46	0.46	0.47	0.47	0.48	0.48	0.49	0.49	0.50

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,071 mg/L N_2H_4

Traceability: The traceability of Hydrazine method settles down with ASTM D-1385-78,376(1979)

HYDROGEN PEROXIDE. Code 1.9436.00 (50t) - 1.9485.00 (250t) **Photometer Method 520 nm**
Test for Hydrogen Peroxide in water **0 -2,0mg / l**

Hydrogen Peroxide is used in various water treatment process and it is important the control of concentration.
The *Dinko* test provides a simple means of measuring Hydrogen Peroxide levels over the range 0- 2.0 mg/l.

METHOD

Hydrogen Peroxide react with Potassium Iodide under slightly acid conditions, and in the presence of a catalyst, to release iodine into solution. The iodine then reacts with diethyl-p-pheneylendiamine (DPD) to produce a pink coloration. In the *Dinko* test the reagents are combined in the form of a single tablet and the test is simply carried out by adding a tablet to a sample of water.
The intensity of colour produced is proportional to the Hydrogen Peroxide concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Hydrogen Peroxide LR Tablet / Round cuvette 16mm Ø with cap. (4pcs). Code: 1.9365.00. (cuvette used in the chart)
Square cuvette 10 mm with cap. (100pcs). Code 1.9363.00
DINKO D-101 Photometer use the calibration chart / *DINKO* D-105 Photoanalyzer and D-100 Photometer select program nr. 35.

PROCEDURE

1. - Rinse test tube with sample leaving 2 to 3 drops of sample in the tube.
2. - Add one Hydrogen Peroxide LR Tablet, crush and then fill the tube with sample to 10 ml mark. Mix to dissolve tablet.
3. - Stand two minutes to allow full colour development. Select filter of 520 nm on the Photometer.
4. - Take Photometer reading. Make zero using sample without tablets.
5. - Consult chart, Photometer D-101. Select program nr.35, Photoanalyzer D-105 and D-100

Notes
1- The sample should be free of other oxidizing agents such as Chlorine, Bromine etc. as these react in similar manner and will interference with the test. It is unlikely that these oxidizing agents will be used in conjunction with Hydrogen Peroxide and, under normal circumstances, will not usually coexist in solution.
2- For measuring high levels of Hydrogen Peroxide used in industrial processes, use the Hydrogen Peroxide Test 0-100 mg/l.

Range: 0 -2,0 mg / l **Hydrogen Peroxide** **520 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0			0.01	0.03	0.04	0.06	0.08	0.09	0.11	0.12
0.1	0.14	0.15	0.17	0.19	0.20	0.22	0.23	0.25	0.26	0.28
0.2	0.30	0.31	0.33	0.34	0.36	0.37	0.39	0.41	0.43	0.45
0.3	0.47	0.49	0.51	0.53	0.55	0.57	0.59	0.61	0.63	0.65
0.4	0.67	0.69	0.71	0.73	0.75	0.77	0.79	0.81	0.83	0.85
0.5	0.87	0.89	0.91	0.93	0.95	0.97	0.99	1.01	1.04	1.06
0.6	1.09	1.11	1.14	1.17	1.19	1.22	1.24	1.27	1.29	1.32
0.7	1.35	1.37	1.40	1.44	1.48	1.52	1.55	1.59	1.63	1,67
0.8	1.71	1.75	1.79	1.83	1.87	1.91	1.95	2.00		

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,043 mg/L H_2O_2

Traceability: The traceability of Hydrogen Peroxide method settles down with SM

HYDROGEN PEROXIDE. Code 1.9437.00 (50t) - 1.9452.00 (250t) **Photometer Method 490 nm**
Test for high level of Hydrogen Peroxide in water. **0- 100 mg / l**

Hydrogen Peroxide is used as bleach and oxidizing agent in a number of industrial processes like textile bleaching, commercial laundering and paper manufacturing. It is important in such processes to control the Hydrogen Peroxide concentration so as to achieve the bleaching effect without causing damage.

The *DINKO* test provides a simple means to measure the Hydrogen Peroxide concentration in the water over the range 0-100 mg / l.

MÉTHOD

Hydrogen Peroxide reacts with Potassium Iodide under acid conditions to release Iodine which gives a yellow solution. A catalyst is used to speed up the rate of reaction. The reagents are provided in the form of two tablets. The test is simply carried out by adding one of each tablet to a sample of the water.
The intensity of the colour produced in the test is proportional to the Hydrogen Peroxide concentration and is measured using *Dinko* Photometer

REAGENTS AND EQUIPMENT

Hydrogen Peroxide HR Tablet / Acidifying PT Tablet
Round cuvette 16mm. Ø with cap (4pcs). Code 1.9365.00. (cuvette used in the chart)/ Square cuvette 10 mm with cap. (100pcs). Code 1.9363.00
DINKO D-101 Photometer use the calibration chart / *DINKO* D-105 Photoanalyzer and D-100 Photometer select program nr. 36.

PROCEDURE

1. - Fill test tube with sample to the 10 ml mark.
2. - Add one Acidifying PT tablet and one Hydrogen Peroxide HR tablet. Crush and mix to dissolve.
3. - Select 490 nm filter.
4. -Take the Photometer reading. Make zero with sample without tablets.
5. - Consult the chart, Photometer D-101. Select program nº 36, Photoanalyzer D-105 and D-100

Range: 0 - 100 mg / l **Hydrogen Peroxide** **490 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0,0			0,4	1,5	2,6	3,7	4,8	5,9	7,0	8,1
0,1	9,2	10,2	11,4	12,5	13,6	14,6	15,7	16,8	17,9	19,0
0,2	20	21	23	24	25	27	28	29	31	32
0,3	33	35	36	37	38	40	41	43	44	46
0,4	47	49	50	51	53	54	56	57	59	60
0,5	62	63	65	66	68	69	71	72	74	75
0,6	77	78	80	82	83	85	86	88	89	91
0,7	92	94	96	97	99					

1. – The sample should be free of other oxidizing agents such as Chlorine Bromine as these react in similar manner and will interfere with the test. It is unlikely that these oxidizing agents will be used in conjunction with Hydrogen Peroxide and, under normal circumstances, will not usually coexist in solution.
2. - To measure low levels of Hydrogen Peroxide, use the Hydrogen Peroxide Low Range test.

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 2,129 mg/L H_2O_2

Traceability: The traceability of Hydrogen Peroxide method settles down with SM

IRON. Code 1.9443.00 (50t) - 1.9500.00 (250t) **Photometer Method 520 nm**
Test for Iron in natural, treated and industrial water **0 – 5,0 mg / l**

Iron occurs widely in nature and is found in many natural and treated waters. Iron is an objectionable constituent in both domestic and industrial water supplies. The presence of Iron affects the taste of beverages and causes unsightly staining of laundered clothes, plumbing fittings, swimming pool surfaces and the like. The formation of insoluble iron deposits is troublesome in many industrial applications and in the agricultural water uses such as drip feed irrigation. In industry iron salts occur trough corrosion of plant and equipment, and from industrial process.
The *Dinko* Iron test provides a simple method for the determination of both ferrous and ferric iron. Is capable of dissolving colloidal and particulate Iron and thus gives a measure of total Iron content of the water.

METHOD

In the *Dinko* method Iron is reduced to the ferrous form and then reacted with 1,10-phenantroline to form an orange coloured complex. A decomplexing agent is added into the reagent system in order to break down complexed forms of Iron. The test is simply carried out by adding tablet reagents to a sample of the water under test.
The intensity of the colour produced is proportional to the Iron concentration and is measured using a *Dinko* Photometer.

REAGENTS AND EQUIPMENT

Iron MR nº 1 Tablets / Iron MR nº 2 Tablets / Citrate IR Tablets
Round cuvette 10 mm path light. (4pcs). Code 1.9365.00.(cuvette used in the chart)
DINKO D-101 Photometer use calibration chart / *DINKO* D-105 Photoanalyzer and D-100 Photometer select program nr. 38.

PROCEDURE

1. – Fill the test tube with sample to the 10 ml mark.
2. – Add one Iron MR nr. 1 tablet, crush and mix to dissolve.
3. – Add one Iron MR nr. 2 tablet, crush and mix to dissolve.
4. – Stand for 10 minutes to allow full colour development.
5. – Select the filter 520 nm. on the Photometer..
6. – Take Photometer reading in usual manner. Make zero with sample without tablets.
7. – Consult Iron calibration chart(D-101). Select program nr. 38 (D-100 and D-105).

INTERFERENCES

Hardness 500 mg/l $CaCO_3$, silica 150 mg/l SiO_2 and Copper 3 mg/l Cu do not interfere with the test. Chromium 10mg/l may cause slightly high results.
Nitrite greater than 50 mg/l NO_2 causes low results and molybdates at any concentration causes precipitation. The pre-treatment procedures described below using Citrate IR tablets remove interferences from nitrite up to 500 mg/l NO_2 and molybdate up to 20 mg/l MoO_4. This pre-treatment does however reduce the tolerance to Chromium and is not recommended therefore for Chromium containing samples.

Pre-treatment procedure using Citrate IR tablets . (50pcs) Code 1.9443.01, not included

Sample containing nitrite:

1. - Fill the test tube with sample to 10 ml mark.
2. - Add one Citrate IR tablet, crush and mix to dissolve. Ensure all particles are dissolved.
3. - Continue the test as described in the test procedure from stage 2 above but allow the tube to stand for 15 minutes to allow full development before taking the photometer reading.

Sample containing molybdate:

1. - Fill the test tube with sample to 10 ml mark.
2. - Add one Iron nr. 1 tablet, crush and mix to dissolve
3. - Add one Citrate IR tablet, crush and mix to dissolve. Ensure all particles are dissolved.
4. - Continue the test as described in the test procedure from stage 3 but allow the tube to stand 15 minutes to allow full colour development before taking the reading.

Range: 0- 5,0 mg / L Fe					Iron					520 nm
ABS	0	1	2	3	4	5	6	7	8	9
0.0			0.03	0.11	0.18	0.26	0.33	0.41	0.48	0.56
0.1	0.64	0.71	0.79	0.86	0.94	1.02	1.11	1.20	1.29	1.39
0.2	1.48	1.57	1.66	1.75	1.84	1.94	2.03	2.11	2.20	2.28
0.3	2.37	2.45	2.54	2.62	2..71	2.79	2.88	2.97	3.06	3.17
0.4	3.27	3.38	3.48	3.58	3.69	3.79	3.90	4.00	4.11	4.22
0.5	4.32	4.43	4.54	4.65	4.75	4.86	5.00			

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,128mg/L Fe

Traceability: The traceability of Phenantroline method settles down with A.E. Harvery, Anal. Chem., 27,26(1955)

IRON. Code 1.9438.00 (50t) **Photometer Method 577 - 580 nm**
Test for high levels of Iron in natural and treated water. **0 - 10 mg / l**

Iron occurs widely in nature and is found in many natural and treated waters. Iron is an objectionable constituent in both domestic and industrial water supplies. Iron affects the taste of beverages and causes unsightly staining of laundered clothes, plumbing fittings, swimming pool surfaces and the like. The formation of insoluble iron deposits is troublesome in many industrial applications and in agricultural waters uses such as drip feed irrigation. In industry iron salts occur through corrosion of plant and equipment, and from industrial processes.

Iron is therefore an important test for the monitoring of waters. The *DINKO* Iron test provides a simple method for determination of high levels of iron in water over the range 0 to 10 mg/ l. The test responds to both ferrous and ferric Iron and thus gives a measure of the total Iron content of the water.

METHOD

The *DINKO* Iron test is based on a simple tablet reagent containing an alkaline thioglycollate. The test is carried out simply by adding a tablet to a sample of the water under test. The thioglycollate reduces ferric Iron to ferrous Iron and this, together with any ferrous iron already present in the sample, reacts to give a pink coloration.
The intensity of colour produced is proportional to the Iron concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Iron HR Tablet.
Round cuvette 16 mm. Ø (4pcs). Code 1.9365.00. (cuvette used in the chart). Square cuvette 10 mm with cap.(100pcs). Code 1.9363.00
DINKO D-101 Photometer use the calibration chart. Filter 580 nm.
DINKO D-105 Photoanalyzer and D-100 Photometer select program nr.14.

PROCEDURE

1. - Fill test tube with sample to the 10 ml mark.
2. - Add one Iron HR tablet, crush and mix to dissolve.
3. - Stand for 1 minute to allow full colour development.
4. - Select the filter 580 nm on Photometer (D-101). D-105 and D-100 photometers select program nr. 14
5. - Take Photometer reading(see Photometer instructions). Make zero whit sample without tablet.
6. - Consult Iron calibration chart(D-101). Select program nr. 14 (D-105 and D-100)

IRON COMPLEXES

The test colour development will normally be completed within one minute. Continued colour development after this time is indicative of more strongly bound Iron complexes in the water. In such cases the test solution should be stood for a longer period, say 10-15 minutes, until colour development is complete.

In certain industrial applications strong complexing agents are added to act as corrosion inhibitors. Moreover some samples may contain precipitated Iron complexes or particles of metallic iron. These samples will require pre-treatment by a standard laboratory procedure if it is required to determine the total Iron content.

The usual method of pre-treatment is acidification-with or without boiling, depending on the nature of the sample.

To use the *Dinko* Iron test after such pre-treatment procedures, add the Iron HR tablet to the acidified sample, adjust to pH 6,0-9,0 using Ammonia or Sodium hydroxide, then take the photometer reading in the normal manner.

Range: 0 -10 mg / l Fe					Iron					580 nm
ABS	0	1	2	3	4	5	6	7	8	9
0.0							0	0.30	0.65	1.00
0.1	1.35	1.65	2.00	2.30	2.60	2.90	3.20	3.50	3.80	4.05
0.2	4.15	4.30	4.45	4.55	4.70	4.80	4.95	5.05	5.20	5.30
0.3	5.45	5.55	5.70	5.85	5.95	6.10	6.25	6.35	6.50	6.65
0.4	6.80	6.90	7.05	7.20	7.35	7.45	7.60	7.75	7.90	8.00
0.5	8.15	8.30	8.45	8.55	8.70	8.85	8.95	9.10	9.25	9.40
0.6	9.50	9.65	9.80	9.95	10.0					

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,213 mg/L Fe

Traceability: The traceability of Thioglycollate method settles down with H.W. Swank. Ind. Eng. Chem. , Anal. Ed., 10,7 10,7(1938)

MAGNESIUM. Code 1.9440.00 (50t) - 1.9487.00 (250t) **Photometer Method 520 nm**
Test for Magnesium in water **0- 100 mg / l**

Magnesium is a widely occurring natural element and is found in most water supplies. Magnesium salts contribute to the hardness of water and higher levels of magnesium will be found therefore in hard water areas. Scale formation in heating and steam raising equipment is promoted by the presence of magnesium salts in the water. Magnesium salts do however have a lower scale forming tendency than calcium salts.
The *DINKO* Magnesium test provides a simple means of measuring magnesium l in water over the range 0-100 mg/l Mg.

METHOD

The *DINKO* Magnesium test is based on a simple colorimetric procedure. Magnesium reacts with an organic reagent to produce an orange coloured complex. The reagent itself is yellow and thus over the range of the test a series of colours from yellow through to orange are produced. The colour produced in the test is indicative of the magnesium concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Magnecol Tablet / Measuring Syringe 1ml
Round cuvette 16 mm Ø with cap.(4pcs). Code 1.9365.00. (cuvette used in the chart)
Square cuvette 10 mm with cap. (100pcs). Code 1.9363.00
DINKO D-101 Photometer use calibration chart.
DINKO D-105 Photoanalyzer and D-100 Photometer select program nr.15.

PROCEDURE

1. - Using the measuring syringe take a 1 ml sample of the water under test. Transfer to the round test tube and make up to 10 ml mark with deionised water.
2. - Add one Magnecol Tablet, crush and mix to dissolve.
3. - Stand for five minutes to allow full colour development and the slight turbidity to clear. Do not disturb the sample.
4. - Select the filter 520 nm on photometer.
5. - Take photometric reading (see Photometer instructions). Make zero with sample without tablet.
6. - Consult the Magnesium calibration chart(D-101). Select program nr. 15 (D-105 and D-100).

Range: 0-100 mg / L Mg **Magnesium** **520 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.1	0.0	0.8	1.9	3.0	4.1	5.2	6.3	7.4	8.5	9.6
0.2	10.7	11.8	12.9	14.0	15.1	16.2	17.3	18.4	19.5	21
0.3	22	23	24	26	27	28	29	31	32	33
0.4	34	36	37	38	39	41	42	43	45	46
0.5	47	48	50	51	52	54	55	56	57	59
0.6	60	62	64	66	68	70	72	74	76	78
0.7	81	84	87	90	94	97	100			

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 2,835 mg/L Mg

Traceability: The traceability of method settles down with "SM"

MANGANESE. Code 1.9441.00 (50t) - 1.9488.00 (250t) **Photometer Method 620 – 630 nm**
Test for Manganese in water 0- 0,030 mg/l

Manganese salts are commonly found in many natural waters and is an objectionable constituent in water used for domestic purpose or industrial applications. Manganese will cause brown or black staining to laundry or plumbing fittings even at very low concentrations. In paper manufacturing or textile finishing similar staining can occur. Manganese salts may impart an astringent taste to drinking water supplies, and in swimming pool applications can give an aesthetically displeasing brown coloration to the water.
The *DINKO* test provides an extremely sensitive method of measuring low concentrations of Manganese over the range 0 - 0,030 mg/l.

METHOD

Manganese may occur in water in various different valence states. In the first stage of method, manganese in lover valence states is oxidised to form permanganate by the action of an oxidising agent. In the second stage the permanganate formed is further reacted with leucomalachite green to form an intense turquoise coloured complex. Catalyst and inhibitors are incorporated into the tablet reagents to ensure that colour reaction proceeds correctly and interferences are eliminated.
The intensity of colour produced in the test is proportional to the total Manganese concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Nr. 1 Tablet / Nr. 2 Tablet / Round cuvette 16 mm Ø with cap. (4pcs). Code 1.9365.00. (cuvette used in the chart)
Square cuvette 10 mm with cap. (100pcs). Code: 1.9363.00 / *DINKO* D-101 Photometer use the calibration chart. Filter 620nm
DINKO D-105 Photoanalyzer and D-100 select program nr. 39.

SAMPLE COLLECTION

Manganese is readily absorbed on to the surfaces of sample containers. To avoid loss of manganese test sample as soon as possible after collection. It is important, because of extreme sensitivity of this test, to ensure that glassware used for the sample collection and test procedure is very clean. For most accurate results in laboratory use it is recommended that all glassware is acid-rinsed and thoroughly washed out with deionised water before re-use.

PROCEDURE

1. - Fill the test tube to the 10 ml mark with the sample (see Note 1).
2. - Add one Manganese nr. 1 tablet, crush and mix to dissolve.
3. - Add one Manganese nr. 2 tablet, crush and mix to dissolve then cap the tube.
4. - Stand for 20 minutes to allow full colour development (see Note 2)
5. - Select wavelength 620 nm. on the Photometer D-101. Select program nr. 39 on the D-100 and D-105 photometers.
6. - Take Photometer reading immediately(see Photometer Instructions). Make zero with sample without tablets.
7. - Consult Manganese calibration chart (D-101). Select program nr. 39 (D-105 and D-100)

Notes

1.- Colour formation is extremely sensitive to temperature. The sample temperature should be about 20ºC for optimum test results.
2.- It is important to observe the standing period of 20 minutes ± 1 minute for optimum test results.
Any continuing colour development or colour change after this period should be ignored.

Range: 0- 0,030 mg / L Mn **Manganese** **620 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.1					0.000	0.000	0.001	0.001	0.001	0.001
0.2	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.004	0.004
0.3	0.004	0.004	0.005	0.005	0.005	0.005	0.006	0.006	0.006	0.006
0.4	0.007	0.007	0.007	0.008	0.008	0.008	0.009	0.009	0.009	0.010
0,5	0.010	0.010	0.011	0.011	0.011	0.012	0.012	0.012	0.012	0.013
0.6	0.013	0.013	0.013	0.014	0.014	0.014	0.015	0.020	0.020	0.024
0.7	0.026	0.027	0.030							

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,002 mg/L Mn

Traceability: The traceability of the leucomalachita method settles down with Dr. A T Palin

MANGANESE. Code 1.9447.00 (50t) **PhotometerMethod 550nm**
Test for soluble Manganese in water 0 – 5 mg/l

Manganese-containing minerals occur widely and manganese salts are commonly found in many natural waters. Manganese is an objectionable constituent in water used for domestic purposes or industrial applications. In domestic situations, manganese will cause brown or black staining to laundry or plumbing fittings even at very low concentrations. In process applications such as paper manufacturing or textile finishing similar staining can occur. Manganese salts may impart an astringent taste to drinking water supplies, and in swimming pool applications can give an aesthetically displeasing brown coloration to the water.
In most cases where manganese salts occur naturally in the water, it will be necessary to apply special methods of removal before the water can be used for domestic or industrial purposes. The Palintest Manganese test provides an extremely sensitive method of measuring low concentrations of manganese for the assessment of natural waters and the control of manganese removal plant. The test measures total manganese over the range 0 - 5 mg/l.

METHOD

Manganese may occur in water in various different valency states. This method offered is the Formaldoxime Method, with a range of 0 to 5,0mg/l Mn. In alkaline solution manganese reacts with formaldoxime to form an orange-red complex. The color developed is proportional to the manganese concentration. Iron II ions also form a coloured complex, which will interfere.

The intensity of colour produced in the test is proportional to the total manganese concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Manganese HR Nr.1 Tablets /Manganese HR Nr. 2 Tablets /*DINKO* Photometer/ Round Test Tubes,10 ml glass (4pcs).Code 1.9365.00

SAMPLE COLLECTION

Manganese is readily absorbed onto the surfaces of sample containers. To avoid loss of manganese test sample as soon as possible after collection.
It is important, because of the extreme sensitivity of this test, to ensure that glassware used for the sample collection and test procedure is scrupulously clean. For most accurate results in laboratory use it is recommended that all glassware is acid-rinsed and then thoroughly washed out with deionised water before use.

TEST PROCEDURE

Fill test tube with sample to the 10 ml mark
Add one Manganese HR nr. 1 tablet, crush and mix to dissolve.
Add one Manganese HR nr. 2 tablet, crush and mix to dissolve then cap the tube.
Stand for 5 minutes to allow colour development
Select Mn high, program nr. 63 on Photometer D-100 and D-105
Take Photometer reading in usual manner (see Photometer instructions).Make zero with sample without tablets.
The result is displayed as mg/l. Select the 550 nm filter.
Using the calibration chart(Photometer D-101), convert the absorbance reading into a mg/l Mn reading.

Range: 0-5 mg/L Mn **Manganese** **550 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.1		0.06	0.12	0.18	0.24	0.30	0.36	0.42	0.48	0.55
0.2	0.61	0.67	0.74	0.80	0.86	0.92	0.99	1.05	1.11	1.18
0.3	1.89	1.96	2.02	2.09	2.16	2.23	2.30	2.36	2.43	2.50
0.4	2.57	2.64	2.70	2.78	2.85	2.92	2.99	3.07	3.14	3.21
0.5	3.28	3.36	3.43	3.50	3.57	3.65	3.72	3.79	3.86	3.94
0.6	4.01	4.08	4.15	4.23	4.30	4.37	4.42	4.52	4.59	4.66
0.7	4.73	4.80	4.88	4.95						

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,099 mg/L Mn

Traceability: The traceability of the Formaldoxima method settles down with A. Gottlieb and F.Hecht, *Mikrochemie*, 35, 337 (1950)

MOLYBDATE. Code 1.9442.00 (50t) **Photometer Method 415- 420 nm**
Test for low levels of molybdate in industrial waters and effluents **0 - 20 mg / l MoO_4**

Formulations containing molybdate are used as corrosion inhibitors in industrial water treatment like cooling systems. Molybdate based formulations have replaced older forms of corrosion inhibitors. When using molybdate treatment it is necessary to control the molybdate concentration within specified levels depending on the application involved. Moreover, since molybdates are widely used in water treatment and industrial process, molybdate is an increasingly important test for effluents and industrial discharges.
The *DINKO* molybdate test provides a simple means of measuring low levels of molybdate in industrial waters and effluents and covers the range 0-20 mg / l MoO_4 (0-12 mg / l Mo).

METHOD

Molybdates react with dihydroxybezen disulphonic acid salt under slightly acid conditions to give a yellow coloured complex. Under the conditions of the test, iron does not interfere and there is no significant interference from other metals at levels likely to be found in industrial water systems(see note). The reagents are provided in the form of two tablets for maximum convenience. The test is simply carried out by adding one of each tablet to a sample of water. The intensity of the colour produced in the test is proportional to the molybdate concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Molybdate nr. 1 LR Tablet / Molybdate nr. 2 LR Tablet
Round cuvette 16 mm. Ø (4pcs). Code 1.9365.00 (cuvette used in the chart) / Square cuvette 10 mm. Pk. (100). Code 1.9363.00
DINKO D-101 Photometer use calibration chart. Filter 420nm.
DINKO D-105 Photoanalyzer and D-100 Photometer, select program nr. 16.

PROCEDURE

1. - Filter sample if necessary to obtain a clear solution.
2. - Fill test tube with sample to 10 ml mark.
3. - Add one Molybdate nr. 1 LR tablet, crush and mix to dissolve.
4. - Add one Molybdate nr. 2 LR tablet, crush and mix to dissolve.
5. - Stand for two minutes to allow full colour development.
6. - Select filter of 420 nm on the Photometer D-101 and select program nr. 16 with D-105 and D-100 photometers
7. - Take Photometer reading in the usual manner. Make zero with sample without tablets.
8. - Consult the Molybdate calibration chart(D101). Select program nr.16(D-105 and D-100).

Molybdate concentrations can be expressed in a number of different ways.
To convert from MoO_4 to Na_2MoO_4 multiply by 1,3 / To convert from MoO_4 to Mo multiply by 0,6

INTERFERENCES

1. - Copper, Zinc, Calcium and phosphate do not interfere at levels up to 20 mg/l.
2. - Iron and Chlorine at levels of 10mg/l cause slightly high blank readings (equivalent to 0.6 mg/l MoO_4). They do not, however, cause any interference when in the presence of molybdate.

Range: 0 - 20 mg / L MoO_4			Molybdate					420 nm
ABS	0	5	ABS	0	5	ABS	0	5
0.02		0.00	0.22	6.80	7.00	0.42	13.6	13.8
0.03	0.10	0.27	0.23	7.15	7.35	0.43	13.9	14.1
0.04	0.47	0.62	0.24	7.50	7.70	0.44	14.3	14.5
0.05	0.79	0.96	0.25	7.90	8.05	0.45	14.6	14.8
0.06	1.13	1.30	0.26	8.20	8.40	0.46	15.0	15.2
0.07	1.47	1.64	0.27	8.55	8.70	0.47	15.4	15.6
0.08	1.81	1.98	0.28	8.85	9.00	0.48	15.7	15.9
0.09	2.15	2.32	0.29	9.20	9.35	0.49	16.1	16.3
0.10	2.50	2.67	0.30	9.50	9.70	0.50	16.5	16.6
0.11	2.84	3.01	0.31	9.85	10.0	0.51	16.8	17.0
0.12	3.18	3.35	0.32	10.2	10.3	0.52	17.2	17.4
0.13	3.52	3.70	0.33	10.5	10.7	0.53	17.6	17.8
0.14	3.86	4.04	0.34	10.8	11.0	0.54	18.0	18.2
0.15	4.22	4.40	0.35	11.2	11.3	0.55	18.3	18.5
0.16	4.59	4.77	0.36	11.5	11.6	0.56	18.7	18.9
0.17	4.95	5.15	0.37	11.8	12.0	0.57	19.1	19.3
0.18	5.30	5.50	0.38	12.1	12.3	0.58	19.5	19.7
0.19	5.70	5.85	0.39	12.5	12.7	0.59	19.8	20.0
0.20	6.05	6.25	0.40	12.9	13.0			
0.21	6.40	6.60	0.41	13.2	13.4			

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,567 mg/L MoO_4

Traceability: The traceability of Tiron method settles down with J. H. Yoe, Anal. Chem. y F. Will, Anal. Chim-Acta, 8,546(1953)

MOLYBDATE. Code 1.9446.00 (50t) - 1.9480.00 (250t)
Test for molybdate in industrial water.

Photometer Method 415 - 420 nm
0 - 100 mg / l MoO_4

Formulations containing molydate are used as corrosion inhibitors in industrial water treatment. When using molybdate treatment it is necessay to control the molybdate concentration.

METHOD

The molybdate react with thioglycollate under acid conditions to give a yellow coloured complex. Oxidising conditions are maintained during the acidification stage in order to keep the molybdate in a fully oxidised state. Under the conditions of the test, Iron does not interfere and there is no significant interference from other metals at levels likely to be found in industrial water systems. The reagents are provided in the form of two tablets for maximum convenience. The test is simply carried out by adding one of each tablet to a sample of water.
The intensity of the colour produced in the test is proportional to the molybadte concentration, and is measured with a *DINKO Photometer.*

REAGENTS AND EQUIPMENT

Molybdate nº 1 HR Tablet / Molybdate nº 2 HR Tablet
Round cuvette 16 mm.Ø (4pcs). Code 1.9365.00 (cuvette used in the chart) / Square cuvette 10 mm. (100pcs). Code 1.9363.00
DINKO D-101 Photometer use calibration chart. Filter 420 nm.
DINKO D-105 Photoanalyzer and D-100 Photometer, select program nr. 40.

PROCEDURE

1. - Fill test tube with sample to 10 ml mark.
2. - Add one Molybdate nr. 1 HR tablet, crush and mix to dissolve.
3. - Add one Molybdate nr. 2 HR tablet, crush and mix to dissolve.
4. - Select wavelength 420 nm on the Photometer D-100. Select program nr. 40 (D-100 and D-105)
5. - Take Photometer reading in the usual manner. Make zero with sample without tablets.
6. - Consult the Molybdate calibration chart, Photometer D-101. Select program nr.40, D-105 and D-100 Photometers.

Molybdate concentrations can be expressed in a number of different ways.
To convert from MoO_4 to Na_2MoO_4 multiply by 1,3
To convert from MoO_4 to Mo multiply by 0,6

Range: 0 - 100 mg / L MoO_4				Molybdate					420 nm
ABS	0	1	2	3	4	5	6	7	8	9
0,0						0.0	0.8	2.1	3.3	4.5
0,1	5.7	6.9	8.1	9.3	10.6	11.8	13.0	14.2	15.4	16.6
0,2	17.8	19.0	20	22	23	24	25	27	28	29
0,3	30	32	33	34	35	37	38	39	41	43
0,4	44	46	48	50	52	53	55	57	59	61
0,5	62	64	66	68	69	71	73	75	76	78
0,6	80	82	83	85	87	89	91	93	95	97
0,7	100									

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 2,835 mg/L MoO_4

Traceability: The traceability of the method settles down with "Analytical Chemestry", 25(9) 1363(1953)

NICKEL. Code 1.9448.00 (50t) - 1.9490.00 (200t) **Photometer Method 520 nm**
Test for Nickel in natural and treated waters. **0 - 10 mg / l Ni**

Nickel does not occurs naturally in waters but only as result from industrial process in coating and steel industries. The EC maximum admissible concentration for drinking water(MAC) is 0.05 mg / l.
The *DINKO* method provide a simple test for Nickel over the range of 0 - 10 mg / l Ni. The test determine Ni^{2+} and Ni^{4+} and the result represent total soluble inorganic Nickel concentration in the sample.

METHOD

In the *DINKO* method, the Nickel salts are reduced to Nickel (II), and react with Nioxim indicator to give purple coloured complex. The reagents are provided in tablet form and powder reagent to eliminate Copper and Iron interferences. The intensity of colour produced in the test is proportional to the Nickel concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Nickeltest PR Powder(spoon pack) / Nickeltest nr. 1 Tablet / Nickeltest nr. 2 tablet
Round cuvette 16mm.Ø (4pcs). Code 1.9365.00 (cuvette used in the chart) / Square cuvette 10 mm. (100pcs). Code 1.9363.00
DINKO D-101 Photometer use the calibration chart / *DINKO* D-105 Photoanalyzer and D-100 select program nr. 17.

PROCEDURE

1. - Fill the test tube to the 10 ml mark with the sample.
2. - Add one Nickeltest nr. 1 tablet, crush and mix to dissolve. Ensure all particles are dissolved.
3. - If iron is present add one level spoonful of Nickeltest PR powder and mix to dissolve.
4. - Add one Nickel nr. 2 tablet, crush and mix to dissolve.
5. - Stand for 2 minutes to allow full colour development. Select 520 nm filter on the Photometer.
6. - Take Photometer reading (see Photometer Instructions). Make zero with sample without tablets.
7. - Consult Nickel calibration chart D-101 Photometer. Select program nr. 17, Photomters D-105 and D-100.

Range: 0 - 10 mg / L Ni **Nickel** **520 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0	0.00	0.11	0.23	0.35	0.47	0.59	0.71	0.83	0.95	1.07
0.1	1.19	1.30	1.42	1.54	1.66	1.78	1.90	2.02	2.15	2.28
0.2	2.41	2.54	2.67	2.80	2.93	3.06	3.19	3.32	3.45	3.58
0.3	3.71	3.84	3.97	4.11	4.25	4.39	4.53	4.67	4.81	4.95
0.4	5.09	5.23	5.38	5.52	5.66	5.80	5.94	6.08	6.21	6.35
0.5	6.48	6.62	6.75	6.89	7.02	7.16	7.29	7.43	7.56	7.70
0.6	7.83	7.97	8.12	8.27	8.43	8.58	8.73	8.89	9.04	9.20
0.7	9.35	9.50	9.66	9.82	10.00					

Notes

1. - The presence of Cobalt at 0,5mg / l gives a positive response in the test.
2. - The presence of significant levels of EDTA (at least 25 mg / l) complexes Nickel and reduces response in the test. Complexing agents used in water treatment, such as polyphosphates, do not affect the results.

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,198mg/L Ni

Traceability: The traceability of the method settles down with "SM" Standard Methods

NITRATE. Code 1.9450.00 (50t) - 1.9491.00 (200t) **Photometer Method 577 - 580 nm**
Test for nitrate in natural, drinking and waste water. **0 - 1 mg / l N**

Nitrates enter water supplies from the breakdown of natural vegetation, the use of chemical fertilisers in modern agriculture and from the oxidation of nitrogen compounds in sewage effluents and industrial wastes.
Nitrate is an important control test for water supplies. Drinking waters containing excessive amounts of nitrates can cause methaemoglobinaemia in bottle-fed infants(blue babies). The EEC has set a recommended maximum of 5,7 mg/ l N (25 mg / l NO_3) and an absolute maximum of 11,3 mg/l N (50 mg/l NO_3). The *DINKO* Nitrate method provides a simple test for nitrate nitrogen over the range 0-1 mg / l N. The test can however be extended to cover the range 0 -20 mg / l by simple dilution technique.

METHOD

In the Nitrate test method nitrate is first reduced to nitrite, the resulting nitrite is then determined by a diazonium reaction to form a reddish dye. The reduction stage is carried out using the unique zinc-based Nitratest Powder, and Nitrates Tablet which aids rapid flocculation after the one minute contact period. The test is conducted in a special Nitrates Tube –a graduated sample container with hopper bottom to facilitate settlement and decanting of the sample.

The nitrite resulting from the reduction stage is determined by reaction with sulphanilic acid in the presence of N-(1-naphtyl)-ethylene diamine to form a reddish dye. The reagents are provided in a single Nitricol tablet which is simply added to the test solution.

The intensity of the colour produced in the test is proportional to the nitrate concentration and is measured using a *Dinko* Photometer.

REAGENTS AND EQUIPMENT

Nitratest Powder (Spoon Pack) / Nitratest Tablet) / Nitricol Tablet / Tube 20 ml mark. Code 1.9450.01
Round cuvette 16 mm. Ø (4pcs).Code 1.9365.00 / *DINKO* Photometer D-101. Use the calibration chart
DINKO D-105 Photoanalyzer and D-100 select program nr.18.

PROCEDURE

1.- Fill the Tube with sample to the 20 ml mark.
2.- Add one level spoonful of Nitratest Powder and one Nitratest tablet. Do not crush the tablet. Replace screw cap and shake tube well for one minute.
3.- Allow tube to stand for about 1 minute then gently invert three or four times to aid flocculation. Allow tube to stand for 10 minutes to ensure complete settlement. Take care to avoid transferring any Nitratest Power. Ideally, transfer the liquid using a pipette.
4.- Remove screw cap and wipe around the top of the tube with a clean tissue. Careful decant the clear solution into a round test tube, filling to the 10ml mark.
5.- Add one Nitricol tablet, crush and mix to dissolve.
6.- Stand for 10 minutes to allow full colour development.
7.- Select filter 580 nm on Photometer D-101 . Select program nr. 18 with D-100 and D-105 photometers.
8.- Take Photometer reading (see Photometer instructions). Make zero with sample without tablets.
9.- Consult Nitrate calibration chart, Photometer D-101. Select program nr.18, Photometers, D-105 and D-100.

Concentrations of nitrate greater than 1,0 mg/l may be determined by diluting the original sample with deionised water. The test can be conveniently carried out over a range 0 - 20mg / l N as follows:

Take a clean Tube. Add 1ml of sample using a pipette or graduated dropper. Fill the Tube to 20 ml mark with deionised water. Continue the test procedure as given in steps 2 to 9 above. Multiply the chart reading obtained by 20 to obtain the nitrate concentration in the original sample.

NITRITE CORRECTION

The Nitrate test method will also respond to any nitrite present in the sample. In most natural and drinking waters the amount of nitrite will be small in comparison to the nitrate concentration. If it is desired to correct for nitrite, determine nitrite concentration (as mg/l N) in the prescribed manner(see Nitrite Test) and deduct from the nitrate concentration (as mg/l N) obtained from the Nitrate Test.

Range: 0-1 mg / L **N** **580 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0				0.000	0.009	0.017	0.026	0.034	0.043	0.051
0.1	0.060	0.068	0.077	0.085	0.094	0.103	0.113	0.123	0.133	0.143
0.2	0.153	0.163	0.173	0.183	0.193	0.203	0.213	0.223	0.233	0.243
0.3	0.253	0.263	0.273	0.283	0.293	0.303	0.315	0.327	0.339	0.351
0.4	0.363	0.375	0.387	0.400	0.412	0.424	0.436	0.448	0.460	0.472
0.5	0.484	0.496	0.508	0.520	0.532	0.544	0.556	0.568	0.580	0.592
0.6	0.606	0.621	0.636	0.651	0.667	0.682	0.697	0.712	0.728	0.743
0.7	0.758	0.774	0.789	0.805	0.822	0.840	0.857	0.874	0.892	0.909
0.8	0.926	0.944	0.961	0.979	1.000					

To convert mg/L of N to mg/L of NO_3 multiply result by 4,4

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,022 mg/L N

Traceability: The traceability of the method of reduction settles down with "SM" Standard Method 4500-NO_3

NITRATE. Code 1.9010.00 (25t)
Test for nitrate in drinking and waste water.

Photometer Method 415/420 nm
0 - 30 mg / l N
0 - 150 mg / l NO_3

Nitrates are normally present in natural, drinking and waste waters. Nitrates enter water supplies from the breakdown of natural vegetation, the use of chemical fertilisers' in modern agriculture and from the oxidation of nitrogen compounds in sewage effluents and industrial wastes.

Nitrate is an important control test for water supplies. Drinking waters containing excessive amounts of nitrates can cause methaemoglobinaemia in bottle-fed infants(blue babies). The EEC has set a recommended maximum level of 5,7 mg/ l N (25 mg/ l NO_3) and an absolute maximum of 11,3 mg/l N (50 mg/l NO_3) for nitrate in drinking water.
The *DINKO* method provides a simple test for nitrate over the range 0 - 30 mg/ l N (0 - 150 mg/ l NO_3).
This test is also used in the colour development stage of Total Nitrogen test code 1.9012.00.

MÉTHOD

In this metohd, nitrate reacts with chromotropic acid, under strongly acid conditions to produce a yellow colour. Chemicals are incorporated to prevent interference from nitrite, chloride, Iron(Fe III), Chlorine and other oxidising agents. The reagents are provided in the form of a predispensed tube and a powder. The test is simply carried out by adding a sample of the water and a scoop of powder to a tube.
The intensity of colour produced in the test is proportional to the nitrate concentration and is measured using *Dinko* Photometer.

WORKING PRACTICE

This method should be carried out in concordance with Good Laboratory Practice. The reagent tubes contain 90% Sulphuric Acid and must be handled with care. The use of appropriate protective clothing, gloves and safety spectacles is recommended. In the even of skin or eye contact, or spillage, wash immediately with large amounts of water.

Particular care should be taken when opening the reagents tubes to add the water sample as heat will be produced and gases may be evolved. Samples containing cyanide or sulphides will release toxic fumes and for such samples the test must always be carried out in a fume cupboard. It is generally recommended that the test be conducted in a fume cupboard where available.

REAGENTS AND EQUIPMENT

Reagents tubes / Nitrate Powder / Pipettor 1ml / Dosing Scoop / Dossing Funnel / Dossing Scoop Scraper
Photometer D-101, calibration chart, filter 420nm / Photoanalyzer D-105 and D-100, program nr. 60.

Use of Dosing Scoope and Funnel

This elements are specially designed to ensure accurate dosing of reagent powders into the tube-tests.

1. - Dip the scoop into the powder and ensure that it is completely filled. Draw the scraper across the top of the scoop to ensure a level fill.

2. - Place the funnel on top of the tube-test. Locate the scoop in the groove on the side of the funnel. Rotate the scoop to invert then tap gently to ensure that all the reagent goes into the tube.

PROCEDURE

1.- Remove the cap of tube-test and add 1,0 ml of sample using a pippetor. DO NOT SHAKE THE TUBER.
2.- Add one level scoop of Nitrate Powder using a dosing scoop. Cap tube and gently invert five or six times to dissolve and mix the reagents and sample.
3.- Stand for five minutes to allow colour development.
4.- Select 420 nm filter, Photometer D-101. Select program nr. 60 in the D-105 Photoanalyzer and D-100 Photometer
5.- Take Photometer reading. Make the zero with sample without reagents or use an unused tube-test.
6.- Consult the calibration chart, Photometer D-101. Select program nr. 60, D-105 and D-100 Photometers.

Interferences

The test system incorporates reagents to prevent potential interferences from nitrite, chloride, Iron(Fe III), and Chlorine and other oxidising agents. Interferences studies have shown that levels up to nitrite 10 mg/l, chloride 1000 mg/l, Iron 40 mg/l and Chlorine 5 mg/l do not affect the result of the test.

Notes

Nitrate tube-tests is light sensitive. Store in original pack and keep lid closed when not in use. The tubetests contents must be disposed of in accordance with waste regulations and the laid-down disposal procedures of the laboratory of use.

Range: 0-30 mg / L **N** **420 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0	0.00	0.00	0.10	0.00	0.22	0.49	0.77	1.04	1.31	1.59
0.1	1.86	2.13	2.41	2.68	2.95	3.23	3.5	3.8	4.0	4.3
0.2	4.6	4.9	5.1	5.4	5.7	6.0	6.2	6.5	6.8	7.1
0.3	7.3	7.6	7.9	8.2	8.4	8.7	9.0	9.2	9.5	9.7
0.4	9.9	10.2	10.4	10.7	10.9	11.2	11.4	11.6	11.9	12.1
0.5	12.4	12.6	12.9	13.1	13.3	13.6	13.8	14.1	14.3	14.6
0.6	14.8	15.0	15.3	15.5	15.8	16.0	16.3	16.5	16.7	17.0
0.7	17.2	17.5	17.7	18.0	18.2	18.6	18.9	19.2	19.5	19.8
0.8	20.1	20.4	20.7	21.0	21.3	21.6	22.0	22.3	22.6	22.9
0.9	23.2	23.5	23.8	24.1	24.4	24.8	25.1	25.4	25.7	26.0
1.0	26.3	26.6	27.0	27.3	27.6	27.9	28.2	28.5	28.8	29.2
1.1	29.5	29.8								

To convert mg/ L of N to mg/ L of NO_3 multiply the result by 4,4

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,567 mg/L N

Traceability: The traceability of the method of reduction settles down with "SM" Standard Methods

NITRITE. Code 1.9454.00 (50t) - 1.9492.00 (250t) **Photometer Method 520 nm**
Test for nitrite in drinking and waste water. **0- 0,5 mg / l N (0 -1,6 mg / l NO_2)**

Nitrite are found in natural waters as an intermediate product in the nitrogen cycle. Nitrite is harmful to fish and other forms of aquatic life and should be controlled in waters used for fish farms and aquariums. The nitrite test is also applied for pollution control in waste waters and drinking water. The *DINKO* Nitrite test provides a simple method of measuring Nitrogen levels over the range 0 to 0.5 mg / l N. Higher levels can be determinate by diluting the sample.

METHOD

Nitrites in acid solution react with sulphanilic acid producing a diazo compound that couples with N-(1-naphthyl)ethylenediamine to form a reddish dye. The test is simply carried out adding a tablet containing both of these reagents in acidic formulation to a sample of the water under test. The intensity of the colour produced in the test is proportional to the nitrite concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Nitricol Tablet / Round cuvette 16mm Ø with cap. (4pcs). Code: 1.9365.00. (cuvette used in the chart)
DINKO D-101 Photometer use calibration char/ *DINKO* D-105 Photoanalyzer and D-100 Photometer select program nr. 19.

PROCEDURE

1. - Fill round test tube with sample to the 10 ml mark.
2. - Add one Nitricol Tablet, crush and mix to dissolve.
3. - Stand for 10 minutes to allow full colour development.
4. - Select wavelength 520nm on Photometer.
5. - Take Photometer reading (see photometer instructions). Make zero with sample without tablets
6. - Consult Nitrite calibration chart (D-101). Select program nr.19 (D-105 and D-100)

Range: 0- 0,5 mg / L N **Nitrite** **520 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0		0.000	0.003	0.007	0.010	0.014	0.017	0.021	0.025	0.028
0.1	0.032	0.035	0.039	0.042	0.046	0.050	0.053	0.057	0.060	0.064
0.2	0.067	0.071	0.075	0.078	0.082	0.085	0.089	0.092	0.096	0.100
0.3	0.103	0.107	0.111	0.115	0.118	0.122	0.126	0.130	0.134	0.137
0.4	0.141	0.145	0.149	0.153	0.156	0.160	0.164	0.168	0.171	0.175
0.5	0.179	0.183	0.187	0.190	0.194	0.198	0.202	0.205	0.209	0.212
0.6	0.216	0.219	0.223	0.226	0.230	0.233	0.237	0.240	0.244	0.247
0.7	0.251	0.254	0.258	0.261	0.265	0.268	0.272	0.275	0.279	0.282
0.8	0.286	0.289	0.293	0.296	0.300	0.303	0.307	0.310	0.314	0.317
0.9	0.321	0.324	0.328	0.331	0.335	0.338	0.342	0.345	0.349	0.352
1.0	0.356	0.360	0.363	0.367	0.370	0.374	0.377	0.381	0.384	0.388
1.1	0.391	0.395	0.398	0.402	0.405	0.409	0.413	0.416	0.420	0.424
1.2	0.427	0.431	0.435	0.438	0.442	0.445	0.449	0.453	0.456	0.460
1.3	0.464	0.467	0.471	0.475	0.478	0.482	0.486	0.489	0.493	0.497
1.4	0.500									

To convert from mg/L N to mg/L NO_2 multiply result by 3,3.

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,057mg/L N
Traceability: The traceability of the method of settles down with "USEPA"-Federal Register 4500-NO_2

NITRITE. Code 1.9455.00 (50t) - 1.9501.00 (250t) **Photometer Method 490 nm**
Test for nitrite in cooling water **0 -1500 mg / l $NaNO_2$**

Nitrite and nitrite-based formulations are widely used for corrosion control in cooling water systems. The *Dinko* test provides a simple means of measuring nitrite for the control of such treatment products in cooling water. The test covers the range 0-1500 mg/l $NaNO_2$

MÉTHOD

The method is based on a colorimetric procedure using an iodide containing reagent system. Nitrites catalyse the oxidation of iodide to iodine under mildly acid conditions to produce a brown coloration. Over the range of a test a series of colours through yellow to brown are produced. The intensity of the colour produced in the test is proportional to the nitrite concentration and is measured using a *Dinko* Photometer.

REAGENTS AND EQUIPMENT

Nitriphot nº 1 Tablet / Nitriphot nº 2 Tablet / Syringe 1ml
Round cuvette 16 mm. Ø (4pcs). Code 1.9365.00 (cuvette used in the chart) / Square cuvette 10 mm. (100pcs). Code 1.9363.00
DINKO D-101 Photometer use the calibration chart / *DINKO* D-105 Photoanalyzer and D-100 select program nr. 41.

PROCEDURE

1. - Filter sample if necessary to obtain a clear solution. Using the syringe take 1 ml of sample and transfer to the test tube. Make up to the 10 ml mark with deionised water.
2. - Add one Nitriphot nr. 1 tablet. Crush and mix to dissolve.
3. - Add one Nitriphot nr. 2 tablet. Crush and mix to dissolve. Cap tube immediately.
4. - Stand for 15 minutes to allow full colour development.
5. - Select the 490 nm filter on the Photometer.
6. - Take Photometer reading. Make zero with sample without tablets.
7. - Consult calibration chart, Photometer D-101. Select program nr. 41, D-105 and D-100 Photometers.

Range: 0 -1500 mg / L $NaNO_2$ **Sodium Nitrite** **490 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0	0	0	12	24	37	49	61	73	85	98
0.1	110	122	134	146	163	182	201	219	238	257
0.2	276	294	332	377	422	467	512	557	602	647
0.3	692	738	783	828	873	917	961	1004	1047	1090
0.4	1134	1177	1220	1263	1307	1350	1377	1404	1430	1456
0.5	1480	1500								

Interferences:
Positive Chlorine in excess of 30 mg/l may give slight positive interference. However, nitrite and chlorine are incompatible and do not normally co-exist.
The solution should be cooled to below 30ºC before testing for the most accurate analytical results.

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of:
To 150 mg/L ± 17,01 mg/L $NaNO_2$
From 150 to 300 mg/L ± 28,35 mg/L $NaNO_2$
From 300 to 1350 mg/L ± 63,60 mg/L $NaNO_2$
From 1350 to 1500 mg/L ± 28,35 mg/L $NaNO_2$

Traceability: The traceability of the method settles down with "SM" Standard Methods

NITROGEN TOTAL/30. Code1.9012.00 (25t) **Photometer Method 415/420 nm**
Test for Total Persulphate Nitrogen in natural and waste water. 0 - 30 mg / l N

Total nitrogen is a vital test for assessing the quality of effluents and waste water prior to discharge. In the UK the Urban Waste Water Treatment Regulations(1994) make provision for control of discharge of total nitrogen to sensitive bodies of natural water. The monitoring of rate of nitrogen removal is therefore of great importance in waste water treatment. Total nitrogen is composed of nitrate, nitrite ammonium and organic nitrogen compounds. The *DINKO* "Test Tube" for Total Nitrogen provides a simple method of measuring total persulphate nitrogen over the range of 0-30 ml/L N.

METHOD

The *DINKO* "Test Tube" Total Nitrogen test is a simple two stage procedure. The sample is initially digested with alkaline persulphate to break down nitrogenous compounds which are then converted to nitrate. The digested sample is then transferred to a Dinko "Tube Test" Nitrate tube for determination of total nitrogen present. The reagents are provided in the form of predispensed tubes and powders. The powders are using a specially designed scoop and funnel.

The intensity of colour produced in the test is proportional to the total nitrogen concentration and is measured using a *Dinko* Photometer.

In the total nitrogen determination, the recovery of different compounds depends to an extent on the method of oxidisation used the make the conversion to nitrate. It is formal purpose. Results from the *DINKO* Total Nitrogen test should therefore be expressed as "Total Persulphate Nitrogen"

WORKING PRACTICE

This method is a simplified laboratory procedure and should be carried out in accordance with good laboratory working practice.

The Total Nitrogen tubes contain sodium hydroxide solution, to wich potassium persulphate is added.The Tubetest Nitrate tubes contain strong sulphuric acid. These reagents must be handled with care. The use of appropriate protective clothing, gloves and safety spectacles is recommended. In the event of skin or eye contact, or spillage, wash inmediately with large amounts of water.

Particular care should be taken when adding Tubetests Total Nitrogen Reagent nº 2 to the digestion tubes. Sulphur dioxide will be evolved. Care should be taken when opening the Tubetests Nitrate tubes which contains concentrated acid. On adding the digestate head will be produced, the tube will become hot and gases may be evolved. It is generally recommended that the test be conducted in a fume cupboard where available, particularly in the case of samples originally know to contain toxic materials such as cyanide or sulphide.

REAGENTS AND EQUIPMENT

Digestion stage

Tubetests Total Nitrogen Tubes
Tubetests Total Nitrogen Reagent nº 1
Tubetests Total Nitrogen Reagent nº 2
Tube Heater D-64 or D-65
Pipettor 5 ml
Dossing scoop size 1
Dossing scoop size 4
Dossing funnel
Dossing scoop scraper

Colour Development stage

Tubetests Nitrate Tubes
Tubetests Nitrate Powder
Pipettor 1ml
Dossing scoop size 1
Dossing funnel
Dossing scoop scraper
Pipettor 1ml
DINKO D-101 Photometer use calibration chart. Filter 420 nm.
DINKO D-105 Photoanalyzer and D-100 Photometer select the program nr. 61.

Use of Dosing Scoop and Funnel

This Tubetest method uses Dossing scoops and funnels. The scoopes and funnels are specially designed to ensure accurate dosing od reagent powders into the Tubetests tubes.

1. Select the correct size scoop. Dip the scoop into the powder and ensure that it is completed filled. Draw the scraper across the top of the scoop to ensure a level fill.
2. Place the funnel on top of the tubetest . Locate the scoop in the groove on the side of funnel. Rotate the scoop to invert then tap gently to ensure that all the reagent goes into the tube.

Test Instructions-Digestion stage

1.Turn on the Tube heater, set the control to the 105ºC mark and allow to heat up to temperature.
2. Remove the cap of the Total Nitrogen Tube and add three level scoops of Total Nitrogen Reagent nº1 using the size 1 dosing scoop and funnel.
3. Add 5.0 ml of sample using a pipettor. Replace the cap tightly and shake the tube vigorously for 30 seconds
4. Label the tube and place in the Tube Heater. Ensure the safety screen is in position and digest the tube for 30 minutes, then turn of the heater.
5. Carefully remove each tube and transfer to a test tube rack. Handle hot tubes by the cap only.
6. Allow tubes to cool to room temperature.
7. Remove the cap of the Tubetests Total Nitrogen Tube and add one level scoop of Tubetets Total Nitrogen Reagent nº 2 using the size 4 dosing scoop and funnel. Take care, sulphur dioxide will be evolved.
8. Cap the tube and shaker for 15 seconds, then stand for 3 minutes.

Test Instructions- Colour Development stage

1.Using a pipettor, transfer 1 ml of digested sample from the Tubetests Total Nitrogen Tube to a Tubetests Nitrate Tube. Take care to add the digestate slowly. DO NOT SHAKE THE TUBE.
2. Add one level scoop of Tubetests Nitrate Powder using the size 1 dosing scoop and funnel. Cap tube and invert slowly ten times to dissolve and mix the reagents and samples. Take care. The tube will become hot.
3. Stand for five minutes to allow colour development.

4. Select filter of 420 nm on Photometer D-101. Select program nr.61 on Photoanalyzer D-105 and Photometer D-100.
5. Take photometer reading in usual manner(see Photometer Instructions). Use an unused Tubetests Nitrate Tube to set the blank on the Photometer.
6. Consult the Total Persulphate Nitrogen calibration chart. With the *DINKO* D-105 Photoanalyzer and D-100 Photometer select the program nr. 61

Range: 0-30 mg / L **Persulphate Nitrogen/30 N** **420/415 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.3	0.6	0.9	1.3
0.1	1.6	1.9	2.3	2.6	2.9	3.3	3.6	3.9	4.3	4.6
0.2	5.0	5.4	5.8	6.2	6.6	7.0	7.4	7.8	8.2	8.6
0.3	9.0	9.4	9.8	10.2	10.6	11.0	11.4	11.8	12.2	12.6
0.4	12.9	13.3	13.7	14.1	14.5	14.9	15.4	15.8	16.2	16.6
0.5	16.9	17.3	17.7	18.1	18.5	18.9	19.3	19.7	20.1	20.5
0.6	20.9	21.4	21.8	22.2	22.7	23.1	23.5	23.9	24.3	24.8
0.7	25.2	25.6	26.1	26.5	26.9	27.3	27.8	28.2	28.6	29.0
0.8	29.5	29.9	30.3	30.5						

To convert mg/ l de N to mg/ l NO_3 multiply result by 4,4

Notes:

1-This method is based on the Persulphate Method from “Standard Methods for the Examination of Water and Waste Water” 19 th Edition 1995 page 4-95. The method, in general, does not yield 100% recovery. Recoveries of various nitrogen compounds have been tested in our laboratories. Inorganic compounds such as potassium nitrate, sodium nitrite and ammonium chloride yiels in excess of 95% recovery. The typical recoveries of some organic nitrogen compounds are quoted below:

Compound	Typical Recovery
Glycine	95% all levels
Urea	90% all levels
Nicotinic Acid	95% at 10 mg/l, 45% at 30 mg/l
Creatinine	100% at 10 mg/l, 70% at 30 ml/l

2- Tubetests Nitrate Powder is light sensitive. Store in original pack and keep lid closed when not in use.
3- Disposal. The used Tubetests Nitrate/30N Tubes contain strong sulphuric acid and other chemical reagents and care must therefore be exercised in their disposal. The tube contents should be disposed of in accordance with the laid-down disposal procedures of the laboratory of use.

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0.567 mg/L N

Traceability: The traceability of the method of settles down with, “ Standard Methods” 4500-NO_3 – Persulphate Method.

ORGANOPHOSPHONATE (OP). Code 1.9414.00 (50t) - 1.9502.00 (250t) **Photometer Method 620 - 630 nm**
Test for organophosphonate in cooling water. **0 - 20 mg / l PO_4**

The use of organophosphonate compounds as inhibitors in cooling systems has become widespread and is essential to control the concentration.
The *DINKO* OP test provides a reliable means of monitoring organophosphonate levels over the range 0-20 mg/l PO_4. The test has been developed for use with commercially available organophosphonate products such as those based on aminotrimethyl phosphonic acid and hydroxyethane diphosphonic acid.

METHOD

In the OP test organophosphonate are first converted to orthophosphate by a catalysed cold oxidation process. Excess oxidising agent is removed from the sample by precipitation and filtration. The orthophosphate formed in the reaction is then determined using the “molybdenum blue” method. The reagents for the procedure are provided in tablet form and the test is simply carried out by adding the appropiate tablets in sequence to a diluted sample of water.The intensity of blue coloration formed in the test is proportional to the organophosphonate concentration and is determined using a *DINKO* Photometer.
A separate correction procedure is applied to those sample known or suspected to contain orthophosphate.

REAGENTS AND EQUIPMENT

Oxidising OP Tablets
OP-B Tablet
Tube, mark 20ml, code 1.9450.01
Filtration kit (syringe c.luer+10 syringe filter), code 1.9594.01 (order separate)
DINKO D-105 and D-100 Photometers select program nr. 42.
OP-A Tablet
OP-AX Tablet
Round cuvette 16mm with cap.(4pcs) Code 1.9365.00
DINKO D-101 Photometer use calibration chart.

SAMPLE PREPARATION AND DILUTION

1. - Filter sample if necessary to obtain a clear solution. Glass fiber filter can be used.
2. - Prepare x 5 dilution of sample.

This diluted sample is used for both the organophosphonate and correction procedures. The test calibration take this dilution into account - it is not necessary to apply a dilution factor in the result calculation.

PROCEDURE - ORGANOPHOSPHONATE

1. - Fill the plastic test tube with diluted sample to the 20 ml mark.
2. - Add one Oxidising-OP tablet. Replace screw cap and shake tube until tablet dissolves. Allow the tube stand for five minutes.
3. - Add one OP-A tablet. Replace screw cap and shake tube until tablet dissolves. Allow the tube stand for two minutes
4. - Filter a portion of the solution into a round glass test tube filling to the 10 ml mark.
5. - Add one OP-B tablet, crush and mix to dissolve. Stand for five minutes to allow colour development.
6. - Select wavelength 620 nm on Photometer D-101. On Photoanalizer D-105 and D-100 Photometer select program nr. 42.
7. - Take Photometer reading. Make zero with the diluted sample, without tablets.
8. - Consult the calibration chart (Result A). On Photoanalyzer D105 and D-100 select program 42.

The test may be terminated at this stage if the original sample is know not to contain orthophosphate.

PROCEDURE- CORRECTION FACTOR

If it is suspected that the sample contains orthophosphate, carry out the following correction procedure:

1. - Fill a round glass test tube with diluted sample to the 10 ml mark.
2. - Add one OP-AX tablet. Crush and mix to dissolve.
3. - Add one OP-B tablet. Crush and mix to dissolve. Stand for five minutes to allow full colour development
4. - Select wavelength 620 nm on Photometer D-101. On Photoanalyzer D-105 and D-100 select program nr. 42.
5. - Take Photometer reading. Make zero with the diluted sample, without tablets.
6. - Consult the correction chart (Result B). On Photoanalyzer D-105 and D-100 select program 43.
   Subtract this value (B) from the organophosphonate concentration previously obtained (A).

Corrected Organophosphonate (mg/l PO_4) = Result A - Result B

RANGE: 0 -20 mg / l PO_4 ORGANOPHOSPHONATE - RESULT A 620 nm

ABS	0	1	2	3	4	5	6	7	8	9
0.0										0.06
0.1	0.2	0.4	0.5	0.7	0.8	1.0	1.1	1.3	1.4	1.6
0.2	1.7	1.9	2.0	2.2	2.3	2.5	2.6	2.8	3.0	3.1
0.3	3.3	3.4	3.6	3.7	3.9	4.0	4.2	4.3	4.5	4.6
0.4	4.8	4.9	5.1	5.3	5.4	5.6	5.7	5.9	6.0	6.2
0.5	6.3	6.5	6.7	6.8	7.0	7.1	7.3	7.4	7.6	7.7
0.6	7.9	8.1	8.4	8.8	9.1	9.5	9.8	10.1	10.5	10.8
0.7	11.2	11.5	11.8	12.2	12.5	12.9	13.2	13.6	13.9	14.3
0.8	14.6	15.0	15.3	15.7	16.0	16.5	16.9	17.3	17.8	18.2
0.9	18.7	19.1	19.6	20						

RANGE: 0 -20 mg / l P_4O PHOSPHATE CORRECTION - RESULT B 620 nm

ABS	0	1	2	3	4	5	6	7	8	9
0.0					0.01	0.1	0.2	0.3	0.4	0.5
0.1	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
0.2	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5
0.3	2.6	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6
0.4	3.7	3.8	3.9	4.0	4.1	4.3	4.5	4.6	4.8	5.0
0.5	5.2	5.4	5.5	5.7	5.9	6.1	6.2	6.4	6.6	6.8
0.6	6.9	7.1	7.3	7.5	7.6	7.8	8.0	8.2	8.5	8.8
0.7	9.0	9.3	9.5	9.8	10.1	10.3	10.6	10.9	11.1	11.4
0.8	11.6	11.9	12.1	12.3	12.6	12.9	13.1	13.4	13.6	13.9
0.9	14.1	14.4	14.6	14.9	15.1	15.4	15.6	15.9	16.1	16.5
1.0	16.9	17.3	17.6	18.0	18.4	18.8	19.1	19.5	20	

INTERFERENCES

Chloride in excess of 350 mg / l will cause low results for organophosphonate. Sample containing chloride levels in excess of this value should be further diluted prior to the start of the test.

The result of this test are expressed in terms of mg/l (ppm) active phosphate content. Commercially available products are normally sold as aqueous formulations with a given active content. To utilise the test results, regard must be paid to the active content of the product in use.

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,426mg/L PO_4

Traceability :The traceability of the method settles down with Dr. A. T. Palin

OZONE. Code 1.9445.00 (50t) - 1.9449.00 (250t) **Photometer Method 520 nm**
Test for Ozone in water. **0 - 2.0 mg / l**

Ozone is used for disinfections of swimming pool, and many other water treatment system. Accurate measurement of Ozone residual is essential for the control of these systems.
The *Dinko* DPD test is a simple means of measuring Ozone residuals up to a level of to 2.0mg / l.

METHOD

The *DINKO* test use the DPD method now internationally recognised as standard method of testing for disinfectant residuals. In the DPD method the reagents are provided in tablet form for maximum convenience and simplicity of use. Ozone reacts with diethyl-p-phenylene diamine (DPD) in buffered solution in the presence of potassium iodide to produce a pink coloration. The intensity of the colour is proportional to the Ozone concentration and is measured using a *DINKO* Photometer.
For determination of Ozone in the presence of Chlorine or Bromine, a supplementary procedure using Glycine is used. The Glycine destroys the Ozone in the sample and the colour produced in the DPD test corresponds to the Chlorine or Bromine only. The Ozone will be the difference between the test readings with and without Glycine.

REAGENTS AND EQUIPMENT

Tablet DPD nº 4 / Tablet DPD Glycine
Round cuvette 16 mm. Ø (4pcs). Code 1.9365.00(cuvette used in the chart) Square cuvette 10 mm with cap.(100pcs). Code 1.9363.00
DINKO D-101 Photometer use the calibration chart / *DINKO* D-105 Photoanalyzer and D-100 Photometer select program nr. 44.

PROCEDURE

1. - Rinse test tube with sample leaving two to three drops of sample in the tube.
2. - Add one DPD Nº 4 tablet, crush tablet and then fill the test tube with sample to the 10 ml mark. Mix to dissolve.
3. - Select wavelength 520 nm on Photometer.
4. - Take Photometer reading in usual manner. Make ZERO with water, without tablets.
   Consult Ozone calibration chart (D-101) or select program Nnr.44 (D-105 and D-100).
5. - The result represents the Ozone residual as milligrams per litre(Result A). If sample contents only Ozone the test may be terminated at this stage.
6. - If sample contains Chlorine or Bromine, a correction should be made.
7. - Fill a test tube with sample to the 10 ml mark. Add one DPD Glycine tablet, crush and mix to dissolve.
8. -Take a second clean test tube and add two to three drops of solution from the first tube. Add one DPD Nr. 4 tablet, crush and then add the remainder of solution to make up to the 10 ml mark. Mix to dissolve tablet.
9. -Take Photometer reading. Consult calibration chart(D-101) or select program nr.44 (D-100 and D-105).

   Result B.

10.- Result B is the Ozone equivalent of the Chlorine or Bromine present. To obtain Ozone residual subtract this value from the Ozone residual value obtained in the first procedure.

Ozone(mg/ l) = Result A - Result B

Range: 0 -2,0mg / L **Ozone** **520 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0	0.00	0.02	0.04	0.07	0.09	0.11	0.14	0.16	0.18	0.21
0.1	0.23	0.25	0.28	0.30	0.32	0.34	0.37	0.39	0.42	0.44
0.2	0.47	0.49	0.52	0.54	0.57	0.59	0.62	0.64	0.67	0.69
0.3	0.72	0.74	0.77	0.79	0.82	0.85	0.88	0.91	0.94	0.98
0.4	1.00	1.04	1.07	1.10	1.13	1.16	1.19	1.22	1.25	1.28
0.5	1.30	1.33	1.36	1.39	1.42	1.45	1.48	1.50	1.53	1.56
0.6	1.59	1.62	1.64	1.67	1.70	1.72	1.75	1.78	1.81	1.83
0.7	1.86	1.89	1.91	1.94	1.97	2.00				

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,043 mg/L O_3

Traceability: The traceability of the method of settles down with Palin, A.I. , J.Inst. Water Eng-1-21(6)537-547(1967)

pH (Phenol Red). Code 1.9417.00 (50t) - 1.9504.00 (250t) **Photometer Method 520 nm**
Test for pH in water and aqueous solutions. **6.8 - 8.4 pH**

The Phenol Red indicator method provides a simple colorimetric means of pH determination for neutral and slightly alkaline waters over the range 6,8-8,4 units.

METHOD

The test uses a tablet reagent containing the precise amount of phenol red indicator required for the test. Phenol red reacts in water at different pH values a range of colours from yellow to red. The colour of the test solution is indicative of the pH value and is measured using a *DINKO* Photometer.
Phenol red tablets contain a dechlorinating agent so that the test can be carried out in water containing normal levels of chlorine or other desinfectant residuals.

REAGENTS AND EQUIPMENT

Phenol Red Clear Tablet / Round cuvette 16 mm Ø with cap. (4pcs). Code 1.9365.00. (cuvette used in the chart)
Square cuvette 10 mm with cap. (100pcs). Code 1.9363.00
DINKO D-101 Photometer use the calibration chart / *DINKO* D-105 Photoanalyzer and D-100 Photometer select program nr. 45.

PROCEDURE

1. - Fill test tube with sample to 10 ml mark and mix to dissolve.
2. - Add one Phenol Red tablet. Crush and mix to dissolve. Select the 520 nm filter.
3. - Take the Photometer reading. Make zero with sample without tablet.
4. - Consult calibration chart , Photometer D-101. Photometers D-100 and D-105 select program 45.

Notes

The formation of an intense purple coloration shows that the indicator has been affected by high chlorine or other desinfectant residuals. In such cases the result should be disregarded.

Phenol red does not show any further colour change at pH values below 6,8 or above 8,4. Note therefore that when such values are recorded this could indicate that the samples has a much lower or much higher pH value.

Ionic strength, temperature and other water factors may have an effect on pH readings. This test has been calibrated for conditions most likely to be encountered in a typical swimming pool at 30ºC .

Range: 6,8- 8,4 pH **Phenol red** **520 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.1										6.80
0.2	6.85	6.90	6.95	7.00	7.00	7.00	7.00	7.00	7.05	7.05
0.3	7.05	7.10	7.10	7.10	7.10	7.15	7.15	7.15	7.15	7.20
0.4	7.20	7.20	7.25	7.25	7.30	7.30	7.35	7.35	7.40	7.40
0.5	7.40	7.45	7.45	7.50	7.50	7.50	7.55	7.55	7.60	7.60
0.6	7.60	7.60	7.60	7.65	7.65	7.65	7.65	7.70	7.70	7.70
0.7	7.70	7.75	7.75	7.75	7.80	7.80	7.80	7.80	7.85	7.85
0.8	7.85	7.85	7.90	7.90	7.90	7.95	7.95	7.95	7.95	8.00
0.9	8.00	8.00	8.05	8.10	8.10	8.15	8.15	8.20	8.20	8.25
1.0	8.30	8.35	8.35	8.40						

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,026mg/L pH

Traceability: The traceability of the method of settles down with SM, “Standard Methods”

PHENOL. Code 1.9418.00 (50t) **Photometer Method 520 nm**

Test for Phenol and ortho/meta substituted phenols in natural, drinking and industrial waste waters. **0- 5,0 mg /l as Phenol**

Phenols and substituted phenols may occur in natural drinking and industrial waste waters. Phenols are not readily removed from water by conventional water treatment process. These compounds arise typically from oil and chemical refining, livestock clips, the breakdown of pesticides, human and animal wastes and from naturally occuring sources. Chlorination of such waters may produce odorous and objectionable tasting chlorophenols. The *DINKO* Phenoltest methode provides a simple means of measuring the concentration of phenol and phenolic compounds present in water over the range 0 - 5.0 mg/l. The concentration of phenol determined in the test is due to unsubstituted and to ortho and meta substituted phenols. A proportion of “para” substituted phenols will give a positive response.

METHOD

In the Phenoltest method, phenol and phenolic compounds react with 4-aminoantipyrine in the presence of ferricyanide ions to form a red colour. The reagents are provided in tablet form and the test is carried out simply by adding the appropriate tablets to a sample of the water. A further tablet reagent is used to prevent interference due to metal ions. The intensity of the red colour produced in the test is proportional to the concentration of phenolic compounds present in the sample and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Phenoltest nr.1 Tablet / Phenoltest nr. 2 Tablet / Phenoltest PR Tablet
Round cuvette 16mm Ø with cap.(4pcs). Code 1.9365.00. (cuvette used in the chart).
Square cuvette 10 mm with cap. (100pcs). Code: 1.9363.00
DINKO D-101 Photometer use the calibration chart / *DINKO* D-105 Photoanalyzer and D-100 Photometer select program nr. 46.

PROCEDURE

1. - Fill round test tube to 10 ml mark with sample.
2. - In the case of samples known to contain Copper, Zinc, Iron or Manganese ions, add one Phenoltest PR tablet. Crush and mix to dissolve.
3. - Add one Phenoltest nr. 1 tablet, crush and mix to dissolve.
4. - Add one Phenoltest nr. 2 tablet, crush and mix to dissolve.
5. - Stand for 10 minutes to allow full colour development.
6. - Select wavelength 520 nm on the photometer.
7. - Take Photometer reading (see photometer instructions). Make zero with the sample without tablets.
8. - Consult the Phenol calibration chart (D-101). Select program nr. 46 (D-105 and D-100).

INTERFERENCES

1- Use of the Phenoltest PR tablet will prevent interference from metal ions up to a concentration of 350 mg/l. The test is unaffected by free chlorine in the sample up to 10 mg/l
2- Low results may be obtained in sample containing more than 150 mg/l alkalinity (as $CaCO_3$), 10 mg/l sulphite or 2 mg/l sulphide. Certain organic keto-enol compounds may cause high results. In case of known or suspected interferences, then the sample should be-treated in accordance with standard analytical procedures.

RANGE: 0- 5,0 mg / L **Phenol** **520 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0		0.00	0.05	0.12	0.19	0.26	0.33	0.40	0.47	0.53
0.1	0.60	0.67	0.74	0.81	0.88	0.95	1.02	1.09	1.16	1.22
0.2	1.29	1.36	1.43	1.50	1.58	1.64	1.72	1.79	1.86	1.93
0.3	2.01	2.08	2.15	2.22	2.30	2.37	2.44	2.51	2.58	2.65
0.4	2.72	2.79	2.85	2.92	2.99	3.06	3.13	3.20	3.26	3.33
0.5	3.40	3.47	3.54	3.60	3.67	3.74	3.81	3.88	3.95	4.01
0.6	4.09	4.16	4.24	4.31	4.39	4.46	4.54	4.61	4.69	4.76
0.7	4.85	4.92	5.00							

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,099 mg/L as Phenol

Traceability: The traceability of method settles down with SM, "Standard Methods" 6th Ed. V2. 2,51,2464(1975) and USEPA 420.1

PHMB. Code 9420 (50t)

Photometer Method 620 - 630 nm
0 -100 mg / l

Test for PHMB-based sanitizers in swimming pool water.

Polyhexamethylbiguanide (PHMB) is an organic biocide used for water desinfection. PHMB-based sanitizers are widely used for treatment of swimming pool water. These sanitizers are typically sold under branded names, for example Baquacil (Zeneca), Softswim (Biolab), Revosil (Mareva) and Nicosil (Nico Norge).

The test provides a simple means of measuring PHMB-base sanitiser levels in swimming pool waters over the range 0-100 mg/l. The test is calibrated in terms of commercially available sanitizers products which normally contain 20% active biocide.

METHOD

In the test the PHMB reacts with a sulphonephtalein indicator under midly acid conditions to form a intense blue complex. The indicator itself is yellow in colour. Thus at different PHMB levels a distinctive range of colours from yellow, through green, to blue are produced.

The reagents are combined in the form of a single of water. The intensity of colour produced is proportional to the PHMB concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

PHMB Tablet / Round cuvette 16 mm Ø with cap. (4pcs). Code 1.9365.00. (cuvette used in the chart)
Square cuvette 10 mm with cap. (100pcs). Code: 1.9363.00 / *DINKO* D-101 Photometer use the calibration chart, filter 620 nm.
DINKO D-105 Photoanalyzer and D-100 Photometer select program nr. 47.

PROCEDURE

1. - Fill test tube with sample to the 10 ml mark. Crush and mix to dissolve.
2. - Add one PHMB tablet. Crush and mix to dissolve.
3. - Select filter 620 nm (D-101 Photometer). D-105 Photoanalyzer and D-100 Photometer select program nr. 47
4. - Take the Photometer reading. Make zero with sample without tablet.
5. - Consult calibration chart , Photometer D-101. Photometers D-100 and D-105 select program nr.47.

Range: 0 -100 mg / L **PHMB** **620 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0	0.00	0.00	2.79	5.56	8.33	10.8	12.7	14.7	16.6	18.5
0.1	20.5	22.4	24.4	26.3	28.3	30.2	32.1	34.1	36.0	38.0
0.2	39.9	41.9	43.8	45.7	47.7	49.6	52.0	54.4	56.9	59.4
0.3	61.9	64.3	66.8	69.3	73.2	77.8	82.4	87.0	91.6	96.3
0.4	100									

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 3,403mg/L PHMB

Traceability: The traceability of the method of settles down with Dr. A. T. Palin

PHOSPHATE. Code 1.9432.00 (50t) - 1.9482.00 (200t)

Photometer Method 620- 630 nm
0 - 4,0 mg / l PO_4

Test for low levels of phosphate in natural and drinking water

Phosphates are extensively used in detergent formulations and washing powders. Also find application in the food processing industry and in industrial water treatment processes. Agricultural fertilisers normally contain phosphate minerals and phosphates also arise from the breakdown of plant materials and in animal wastes.

Whilst phosphates are not generally considered harmful for human consumption, they do exhibit a complex effect on the natural environment. Phosphates are associated with eutrophication of water and with rapid unwanted plant growth in rivers and lakes.

The *DINKO* test provides a simple method of measuring phosphate levels over the range 0- 4 mg /l of PO_4 . For drinking water the ECC has set a guide level of 0,5mg/l PO_4 (0,4 mg/l P_2O_5) and a maximum admissible concentration of 6,7 mg/l PO_4 (5 mg/l P_2O_5).

METHOD

The phosphate reacts under acid conditions with ammonium molybdate to form phospho-molybdic acid. This compound is reduced by ascorbic acid to form the intensely coloured " molybdenum blue" complex. A catalyst is incorporated to ensure complet and rapid colour development, and a inhibitor is used to prevent interference from silica. The reagents are provided in the form of two tablets for maximum convenience. The test is simply carried out by adding one of each tablet to a sample of the water.
The intensity of the colour produced in the test is proportional to the phosphate concentration, and is measured using a *DINKO* Photometer.

REACTIVOS Y EQUIPO

Phosphate nº 1 LR tablet / Phosphate nº 2 LR tablet/ Round cuvette 16 mm Ø with cap. (4pcs). Code: 1.9365.00. (cuvette used in the chart) / Square cuvette 10 mm with cap. Pk.(100). Code 1.9363.00
DINKO D-101 Photometer use the calibration chart. Filter 620 nm
DINKO D-105 Photoanalyzer and D-100 select program nr.48

PROCEDURE

1. - Fill the test tube to the 10 ml mark with the sample.
2. - Add one Phosphate nº 1 LR tablet, crush and mix to dissolve.
3. - Add one Phosphate nº 2 LR tablet, crush and mix to dissolve.
4. - Stand for ten minutes to allow full colour development.
5. - Select wavelength 620 nm (D-101). Select program nr. 48 on the Photometers D-105 and D-100.
6. - Take Photometer reading (see Photometer Instructions). Make zero with the sample without tablets.
7. - Consult Phosphate calibration chart (D-101) or select program nr.48 (D-105 and D-100)

RANGE: 0- 4,0 mg / L PHOSPHATE **mg/ L PO_4** **620 – 630 nm**

ABS.	0	1	2	3	4	5	6	7	8	9
0.0			0	0.04	0.08	0.13	0.17	0.22	0.26	0.31
0.1	0.35	0.39	0.44	0.48	0.53	0.58	0.63	0.68	0.73	0.77
0.2	0.82	0.87	0.92	0.97	1.01	1.06	1.11	1.16	1.21	1.26
0.3	1.31	1.36	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75
0.4	1.80	1.84	1.89	1.94	1.99	2.05	2.11	2.17	2.24	2.30
0.5	2.36	2.42	2.48	2.55	2.61	2.67	2.73	2.80	2.86	2.92
0.6	2.98	3.05	3.13	3.21	3.29	3.37	3.45	3.52	3.60	3.68
0.7	3.76	3.84	3.91	4.00						

Phosphate concentrations can be expressed in a number of different ways.The following factors may be used for the conversion of readings:
To convert from PO_4 to P_2O_5 multiply by 0,75 / To convert from PO_4 to P multiply by 0,33

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,085mg/L as PO_4

Traceability: The traceability of method settles down with “UEPA 365.2” and “SM4500-P-E”

PHOSPHATE. Code 1.9426.00 (50t) - 1.9462.00 (250t) **Photometer Method 490 nm**
Test for high levels of phosphate in boiler water **0-100 mg / l PO_4**

Phosphates are extensively used for treatment water in boilers and steam raising plant. Phosphates are added to control the deposition of sediment within the boiler and is essential to know the concentration. The *DINKO* Phosphate test provides a simple method of measuring phosphate levels in boiler waters over the range 0 - 100 mg /l de PO_4.

METHOD

The *DINKO* Phophate test is base on the vanadomolybdate method. All the reagents required are provided in form of a test tablet. The test is carried out by adding a single tablet to a sample of the boiler water. In the test phosphates react with ammonium molybdate, in presence of ammonium vanadate, to form the yellow phosphovanadomolybdate. The intensity of the colour produced in the test is proportional to the phosphate concentration and is measured using a *DINKO* Photometer.

SAMPLE COLLECTION

Samples drawn from boiler sampling points may be hot and contain particulate matter. Prior to analysis samples should be cooled to below 25ºC and filtered.

REAGENTS AND EQUIPMENT

Phosphate HR Tablets
DINKO D -101 Photometer use the calibration chart. Photoanalyzer D -105 and D-100 select program nr.49.
Round cuvewtte 16 mm. Ø with cap (4pcs). Code 1.9365.00 (cuvette used in the chart) / Square cuvette 10 mm. (100pcs). Code 1.9363.00

PROCEDURE

1. - Fill test tube with sample to the 10 ml mark.
2. - Add one Phosphate HR tablet, crush and mix to dissolve.
3. - Stand for teen minutes to allow colour development. Select wavelength 490 nm on Photometer
4. - Take photometer reading (see photometer instructions). Make zero with the sample without tablets
5. - Consult Phosphate calibration chart (D-101) or select program nr.49 (D-100 and D-105).

RANGE: 0-100 mg/L **mg//L PHOSPHATE PO_4** **490 nm**

ABS.	0	5	ABS.	0	5	ABS.	0	5
0.07	0.0	0.4	0.15	30	33	0.23	71	73
0.08	2	4	0.16	35	38	0.24	76	78
0.09	6	8	0.17	40	43	0.25	81	84
0.10	9	11	0.18	45	48	0.26	87	91
0.11	13	15	0.19	50	53	0.27	94	97
0.12	17	19	0.20	55	58	0.28	100	
0.13	21	23	0.21	61	63			
0.14	25	28	0.22	66	68			

The following factors may be used for conversion of readings:

To convert from PO_4 to P_2O_5 multiply by 0,75 / To convert from PO_4 to P multiply by 0,33

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 7.088mg/L PO_4

Traceability: The traceability of method settles down with " SM, " Standard Methods"

PHOSPHORUS, TOTAL. Code 1.9007.00 (25t) **Photometer Method 620- 630 nm**
Test phosphorus compounds in natural and waste water **0 - 12,0mg / l P**

Total Phosphorus is composed of orthophosphates, polyphosphates and organic phosphorus compounds. Ortho and polyphosphates are extensively used in detergents formulations and washing powders. Phosphates and phosphorus compounds also find widespread application in the food processing industry, industrial water treatment process, agricultural fertilisers and are found in animal wastes or from certain manufacturing processes.
The monitoring of Total Phosphorus is therefore of great importance .
The *DINKO* test provides a simple method of measuring total Phosphorus compounds over the range 0 -12,0mg /l P

METHOD

The *DINKO* tubetest is a simple two stage procedure. The sample is first digested with acid persulphate to break down polyphosphates and organic phosphorus compounds and convert them to orthophosphate. Then all phosphate present in the sample is determined by reaction with ammonium molybdate and ascorbic acid to form a intensely coloured "molybdenum blue" complex ". A catalyst is incorporated to ensure complete and rapid colour development, and an inhibitor is used to prevent interference from silica.

The intensity of colour produced is proportional to the total phosphorus concentration, and is measured using a *DINKO* Photometer

REAGENTS AND EQUIPMENT –Digestion Stage

Reagent Tubes, 25u / Digest Ox Tablets / Heater block *DINKO* model D-64 or D-65 / Pipettor, 2ml

REAGENTS AND EQUIPMENT- Colour Development Stage

PhosNeut Solution Phos Nr. 1 Tablets / Phos nr. 2 Tablets / Photometer D-101 use the chart, filter 620 nm.
Photoanalyzer *DINKO* D-105 and Photometer D-100 select program nr. 59.

PROCEDURE – Disgestion Stage

1- Turn on the Heater block, set to 100-105º C and allow to heat up the temperature.
2- Remove the cap of the tubetest and add 2 ml of sample using the pipettor.
3- Add two Digest Ox tablets, crush and mix to dissolve.
4- Replace te cap tightly and invert tube gently to mix. Label the tube and place in the Heater block. Ensure the safety bell is in position. Digest the tube for one hour(minimum 45 minutes) then turn of the heater.
5- Carefully remove the tube, transfer to a test tube rack and allow to cool to room temperature.

PROCEDURE- Colour Development Stage

1- Carefully remove the cap from the cooled tube and add 2,0ml of Phosneut solution using the pipettor.
2- Add one Phos nr. 1 tablet, crush and mix to dissolve. Ensure all particles of the tablet have dissolved.
3- Add one Phos nr. 2 tablet, crush and mix to dissolve. Cap tube and gently invert several times to mix.
4- Stand tube for 10 minutes to allow colour development.
5- Select filter 620 nm on D-101 Photometer. For D-105 Photoanalyzer and Photometer D-100 select program nr. 59
6- Take the photometer reading. Use an unused Tubetest Reagent to set the zero on the Photometers. Also a tube containing deionised water only may be used.
7- Consult the Phosphorus table. Select program nr. 59 in the model D-105 and D-100.

RANGE: 0 -12,0 mg / L **PHOSPHORUS,TOTAL P** **620 - 630 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0	0.00	0.04	0.12	0.20	0.28	0.36	0.43	0.51	0.59	0.67
0.1	0.74	0.82	0.89	0.97	1.04	1.11	1.19	1.26	1.34	1.41
0.2	1.49	1.57	1.64	1.71	1.79	1.86	1.93	2.01	2.08	2.16
0.3	2.23	2.31	2.38	2.46	2.53	2.61	2.68	2.76	2.83	2.91
0.4	2.98	3.06	3.13	3.21	3.28	3.35	3.43	3.50	3.58	3.65
0.5	3.73	3.80	3.88	3.97	4.06	4.15	4.24	4.34	4.43	4.52
0.6	4.62	4.71	4.80	4.90	4.99	5.08	5.17	5.27	5.36	5.45
0.7	5.55	5.64	5.73	5.58	5.92	6.01	6.11	6.20	6.29	6.38
0.8	6.48	6.57	6.66	6.80	6.96	7.12	7.28	7.48	7.60	7.76
0.9	7.92	8.08	8.24	8.40	8.56	8.72	8.88	9.04	9.20	9.36
1.0	9.52	9.68	9.84	10.0	10.2	10.3	10.5	10.6	10.8	11.0
1.1	11.1	11.3	11.4	11.6	11.8	12.0				

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,014 mg/L P

Traceability: The traceability of Phosphorus Total method settles down with USEPA 365.2

POTASSIUM. Code 1.9456.00 (50t) - 1.9494.00 (250t) **Photometer Method 520 nm**
Test for Potassium in natural and treated water. **0 -12,0 mg / l**

Potassium is an abundant natural element. However in fresh water potassium levels are normally low. The guide level prescribed for drinking water supplies under the EEC Regulations is 10 mg/l .The *DINKO* Potassium test provides a simple means of testing potassium levels in water over the range 0-12,0 mg / l.

METHOD

The *DINKO* Potassium test is based on a single tablet containing sodium tetraphenylboron. Potassium salts react with sodium tetraphenylboron to form an insoluble white complex. At the potassium levels encountered in th test, this is observed as a turbidity in the test sample. The degree of turbidity is proportional to the Potassium concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Potassium K Tablet/Round cuvette 16 mm Ø with cap.(4pcs). Code 1.9365.00(cuvette used in the chart)/Square cuvette 10 mm with cap. (100pcs). Code 1.9363.0 /D-101 Photometer use the calibration chart /D-105 Photoanalyzer and D-100 Photometer select program nr. 20

PROCEDURE

1. - Fill test tube with sample to the 10 ml mark.
2. - Add one Potassium K tablet, crush and mix to dissolve. A cloudy solution indicates the presence of Potassium.
3. - Select wavelength 520 nm on the Photometer.
4. -Take Photometer reading (see Photometer Instructions). Make zero with the sample without tablet.
5. - Consult Potassium calibration chart (D-101). Select program nr. 20 (D-100 and D-105).

Range: 0-12,0 mg/L K **PPM POTASSIUM** **520 nm**

ABS	0	2	6	8	ABS	0	2	6	8
0.0	0.0	0.4	1.0	1.4	1.1	7.1	7.2	7.4	7.5
0.1	1.8	2.0	2.1	2.2	1.2	7.7	7.8	8.0	8.1
0.2	2.3	2.4	2.5	2.6	1.3	8.2	8.4	8.6	8.7
0.3	2.7	2.8	2.9	3.0	1.4	8.8	8.9	9.2	9.3
0.4	3.1	3.2	3.4	3.5	1.5	9.4	9.5	9.8	9.9
0.5	3.6	3.7	4.0	1.6	1.6	10.0	10.1	10.3	10.4
0.6	4.2	4.3	4.5	4.7	1.7	10.4	10.6	10.8	10.9
0.7	4.8	4.9	5.1	5.2	1.8	11.0	11.1	11.4	11.5
0.8	5.3	5.5	5.7	5.8	1.9	11.6	11.7	11.9	12.0
0.9	5.9	6.0	6.3	6.4	2.0				
1.0	6.5	6.6	6.8	7.0					

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,089 mg/L K

Traceability: The traceability of the method of settles down with SM, “Standards Methods”

SILICA. Code 1.9457.00 (50t) - 1.9495.00 (200t) **Photometer Method 620 - 630nm**
Test for Silica in natural treated and industrial water **0- 4,0mg / l SiO_2**

Silicon, in the form of silica, is one of the earth’s most abundant elements. Silicon is found widely in natural waters as colloidal silica or soluble silicates. Silica and silicates do not normally cause any problems in water intended for domestic consumption. However their presence is undesirable in water used in a variety of industrial application. This is because of the tendency of such water to form a hard scale on equipment. Silica and silicate containing waters are particularly troublesome in steam generating plant such as high pressure boilers since silica scale can build up on turbine blades.
The test provides a simple means to measuring silica and silicate levels in natural, treated and industrial waters over the range 0-4 mg/l SiO_2

METHOD

Ammonium molybdate reacts with silica under acid conditions to produce molyb-dosilicic acid. In the presence of a reducing agent, this compound is reduced to form an intense blue complex. Phosphate reacts in a similar manner. Interference by phosphate is prevented by introducing a reagent which destroy any molybd-dophosphoric acid which may form. The reagents are provided in tablet form and the test is carried out by adding tablets to a sample of water. The intensity of colour produced in the test is proportional to the silica concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Silica nr.1 Tablet / Silica nr. 2 Tablet / Silica PR Tablet / Round cuvette 16 mm. Ø with cap (4pcs). Code 1.9365.00/ *DINKO* D-101 Photometer, use calibration chart, filter 620 nm./ *DINKO* D-105 and D-100 Photometers use program nr. 21

PROCEDURE

1. - Fill tube test with sample to the 10ml mark.
2. - Add one Silica nr. 1 tablet, crush and mix to dissolve. Stand for 5 minutes to allow the silica to react.
3. - Add one Silica PR tablet, crush and mix to dissolve. This stage may be omitted if sample is free of phosphate.
4. - Add one Silica nr. 2 tablet, crush and mix to dissolve. Stand for 5 minutes to allow colour development.
5. - Select filter 620 nm. for D-101. For D-100 Photometer and D-105 Photoanalyzer select program nr. 21
6. - Take photometer reading. Make zero with sample without tablets.
7. - Consult Silica calibration chart with D-101 Photometer. With D-105 and D-100 Photometers select program nº 21.

RANGE: 0- 4,0 mg / L Silica SiO_2 620 nm

ABS	0	1	2	3	4	5	6	7	8	9
0.0								0	0.04	0.09
0.1	0.14	0.19	0.24	0.29	0.34	0.39	0.44	0.49	0.54	0,. 0
0.2	0.67	0.73	0.79	0.85	0.91	0.98	1.03	1.09	1.14	1.19
0.3	1.25	1.30	1.35	1.41	1.46	1.52	1.57	1.62	1.68	1.73
0.4	1.78	1.84	1.89	1.95	2.00	2.06	2.12	2.18	2.24	2.30
0.5	2.36	2.42	2.48	2.55	2.61	2.67	2.73	2.79	2.85	2.91
0.6	2.97	3.03	3.08	3.13	3.18	3.23	3.28	3.33	3.38	3.44
0.7	3.49	3.54	3.59	3.64	3.70	3.74	3.79	3.85	3.90	3.95
0.8	4.00									

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,071 mg/L SiO_2

Traceability: The traceability of the method of settles down with SM, "Standards Methods"

SILICA. Code 1.9421.00 (50t) - 1.9453.(200t) **Photometer Method 420- 450 nm**
Test for Silica in natural, treated and industrial water. **0 - 150mg / l SiO_2**

Silicon, in the form of silica, is one of the earth´s most abundant elements and do not cause problems in water intended for domestic consumption. Their presence is undesirable because of the tendency to form a hard scale on equipment.
The *DINKO* test provides a simple means of measuring silica and silicates levels over the range 0 -150 mg / l SiO_2

METHOD

Sodium molybdate reacts with silica under acid conditions to produce molybdosilicic acid. Phosphate reacts in similar manner. Interference by phosphate is prevented by introducing a reagent which destroy any molybdophosphoric acid which may form. The regents are provided in tablet form to be added in a sample of water. The intensity of colour produced in the test is proportional to the silica concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Silica HR Nr. 1 Tablet / Silica HR nr. 2 Tablet / Silica PR Tablet / Round cuvette 16 mm. Ø with cap (4pcs). Code 1.9365.00
DINKO D-101 Photometer, use calibration chart, filter 420 nm.
DINKO D-105 and D-100 Photometers, select program nr. 50

PROCEDURE

1. - Fill the test tube with sample to the 10 ml mark.
2. - Add one Silica HR nr. 1tablet, crush and mix to dissolve.
3. - Add one Silica HR nr. 2 tablet, crush and mix to dissolve. Stand for 10 minutes to allow full colour development.
4. - Add one Silica PR tablet, crush an mix to dissolve. Stand for two minutes. This stage may be omitted if the sample is free of phosphate and chlorine.
5. - Select wavelength 420 nm. on D-101 and on D-100 and D-105 Photoanalyzer select program nr. 50
6. - Take Photometer reading. Make zero with sample without tablets.
7. - Consult Silica calibration chart with D-101Photometer. Select program nr. 50 with D-105 and D-100 Photometers.

RANGE: 0-150 mg / L Silica SiO_2 420 nm

ABS	0	1	2	3	4	5	6	7	8	9
0.0				0	1	2	4	5	6	8
0.1	9	10	12	13	15	16	17	19	20	21
0.2	23	24	26	27	28	30	32	34	35	37
0.3	39	41	43	45	47	49	51	53	55	57
0.4	59	61	64	66	69	71	74	76	78	81
0.5	83	86	88	91	94	98	101	104	107	110
0.6	113	116	119	123	128	132	137	141	145	150

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 4.253mg/L SiO_2

Traceability: The traceability of the method of settles down with SM, "Standards Methods

SULPHATE. Code 1.9458.00 (50t) - 1.9496.00 (200t) **Photometer Method 520 nm**
Test for sulphate in natural and treated waters. **0 - 200 mg / l**

Sulphates are introduced into treated waters by the use of such chemicals as aluminium sulphate, Sodium bisulphate and Sulphuric acid. The presence of high levels of sulphate can be undesirables. In industrial waters containing sulphate localised corrosion of Iron, steel and Aluminium in plant and pipe work can occur through the action of sulphate-reducing bacteria. These bacteria, which generate sulphides, cause a characteristic pitting of the metal surface. High sulphate levels can also cause damage to concrete and cement based materials through the formation of Calcium sulphoaluminate. This cause expansion and crumbling of cement. It can affect concrete structures and pipes in water distribution systems carrying sulphate-bearing ground waters; and can attack grouting in tiled swimming pools using Sodium bisulphate for pH adjustement.Test range is 0-200 mg/l SO_4 Higher levels may be determined by diluting sample.

METHOD

The *DINKO* Sulphate test is based on a single tablet reagent containing Barium chloride in a slightly acidic formulation. Barium salts react with sulphates to form insoluble Barium sulphate. At the sulphate levels encountered in the test, this is observed as turbidity in the test sample. The degree of turbidity is proportional to the sulphate concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Sulphate Turb Tablets / Square cuvette 10 mm. (100pcs). Code 1.9363.00
Round cuvette 16 mm. Ø with cap (4pcs). Code 1.9365.00 (cuvette used in the chart).
D-101 Photometer use calibration chart / D-105 Photoanalyzer and D-100 select program nr. 22.

PROCEDURE

1. - Fill test tube with sample to the 10 ml mark.
2. - Add one Sulphate Turb tablet, crush and mix to dissolve. Select wavelength 520 nm on the photometer.
3. - Take Photometer reading(see photometer instructions). Make zero with sample without tablet.
4. - Consult Sulphate calibration chart(D-101). Select program nr. 22 (D-105 and D-100)

Range: 0 - 200 mg / l **SULPHATE SO_4** **520 nm**

ABS	0	2	6	8	ABS	0	2	6	8
0.0	0	2	7	10	1.1	105	106	110	111
0.1	12	15	20	22	1.2	113	115	118	120
0.2	24	26	31	33	1.3	122	123	127	128
0.3	35	38	42	43	1.4	130	132	135	137
0.4	45	47	50	52	1.5	139	145	145	147
0.5	54	55	59	60	1.6	149	151	155	157
0.6	62	64	67	69	1.7	159	162	166	169
0.7	71	72	76	77	1.8	170	172	176	178
0.8	79	81	84	86	1.9	181	185	192	196
0.9	88	89	93	94	2.0	200			
1.0	96	98	101	103					

CAUTION
Sulphate tablets each contain 20 mg Barium Chloride. These tablets are harmful if ingested. Avoid handling tablets whenever possible and wash hands after use.

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 1,063 mg/L SO_4

Traceability: The traceability of the method of settles down with USEPA 375.4

SUPHIDE Código 1.9460.00 (50t) **Photometric Method 620- 630 nm**
Test for sulphide in natural and waste water **0- 0,5 mg/ l**

Natural waters containing dissolved Hydrogen sulphide and other sulphides are found in certain parts of the world, in areas having hot springs. Sulphides are constituents of many industrial wastes such as those from tanneries, gas plants and chemicals works. Sulphides can be toxic to fish and aquatic life and their presence in water supplies gives rise to undesirable tastes and odours.
The *DINKO* Sulphide test provides a simple method of measuring total available sulphide over the range 0 to 0,5mg/l and is particularly applicable to natural and drinking waters. Higher levels , such as those found in effluents and waste waters, can be determinate by diluting the sample.

METHOD

The method is based on a reagent containing Diethyl-p-phenylenediamine (DPD) and Potassium dichromate. Sulphide reacts with DPD to produce a blue complex. In the absence of sulphides the reagent is pink colour. Chlorine, and other oxidising agents, do not interfere with the test. The reagents are provided in two tablets. The colour produced is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Nr. 1Tablets / Nr. 2 Tablets / Round cuvettes 16 mm Ø with cap (4pcs). Code:1.9365.00 (cuvette used in the chart)
DINKO D-101 Photometer use calibration chart. Filter 620 nm
DINKO D-105 Photoanalyzer and D-100 Photometer select program nr. 23

SAMPLE COLLECTION

Collect the sample carefully with a minimum of agitation and test immediately after collection.

PROCEDURE

1.- Fill the test tube with sample to 10 ml mark.
2.- Add one Nr. 1 tablet and one Nr. 2 tablet, crush and mix gently to avoid loss of sulphide.
3.- Stand 10 minutes to allow full colour development.
4.- Select wavelength 620 or 630nm on the Photometer.
5.- Take photometer reading (see photometer instructions). Make blank without tablets.
6.- Consult the Sulphide calibration chart (D-101). Select program nr. 23 (D-105 and D-100).

Range: 0-0,5 mg / l					Sulphide					620 nm
ABS	0	1	2	3	4	5	6	7	8	9
0.1							0.00	0.01	0.02	003
0.2	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13
0.3	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23
0.4	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.33	0.34
0.5	0.35	0.35	0.36	0.36	0.37	0.38	0.38	0.39	0.39	0.40
0.6	0.41	0.41	0.42	0.43	0.43	0.44	0.45	0.47	0.48	0.49
0.7	0.50	To convert from mg/l S to mg/l H_2S multiply results by 1.06								

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is ± 0,014 mg/L S^-

Traceability: The traceability of the method of settles down with USEPA 376.2 and SM 4500-S^2

SULPHITE. Code 1.9459.00 (50t) - 1.9497.00 (250t)
Test for sulphite in boiler water

Photometric Method 580- 577 nm
0- 500 mg/l Na_2SO_3

Oxygen is major cause of corrosion in boilers and steam raising plant. Sodium sulphite and catalysed sulphite formulations are extensively used as oxygen scavengers in boiler water treatment. The test covers the range 0 a 500 mg / l.

METHOD

The method is based on a colorimetric procedure involving the reduction of an indicator. Sulphites react with the indicator under buffered conditions to destroy the original purple coloration. With increasing sulphite concentrations a range of colours from purple to colourless is produced. This method does not respond to other reducing species as do traditional iodometric methods. The degree of colour loss in the test is proportional to the sulphite concentration and is measured using a *DINKO* Photometer.

REAGENTS AND EQUIPMENT

Nº 1 Tablets/ Nº 2 Tablets / Round cuvette 16 mm. Ø with cap (4pcs). Code 1.9365.00 (cuvette used in the chart)
Square cuvette 10 mm. with cap.(100pcs). Code1.9363.00 / *DINKO* D-101 Photometer use calibration chart, filter 580 nm.
DINKO D-105 Photoanalyzer and D-100 Photometer select program nr. 24

PROCEDURE

1.- Filter sample if necessary to obtain a clear solution. Fill the test tube with sample to 10 ml mark.
2.- Add one Nr. 1 tablet, crush and mix to dissolve.
3.- Add one Nr. 2 tablet, crush and mix to dissolve. Cap tube immediately. Stand two minutes.
4.- Select filter 580 on the Photometer D-101. Select program nr. 24 with photometers D-100 and D-105
5.- Take photometer reading (see photometer instructions). Make zero with sample without tablets.
6.- Consult the Sulphite calibration chart(D-101). Select program 24 (D-100 and D-105).

Equipment should be washed immediately after use, with a detergent if necessary, to prevent staining.

RANGE: 0-500 mg / L					Sulphite (Na_2SO_3)					580 nm
ABS.	0	1	2	3	4	5	6	7	8	9
0.0										
0.1	500	495	440	385	330	285	260	235	210	190
0.2	170	155	140	125	110	98	93	87	82	77
0.3	72	67	62	57	52	49	47	45	44	42
0.4	40	39	37	35	34	32	30	28	27	25
0.5	23	22	20	18	16	15	13	11	9	8
0.6	6	4	3	1						

To convert from mg/l Na_2SO_3 to mg/l SO_3 multiply by 0,63.

INTERFERENCES

1.- This test is not affected by presence of other reducing species such as nitrite (up to 200 mg/l), ferrous iron (up to 20 mg/l) and sulphide (up to 10 mg/l); or by the presence of polyacrylates.
2.- Chlorine up to 250 mg/l does not cause interference, However, since sulphite and Chlorine do not normally co-exist, the test will not usually be carried out in the presence of Chlorine.
3.- The test gives low results if used in presence of Tannic acid or Tannin treated waters.

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is: to 50 mg/L ± 5,148 mg/L Na_2SO_3 , from 50 to 100 mg/L ± 7,280, from 100 to 300 mg/L ± 28,36 and from 300 to 500 mg/L ± 63,61mg/L Na_2SO_3

Traceability: The traceability of the method settles down with "SM"

SURFACTANTS, ANIONICS. Code 1.9371.00(50t) **Photometric Method 630-620 nm**
Test for anionic surfactants in water **0,00 -4,0 mg / l**

The surfactants are present in all the detergents, industrial or domestic. The surfactants are used abundantly in the daily life. The residual waters contain them, being able to contaminate drinking waters. The surfactants remains in pipes and deposits cleaned with detergents and not well clarified.

METHOD

The Methylene Blue is soluble in Trichlormethane. In presence of anionic surfactants the Methylene Blue reacts forming compounds that can recovery with Trichlormethane, that is colored of blue proportionally to the quantity of surfactants present in the aqueous sample. The method determines all the surfactants that react with Methylene Blue or MBAS (Methylene Blue Active Substances), mainly anionic surfactants of the type sulphates and sulphonates. As the molecular weight of these substances are very different, the result is calculated in mg/l of Sodium Dodecylsulphate.

REAGENTS AND EQUIPMENT

Extractor solvent. Code 1.9371.01 / Surfactants reagent nr. 1 / Surfactants Reagent nr. 2 / Tube reagent / Empty tube zero / Pippetor Round cuvette 16mm Ø with cap (4pcs). Code1.9365.00. (cuvette used in the test).
DINKO D-101 Photometer use the calibration chart, 620 nm filter.
DINKO D-105 Photoanalyzer and D-100 Photometers select program nr. 57

PROCEDURE

1.- Fill tube reagent with 5 ml of Extractor Solvent using the pippetor. See notes.
2.- Add 5 ml of sample. No mix.
3.- Add 3 drops of Surfactants reagent nr.1. No mix.
4.- Add 3 drops of Surfactants reagent nr. 2
5.- Replace the cap tightly and invert tube gently four times to mix contents. Stand 1 minute and invert against tube four times to mix. The sample should be clear. Due to a inadequate room temperature can appear turbidity that it will falsify the reading. In these cases to simply heat with the hand the tube until the sample is completely clear. Take photometer reading immediately
6.- Select filter 620 nm. On D-101 Photometer. Make zero using the Empty tube zero with 5 ml of Extractor Solvent only.
7.- Select program nr. 57 with D-105 an D-100 Photometers. Use chart with D-101 Photometer

Range: 0,0-4,0 mg / L **Anionic surfactans** **620 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0	0.0	0.0	0.05	0.09	0.14	0.19	0.23	0.28	0.33	0.37
0.1	0.42	0.47	0.51	0.56	0.61	0.65	0.70	0.74	0.79	0.84
0.2	0.88	0.93	0.98	1.03	1.07	1.12	1.17	1.21	1.26	1.31
0.3	1.35	1.40	1.45	1.49	1.54	1.59	1.63	1.68	1.73	1.77
0.4	1.82	1.87	1.91	1.96	2.01	2.05	2.10	2.15	2.19	2.24
0.5	2.29	2.34	2.38	2.43	2.49	2.54	2.60	2.65	2.71	2.76
0.6	2.82	2.87	2.93	2.98	3.04	3.09	3.15	3.20	3.26	3.31
0.7	3.37	3.43	3.49	3.54	3.60	3.66	3.71	3.77	3.83	3.89
0.8	3.95	4.00								

The following problems can happen when will make the photometer readings:

1 - The colored side of the tube (Extractor solvent) it is cloudy.
2 - Watery drops exist in the tube wall corresponding to Extractor solvent side.

Anyone of these two problems prevents to make correct readings.

It is necessary to use very clean tubes exempt of residual detergents coming from not well clarified laundries that they generate error and can favour the appearance of bubbles.

To mix by invert tube and to heat with the hand to avoid the turbidity

If the drops of the inside wall of the tube don't disappear, to incline the tube and to carry out some rotations to detach the drops.

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is ± 0,071mg/L Anionic surfactants

Traceability: The traceability of the method of settles down with SM “Standard Methods” 5540C

TURBIDITY . Code 1.9444.00(50t) **Photometer Method 520 nm.**
Test for turbidity in natural and treated waters **5 - 400 Turbidity Units**

The turbidity is a important measure to know the water quality. It is caused by the scattering of light by suspended matter. A knowledge of turbidity is a estimation of the concentration of suspended substances

METHOD

The turbidity is determined using a *DINKO* Photometer. In order to avoid the effect of colour sample , the sample is compared against a filtered portion of the same water. The method has been calibrated with recognised formazin turbidity solutions. The turbidity is expressed in terms of Formazin Turbidity Units (FTU). These units are equivalent to Jackson Turbidity Units(JTU) and Nephelometric Turbidity Units (NTU)

REAGENTS AND EQUIPENT

Filtration Kit (cono-luer lock syringe+10 syringe filters). Code 1.9594.01 / Round cuvette 16 mm. Ø with cap (4pcs). Code 1.9365.00 (cuvette used in the test) / *DINKO* D-101 Photometer, use the calibration chart.
DINKO D-105 Photoanalyzer and D-100 Photometer, select program nr. 53

PROCEDURE

1. - Filter a portion of sample through a syringe filter system
2. - Fill a test tube with filtered sample and retain for use as the blank tube.
3. - Fill a test tube with unfiltered sample to 10 ml mark.
4. - Select 520 nm filter on photometer.
5. - Take photometer reading. Use the filtered sample as the zero.
6. - Consult calibration chart (D-101 Photometer). Select program nr. 53 (D-100 and D-105 Photometers).

Range: 5 - 400 FTU **Turbidity** **520 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0	0	3	7	11	14	18	22	25	29	33
0.1	36	40	43	47	51	54	58	62	65	69
0.2	72	76	80	84	89	93	98	103	107	112
0.3	116	121	125	129	132	136	140	144	148	152
0.4	156	160	163	167	171	174	178	182	186	189
0.5	193	197	200	205	209	213	218	222	226	231
0.6	235	239	244	248	252	257	261	265	270	274
0.7	278	283	287	291	295	300	304	308	313	317
0.8	321	326	330	334	339	343	347	352	356	360
0.9	365	369	373	382	386	390	395	400		

Optionally, a light cover is provided to cover the cuvette and reduce the light in very bright outdoor environments.
It is not necessary to use it indoors.

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is ± 4,700 NTU

Traceability: The traceability of the method of settles down with SM "Standard Methods of Water and Wastewater, APHA-AWWA-WOPC F, Edition 16 and 17, adapted for photometric reading.

ZINC. Code 1.9411.00 (50t) - 1.9499.00 (250t) **Photometer Method 620-630 nm**
Test fo Zinc in natural and treated water **0- 4,0 mg / l**

Zinc compounds are used as corrosion inhibitors in industrial cooling water systems. The Zinc level in such systems is important. The *DINKO* Zinc test provides a simple means to control the Zinc level over the range of 0 a 4 mg/l. in industrial effluents and natural or drinking waters

METHOD

Zinc reacts with 5-(o- carboxyphenyl)-1-(2-hydroxi-5-sulphoophenyl)-3-phenilformazan (Zincon) in alkaline solution to give a intense blue colour. The reagent itself is orange in solution. At different zinc levels a distinctive colour range from orange through purple to blue is produced. In the test a tablet reagent containing both Zincon and an alkaline buffer is used for maximum convenience. The test is carried out by adding a tablet to the sample of the water. Samples containing high chlorine residuals are pre-treated with a special dechlorinating tablet to prevent bleaching of the test colours.
The colour produced in the test is indicative of the Zinc concentration and is measured using a *DINKO* Photometer.
Copper reacts in similar manner to Zinc and a correction procedure using EDTA is applied to those which contain both zinc and copper. EDTA destroys the colour complex formed with Zinc.

REAGENTS AND EQUIPMENT

Zinc Tablet / Zinc / Dechlor Tablet / EDTA Tablet /Round cuvette 16mm Ø with cap.(4pcs). Code 1.9365.00 (cuvette used in the chart) Square cuvette 10 mm with cap. (100pcs). Code: 1.9363.00 / Photometer *DINKO* D-101, use the calibration chart, filter 620 nm Photoanalyzer *DINKO* D-105 and D-100 Photometer select program nr. 51

PROCEDURE

1. - Fill the test tube to the 10 ml mark with the sample.
2. - IN THE CASE OF CHLORINE CONTAINING SAMPLE ONLY. Add one Zinc-Dechlor tablet, crush and mix to dissolve.
3. - Add one Zinc tablet, crush and mix to dissolve.
4. - Stand for five minutes then mix again to ensure complete dissolution of the indicator.
5. - Select wavelength 620 or 630nm on the Photometer.
6. - Take Photometer reading (see Photometer Instructions). Make blank without tablets.
7. - Consult calibration chart (D-101). Select program 51 (D-105 and D-100)
8. - FOR COPPER CONTAINING SAMPLE ONLY.
   Continue the test on the same test portion. Add one EDTA tablet, crush and mix to dissolve.
9. - Take Photometer reading or consult calibration chart. Then subtract the value obtained from the Zinc concentration previously noted. This gives the corrected Zinc concentration.

Range: 0-4,0 mg / L **Zn** **620 nm**

ABS	0	1	2	3	4	5	6	7	8	9
0.0					0.00	0.02	0.05	0.08	0.11	0.13
0.1	0.16	0.18	0.21	0.24	0.26	0.29	0.31	0.34	0.36	0.39
0.2	0.42	0.44	0.47	0.49	0.52	0.55	0.57	0.60	0.62	0.65
0.3	0.68	0.70	0.73	0.75	0.78	0.80	0.83	0.86	0.88	0.91
0.4	0.93	0.96	0.99	1.01	1.04	1.06	1.09	1.11	1.14	1.17
0.5	1.19	1.22	1.25	1.28	1.31	1.33	1.36	1.39	1.42	1.45
0.6	1.48	1.51	1.53	1.56	1.59	1.62	1.65	1.68	1.71	1.73
0.7	1.76	1.79	1.82	1.85	1.88	1.91	1.93	1.96	1.99	2.02
0.8	2.05	2.08	2.11	2.15	2.18	2.21	2.24	2.27	2.30	2.33
0.9	2.36	2.39	2.42	2.45	2.48	2.52	2.55	2.58	2.61	2.64
1.0	2.67	2.70	2.73	2.76	2.79	2.83	2.87	2.90	2.94	2.98
1.1	3.02	3.05	3.09	3.13	3.17	3.20	3.25	3.29	3.34	3.38
1.2	3.42	3.47	3.51	3.55	3.60	3.64	3.69	3.73	3.77	3.82
1.3	3.86	3.90	3.95	4.00						

Uncertainty: The uncertainty associated to the calibration for a constant of trust K=2 is of ± 0,043mg/L Zn

Traceability: The traceability of the method settles down with " Federal Register" 42 (105)36166

OTHER *DINKO* APPARATUS

- Blenders-Homogenizers
-Colorimeters
- Conductimeters
- Extractor for mince analysis
- Heater Metallic Blocks
- Heater Plates
- Infrared Ovens
- Kits for Water Analysis
- Magnetic Stirerrs
- Microscopes
- Moisture Analyze
- Nephelometers
- Orbital Shakers
- Oxygen Meters
- Peristaltic Pumps
- pH-meters
- Photometers
- Proportioner Pumps
- Rotary Stirrers
- Rod Stirrers
- Sand Baths
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- Triquinoscopes
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DINKO Instruments

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