

:: Tintometer® - Group ::

Spectrophotometer SpectroDirect



**Spectrophotometer
for water and
waste water testing
330 - 900 nm**



SpectroDirect

The SpectroDirect is a modern single-beam spectrophotometer with an excellent price/performance ratio that is specifically designed for water testing.

The instrument is equipped with a wide range of pre-programmed methods based on the proven range of Lovibond® tube tests, tablet reagents, liquid reagents and powder reagents (Vario Powder Packs).

Optics

The SpectroDirect is a single-beam spectral photometer (see illustration).

The light source is a tungsten halogen lamp with flash function. The lamp is switched on only momentarily during of the measurement process¹⁾, so there is no need for a warm-up period. The SpectroDirect is ready to perform a self-test as soon as it is switched on.

The light passes through an entry slot to the monochromator, where it is split into spectral ranges. The monochromator is a holographically produced, transparent grating. The movable mirror ensures that light of the desired wavelength is focused automatically so that it passes through the exit slot, into the sample chamber and therefore through the water sample. The light that is not absorbed by the sample travels to the silicon photodiode detector. This signal is then evaluated by a microprocessor and shown as a result in the display.

1) (Exception: permanent light is used for a wavelength scan).

Applications

Waste Water

Drinking Water

Industrial Process Water

Scientific & Research

Governmental and
Private Laboratories

Multifunctional sample chamber

Round vials measuring 16 mm and 24 mm in diameter and rectangular cells with pathlengths from 10 to 50 mm may be used without an adapter. Only the 10 mm cell will be fixed by a little holder that must be inserted into the sample chamber (see picture).

Self-test

After it is switched on, the SpectroDirect automatically performs a self-test – beginning with a function test of the stepper motor and the halogen lamp, followed by an optics test. For this purpose, the unit has a built-in didymium glass filter. This filter checks the correct wavelength setting. If the wavelengths are incorrect, the optical system is automatically adjusted during the self-test.

New methods

Test methods are continuously updated to suit market requirements.

New methods can be added easily and quickly using software available on our website.

You can find updates for new methods and additional languages on our website at www.tintometer.com.

Maintenance

Thanks to the design of the SpectroDirect, the only maintenance that is required is replacement of the light source. The lamp is situated at the back of the photometer in an easily accessible position. Changing the lamp is fast and simple and does not require any tools. The positioning of the assembly ensures optimum focusing of the halogen lamp. For keeping data if there is no power supply from mains, two batteries must be inserted. This is only an action of a few seconds.

Advantages

Wavelength range from 330 to 900 nm

Interface RS232

Large illuminated graphic display

Touch-sensitive film keypad with logical layout

Use of round vials and rectangular cells of different sizes without adapter

16 user-specific methods*

Fast, easy lamp change

Software updates free of charge

Power supply for SpectroDirect

The required input voltage is 12 V. The SpectroDirect is connected to an external power pack as standard. Battery operation is also possible by using an external energy station (see Accessories).

Choice of language

The user prompt in the display can be switched to German, English, French, Italian, Spanish or Portuguese. When further languages are available they can be updated via internet.

N.I.S.T Traceability

This spectrophotometer can be calibrated using a Secondary Standard Filter Set (order code 711160) which is N.I.S.T traceable. Furthermore the instrument may be calibrated for each method in a "user calibration mode" with N.I.S.T traceable standards.

Functions

Pre-programmed Lovibond® methods

Absorption

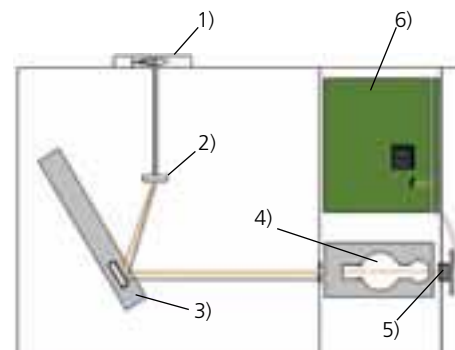
Transmission

Spectral data recording

User calibration (polynomials)*

Concentration (linear)*

Multiple wavelength function*



1) Tungsten halogen lamp

2) Monochromator

3) Movable mirror

4) Sample chamber

5) Silicon photodiode

6) Microprocessor unit

* Available end of 2006 / January 2007, download under www.tintometer.com

Tintometer®-Group

Printer/PC connection

On the back of the SpectroDirect photometer, there is an RS232 interface with a 9-pin D-Sub connector for connection of a PC or a printer with serial interface (see accessories).

Printing data

Every result is printed with date, time, reg. no, code no., measuring range and method number.

Storing data

You can store results of programmed and user-specific methods (polynomials) in a memory with a capacity of 1000 data sets. Alongside the result, the data sets contain information on method, date and time of the test.

User prompt

The user prompt is a convenient and easy to understand feature that guides the user step by step all the way through to the test result.

Zero calibration and measurements

The user chooses the desired method either from the method list in alphabetical order or by entering a numerical code. If desired additional information like the required vial, the reagent type and the measuring range can be displayed using the functional keys. The date and time are shown in the display by pressing the "clock key". The SpectroDirect automatically selects the correct wavelength.

Zero calibration is performed with the water sample by pressing the ZERO key.

A characteristic coloration develops when you add the indicator to the water sample. Press the [M] key to initiate the measurement (which starts either immediately or after the time required for colour development).

Countdown function

With some methods, after adding the indicator to the water sample, the user has to wait for a predefined colour reaction time. This time interval is shown in the display. The remaining time is displayed continuously. An alarm sounds during the last 10 seconds of the time period. Measurement then starts automatically, and the result is shown in the display. The countdown function can be switched off to allow rapid processing of a series of samples.

Differentiation of results

The SpectroDirect allows differentiated tests for certain methods. With the Chlorine method, for example, differentiated measurement is possible for free, combined and total chlorine.

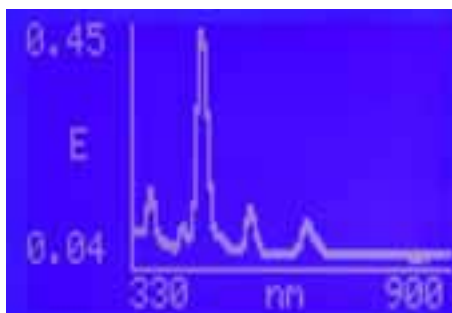
Functions*

The SpectroDirect is ideal for routine laboratory use and is equipped with additional functions for user-specific applications. One example is the creation of a user-defined method for a routine check.

Spectral data

A wavelength scan is performed over the user-defined interval between 330 and 900 nm.

The display shows the graph of the spectrum; if the user presses a key, the display also shows a data list with the corresponding maximum and minimum absorption levels. For example:



Absorption/Transmission

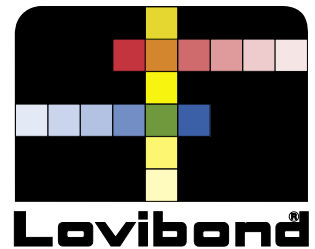
Using this function, the operator can, for example, carry out measurement of standards with different concentrations using the user-selected wavelength in order to obtain the data pairs required for a polynomial. Result output is in Abs and % Transmission.

Polynomials*

With the help of an external mathematical program, the corresponding polynomial is created from data pairs (concentration/absorption). A known polynomial may also be used. 10 order polynomials ($y = A+Bx+Cx^2 + Dx^3 + Ex^4 + Fx^5$) can be stored together with user-specific parameters such as wavelength, measuring range, unit and number of decimals (up to three).

Concentration*

This function can be used to measure 2 to 8 known standards. On the basis of the concentrations/absorption pairs obtained, the photometer will calculate a linear interpolation between the measured points. Up to 5 methods can be stored for further sample measurements.



Technical data SpectroDirect

Wavelength range:	330 to 900 nm
Photometric range:	-0.3 to 2.5 Abs
Spectral bandwidth:	10 nm
Wavelength accuracy:	±2 nm
Wavelength reproducibility:	±1 nm
Light source:	Pre-adjusted tungsten halogen lamp
Monochromator:	Holographic grating
Detector:	Silicon photodiode
Multifunctional sample chamber for:	Round vials 24 and 16 mm Ø, Rectangular cells 10-50 mm
Display:	Backlit LCD graphic display
Language options:	German, English, French, Italian, Spanish, Portugese
Storage capacity:	1000 test data sets
Serial interface:	RS232
Dimensions: (L x W x H)	270 x 275 x 150 mm
Weight:	approx. 3.2 kg
Power supply unit:	Input: 100 - 240 V ~ 1.0 A 50 - 60 Hz Output: 12 V 30 W
CE:	EN 50082-1 Standard - 1992 Edition-Immunity Generic Standard EN 55022 Standard Class - 1994 Edition Emission Generic Standard EN 5081-1 Standard 1992 Edition -Emission Generic Standard

Accessories

	Code
Case for transport	71 11 50
Replacement halogen lamp	71 10 00
Secondary standard set	71 11 60
Power supply unit	71 10 90
Power station, storage battery 12 V / 18 Ah Input: 230 V / 50 Hz with cable for connection (approx. 9 kg / 380 x 160 x 160 mm)	71 10 50
12 round vials with lid Height 48 mm, 24 mm Ø	19 76 20
12 special vials with lid Height 55 mm, 24 mm Ø only for fluoride	19 76 55
10 round vials with lid Height 90 mm, 16 mm Ø	19 76 65
W 100, rectangular cell optical glass OG, 10 mm path length	60 10 40
W 100, rectangular cell optical glass OG, 50 mm path length	60 10 70
W 110, rectangular cell Quartz-UV-glass, 10 mm path length	66 11 30
Paper printer DPN 2335 with power pack (230 V, 50 Hz) connection cable and one paper roll	19 80 75
Serial cable for PC-connection RS232 C, D9F-D9M	19 81 98
Setup for Arsenic-test complet	37 05 00
Spare parts:	
Erlenmeyer flask for the determination of arsenic	37 05 01
Glass stopper for the determination of arsenic	37 05 02
Absorption tube for the determination of arsenic	37 05 03
W 100, cell, Optical-Glass-OG, 20 mm path length for the determination of arsenic	60 10 50

Lovibond® SpectroDirect

Spectrophotometer 330 - 900 nm
complete with power supply unit (100-240 V, 50-60 Hz), two batteries for keeping data and serial cable for connection to a PC (D9F-D9M).
Order code: 71 20 00

Lovibond® SpectroDirect

Spectrophotometer 330 - 900 nm
in case as above, with energy station, replacement lamp, 12 round vials with lid (height 48 mm, ø 24 mm), 10 round vials with lid (height 90 mm, ø 16 mm), W 100 rectangular cell (50 mm path length), W 100 rectangular cell (10 mm path length), plastic stirring rod, but without reagents.
Order code: 71 20 05

We would be pleased to quote a ready to use spectrophotometer unit for the parameters and required accessories.

Parameter, Ranges and Reagents for

Test	$\lambda^a)$ / nm	Method	Cuvette	Range	Display
Alkalinity-m	615	Acid/Indicator ^{1,2}	24 mm \emptyset	5 - 200 mg/l	CaCO ₃
Alkalinity-p	551	Acid/Indicator ^{1,2}	24 mm \emptyset	5 - 300 mg/l	CaCO ₃
Aluminium	530	Eriochrome cyanine R ²	24 mm \emptyset	0.01 - 0.25 mg/l	Al
Ammonia	676	Salicylate ^{1,2}	24 mm \emptyset	0.02 - 1 mg/l	N
Ammonia vario	655	Salicylate ²	24 mm \emptyset	0 - 0.5 mg/l	N
Ammonia vario LR	655	Salicylate ²	16 mm \emptyset	0 - 2.5 mg/l	N
Ammonia vario HR	655	Salicylate ²	16 mm \emptyset	0 - 50 mg/l	N
Arsenic (III, IV)	507	Silberdiethyldithiocarbamate ¹	20 mm \square	0.02 - 0.6 mg/l	As
Boron	430	Azomethine ³	24 mm \emptyset	0.1 - 2 mg/l	B
Bromine	510	DPD ⁵	50 mm \square 10 mm \square 24 mm \emptyset	0.05 - 1 mg/l 0.1 - 3 mg/l 0.1 - 6.5 mg/l	Br
Bromine	510	DPD ⁵	24 mm \emptyset	0.1 - 4.5 mg/l	Br
Cadmium (Cd²⁺)	525	Cadion	16 mm \emptyset	0.025 - 0.75 mg/l	Cd
Chlorine ^{b)}	510	DPD ^{1,2}	50 mm \square 10 mm \square 24 mm \emptyset	0.02 - 0.5 mg/l 0.05 - 1.5 mg/l 0.05 - 3 mg/l	Cl ₂
Chlorine ^{b)}	510	DPD ^{1,2}	24 mm \emptyset	0.05 - 2 mg/l	Cl ₂

MSDS (Material Safety Data Sheets): www.tintometer.com

Legend

¹ Deutsche Einheitsverfahren zur Wasser-, Abwasser- und Schlamm- Untersuchung

² Standard Methods for the Examination of Water and Wastewater, 18th Edition; 1992

³ Photometrische Analysenverfahren, Schwedt, Wissenschaftliche Verlagsgesellschaft mbH, Stuttgart; 1989

⁴ Photometrische Analyse, Lange/Vejdelek, Verlag Chemie; 1980

⁵ Colorimetric Chemical Analytical Methods, 9th Edition, Lovibond,

\square Rectangular cell

\emptyset Round vial

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Reagent	Form of reagent/Quantity	Order-No.
ALKA-M-PHOTOMETER	Tablet / 100	51 32 10
ALKA-P-PHOTOMETER	Tablet / 100	51 32 30
VARIO Aluminum ECR/F20 VARIO Aluminum Hexamine/F20 VARIO Aluminum Masking Reagt.	Powder Pack / 100 Powder Pack / 100 Liquid reagent / 25 ml Set	53 50 00
AMMONIA No. 1	Tablet / 100	51 25 80
AMMONIA No. 2	Tablet / 100	51 25 90
VARIO Ammonia Salicylate F10 VARIO Ammonia Cyanurate F10	Powder Pack / 100 Powder Pack / 100	53 13 80 53 13 70
VARIO Ammonia Salicylate F5 VARIO Ammonia Cyanurate F5 VARIO Am Diluent Reagent Low Range	Powder Pack / 100 Powder Pack / 100 Tube test / 50 Set	53 56 00
VARIO Ammonia Salicylate F5 VARIO Ammonia Cyanurate F5 VARIO Am Diluent Reagent High Range	Powder Pack / 100 Powder Pack / 100 Tube test / 50 Set	53 56 50
Details on request	----	
BORON No. 1	Tablet / 100	51 57 90
BORON No. 2	Tablet / 100	51 58 00
DPD No. 1 DPD No. 1 HIGH CALCIUM ^{†)}	Tablet / 100 Tablet / 100	51 10 60 51 57 40
DPD 1 Buffer-Solution	Liquid reagent / 15 ml	47 10 10
DPD 1 Reagent-Solution	Liquid reagent / 15 ml	47 10 20
Spectroquant® 1.14834.0001	Tube test / 25	42 07 50
DPD No. 1 DPD No. 1 HIGH CALCIUM ^{†)} DPD No. 3	Tablet / 100 Tablet / 100 Tablet / 100	51 10 60 51 57 40 51 10 80
DPD 1 Buffer-Solution DPD 1 Reagent-Solution DPD 3 Solution	Liquid reagent / 15 ml Liquid reagent / 15 ml Liquid reagent / 15 ml	47 10 10 47 10 20 47 10 30



Legend

- a) Wavelength
- b) Determination of free, combined and total is possible.
- c) User must re-calibrate the photometer with each new batch of SPADNS-reagent. Therefore the Fluoride-standard is needed
- d) Determination of total chromium, Cr(VI) and Cr(III) is possible
- e) Please order from your Merck local dealer. Spectroquant® is a Merck KGaA Trademark.
- f) alternative reagent, used instead of DPD No.1 where turbidity in the water sample caused by high concentration of calcium and/or high conductivity
- * Reactor necessary for COD (150°C), TOC (120°C), total -chromium, -nitrogen, -phosphate (100°C)
- RT Reagent test: Includes complete set of chemicals necessary for this method.
- TT Tube test: Includes vials and reagents.

Parameter, Ranges and Reagents for

Test	$\lambda^a)$ / nm	Method	Cuvette	Range	Display
Chlorine vario^{b)}	510	DPD ^{1,2}	24 mm \emptyset	0.01 - 2 mg/l	Cl ₂
Chlorine HR	470	Potassium iodide ⁵	16 mm \emptyset	5 - 200 mg/l	Cl ₂
Chlorine Dioxide	510	DPD ^{1,2}	50 mm \square 24 mm \emptyset	0.04 - 1 mg/l 0.5 - 2.5 mg/l	ClO ₂
Chlorine Dioxide	510	DPD ^{1,2}	24 mm \emptyset	0.5 - 2.5 mg/l	ClO ₂
Chloride	455	Iron (III)-thiocyanate ⁴	24 mm \emptyset	5 - 60 mg/l	Cl
Chromium^{d)}	542	1,5-Diphenylcarbohydrazide ^{1,2}	50 mm \square 16 mm \emptyset	0.005 - 0.5 mg/l 0.02 - 2 mg/l	Cr
COD vario LR* (ISO 15705:2003-01)	420	Dichromate/H ₂ SO ₄ ¹	16 mm \emptyset	0 - 150 mg/l	COD
COD vario MR* (ISO 15705:2003-01)	620	Dichromate/H ₂ SO ₄ ¹	16 mm \emptyset	0 - 1500 mg/l	COD
COD vario HR*	620	Dichromate/H ₂ SO ₄ ¹	16 mm \emptyset	0 - 15000 mg/l	COD
Copper^{b)}	559	Biquinoline ⁴	50 mm \square 24 mm \emptyset	0.05 - 1 mg/l 0.5 - 5 mg/l	Cu
Cyanide	585	Pyridine-barbituric acid ¹	50 mm \square 24 mm \emptyset	0.005 - 0.2 mg/l 0.02 - 0.5 mg/l	CN
DEHA	562	PPST ³	24 mm \emptyset	0.02 - 0.5 mg/l	DEHA
Fluoride	580	SPADNS ²	24 mm \emptyset	0.02 - 1.5 mg/l	F
Formaldehyde	585	H ₂ SO ₄ /Chromotropic acid	10 mm \square 50 mm \square	1 - 5 mg/l 0.02 - 1 mg/l	HCHO
Formaldehyde	575	H ₂ SO ₄ /Chromotropic acid	16 mm \emptyset	0.1 - 5 mg/l	
Hardness-total	571	Metallphthalein ³	24 mm \emptyset	2 - 50 mg/l	CaCO ₃
Hazen (Pt-Co units, APHA)	455	Direct reading ²	50 mm \square	0 - 500 mg Pt/l	Pt-Co units

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Legend

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⁴ Photometrische Analyse, Lange/Vejdelek, Verlag Chemie; 1980

⁵ Colorimetric Chemical Analytical Methods, 9th Edition, Lovibond,

\square Rectangular cell

\emptyset Round vial

the SpectroDirect

Reagent	Form of reagent/Quantity	Order-No.
VARIO Chlorine FREE-DPD/F10	Powder Pack / 100	53 01 00
VARIO Chlorine TOTAL-DPD/F10	Powder Pack / 100	53 01 20
CHLORINE HR (KI)	Tablet / 100	51 30 00
ACIDIFYING GP	Tablet / 100	51 54 80
DPD No. 1	Tablet / 100	51 10 60
DPD No. 1 HIGH CALCIUM ^{f)}	Tablet / 100	51 57 40
DPD 1 Buffer-Solution	Liquid reagent / 15 ml	47 10 10
DPD 1 Reagent-Solution	Liquid reagent / 15 ml	47 10 20
RT (Chlorid-51 / Chlorid-52)	Reagent test (Liquid reagent) 100 Tests	2 41 90 31
"PERSULF. RTG FOR CR", Chromium Hexavalent	Powder Pack / 100 Powder Pack /100	53 73 00 53 73 10
COD VARIO 0 - 150 mg/l	Tube test / 25	2 42 07 20
COD VARIO 0 - 1500 mg/l	Tube test / 25	2 42 07 21
COD VARIO 0 - 15000 mg/l	Tube test / 25	2 42 07 22
COPPER No. 1	Tablet / 100	51 35 50
COPPER No. 2	Tablet / 100	51 35 60
RT (Cyanid-11 / Cyanid-12 / Cyanid-13)	Reagent test (Powder, Liquid reagent) / 130 Tests	2 41 88 75
DEHA Solution	Liquid reagent / 100 ml	46 11 81
DEHA	Tablet / 100	51 32 20
SPADNS-Reagent	Liquid reagent / 250 ml	46 74 81
Fluoride-Standard ^{d)}	Liquid / 30 ml	20 56 30
Spectroquant® 1.14678.0001 ^{e)}	Reagent test / 150	42 07 51
Spectroquant® 1.14500.0001 ^{e)}	Tube test / 25	42 07 52
HARDCHECK P	Tablet / 100	51 56 60
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Legend

- a) Wavelength
- b) Determination of free, combined and total is possible.
- c) User must re-calibrate the photometer with each new batch of SPADNS-reagent. Therefore the Fluoride-standard is needed
- d) Determination of total chromium, Cr(VI) and Cr(III) is possible
- e) Please order from your Merck local dealer. Spectroquant® is a Merck KGaA Trademark.
- f) alternative reagent, used instead of DPD No.1 where turbidity in the water sample caused by high concentration of calcium and/or high conductivity
- * Reactor necessary for COD (150°C), TOC (120°C), total -chromium, -nitrogen, -phosphate (100°C)
- RT Reagent test: Includes complete set of chemicals necessary for this method.
- TT Tube test: Includes vials and reagents.

Parameter, Ranges and Reagents for

Test	$\lambda^{\text{a)}}$ / nm	Method	Cuvette	Range	Display
Hydrogenperoxide	510	DPD/Catalyst ⁵	50 mm □ 24 mm ø	0.01 - 0.5 mg/l 0.5 - 1.5 mg/l	H ₂ O ₂
Iron (ferrous Fe ²⁺ , ferric Fe ³⁺) soluble	562	PPST ³	50 mm □ 10 mm □ 24 mm ø	0.01 - 0.5 mg/l 0.1 - 1 mg/l 0.1 - 1 mg/l	Fe
Iron (ferrous Fe ²⁺) soluble	562	PPST ³	50 mm □ 10 mm □ 24 mm ø	0.01 - 0.5 mg/l 0.1 - 1 mg/l 0.1 - 1 mg/l	Fe
Iron vario (ferrous Fe ²⁺ , (ferric Fe ³⁺) soluble	510	1, 10- Phenantroline ^{1,2}	24 mm ø	0.1 - 3 mg/l	Fe
Lead (Pb ²⁺)	520	4-(2-Pyridylazo)-resorcin	10 mm □	0.1 - 5 mg/l	Pb
Lead (Pb ²⁺)	515	4-(2-Pyridylazo)-resorcin	16 mm ø	0.1 - 5 mg/l	Pb
Manganese	450	Formaldoxime ¹	24 mm ø	0.05 - 4 mg/l	Mn
Molybdate	366	Thioglycolate ⁴	24 mm ø	0.5 - 30 mg/l	MoO ₄
Nickel	443	Dimethylglyoxime ^{2,3}	50 mm □ 24 mm ø	0.02 - 1 mg/l 0.2 - 7 mg/l	Ni
Nitrate	340	2,6-Dimethylphenole ^{2,3}	16 mm ø	0.5 - 14 mg/l	N
Nitrite	545	NED ^{2,3}	24 mm ø	0.01 - 0.5 mg/l	N
Nitrite	545	Sulfanilic acid, Naphthyl-amine ¹	16 mm ø	0.03 - 0.6 mg/l 0.3 - 3 mg/l	N
Nitrogen-total*	340	2,6-Dimethylphenole ^{2,3}	16 mm ø	0.5 - 14 mg/l 14 - 140 mg/l	N
Ozone	510	DPD/Glycine ⁵	50 mm □ 24 mm ø	0.02 - 0.5 mg/l 0.1 - 1 mg/l	O ₃
Phenols	507	4-Aminoantipyrine ²	24 mm ø	0.1 - 5 mg/l	C ₆ H ₅ OH

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⁴ Photometrische Analyse, Lange/Vejdelek, Verlag Chemie; 1980

⁵ Colorimetric Chemical Analytical Methods, 9th Edition, Lovibond,

□ Rectangular cell

ø Round vial

the SpectroDirect

Reagent	Form of reagent/Quantity	Order-No.
HYDROGENPEROXIDE LR	Tablet / 100	51 23 80
IRON LR	Tablet / 100 Tablet / 100	51 53 70 51 54 20
IRON (II) LR	Tablet / 100 Tablet / 100	51 53 70 51 54 20
VARIO Ferro F10	Powder Pack /100	53 05 60
Spectroquant® 1.09717.0001 ^{e)}	Reagent test / 50 Tests	42 07 53
Spectroquant® 1.14833.0001 ^{e)}	Tube test / 25	42 07 54
MANGANESE LR 1 MANGANESE LR 2	Tablet / 100 Tablet / 100	51 60 80 51 60 90
MOLYBDATE HR No. 1 MOLYBDATE HR No. 2	Tablet / 100 Tablet / 100	51 30 60 51 30 70
RT (Nickel-51, Nickel-52)	Reagent test (Powder, Liquid reagent) / 50 Tests	2 41 90 33
TT (Nitrat-111)	Tube test (Liquid reagent) / 24	2 42 07 02
NITRITE LR	Tablet / 100	51 23 10
TT (Nitrit-101)	Tube test (Powder) / 24	2 41 90 18
TT (Digestion reagent, Compensation- reagent, Nitrat-111)	Tube test (Powder, Liquid reagent) / 24	2 42 07 03
DPD No. 1 DPD No. 1 HIGH CALCIUM ^{f)} DPD No. 3 DPD GLYCINE ^{g)}	Tablet / 100 Tablet / 100 Tablet / 100 Tablet / 100	51 10 60 51 57 40 51 10 80 51 21 70
PHENOLE No. 1 PHENOLE No. 2	Tablet / 100 Tablet / 100	51 59 50 51 59 60



Legend

- ^{a)} Wavelength
- ^{b)} Determination of free, combined and total is possible.
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- ^{d)} Determination of total chromium, Cr(VI) and Cr(III) is possible
- ^{e)} Please order from your Merck local dealer. Spectroquant® is a Merck KGaA Trademark.
- ^{f)} alternative reagent, used instead of DPD No.1 where turbidity in the water sample caused by high concentration of calcium and/or high conductivity
- ^{g)} required for determination of ozone in the presence of chlorine
- * Reactor necessary for COD (150°C), TOC (120°C), total -chromium, -nitrogen, -phosphate (100°C)
- RT Reagent test: Includes complete set of chemicals necessary for this method.
- TT Tube test: Includes vials and reagents.

Parameter, Ranges and Reagents for

Test	$\lambda^{\text{a)}}$ / nm	Method	Cuvette	Range	Display
Phosphate-total (PMB)*	690	Phosphomolybdic acid/ Ascorbic acid ²	16 mm \emptyset	0.07 - 3 mg/l 0.2 - 10 mg/l	P PO ₄
Phosphate-total (PMB)*	690	Phosphomolybdic acid/ Ascorbic acid ²	16 mm \emptyset	1.5 - 20 mg/l 5 - 60 mg/l	P PO ₄
Phosphate-ortho	710	Phosphomolybdic acid/ Ascorbic acid ²	24 mm \emptyset	0.05 - 4 mg/l	PO ₄
Phosphate-ortho (VM)	438	Vanadomolybdate ²	16 mm \emptyset	3 - 60 mg/l	PO ₄
pH-value	558	Phenol red ⁵	24 mm \emptyset	6.5 - 8.4	pH
Potassium	730	Tetraphenylborate, Turbidity ⁴	24 mm \emptyset	0.5 - 12 mg/l	K
Silica	820	Silicomolybdate ^{1,2}	24 mm \emptyset	0.05 - 3 mg/l	SiO ₂
Spectral Absorption-coefficient	436 525 620	Direct Reading ¹ ISO 7887:1994	50 mm \square	0 - 50 m-1	---
Sulphate vario	450	Barium sulphate, Turbidity ²	24 mm \emptyset	2 - 100 mg/l	SO ₄
Sulphide	668	DPD/Catalyst ^{3,4}	24 mm \emptyset	0.04 - 0.5 mg/l	S
Sulphite LR	405	DTNB	10 mm \square 24 mm \emptyset	0.1 - 10 mg/l 0.05 - 4 mg/l	SO ₃
Surfactants (anionic)	653	Methylene blue ¹	16 mm \emptyset	0.05 - 2 mg/l	MBAS
TOC*	596	H ₂ SO ₄ / Indicator	16 mm \emptyset	50 - 800 mg/l	TOC
Turbidity	860	Attenuated Radiation Method	50 mm \square	5 - 500	NTU
Zinc	616	Zincon ³	24 mm \emptyset	0.02 - 1 mg/l	Zn

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Legend

¹ Deutsche Einheitsverfahren zur Wasser-, Abwasser- und Schlamm- Untersuchung

² Standard Methods for the Examination of Water and Wastewater, 18th Edition; 1992

³ Photometrische Analysenverfahren, Schwedt, Wissenschaftliche Verlagsgesellschaft mbH, Stuttgart; 1989

⁴ Photometrische Analyse, Lange/Vejdelek, Verlag Chemie; 1980

⁵ Colorimetric Chemical Analytical Methods, 9th Edition, Lovibond,

\square Rectangular cell

\emptyset Round vial