

# Lovibond® Water Testing Tintometer® Group



## SpectroDirect (standard equipment)

For water and waste water testing 330 - 900 nm



- 330 to 900 nm
- Interface RS232
- Large illuminated display
- Touch-sensitive film keypad with logical layout

Part Number: 712000

### 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 the measurement process<sup>1)</sup>, 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.

<sup>1)</sup> (Exception: permanent light is used for a wavelength scan).

### 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.

### New methods

Test methods are continuously updated to suit market requirements. You can find updates for new methods and additional languages on our website at [www.lovibond.com](http://www.lovibond.com).

#### Functions

- Pre-programmed Lovibond® methods
- Absorption
- Transmission

- Spectral data recording
- User calibration (polynomials)
- Concentration (linear)
- Kinetics

### 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.

### 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.

### Power supply

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 become available, they will be updated via internet.

## N.I.S.T. Traceability

This spectrophotometer can be tested 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.

## 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 [Test] 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.

## 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. 25 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.

## Concentration

This function can be used to measure 2 to 14 known standards. On the basis of the concentrations/absorption pairs obtained, the photometer will calculate a linear interpolation between the measured points. Up to 10 methods can be stored for further sample measurements.

## Industry

Chemical Industry | Food and Beverage Industry | Industries Others | Marine Industry | Municipalities | NGO | Oil and Gas | Pharmaceutical Industry | Power and Energy

## Application

Boiler Water | Cooling Water | Disinfection Control | Drinking Water Treatment | Galvanization | Pool Water Control | Pool Water Treatment | Raw Water Treatment | Waste Water Treatment

## SpectroDirect (standard equipment)

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).

## Measuring Range

Test Name	Measuring Range	Chemical Method
Alkalinity-m HR T	5 - 500 mg/l CaCO <sub>3</sub>	Acid / Indicator
Alkalinity-m T	5 - 200 mg/l CaCO <sub>3</sub>	Acid / Indicator
Alkalinity-p T	5 - 500 mg/l CaCO <sub>3</sub>	Acid / Indicator
Aluminium PP	0.01 - 0.25 mg/l Al	Eriochrom Cyanine R
Aluminium T	0.01 - 0.3 mg/l Al	Eriochrom Cyanine R
Ammonia HR TT	1.0 - 50 mg/l N	Salicylate
Ammonia LR TT	0.02 - 2.5 mg/l N	Salicylate
Ammonia PP	0.01 - 0.8 mg/l N	Salicylate
Ammonia T	0.02 - 1 mg/l N	Indophenole Blue
Arsenic	0.02 - 0.6 mg/l As	Silver Diethyldithiocarbamate
Boron T	0.1 - 2 mg/l B	Azomethine
Bromine 10 T	0.1 - 3 mg/l Br <sub>2</sub>	DPD
Bromine 50 T	0.05 - 1 mg/l Br <sub>2</sub>	DPD
Bromine T	0.05 - 13 mg/l Br <sub>2</sub>	DPD
Cadmium M. TT	0.025 - 0.75 mg/l Cd	Cadion
Chloride L (B)	5.00 - 60 mg/l Cl <sup>-</sup>	Iron(III)-thiocyanate
Chloride T	0.5 - 25 mg/l Cl <sup>-</sup>	Silver Nitrate / Turbidity
Chlorine 10 T	0.1 - 6 mg/l Cl <sub>2</sub>	DPD
Chlorine 50 T	0.02 - 0.5 mg/l Cl <sub>2</sub> <sup>a)</sup>	DPD
Chlorine dioxide 50 T	0.05 - 1 mg/l ClO <sub>2</sub>	DPD / Glycine
Chlorine dioxide T	0.05 - 2.5 mg/l ClO <sub>2</sub>	DPD / Glycine
Chlorine HR 10 T	0.1 - 10 mg/l Cl <sub>2</sub> <sup>a)</sup>	DPD
Chlorine HR (KI) T (105)	5 - 200 mg/l Cl <sub>2</sub>	KI / Acid
Chlorine L	0.02 - 3 mg/l Cl <sub>2</sub> <sup>a)</sup>	DPD
Chlorine MR PP	0.02 - 3.5 mg/l Cl <sub>2</sub> <sup>a)</sup>	DPD
Chlorine PP	0.02 - 2 mg/l Cl <sub>2</sub> <sup>a)</sup>	DPD
Chlorine T	0.02 - 6.0 mg/l Cl <sub>2</sub> <sup>a)</sup>	DPD
Chromium 50 PP	0.005 - 0.5 mg/l Cr <sup>b)</sup>	Diphenylcarbazide
Chromium PP	0.02 - 2 mg/l Cr <sup>b)</sup>	Diphenylcarbazide

Test Name	Measuring Range	Chemical Method
COD HR TT	200 - 15000 mg/l COD <sup>b)</sup>	Dichromate / H <sub>2</sub> SO <sub>4</sub>
COD LMR TT	15 - 300 mg/l COD <sup>b)</sup>	Dichromate / H <sub>2</sub> SO <sub>4</sub>
COD LR TT	3 - 150 mg/l COD <sup>b)</sup>	Dichromate / H <sub>2</sub> SO <sub>4</sub>
COD MR TT	20 - 1500 mg/l COD <sup>b)</sup>	Dichromate / H <sub>2</sub> SO <sub>4</sub>
Copper 50 T	0.05 - 1 mg/l Cu <sup>a)</sup>	Biquinoline
Copper PP	0.05 - 5 mg/l Cu	Bicinchoninate
Copper T	0.05 - 5 mg/l Cu <sup>a)</sup>	Biquinoline
CyA HR T	10 - 200 mg/l CyA	Melamine
Cyanide 50 L	0.005 - 0.2 mg/l CN	Pyridine-barbituric Acid
Cyanide L	0.01 - 0.5 mg/l CN	Pyridine-barbituric Acid
CyA T	10 - 160 mg/l CyA	Melamine
DEHA PP	0.02 - 0.5 mg/l DEHA	PPST
DEHA T (L)	0.02 - 0.5 mg/l DEHA	PPST
Fluoride L	0.05 - 2 mg/l F <sup>-</sup>	SPADNS
Formaldehyde 10 M. L	1.00 - 5.00 mg/l HCHO	H <sub>2</sub> SO <sub>4</sub> / Chromotropic acid
Formaldehyde 50 M. L	0.02 - 1.00 mg/l HCHO	H <sub>2</sub> SO <sub>4</sub> / Chromotropic acid
Formaldehyde M. TT	0.1 - 5 mg/l HCHO	H <sub>2</sub> SO <sub>4</sub> / Chromotropic acid
H <sub>2</sub> O <sub>2</sub> 50 T	0.01 - 0.5 mg/l H <sub>2</sub> O <sub>2</sub>	DPD / Catalyst
H <sub>2</sub> O <sub>2</sub> T	0.03 - 1.5 mg/l H <sub>2</sub> O <sub>2</sub>	DPD / Catalyst
Hardness total HR T	20 - 500 mg/l CaCO <sub>3</sub> <sup>1)</sup>	Metallphthaleine
Hardness total T	2 - 50 mg/l CaCO <sub>3</sub>	Metallphthaleine
Hazen 50	10 - 500 mg/l Pt	(APHA) Platinum Cobalt Standard Method
Hydrazine L	5 - 600 µg/l N <sub>2</sub> H <sub>4</sub>	Dimethylaminobenzaldehyde
Hydrazine P	0.05 - 0.5 mg/l N <sub>2</sub> H <sub>4</sub>	Dimethylaminobenzaldehyde
Iron 10 T	0.05 - 1 mg/l Fe	Ferrozine / Thioglycolate
Iron 50 PP	0.01 - 1.5 mg/l Fe <sup>a)</sup>	1,10-Phenanthroline
Iron 50 T	0.01 - 0.5 mg/l Fe	Ferrozine / Thioglycolate
Iron (TPTZ) PP	0.1 - 1.8 mg/l Fe	TPTZ
Iron PP	0.01 - 1.5 mg/l Fe <sup>a)</sup>	1,10-Phenanthroline
Iron T	0.1 - 1 mg/l Fe	Ferrozine / Thioglycolate
K <sub>S4.3</sub> T	0.1 - 4 mmol/l K <sub>S4.3</sub>	Acid / Indicator
Lead 10	0.1 - 5 mg/l Pb	4-(2-Pyridylazo)-resorcin
Lead (A) TT	0.1 - 5 mg/l Pb	4-(2-Pyridylazo)-resorcin
Lead (B) TT	0.1 - 5 mg/l Pb	4-(2-Pyridylazo)-resorcin
Iodine T	0.05 - 3.6 mg/l I	DPD
Manganese HR PP	0.1 - 18 mg/l Mn	Periodate Oxidation
Manganese LR PP	0.01 - 0.7 mg/l Mn	PAN
Manganese T	0.2 - 4 mg/l Mn	Formaloxime
Molybdate HR PP	0.3 - 40 mg/l Mo	Mercaptoacetic Acid
Molybdate LR PP	0.03 - 3 mg/l Mo	Ternary Complex
Molybdate T	1 - 30 mg/l MoO <sub>4</sub>	Thioglycolate
Nickel 50 L	0.02 - 1 mg/l Ni	Dimethylglyoxime
Nickel L	0.2 - 7 mg/l Ni	Dimethylglyoxime
Nitrate HR	1.2 - 35 mg/l N	2,6-Dimethylphenole
Nitrate LR2 TT	0.2 - 15 mg/l NO <sub>3</sub> <sup>-</sup> N	2,6-Dimethylphenole
Nitrate LR TT	0.5 - 14 mg/l N	2,6-Dimethylphenole
Nitrate TT	1 - 30 mg/l N	Chromotropic Acid
Nitrite HR TT	0.3 - 3 mg/l N	Sulfanilic / Naphthylamine
Nitrite LR TT	0.03 - 0.6 mg/l N	Sulfanilic / Naphthylamine
Nitrite PP	0.01 - 0.3 mg/l N	Diazotation

Test Name	Measuring Range	Chemical Method
Nitrite T	0.01 - 0.5 mg/l N	N-(1-Naphthyl)-ethylen-diamine
Oxygen active T	0.1 - 10 mg/l O <sub>2</sub>	DPD
Ozone 50 T	0.02 - 0.5 mg/l O <sub>3</sub>	DPD / Glycine
Ozone PP	0.015 - 2 mg/l O <sub>3</sub>	DPD / Glycine
Ozone T	0.02 - 1 mg/l O <sub>3</sub>	DPD / Glycine
Phenol T	0.1 - 5 mg/l C <sub>6</sub> H <sub>5</sub> OH	4-Aminoantipyrine
Phosphate h. TT	0.02 - 1.6 mg/l P <sup>b)</sup>	Phosphomolybdenum Blue
Phosphate HR T	0.33 - 26 mg/l P	Vanadomolybdate
Phosphate HR TT	1 - 20 mg/l P	Vanadomolybdate
Phosphate LR T	0.02 - 1.3 mg/l P	Phosphomolybdenum Blue
Phosphate PP	0.02 - 0.8 mg/l P	Phosphomolybdenum Blue
Phosphate t. TT	0.02 - 1.1 mg/l P <sup>b)</sup>	Phosphomolybdenum Blue
Phosphate total HR TT	1.5 - 20 mg/l P <sup>b)</sup>	Phosphomolybdenum Blue
Phosphate total LR TT	0.07 - 3 mg/l P <sup>b)</sup>	Phosphomolybdenum Blue
Phosphate TT	0.02 - 1.6 mg/l P	Phosphomolybdenum Blue
Phosphonate PP	0.2 - 125 mg/l PO <sub>4</sub>	Persulfate UV Oxidation Method
pH value L	6.5 - 8.4	Phenol Red
pH-value T	6.5 - 8.4	Phenol Red
Potassium T	0.7 - 16 mg/l K	Tetraphenylborat Turbidity
SAC 436 nm	0.5 - 50 m <sup>-1</sup>	Direct Reading EN ISO 7887:1994
SAC 525 nm	0.5 - 50 m <sup>-1</sup>	Direct Reading EN ISO 7887:1994
SAC 620 nm	0.5 - 50 m <sup>-1</sup>	Direct Reading EN ISO 7887:1994
Selenium	0.05 - 1.6 mg/l Se	3,3'-Diaminobenzidine in Toluene
Silcate T	0.05 - 4 mg/l SiO <sub>2</sub>	Silicomolybdenum Blue
Silicate HR PP	1 - 100 mg/l SiO <sub>2</sub>	Silicomolybdate
Silicate LR PP	0.05 - 1.6 mg/l SiO <sub>2</sub>	Heteropolyblue
Silica VLR PP	0.005 - 0.5 mg/l SiO <sub>2</sub>	Heteropolyblue
Sulphate HR PP	50 - 1000	Bariumsulphate Turbidity
Sulphate PP	5 - 100 mg/l SO <sub>4</sub> <sup>2-</sup>	Bariumsulphate Turbidity
Sulphide T	0.04 - 0.5 mg/l S <sup>2-</sup>	DPD / Catalyst
Sulphite 10 T	0.1 - 10 mg/l SO <sub>3</sub>	DTNB
Sulphite T	0.05 - 4 mg/l SO <sub>3</sub>	DTNB
Surfactants M. (anion.) TT	0.05 - 2 mg/l SDSA	Methylene Blue
Surfactants M. (cation.) TT	0.05 - 1.5 mg/l CTAB	Disulphine Blue
Surfactants M. (not ionic) TT	0.1 - 7.5 mg/l Triton X-100	TBPE
Suspended solids 50	10 - 750 mg/l TSS	Turbidity / Attenuated Radiation Method
TN HR 2 TT	5 - 140 mg/l N <sup>b)</sup> <sup>1)</sup>	2,6-Dimethylphenole
TN HR TT	5 - 150 mg/l N <sup>b)</sup>	Persulphate Digestion
TN LR 2 TT	0.5 - 14 mg/l N <sup>b)</sup>	2,6-Dimethylphenole
TN LR TT	0.5 - 25 mg/l N <sup>b)</sup>	Persulphate Digestion
TOC HR M. TT	50 - 800 mg/l TOC <sup>b)</sup>	H <sub>2</sub> SO <sub>4</sub> / Persulphate / Indicator

Test Name	Measuring Range	Chemical Method
TOC LR M. TT	5 - 80 mg/l TOC <sup>b)</sup>	H <sub>2</sub> SO <sub>4</sub> / Persulphate / Indicator
Turbidity 50	5 - 500 FAU	Attenuated Radiation Method
Urea T	0.1 - 2 mg/l Urea	Indophenol / Urease
Zinc T	0.02 - 0.5 mg/l Zn	Zincon

## Technical Data

<b>Monochromator</b>	Holographic grating (600 lines/mm)
<b>Wavelength Range</b>	330 - 900 nm
<b>Wavelength Accuracy</b>	±2 nm
<b>Wavelength Reproducibility</b>	±1 nm
<b>Photometric Range</b>	-0.3 - 2.5 Abs
<b>Operation</b>	Acid and solvent resistant, touch-sensitive keypad with audible feedback
<b>Display</b>	Backlit LCD graphic display
<b>Suitable Vials</b>	Rectangular Cuvettes 10 mm Round Cuvettes 16 mm Round Cuvettes 24 mm
<b>Interfaces</b>	RS 232
<b>Internal Storage</b>	1000 test data sets
<b>Power Supply</b>	100 - 240 V / 50-60 Hz
<b>Auto – OFF</b>	Yes
<b>Portability</b>	Benchtop
<b>Compliance</b>	CE
<b>Languages User Interface</b>	German, English, French, Portuguese, Italian, Spanish
<b>Dimensions</b>	275 x 150 x 270 mm
<b>Weight</b>	3.2 kg

## Delivery Scope

- Spectrophotometer (basic unit)
- Power supply unit 100 -240 V
- Serial cable for Connection to a PC
- Magnetic pin
- Batteries
- Manufactures test certificate M
- Instruction manual
- Warranty information

## Accessories

Title	Part Number
Round cuvette 24 mm, set of 12	197620
Round cuvette 24 mm, set of 5	197629
Cleaning cloth	197635
Round cuvette 16 mm, set of 10	197665
Magnetical pin, required for updates	19801687-2
Mixing cylinder, 25 ml	19802650
Connection cable for connection to PC, serial 9-pins, SpectroDirect	198197
Thermoreactor RD 125	2418940
Standard Solution Ammonia, 1.3 mg/l NH <sub>4</sub> = 1.0 mg/l N	2420800
Standard Solution Ammonia, 5.2 mg/l NH <sub>4</sub> = 4.0 mg/l N	2420801
Standard Solution Ammonia, 26 mg/l NH <sub>4</sub> = 20 mg/l N	2420802

Title	Part Number
Standard Solution COD 100 mg/l	2420803
Standard Solution COD 500 mg/l	2420804
Standard Solution COD 5000 mg/l	2420805
Standard Solution Nitrate, 40 mg/l NO <sub>3</sub> = 9.0 mg/l N	2420806
Standard Solution Nitrate, 5 mg/l NO <sub>2</sub> = 1.5 mg/l N	2420807
Standard Solution Phosphate, 4.6 mg/l PO <sub>4</sub> = 1.5 mg/l P	2420808
Standard Solution Phosphate, 20 mg/l PO <sub>4</sub> = 6,5 mg/l P	2420809
Membrane filter set for use when preparing samples, 25 membrane filters 0.45 µm, 2 syringes 20 ml	366150
Erlenmeyer flask for determination of arsenic	370501
Glas stopper for determination of arsenic	370502
Absorption tube for determination of arsenic	370503
Measuring spoon, 1 g	384930
UV Pen Lamp, 254 nm	400740
Cuvette stand for 6 round cuvettes Ø 24 mm	418951
Cuvette stand for 10 round cuvettes Ø 16 mm	418957
Pipette tips, 1-5 ml (white) 100 pc.	419066
Automatic pipette, 1-5 ml	419076
Screw caps TOC	420757
Measuring spoon no. 8, black	424513
Universal Container - Cap	424648
Plastic funnel with handle (white)	471007
ValidCheck Chlorine 1,5 mg/l	48105510
W100/OG/10MM Rectangular cell, optical glass	601040
W100/OG/20MM Rectangular cell, optical glass for determination of arsenic	601050
W100/OG/50MM Rectangular cell, optical glass	601070
W110/UV/10MM Rectangular cell, Quartz UV	661130
Light source replacement SpectroDirect (preadjusted)	711000
12 V-plug connector for cigarette lighter	711040
Energy station XD series/SpectroDirect	711051
Power supply unit 110 - 240 V / 50 - 60 Hz	711090
Secondary standard set VIS with DAKKS calibration certificate	711160
Carrying case with foam for SpectroDirect	712050
Semimicro cell, 50 mm with lid	71310045

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Technical changes without notice  
Printed in Germany

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