Photometry

Straightforward measuring!

WTW offers photometers and test sets, perfectly matched for specific applications. The programs to run the test kits are stored in the meter.

pHotoFlex®

... for all-purpose use

Cell Tests without barcodes

Powder Tests

Portable and powerful – Ideal for field use

p. 112

pHotoFlex®

p. 106

Cases / Sets

The portable lab for field use

p. 108

LabStation

The small lab solution: pHotoFlex® plus LabStation

p. 108

photoLab® & photoLab® 6000 Series

... utmost precision for use in the lab and in-the-field

photoLab®

p. 104

NEW

photoLab® 6000 series

p. 100

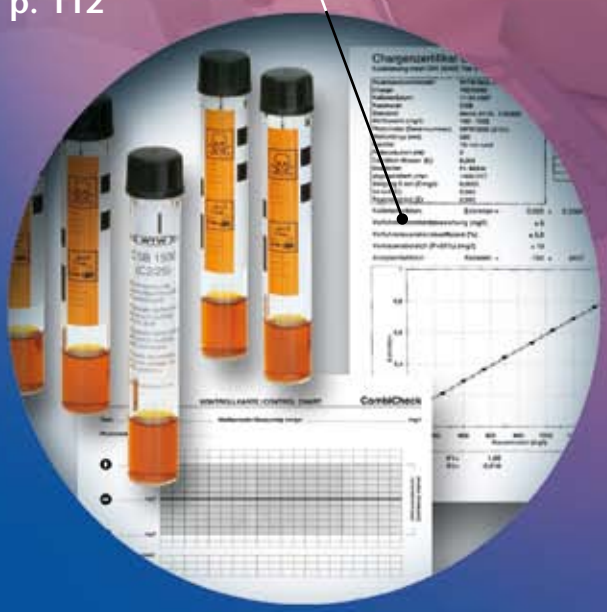
Thermoreactors

Convenient and secure digestions

p. 110

Reagents/ accessories

p. 112



Systematic and Spectral Analysis – Routine Measurement and Photometric Testing

Photometric identification can be split into two groups:

The **routine measurement of standard parameters** – also known as systematic analytics – displays the measured values of each parameter promptly thanks to the stored test kit methods. The test kit reagent reacts to the substance and is transformed into a measurable color. The coloration is caused by the absorption at certain wavelengths of the light spectra. Measurement takes place mostly at the wavelength with highest absorption.

These routine measurements are standard in wastewater, drinking water and environmental monitoring.

A photometer used in conjunction with specific test kits offers a harmonized system for measuring in a variety of applications. The test kit methods and measuring range may not be identical to each photometer model due to optical and light related differences.

Spectral analysis is particularly useful for studies of unknown substances, methods development and for optimizing testing systems: For example, to determine the absorption maximum for test systems, and the suitable wavelength, spectra are run over a wider wavelength range in order to identify the highest and most suitable. Additionally, enzyme kinetics or multi-wavelength measurements can also be processed.

Portable and Accurate: The pHotoFlex®, photoLab® and photoLab® 6000 Series

In order to choose the appropriate instrument, the following should be considered:

Portable measuring	Measuring in laboratory environment
With pHotoFlex® and pHotoFlex® Turb	**With photoLab® S6/S12 and photoLab® 6000 series**
For fast and accurate measurements in the field these are important factors: • Low power consumption • Durability • Portability • Precision These requirements are met by a special optical system working with a combination of LED and filters. The portable pHotoFlex® instruments feature low warming and long lifespan LED technology for ultimate durability. With two cuvette sizes, these photometers can perform all common tests and a wide measuring range. LabStation and LSdata offer the convenience of a lab.	Precise, accurate results for research and routine measurements in the lab, these instruments offer: • AQA/IOC • Accurate measuring • Wide measuring ranges • Convenient features including test and cuvette recognition A complex optical system and lab conditions guarantee constant measuring conditions. The constant power supply allows the use of barcodes. The optical system and rectangular cuvettes up to 50 mm allow wide measuring ranges reaching up to trace elements analysis. The largely constant temperature in the lab allows extensive presettings for the methods, thereby providing a higher user comfort. Additionally, the following tasks can be accomplished using photoLab® 6000 series: • Measurement from 190 – 1100 nm • AQA extended for matrix check and large user groups • Scans (spectra), kinetics and multi-wavelength measurements • Data management via USB and PC-software (optional)

Features include:
- Proven quality
- Highest accuracy corresponding to optical technology used
- Large selection of cuvettes
- Outstanding instrument features

Application Photometers

Application range	Portable Photometers		Filter		Spectral	
	pHotoFlex®	pHotoFlex® Turb	photoLab® S6	photoLab® S12	photoLab® 6100	photoLab® 6600
Application areas	Environmental monitoring, water treatment, beverage industry, wine industry, process control, multi-parameter applications for photometry, pH and turbidity.		Routine measurements in wastewater and drinking water, optional field use	Routine measurements in wastewater and drinking water, comprehensive laboratory testes, optional field use	Spectral and special analysis in industry, education and science and analysis of routine measurements with standard parameters in wastewater and drinking water, as well as environmental analysis and in-the-field use.	
Wavelengths	6 wavelengths: 436, 517, 557, 594, 610, 690 nm	6 wavelengths: 436, 517, 557, 594, 610, 690, 860 nm	6 wavelengths: 340, 445, 525, 550, 605, 690 nm	12 wavelengths: 340, 410, 445, 500, 525, 550, 565, 605, 620, 665, 690, 820 nm	320 nm–1100 nm (VIS), freely definable	190 nm–1100 nm (UV-VIS), freely definable
Optical system	LED with filters		Filter/Reference beam	Filter/Reference beam	Monochromator/Single Beam + AutoCheck	
Special functions	pH measurement	pH measurement, turbidity (IR)	—	Kinetics	Spectra, kinetics, multi-wavelength measurements, graphical data evaluation, environmental parameters with routine and special tasks with AQA support, PC-software photoLab® Data *spectral*	
	Optional: LabStation with PC-software LSdata, rechargeable batteries, PC-software LSdata (stand-alone)					
User-defined methods	100		No	50	100, 20 profiles	
Cuvettes	Round: 16 mm (height: 91 – 104 mm), 28 mm		Round 16 mm	Round / rectangular 10, 20, 50 mm	Round and rectangular 10, 20, 50 mm	

NEW

The photoLab® 6000 Series
Spectral analysis – universal and flexible

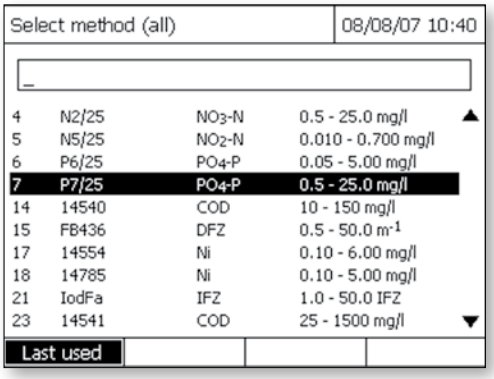
The spectrophotometers of the photoLab® 6000 series for VIS and UV/VIS range offer the unique combination of systematic and spectral analysis with the proven analytical quality assurance AQA and the convenience of a filter photometer.

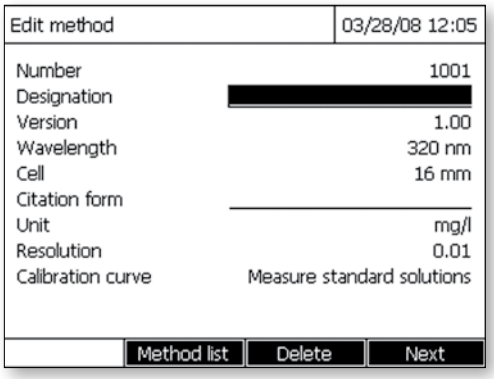
photoLab® 6000 Series

- 190 – 1100 nm
- Innovative optics
- Intuitive interface
- Extensive AQA

Thanks to state-of-the-art technology all photoLab® 6000 models are complete with optimized operation – fast, direct and intuitive:

- Menu navigation for all applications for concise operation
- Large, backlit graphic display, for simple graphical evaluation
- Direct access to functions such as menu related settings, dilution, quotation mode using function keys
- Selection tables for convenient selection and search of data, parameters, methods etc.
- Data filter for selective choice of measuring data sets
- Masks for easy handling and measuring of user defined methods
- USB for all data transfers





Systematic analysis – routine measurement with test kits

Especially important for routine measurements (***see p. 98***) are speed, precision and convenient data transfer. photoLab® 6000 series offers proven and innovative functionalities:

- **AutoCheck** – an automatic referencing – for highest precision
- The proven combination of round and rectangular **cuvette** slots
- Automatic **cuvette** recognition for fast and effective handling
- Integrated **barcode recognition for round and rectangular cuvettes**, eliminating cuvette failures and initiating prompt measuring start
- More than 250 methods for commercial test kits
- Color measurement according to APHA 2120F
- Direct methods such as SAC, color etc.
- Industrial applications, e.g. brewery

Analytical Quality Assurance (AQA) – From self monitoring to large laboratory environment

The instrument supported **A**nalytical **Q**uality **A**ssurance has become a must across all industries to guarantee plausible and correct measuring results. The photoLab® 6000 series supports the AQA for checking the instrument and for individual routine measurements. The administration of user groups for large laboratory environments including administrative, user and guest profiles is also supported. The AQA feature can be switched on or off.

AQA

- Extensive equipment testing
- MatrixCheck
- Extended user administration

- Calibration intervals for instrument and test kits
- **PhotoCheck**: Instrument check including linearity at 3 wavelengths and 4 measuring points
- Grey filter and UV-VIS test standards
- Standards for single parameters and combined checks
- Matrix check with spiking

AQA2 setup	08/16/07 18:25
General	
Mode	Measurements
Lock methods	Yes
Method	6: P6/25
AQA2	AQA2 inactive
Interval	50 Measurements
Target value	0.80 mg/l PO_4-P
Tolerance	0.08 mg/l PO_4-P
Standard ID	
Method	Apply

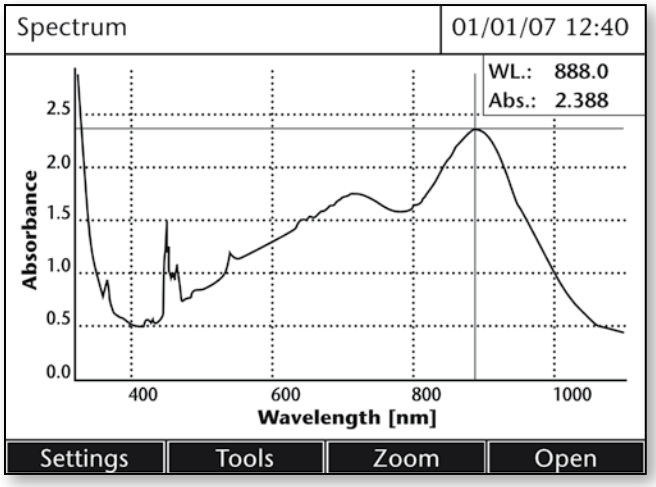
PhotoCheck

Spectral analysis –
For user-defined methods, spectra and kinetics

All user-specific laboratory applications and special tasks are made easy by the menu navigated instruction, and additional functions:

- **100 user-defined methods**
  Linear and non-linear applications can be entered via entry mask over pairs of variates or functions, with AQA support
- **Special tasks / entry of formulas for complex measurement** procedures
- **Spectra:**
  Over a definable wavelength area with graphical evaluation
- **Multi-wavelength measurement:**
  Up to 4 different wavelengths
- **Kinetics:**
  With a maximum or selectable number of measurements
- Time interval and start delay are adjustable

The settings can be stored in 20 profiles each and recalled when required. The 4 MB capacity can store approximately 100 spectra of 300 – 900 nm and 400 kinetics sets with each of 150 measuring values.



Data management with USB and photoLab® Data *spectral*

photoLab® 6000 series is equipped with three interfaces: USB-A to connect printer, barcode reader and USB stick, USB-B for PC-connection and an RS 232 interface. Thus, the data exchange via USB is extremely convenient:

- Measurement data, spectra, and kinetics
- Software and method updates

The PC-Software photoLab® Data *spectral* offers a convenient user interface for easy data exchange and post-processing of measurement data:

- GLP-compliant data management with device ID and user administration
- Data transfer to PC for further processing with LIMS and export into spreadsheet
- Export of spectra in application software for the uniform presentation and processing of spectra
- Adjustment of several photometers
- Administration of IQ LabLink job files

photoLab® 6000 series en-route – convenient portable operation

A spectrophotometer is typically used in the laboratory, although it is convenient when it can also be operated on-site. For on-site use, it is important to have safe transport, a sheltered area and a corresponding measuring preparation with warm up period and zeroing after transport. The light-weight and easy-to-operate photoLab® 6000 series is flexible when on-site operation is required. A sturdy carrying case, and a 12 V adapter cable for connection to a typical car battery are available options.

Technical Data photoLab® 6000 series

Model	photoLab® 6100 (VIS)	photoLab® 6600 (UV/VIS)
Wavelength range	320 – 1100 nm	190 – 1100 nm
Technique	Single Beam with AutoCheck (time-shifted reference)	
Lamp	Tungsten	Xenon Flashlamp
Wavelength resolution / accuracy	1nm; ±1nm	
Scan speed	Approx. 334 nm/min resp. 5.6 nm/sec	Approx. 455 nm/min resp. 7.6 nm/sec
Band width	4 nm	
Test recognition	Automatic test recognition via barcode for all cuvette types with automatic measurement start	
Absorbance range	-3.3 …+3.3 Abs	
Photometric resolution	0.5% of measurement value or 0.005 Abs at Extinction 2	
Photometric reproducibility	± 0.002 E @ 1 E (or better)	
Photometric accuracy	0.003 E for E < 0.600 E 0.5% or value or 0.600 E - 2.000 E	
Photometric linearity	< 1% up to 2.000 A at 340 - 900 nm	
Stray light	< 0.1% at 340 and 408 nm	
Cuvette recognition	Automatically for all cuvette types: round 16 mm, 10, 20, 50 mm w/o adapter	
Measurement modes	Concentration, absorbance, transmission, kinetics and spectra with absorbance, % transmission, multi-wavelength measurement	
Display	Graphical display with backlit for enhanced graphical evaluation of data	
Storage	1000 measurement values; spectra and kinetics up to 4 MB => 100 spectra (300 – 900 nm) and 400 kinetics with 150 values	
Methods and profiles	More than 200 programmed methods, 100 user defined methods, 20 profiles each for kinetics and absorption spectra	
Update	Via internet, PC, USB stick	
Interfaces	1 USB-A for USB stick, printer, barcode reader, 1 USB-B for PC, 1 RS 232 for serial connection of printer/PC	
Approvals	cETLus (= UL), CE	
Protection class	IP 30 and protecting rinse for optical slot	
Power supply	Universal plug	
Temperature range/ humidity	Use between +10 °C and +35 °C (+50 °F and +95 °F), Storage: -25 °C up to +65 °C (-13 °F up to +149 °F) Average p.a.: ≤75 %, 30 days /year: 95%; rest: 85%	
Dimensions (W x H x D)	404 x 197 x 314 mm (15.9 x 7.8 x 12.4 in.)	
Weight	Approx. 4.5 kg (9.9 lb without plug-in power supply)	
Accessories	PC software for easy data evaluation (Q2/2008), cable for portable car battery (12 V) , carrying case	

Ordering Information

Model		Order No.
photoLab® 6100 VIS	Spectrophotometer (VIS) for spectral and routine analysis in the range of 320 - 1100 nm	250 201
photoLab® 6600 UV-VIS	Spectrophotometer (UV/VIS) for spectral and routine analysis in the range of 190 - 1100 nm	250 202
photoLab® Data *spectral*	PC software for convenient data management	902 761
FC spectral 6000	Field case for photoLab® 6000 series	250 212
ADA 12V	12 V car adapter cable for operation of photoLab® 6000 series	902 760

IP 30 CE cETLus 2 Year Warranty

The photoLab® Series – Immediate and high precision measuring

The photoLab® filter photometers offer laboratory precision, convenience and rapid results for routine operation:

Open the lid, insert the cuvette, read the measuring value instantly

photoLab® Series

- AQA/IQC, multistage
- Automatic cuvette identification
- Barcode recognition for all cuvette types

Speed and accuracy results from the filter technology used with reference beam technique. Combined with barcoded round and rectangular cuvette tests, efficient and cost-effective measurements are possible. Defined wavelengths by high-precision filters do not require any mechanics and therefore make this measuring instrument practically maintenance free.

- Auto Check for highest stability and precision
- Automatic cuvette recognition for all used cuvette types
- Automatic test recognition via barcode for round and rectangular cuvette tests
- Automatic measuring start
- Automatic Quality Assurance (AQA)
- Wide range of programmed test kits: from convenient cell test to economical reagent test kits

photoLab® S6

The filter photometer with 6 wavelengths for all common routine determinations with cell tests (round) for wastewater and drinking water analysis.

The instrument is simple and easy, ideal for:

- Sporadic, single measurements
- Using cell tests for fast measuring results
- Standard measurements with easy storage

photoLab® S12

Filter photometer with 12 wavelengths for extensive routine operations in service laboratories and for education.

In addition to the barcoded cell tests, there are a considerable number of economic reagent test kits available for rectangular cuvettes. Uniquely, the barcode support also comes with test kits for 10 mm, 20 mm and 50 mm rectangular cuvettes. Even trace concentrations are covered – especially important for drinking water analysis. Additionally, 50 user defined methods are possible and measurements of kinetics can be performed.

The instrument is highly efficient and cost-effective for:

- Routine determinations with a large number of samples
- Measuring the smallest concentrations
- Special tasks with user-defined methods

These features are also suitable for service laboratories.

Technical Data photoLab®

Model	photoLab® S6 and S6-A	photoLab® S12 and S12-A
Type	Filter photometer	Filter photometer
Photodiode array for	6 wavelengths	12 wavelengths
Wavelengths, nm	340, 445, 525, 550, 605, 690	340, 410, 445, 500, 525, 550, 565, 605, 620, 665, 690, 820
User-defined methods	–	50
Auto-zero adjustment	Yes	Yes
AutoSelect-function	Yes	Yes
Cuvette recognition	Yes	Yes
Cuvette type	Round	Round, 10 mm, 20 mm and 50 mm
Data storage and time	500 data sets with date and time	1000 data sets with date and time
Essential functions	Concentration, absorption and transmission measurement, AQA/IQC, RS 232 interface	Concentration, absorption and transmission measurement, AQA/IQC, Kinetics, RS 232 interface
Operation with rechargeable batteries (optional)	1 working day, total discharge protection, maintenance charging during AC operation	1 working day, total discharge protection, maintenance charging during AC operation
Test marks	CE, UL, CUL	CE, UL, CUL
Warranty	2 years	2 years

Ordering Information

Model		Order No.
photoLab® S6	AC power operated version, universal plug	250 013
photoLab® S6-A	Version with rechargeable batteries, universal plug	250 022
photoLab® S12	AC power operated version, universal plug	250 024
photoLab® S12-A	Version with rechargeable batteries, universal plug	250 026

CE UL CUL 2 Year Warranty

Note: versions for other power supplies/countries on request

pHotoFlex®: The Portable Photometers

The pHotoFlex® series offers the most robust optics, combining precision with low power consumption achieved through optical filters together with the LEDs. The instruments are equipped with 6 wavelengths. Additionally, the pH measuring and the optional turbidity measuring (IR range) are integrated, making these instruments the perfect partners for all measurements in the field: in a wastewater plant for wastewater and reference measurements, in drinking water analysis at a wellhead or in a cistern, and for monitoring bodies of water. They are versatile, low current and offer many extra features.

pHotoFlex® Series

- Precise
- Versatile
- Robust

- The smart adapter solution for operating different cuvette types: Flip the adapter: ø 28 mm and 16 mm from 92 up to 104 mm
- Backlit display with automatic switch-off
- User guidance via display for easy operation without handbook reading
- Large selection of test sets for all requirements
- Integrated pH measurement with automatic temperature compensation
- Turbidity measurement with infrared light source according to DIN 27027/ISO 7027 (optional)
- 100 program storage places for user-defined routine measurements

The menu guides you through all measuring tasks, and allows a quick and easy selection of the 10 most frequently used tests out of a "favorites" list. When necessary, especially in the field, all other test sets can also be traced. To further enhance in-the-field operation, use the field case with convenient, integrated laboratory tray.
(*see p. 108 for details).*

Beneficial: Measurements and data evaluation can be processed conveniently in the laboratory with LabStation and LSdata. (*see p. 108 for details).*

The constant ambient conditions and permanent power supply provide convenient operation via barcode and without repeated zeroing. Barcodes are included in the analysis descriptions.

pHotoFlex® – Portable Photometer with pH

The portable photometer pHotoFlex® demonstrates its capability with complex tasks in environmental and process monitoring at a variety of sites.

pHotoFlex®

- More than 160 methods available
- Integrated pH measurement
- Color measurements

with pH sensor SenTix® 41

pH function

The integrated pH function allows measurements of pH 0 ... 16 with automatic buffer recognition (TEC/NIST). Temperature compensation is automatic within the permitted range of – 5 ... 100 °C (23 ... 212 °F). WTW's MultiCal®-routine allows the automatic calibration with up to 3 calibration points. WTW offers a large selection of pH sensors as optional accessories: For field use, the maintenance-free SenTix® 41 is recommended, whereas for precision measurements in the laboratory, the SenTix® 81 glass electrode could be used. The electrodes are described in detail in the pH measuring chapter, starting on page 29.

pHotoFlex® Turb – Total Capability

The pHotoFlex® Turb is analogous to the pHotoFlex®, but includes an infrared (IR) light source for nephelometric turbidity measurement (90°), according to the requirements of DIN 27027/ISO 7027. Its precision is comparable to laboratory instruments for turbidity measurement.

The calibration with the supplied AMCO Clear® standards and measured data can be documented and output via RS232.

The AMCO Clear® standards enable highest precision for the sensitive testing of drinking water.

pHotoFlex® Turb

Additionally:

- Turbidity measurement according to DIN 27027/ ISO 7027
- 0-1100 NTU/FNU
- Calibration kit (0.02-10-1000 NTU)

Field Case Set

- The “in-field laboratory”
- Integrated tray
- Convenient

pHotoFlex® series in a convenient field case

A small lab for in-field use. The integrated tray features places for the instrument, cuvettes, measuring beaker and a stand for the pH electrode, making it practical for transport.
Complete sets with:

- pH electrode SenTix® 41 for all pHotoFlex® models
- 1 variable pipette with 5 ml volume for all pHotoFlex® models
- Calibration standards for pHotoFlex® Turb and Turb® 430 IR/T
- LSdata for convenient data management and definition of user-defined methods.
- Many useful accessories: empty cuvettes, buffer solutions with pH 4.01 and 7.00, PC cable AK Labor 540 B, stand for the pH electrode, cleaning tissues, screwdriver for battery change
- Space for other accessories

LabStation and LSdata

Smart data management

The LabStation – holding the instrument – upgrades the portable pHotoFlex® and Turb® 430 models (*see p. 128)* to a small laboratory solution. The LabStation also serves as charging station for the included rechargeable battery set.

With the software package LSdata, the measured data can be processed on a PC conveniently and according to GLP standards. The software is included in the LabStation and field cases. LSdata is also available as stand-alone package.

- Data export from the instrument to the PC according to GLP and with password protection
- Subsequent processing in Excel format, e.g. for clear documentation of individual sampling points
- Generation, administration and matching between instrument and PC of user-defined methods via dialogue window
- Calculation of calibration curve for user-defined methods

A useful note for field work:

For taking along all necessary utensils, such as test kits and spray bottle with distilled water as well as a disposal container, you can also pick a tool box from any from any building center to perfectly suit your needs.

pHotoFlex® with LabStation

Technical Data

Model	pHotoFlex®	pHotoFlex® Turb
Light source	LED	LED
Wavelengths nm	436, 517, 557, 594, 610, 690	436, 517, 557, 594, 610, 690 + 860
User-defined methods	100	100
Methods/software update	Via Internet	Via Internet
Data storage	1000 data sets	1000 data sets
pH	0-16	0-16
Turbidity	—	0-1100 NTU/FNU
Accuracy Photometry pH pH / Turbidity	<2 nm wavelength accuracy, 0.005 abs. reproducibility ±0.01 pH —	< 2 nm wavelength accuracy, 0.005 abs. reproducibility ±0.01 pH 0.01 NTU/FNU or ±2% of the measured value
Auto-zero adjustment/calibration: Photometry pH / Turbidity	 With start of new method, with LabStation once a day 3 point	 With start of new method, with LabStation once a day 3 point
Interface	RS 232, USB via adapter (optional)	RS 232, USB via adapter (optional)
Measuring parameters	Photometry, pH	Photometry, pH, Turbidity
Battery	Type AA batteries 4x1.5 V, for approx. 3000 measurements	Type AA batteries 4x1.5 V, for approx. 3000 measurements
Rechargeable battery	Optional: rechargeable battery or LabStation	Optional: rechargeable battery or LabStation
Test marks	cETLus	cETLus
Warranty	2 years	2 years

Ordering Information

pHotoFlex®		Order No.
pHotoFlex®	Portable photometer with pH	251 100
pHotoFlex® Turb	Portable photometer with pH and turbidity	251 110
pHotoFlex®/SET	Portable universal LED filter photometer in a field case with tray to hold instrument, LSdata and accessories	251 200
pHotoFlex® Turb/SET	Portable universal LED filter photometer with integrated turbidity measurement and pH functions in a field case with tray to hold instrument, calibration standard kit, LSdata and accessories	251 210
LSdata	PC-software for photoFlex®/Turb® 430 series	902 762
FC pHotoFlex®/Turb® 430	Field case with tray to hold instrument, for all pHotoFlex® and Turb® 430 models	251 304
LS Flex/430	LabStation for all pHotoFlex® and Turb® 430 models with LSdata software, rechargeable battery and universal mains adapter	251 301
RB Flex/430	Rechargeable battery for all pHotoFlex® models and Turb® 430 IR/T with universal plug	251 300

IP 67 CE cETLus 2 Year Warranty

Thermoreactors

Thermoreactors for COD and all other thermal digestion processes

Thermoreactors are required for the determination of COD, total nitrogen or total phosphorus. They ensure complete digestion of the sample, as they maintain the necessary high reaction temperature throughout the defined period.
For sample digestion three crack sets are available: crack set 10 (model 14687, 100 digestions) and crack set 10-C (model 14688, 25 cuvettes) for heavy metal, as well as crack set 20 for total nitrogen (model 14963, 90 determinations).

In each of the WTW thermoreactors, the most important temperatures and digestion times are stored in 8, easily selectable digestion programs. In addition to these 8 fixed standard programs, CR 3200 and CR 4200 thermoreactors allow you to store 8 of your own user-defined programs. Suitable for 16 mm cuvettes.

Thermoreactors

- Programs for routine tests
- Rapid digestion for COD
- Quality assurance with testing sensor (optional)

CR 2200

CR 3200

CR 4200

Fast Digestion for CSB

New programs for COD

For COD digestion, programs according to various international standard methods are available. On demand of many customers, a rapid digestion for 20 minutes at 148 °C (298.4 °F) is provided, as this timespan has proven to be sufficient for many applications.

All reactors have timer functions. All reactors display when the reaction temperature is reached.

Safety precautions

Along with superior safety, all WTW thermoreactors optimize the heat transmission between the heating block and cuvettes. The safety hood prevents chemicals from splashing in the event of a broken cuvette, a covering provides protection from contact with the heating block surface.

CR 2200

Ideal for performing routine water analysis tests with small sample amounts, as 7 programs are available for digestion of 12 sample cuvettes at 100, 120, 148 and 150 °C (212, 248 and 298.4 °F).

CR 3200

In addition, you can program the CR 3200 to carry out 8 of your individual digestions at freely selectable temperatures up to 170 °C (338 °F).

CR 4200

The right choice for performing multiple tests simultaneously, such as COD (148 °C/298.4 °F) and total-N (120 °C/248 °F), as the two thermoblocks for 12 cuvettes can each be controlled separately. It also has memory for 8 of your own user-defined programs with free temperature selection up to 170 °C (338 °F).

Temperature Probe TFK CR

Quality Assurance:

Quality assurance is constantly increasing in importance, even in the operational analysis sector. The CR 3200 and CR 4200 thermoreactors are both equipped with the external temperature probe TFK CR (Order No. 250 100) as a testing aid. This temperature probe can be plugged into the interface in place of a cuvette, and the set and actual temperatures can be outputted either to a printer or a PC. This means that the function can not only be monitored, but also documented.

Application Areas and Technical Data Thermoreactors

Application Areas	CR 2200	CR 3200	CR 4200
Routine measurements	●	●	●
Wastewater	●	●	●
Specialized tasks in wastewater	–	●	●
Specialized tasks in wastewater and in laboratories	–	●	●
Number of samples, max.	1 x12	2 x 12, same program	2 x 12, different programs
8 pre-stored programs	100 °C (212 °F) 30 min, 60 min, 120 °C (248 °F) with 30 min, 60 min, 120 min, 148 °C (298.4 °F) 120 min, 20 min 150 °C (302 °F) 120 min	100 °C (212 °F) 30 min, 60 min, 120 °C (248 °F) with 30 min, 60 min, 120 min, 148 °C (298.4 °F) 120 min, 20 min 150 °C (302 °F) 120 min	100 °C (212 °F) 30 min, 60 min, 120 °C (248 °F) with 30 min, 60 min, 120 min, 148 °C (298.4 °F) 120 min, 20 min 150 °C (302 °F) 120 min
User programs	–	8 freely selectable 25-170 °C (77-338 °F)	8 freely selectable 25-170 °C (77-338 °F)
Control accuracy	±1 °C ±1 digit		
Safety class	I to DIN VDE 0700 part 1/11.90		
Instrument safety	EN 61010, UL 3101, CAN/CSA C22.2-1010; EN 61010-2-010, IEC-CAN/CSA C22.2-1010.2.010		
Dimensions	W: 256 mm (10.08 in); H: 185 mm (7.28 in), open: 290 mm (11.42 in); D: 315 mm (12.4 in)		

Ordering Information

Model		Order No.
CR 2200	Reactor (230 VAC with Europlug*) for COD and other thermal digestions. For up to 12 reaction cuvettes. (Regional power supply available on demand)	1P21-1
CR 3200	Reactor (230 VAC with Europlug*) for COD and other thermal digestions. For up to 2x12 reaction cuvettes. (Regional power supply available on demand)	1P22-1
CR 4200	Reactor (230 VAC with Europlug*) for COD and other thermal digestions. For up to 2x12 reaction cuvettes in two separately controllable heating blocks. (Regional power supply available on demand)	1P23-1

CE cETLus 2 Year Warranty

*) other plugs are available

Reagents from A – Z
The Right Test for Every Application

A wide choice of tests is available for routine analysis in different applications. Depending on the optical system and the wavelength employed, photometer and test set make up a matched system with different specific advantages.

For use with portable photometers, test sets need to be straightforward. The low consumption LED optics allows the use of easy-to-use and cost-effective test sets, e.g. powder tests. In the laboratory, instruments with barcode and utmost optical sensitivity suggest the use of high-precision tests with barcode reader, certificate and quality assurance support.

WTW continues to expand the reagent offering. Not only are new tests developed, but the compatability of tests with different instruments is continuously being developed. Due to the different photometer optics, one test may yield different measuring ranges in different instruments; LED photometers may have smaller measuring ranges for the same test.

Reagents for Routine Tasks

- Convenient and cost effective
- Precise
- Assured quality by AQA/IQC

Taking measurements correctly

In reviewing lot certificates, one recognizes the most important factor: Choosing the matching measuring range is critical. Every concentration determination is accurate only within the linear absorption range. At the limits of the measuring range, the given tolerance has the biggest impact on the results. Therefore, it may be worth repeating the measurement using a test set with a better suited measuring range.

Test Types Overview

Identification: ● = cell test TC = cell test TP = powder test ■ = reagent test

Type	Round cell test	Reagents test	Powder test
Certificate	With certificate (●) for optimum precision Without certificate (TC) for very good precision	With certificate (■) for optimum precision	Without certificate (TP), precise
Test identification	Barcode (●) and/or method selection	Barcode (●) and/or method selection	Method selection, barcode optional (external)
Advantages:	Reaction cuvette with barcode or method selection, 16 mm: Sample adding, inserting, measuring and reading at minimum work, QA support for assured results	Wide measuring range, using 10, 20 and 50 mm rectangular cuvettes for determination of trace concentrations. QA support for assured results	Compact, straightforward procedure; minimal equipment required
Application area:	Laboratory, infrequent work or very large sample throughput	Laboratory, low concentrations, cost-effective routine work with large sample throughput	Portable measurements, screening and monitoring tasks

Reagents

	Model	Measuring Range (Specification max.)	Cuvette (mm) [1] Depending on meter	ml	Order No.	No. of tests	CC	SW	photoLab® S6	photoLab® S12	photoLab® 6000	photoLab® Spektral	pHotoFlex®
Acid Capacity up to pH 4.3													
● / ■	01758	**Ks 4.3 0.40 - 8.00 mmol/l 20 - 400 mg/l $CaCO_3$**	16	1	252 087	120	✔	✔	●	●	●	●	–
Aluminum Al													
●	00594	**0.02 - 0.50 mg/l Al**	16	6	252 068	25	–	✔	–	●	●	●	–
■	14825	**0.020 - 1.20 mg/l Al**	10, 20, 50, 28	5	250 425	300	✔	✔	–	●	●	●	●
TP	Al-1 TP	**0.00 - 0.25 mg/l**	28	20	251 400	100	–	–	–	–	–	–	●
Ammonia NH_3 (subject to pH value)													
●	14544	**0.5 - 16.0 mg/l NH_4-N 0.7 - 20.6 mg/l NH_4**	16	0.5	250 329	25	–	–	–	–	–	–	●
■	14752/1	**0.02 - 1.50 mg/l NH_4-N 0.03 - 1.93 mg/l NH_4**	16, 28	5	250 426	500	–	–	–	–	–	–	●
■	14752/2	**0.02 - 1.50 mg/l NH_4-N 0.03 - 1.93 mg/l NH_4**	16, 28	5	252 081	250	–	–	–	–	–	–	●
Ammonium NH_4													
●	14739	**0.010 - 2.000 mg/l NH_4-N 0.01 - 2.60 mg/l NH_4^+**	16	5	250 495	25	✔	–	●	●	●	●	–
●	A6/25	**0.20 - 8.00 mg/l NH_4-N 0.26 - 10.3 mg/l NH_4^+**	16	1	252 072	25	✔	✔	●	●	●	●	●
●	14544	**0.5 - 16.0 mg/l NH_4-N 0.6 - 20.6 mg/l NH_4^+**	16	0.5	250 329	25	✔	✔	●	●	●	●	●
●	14559	**4.0 - 80.0 mg/l NH_4-N 5.2 - 103.0 mg/l NH_4^+**	16	0.1	250 424	25	✔	✔	●	●	●	●	–
■	14752/1	**0.010 - 3.00 mg/l NH_4-N 0.013 - 3.86 mg/l NH_4^+**	10, 20, 50, 16, 28	5	250 426	500	✔	✔	–	●	●	●	●
■	14752/2	**0.010 - 3.00 mg/l NH_4-N 0.013 - 3.86 mg/l NH_4^+**	10, 20, 50, 16, 28	5	252 081	250	✔	✔	–	●	●	●	●
■	00683	**2.0 - 150 mg/l NH_4-N 2.6 - 193 mg/l NH_4^+**	10	0.1, 0.2	252 027	100	✔	✔	–	●	●	●	–
TP	NH_4-1 TP	**0.00 - 0.50 mg/l NH_4-N 0.00 - 0.64 mg/l NH_4^+**	28	10	251 408	200	–	–	–	–	–	–	●
TC	NH_4-2 TC (LR)	**0.00 - 2.50 mg/l NH_4-N 0.00 - 3.20 mg/l NH_4^+**	16	2	251 997	50	–	–	–	–	–	–	●
TC	NH_4-3 TC (HR)	**0 - 50 mg/l NH_4-N 0 - 64 mg/l NH_4^+**	16	0.1	251 998	50	–	–	–	–	–	–	●
Antimony: Please ask for application brochures													
AOX													
●	00675	**0.05 - 2.50 mg/l AOX**	16		252 023	25	–	–	●	●	●	●	–
Arsenic													
■	01747	**0.001 - 0.100 mg/l As**	10, 20, 16	350	252 063	30	–	–	–	●	●	●	●
Additionally,	AS absorption tube required				252 066								
Ascorbic acid: Please ask for application brochures													
BOD Biochemical oxygen demand O_2													
●	00687	**0.5 - 3000 mg/l BOD**	16	–	252 028	50	–	✔	●	●	●	●	–

● = Cell Tests
■ = Reagent tests
TC = Cuvette Tests
TP = Powder Pillows
CC = CombiCheck
SW = Saltwater
ml = Sample volume (photoLab®)
1) Ø 16, 28
□ 10, 20, 50

Reagents

	Model	Measuring Range (Specification max.)	Cuvette (mm) [1] Depending on meter	ml	Order No.	No. of tests	CC	SW	photoLab® S6	photoLab® S12	photoLab® 6000	photoLab® Spektral	pHotoFlex®
Boron B													
■	14839	**0.050 - 0.800 mg/l B**	10, 20	5	250 427	60	–	–	–	●	●	●	–
●	00826	**0.05 - 2.00 mg/l B**	16	4	252 041	25	–	✔	–	●	●	●	–
Bromine Br_2													
■	00605	**0.020 - 10.00 mg/l Br_2**	10, 20, 50	10	252 014	200	–	–	–	●	●	●	–
Cadmium Cd													
●	14834	**0.025 - 1.000 mg/l Cd**	16	5	250 314	25	✔	–	●	●	●	●	●
■	01745	**0.002- 0.500 mg/l Cd**	10, 20, 50, 28	10	252 051	55	–	–	●	●	●	●	●
Calcium Ca													
■	14815	**1.0 - 160 mg/l Ca**	10, 20, 16, 28	0.1	250 428	100	–	✔	–	●	●	●	●
●	00858	**10 - 250 mg/l Ca**	16	1	252 047	25	–	–	●	●	●	●	–
Chlorine Cl_2		*(f = free, t = total)*											
●	00595	**0.03 - 6.00 Cl_2, f**	16	5	250 419	200	–	–	●	●	●	●	●
●	00597	**0.03 - 6.00 Cl_2, f+t**	16	5	250 420	200	–	–	●	●	●	●	●
■	00598/1	**0.010 - 6.00 Cl_2, f**	10, 20, 50	10	252 010	1200	–	–	–	●	●	●	–
■	00598/2	**0.010 - 6.00 Cl_2, f**	10, 20, 50	10	252 011	200	–	–	–	●	●	●	–
■	00599	**0.010 - 6.00 Cl_2, f+t**	10, 20, 50	10	252 012	200	–	–	–	●	●	●	–
■	00602/1	**0.010 - 6.00 Cl_2, t**	10, 20, 50	10	252 013	200	–	–	–	●	●	●	–
■	00602/2	**0.010 - 6.00 Cl_2, t**	10, 20, 50	10	252 055	1200	–	–	–	●	●	●	–
TP	Cl-1 TP	**0.00 - 2.00 mg/l Cl_2, f**	28	10	251 401	100	–	–	–	–	–	–	●
TP	Cl-2 TP	**0.00 - 5.00 mg/l Cl_2, f**	28	25	251 402	100	–	–	–	–	–	–	●
TP	Cl-3 TP	**0.00 - 2.00 mg/l Cl_2, t**	28	25	251 414	100	–	–	–	–	–	–	●
Chlorine Liquid test kit (free and total chlorine) Cl_2													
● / ■		**0.010 - 6.00 Cl_2**	16, 50	10			–	–	●	●	●	●	–
	00086 Chlorine reagent Cl2-1				252 077	200							
	00087 Chlorine reagent Cl2-2				252 078	400							
	00088 Chlorine reagent Cl2-3				252 079	600							
	00089 Accessories Cl2 (round cells etc.)				252 080	25							
Chloride Cl													
●	14730	**5 - 125 mg/l Cl**	16	1	250 353	25	✔	✔	●	●	●	●	●
■	14897/1	**2.5 - 250 mg/l Cl**	10, 16	1, 5	250 491	100	✔	✔	–	●	●	●	●
■	14897/2	**2.5 - 250 mg/l Cl**	10, 16	1, 5	252 082	175	✔	✔	–	●	●	●	●
Chlorine dioxide ClO_2													
■	00608	**0.020 - 10.00 mg/l ClO_2**	10, 20, 50, 16, 28	10	252 017	200	–	–	–	●	●	●	●
Chromate (chromium VI and total chromium) Cr													
●	14552	**0.05 - 2.00 mg/l Cr**	16	10	250 341	25	–	✔	●	●	●	●	●
■	14758	**0.01 - 3.00 mg/l Cr**	10, 20, 50	5	250 433	250	–	✔	–	●	●	●	–
Chromium plating bath CrO_3: See reagent-free tests													

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1) Ø 16, 28
□ 10, 20, 50

Reagents

	Model	Measuring Range (Specification max.)	Cuvette (mm) [1] Depending on meter	ml	Order No.	No. of tests	CC	SW	photoLab® S6	photoLab® S12	photoLab® 6000	photoLab® Spektral	pHotoFlex®
COD Chemical oxygen demand O_2													
●	14560	**4.0 - 40.0 mg/l COD (148 °C/298.4 °F, 2 h)**	16	3	250 303	25	✔	–	●	●	●	●	–
●	C3/25	**10 - 150 mg/l COD (148 °C/298.4 °F, 2 h)**	16	3	252 070	25	✔	–	●	●	●	●	●
●	14895	**15 - 300 mg/l COD (148 °C/298.4 °F, 2 h)**	16	2	250 359	25	✔	–	●	●	●	●	●
●	14690	**50 - 500 mg/l COD (148 °C/298.4 °F, 2 h)**	16	2	250 304	25	✔	–	●	●	●	●	●
●	C4/25	**25 - 1500 mg/l COD (148 °C/298.4 °F, 2 h)**	16	3	252 071	25	✔	–	●	●	●	●	●
●	14691	**300 - 3500 mg/l COD (148 °C/298.4 °F, 2 h)**	16	2	250 351	25	✔	–	●	●	●	●	●
●	14555	**500 - 10000 mg/l COD (148 °C/298.4 °F, 2 h)**	16	1	250 309	25	✔	–	●	●	●	●	●
TC	COD1 TC (LR)	**0 - 150 mg/l COD (148 °C/298.4 °F, 2 h)**	16	2	251 990	25	–	–	–	–	–	–	●
TC	COD2 TC (MR)	**0 - 1500 mg/l COD (148 °C/298.4 °F, 2 h)**	16	2	251 991	25	–	–	–	–	–	–	●
TC	COD3 TC (HR)	**0 - 15000 mg/l COD (148 °C/298.4 °F, 2 h)**	16	0,2	251 992	25	–	–	–	–	–	–	●
COD Chemical oxygen demand (HG free, Cl^- partly detected) O_2													
●	09772	**10 - 150 mg/l COD (148 °C/298.4 °F, 2 h)**	16	2	250 301	25	✔	–	●	●	●	●	●
●	09773	**100 - 1500 mg/l COD (148 °C/298.4 °F, 2 h)**	16	2	250 306	25	✔	–	●	●	●	●	●
Copper Cu													
●	14553	**0.05 - 8.00 mg/l Cu**	16	5	250 408	25	–	✔	●	●	●	●	●
■	14767	**0.02 - 6.00 mg/l Cu**	10, 20, 50, 16, 28	10	250 441	250	–	✔	–	●	●	●	●
TP	Cu-1 TP	**0.00 - 5.00 mg/l Cu**	28	10	251 403	100	–	–	–	–	–	–	●
Copper plating bath Cu: See reagent-free tests													
Cyanide (free and easy liberatable cyanide) CN													
●	14561	**0.010 - 0.500 mg/l CN**	16	5	250 344	25	–	–	●	●	●	●	●
■	09701	**0.002 - 0.500 mg/l CN**	10, 20, 50	5, 10	250 492	100	–	–	–	●	●	●	–
Cyanuric Acid													
■	19250	**2 - 160 mg/l Cyanuric Acid**	20	5	252 088	100	–	–	–	●	●	●	–
DEHA/Oxygen Scavengers													
■	19251	**0.020 - 0.500 mg/l DEHA**	20	10	252 089	200	–	–	–	●	●	●	–
Detergents: See Surfactants: anionic, cationic, nonionic													
Fluoride F													
●	14557	**0.025 - 1.50 mg/l F**	16	5	250 365	25	–	✔	–	●	●	●	●
■	14598/1	**0.10 - 20.0 mg/l F**	10	5 or 0.5	252 048	100	–	–	–	●	●	●	–
■	14598/2	**0.10 - 20.0 mg/l F**	10	5 or 0.5	252 083	250	–	–	–	●	●	●	–
Formaldehyde HCHO													
●	14500	**0.10 - 8.00 mg/l HCHO**	16	2	250 406	25	–	–	●	●	●	●	●
■	14678	**0.02 - 8.00 mg/l HCHO**	10, 20, 50	3	250 331	100	–	–	–	●	●	●	–
Gold Au													
■	14821	**0.5 - 12.0 mg/l Au**	10, 16	2	250 436	80	✔	✔	–	●	●	●	●
Halogens (total): See Cl_2, Br_2, J_2, ClO_2, O_3													
Hazen: See reagent-free tests: Coloration													

● = Cell Tests ■ = Reagent tests TC = Cuvette Tests TP = Powder Pillows CC = CombiCheck SW = Saltwater ml = Sample volume (photoLab®) 1) Ø 16, 28 □ 10, 20, 50

Reagents

	Model	Measuring Range (Specification max.)	Cuvette (mm) [1] Depending on meter	ml	Order No.	No. of tests	CC	SW	photoLab® S6	photoLab® S12	photoLab® 6000	photoLab® Spektral	pHotoFlex®
Heavy metals: See lead, cadmium, chromium													
Hydrazine N_2H_4													
■	09711	**0.005 - 2.00 mg/l N_2H_4**	10, 20, 50	5	250 493	100	–	–	–	●	●	●	–
Hydrogen peroxide H_2O_2													
●	14731	**0.25 - 20.0 mg/l H_2O_2**	16	10	250 402	25	–	✔	–	●	●	●	–
■	18789	**0.015 - 6.00 mg/l H_2O_2**	10, 20	8	252 067	100	–	–	–	●	●	●	–
Iodine I_2													
■	00606	**0.050 - 10.00 mg/l I_2**	10, 20, 50	10	252 015	200	–	–	–	●	●	●	–
Iodine number: See reagent-free tests: Coloration													
Iron Fe													
●	14549	**0.05 - 4.00 mg/l Fe**	16	5	250 349	25	✔	✔	●	●	●	●	●
●	14896	**1.0 - 50.0 mg/l Fe**	16	1	250 361	25	–	–	●	●	●	●	●
■	14761/1	**0.005 - 5.00 mg/l Fe**	10, 20, 50, 16, 28	5	250 435	1000	✔	✔	–	●	●	●	●
■	14761/2	**0.005 - 5.00 mg/l Fe**	10, 20, 50, 16, 28	5	250 439	250	✔	✔	–	●	●	●	●
■	00796	**0.010 - 5.00 mg/l Fe**	10, 20, 50	8	252 042	150	✔	✔	–	●	●	●	–
TP	Fe-1 TP	**0.00 - 1.80 mg/l Fe**	16, 28	10	251 404	100	–	–	–	–	–	–	●
TP	Fe-2 TP	**0.00 - 3.00 mg/l Fe**	16, 28	10	251 405	100	–	–	–	–	–	–	●
Lead Pb													
●	14833	**0.10 - 5.00 mg/l Pb**	16	5	250 313	25	✔	–	●	●	●	●	–
■	09717	**0.010 - 5.00 mg/l Pb**	10, 50, 16, 28	8	252 034	50	✔	–	–	●	●	●	●
Magnesium Mg													
●	00815	**5.0 - 75.0 mg/l Mg**	16	1	252 043	25	–	✔	●	●	●	●	●
Manganese Mn													
■	01739	**0.005 – 2.000 mg/l Mn**	10, 20, 50	8	252 056	250	–	–	–	●	●	●	
■	14770/1	**0.01 - 10.0 mg/l Mn**	10, 20, 50, 16, 28	5	250 442	500	✔	✔	–	●	●	●	●
■	14770/2	**0.01 - 10.0 mg/l Mn**	10, 20, 50, 16, 28	5	252 084	250	✔	✔	–	●	●	●	●
●	00816	**0.10 - 5.00 mg/l Mn**	16	7	252 035	25	✔	–	●	●	●	●	●
TP	Mn-1 TP	**0.0 - 20.0 mg/l Mn**	16, 28	10	251 406	100	–	–	–	–	–	–	●
Molybdenum Mo													
●	00860	**0.02 - 1.00 mg/l Mo**	16	10	252 040	25	–	–	–	●	●	●	–
■	19252	**0.5 - 45.0 mg/l Mo**	20	10	252 090	100	–	–	–	●	●	●	–
TP	Mo-1 TP	**0.0 - 35.0 mg/l Mo**	16, 28	10	251 407	100	–	–	–	–	–	–	●
Monochloramine													
■	01632	**0.05 – 10.0 mg/l Cl_2**	10, 20, 50	10	252 057	150	–	–	–	●	●	●	–
Nickel Ni													
●	14554	**0.10 - 6.00 mg/l Ni**	16	5	250 409	25	✔	–	●	●	●	●	●
■	14785	**0.02 - 5.00 mg/l Ni**	10, 20, 50, 28	5	250 443	250	✔	–	–	●	●	●	●
Nickel plating bath: See reagent-free tests													
Nitrogen (total): See Total Nitrogen N_{Total}													

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ml = Sample volume (photoLab®)
1) Ø 16, 28 □ 10, 20, 50

Reagents

	Model	Measuring Range (Specification max.)	Cuvette (mm) [1] Depending on meter	ml	Order No.	No. of tests	CC	SW	photoLab® S6	photoLab® S12	photoLab® 6000	photoLab® Spektral	pHotoFlex®
Nitrate NO_3													
●	14556	**0.10 - 3.00 mg/l NO_3-N** **0.4 - 13.3 mg/l NO_3**	16	2	250 411	25	✔	✔	–	●	●	●	●
●	N2/25	**0.5 - 25.0 mg/l NO_3-N** **2.2 - 110.7 mg/l NO_3**	16	1	252 073	25	✔	–	●	●	●	●	–
●	14542	**0.5 - 18.0 mg/l NO_3-N** **2.2 - 79.7 mg/l NO_3**	16	1.5	250 410	25	✔	–	●	●	●	●	●
●	14764	**1.0 - 50.0 mg/l NO_3-N** **4 - 221 mg/l NO_3**	16	0.5	250 347	25	✔	–	●	●	●	●	–
●	00614	**23 - 225 mg/l NO_3-N** **102 - 996 mg/l NO_3**	16	0.1	252 019	25	–	–	●	●	●	●	–
■	14942	**0.2 - 17.0 mg/l NO_3-N** **0.9 - 75.3 mg/l NO_3**	10, 20, 50, 16	1	250 422	50	✔	✔	–	●	●	●	●
■	14773	**0.2 - 20.0 mg/l NO_3-N** **0.9 - 88.5 mg/l NO_3**	10, 20	1.5, 3	250 444	100	✔	–	–	●	●	●	–
■	09713/1	**0.1 - 25.0 mg/l NO_3-N** **0.4 - 110.7 mg/l NO_3**	10, 20, 50	0.5	250 421	90	✔	–	–	●	●	●	–
■	09713/2	**0.1 - 25.0 mg/l NO_3-N** **0.4 - 110.7 mg/l NO_3**	10, 20, 50	0.5	252 085	250	✔	–	–	●	●	●	–
TC	NO3-1 TC	**0 - 30.0 mg/l NO_3-N** **0.0 -133.0 mg/l NO_3**	16	2	251 993	50	–	–	–	–	–	–	●
Nitrite NO_2													
●	N5/25	**0.010 - 0.700 mg/l NO_2-N** **0.03 - 2.30 mg/l NO_2**	16	5	252 074	25	–	✔	●	●	●	●	●
■	14776/1	**0.005 - 1.00 mg/l NO_2-N** **0.016 - 3.28 mg/l NO_2**	10, 20, 50, 16, 28	5	250 445	1000	–	✔	–	●	●	●	●
■	14776/2	**0.005 - 1.000 mg/l NO_2-N** **0.016 - 3.28 mg/l NO_2**	10, 20, 50, 16, 28	5	250 440	335	–	✔	–	●	●	●	●
■	00609	**1.0 - 90.0 mg/l NO_2-N** **3.3 - 295.2 mg/l NO_2**	16	8	252 069	25	–	–	●	●	●	●	–
TP	NO_2-1 TP	**0.00 - 0.33 mg/l NO_2-N** **0.00 - 1.08 mg/l NO_2**	16, 28	10	251 409	100	–	–	–	–	–	–	●
TC	NO_2-2 TC	**0.03 - 0.60 mg/l NO_2-N (LR)** **0.10 - 2.00 mg/l NO_2 (LR)**	16	2	251 994	24	–	–	–	–	–	–	●
		0.30 - 3.00 mg/l NO_2-N (HR) **0.99 - 9.90 mg/l NO_2**	16	0,5									
Organic Acids (volatile)													
●	01763	**50 - 3000 mg/l**	16	0,5	252 060	100	–	–	●	●	●	●	–
Oxygen O_2													
●	14694	**0.5 - 12.0 mg/l O_2**	16	–	250 403	25	–	–	●	●	●	●	–
Ozone O_3													
■	00607/1	**0.010 - 4.00 mg/l O_3**	10, 20, 50, 16, 28	10	252 016	200	–	–	–	●	●	●	●
■	00607/2	**0.010 - 4.00 mg/l O_3**	10, 20, 50, 16, 28	10	252 054	1200	–	–	–	●	●	●	●
■	14732	replaced by ClO_2 00608 and ozone 00607											
pH													
●	01744	**pH 6.4 – 8.6**	16	10	252 050	280	–	✔	●	●	●	●	–
Phenol C_6H_5OH													
■	00856	**0.002 – 0.100 mg/l C_6H_5OH** **0.025 – 5.00 mg/l C_6H_5OH**	20 10, 20, 50	200 10	252 058	50 250	–	✔	–	●	●	●	–
●	14551	**0.10 - 2.50 mg/l C_6H_5OH**	16	10	250 412	25	–	✔	–	●	●	●	●

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CC = CombiCheck SW = Saltwater
ml = Sample volume (photoLab®)
1) Ø 16, 28 □ 10, 20, 50

Reagents

	Model	Measuring Range (Specification max.)	Cuvette (mm) [1] Depending on meter	ml	Order No.	No. of tests	CC	SW	photoLab® S6	photoLab® S12	photoLab® 6000	photoLab® Spektral	pHotoFlex®
Phosphate PO_4													
●	P6/25	**0.05 – 5.00 mg/l PO_4-P** **0.05 – 5.0 mg/l P_{Total}** **0.2 - 15.3 mg/l PO_4**	16	5	252 075	25	✔	✔	●	●	●	●	●
●	P7/25	**0.5 - 25.0 mg/l PO_4-P** **0.5 - 25.0 mg/l P_{Total}** **1.5 - 76.7 mg/l PO_4**	16	1	252 076	25	✔	✔	●	●	●	●	●
●	14546	**0.5 - 25.0 mg/l PO_4-P** **1.5 - 76.7 mg/l PO_4**	16	5	250 413	25	✔	✔	●	●	●	●	●
●	00616	**3.0 - 100.0 mg/l PO_4-P** **9.0 - 307.0 mg/l PO_4**	16	0.2	252 021	25	–	✔	●	●	●	●	●
■	14848/1	**0.010 - 5.00 mg/l PO_4-P** **0.030 - 15.3 mg/l PO_4**	10, 20, 50, 16, 28	5	250 446	420	✔	✔	–	●	●	●	●
■	14848/2	**0.010 - 5.00 mg/l PO_4-P** **0.030 - 15.3 mg/l PO_4**	10, 20, 50, 16, 28	5	252 086	220	✔	✔	–	●	●	●	●
■	14842	**0.5 - 30.0 mg/l PO_4-P** **1.5 - 92.0 mg/l PO_4**	10, 20	5	250 447	400	–	✔	–	●	●	●	–
■	00798	**1.0 - 100.0 mg/l PO_4-P** **3.0 - 307.0 mg/l PO_4**	10, 16	8	252 045	100	–	✔	–	●	●	●	●
TP	PO_4-1 TP	**0.00 - 0.80 mg/l PO_4-P** **0.00 - 2.45 mg/l PO_4**	28	10	251 410	100	–	–	–	–	–	–	●
TC	PO_4-2 TC	**0.00 - 1.60 mg/l PO_4-P** **0.00 - 4.91 mg/l PO_4**	16	5	251 989	50	–	–	–	–	–	–	●
TC	PO_4-3 TC	**0.00 - 1.10 mg/l PO_4-P** **0.00 - 1.10 mg/l P_{Total} (digestion)** **0.00 - 3.37 mg/l PO_4**	16	5	251 988	50	–	–	–	–	–	–	●
Phosphate (total): See Phosphate PO_4													
Potassium K													
●	14562	**5.0 - 50.0 mg/l K**	16	2	250 407	25	–	✔	●	●	●	●	●
●	00615	**30 - 300 mg/l K**	16	0.5	252 020	25	–	✔	●	●	●	●	●
SAC: See reagent-free tests													
Silicate/Silicic acid Si													
■	14794	**0.005 - 5.00 mg/l Si** **0.11 - 10.70 mg/l SiO_2**	10, 20, 50, 16, 28	5	250 438	300	–	✔	–	●	●	●	●
■	00857	**0.5 - 500 mg/l Si** **1.1 - 10.70 mg/l Si**	10, 16	4/0.5	252 046	100	–	–	–	●	●	●	●
TP	Si-1 TP (LR)	**0.00 - 0.75 mg/l Si** **0.00 - 1.60 SiO_2**	28	10	251 411	100	–	–	–	–	–	–	●
TP	Si-2 TP (HR)	**0 - 46.7 mg/l Si** **0 - 100.0 mg/l SiO_2**	16, 28	10	251 412	100	–	–	–	–	–	–	●
Silver Ag													
■	14831	**0.25 - 3.00 mg/l Ag**	10, 20, 16	10	250 448	100	–	–	–	●	●	●	●
		(total-Ag: 100 °C/212 °F or 120 °C/248 °F, 1 h) Digestion reagents are contained in the test set											
Sodium Na													
●	00885	**10 - 300 mg/l Na**	16	0.5	252 044	25	–	–	●	●	●	●	●

● = Cell Tests ■ = Reagent tests
TC = Cuvette Tests TP = Powder Pillows
CC = CombiCheck SW = Saltwater
ml = Sample volume (photoLab®)
1) Ø 16, 28 □ 10, 20, 50

Reagents

	Model	Measuring Range (Specification max.)	Cuvette (mm) [1] Depending on meter	ml	Order No.	No. of tests	CC	SW	photoLab® S6	photoLab® S12	photoLab® 6000	photoLab® Spektral	pHotoFlex®
Sulfate SO_4													
●	14548	**5 - 250 mg/l SO_4**	16	5	250 414	25	✔	✔	●	●	●	●	●
●	00617	**50 - 500 mg/l SO_4**	16	2	252 022	25	✔	✔	●	●	●	●	–
●	14564	**100 - 1000 mg/l SO_4**	16	1	250 415	25	✔	✔	●	●	●	●	–
■	14791	**25 - 300 mg/l SO_4**	10	2.5	250 449	200	✔	–	●	●	●	●	–
TP	SO_4-1 TP	**0 - 70 mg/l SO_4**	16, 28	10	251 413	100	–	–	–	–	–	–	●
Sulfide/Hydrogensulfide S													
●	14779	**0.02 - 1.50 mg/l S**	10, 20, 50	5	250 450	220	–	–	–	●	●	●	–
Sulfite SO_3													
●	14394	**1.0 - 20.0 mg/l SO_3**	16	3	250 416	25	–	–	–	●	●	●	–
■	01746	**1.0 - 60.0 mg/l SO_3**	10	2	252 053	150	–	–	–	●	●	●	–
Surfactants													
a-Ten (anionic) ●	14697	**0.05 - 2.00 mg/l a-Ten**	16	5	250 333	25	–	–	–	●	●	●	–
c-Ten (cationic) ●	01764	**0.05 - 1.50 mg/l CTAB**	16	5	252 062	25	–	–	–	●	●	●	–
n-Ten (nonionic) ●	01787	**0.10 - 7.50 mg/l Triton X-100**	16	4	252 061	25	–	–	–	●	●	●	–
Tin Sn													
●	14622	**0.10 - 2.50 mg/l Sn**	16	5	250 401	25	–	✔	–	●	●	●	–
TOC Total organic carbon													
●	14878	**5.0 - 80.0 mg/l TOC**	16	3	252 036	25	–	–	●	●	●	●	–
●	14879	**50 - 800 mg/l TOC**	16	3	252 037	25	–	–	●	●	●	●	–
Total Nitrogen N_{Total}													
●	14537	**0.5 - 15.0 mg/l N_{Total} (120 °C/248 °F, 1 h)**	16	10	250 358	25	✔	–	●	●	●	●	●
●	14763	**10 - 150 mg/l N_{Total} (120 °C/248 °F, 1 h)**	16	1	250 494	25	✔	–	●	●	●	●	–
●	00613	**0.5 - 15.0 mg/l N_{Total} (120 °C/248 °F, 1 h)**	16	10	252 018	25	✔	–	●	●	●	●	–
TC	N_{tot}1 TC (LR)	**0 - 25.0 mg/l N_{Total} (120°C/248 °F, 30 min.)**	16	2; 2	251 995	50	–	–	–	–	–	–	●
TC	N_{tot}2 TC (HR)	**5 - 150 mg/l N_{Total} (120°C/248 °F, 30 min.)**	16	0.5; 2	251 996	50	–	–	–	–	–	–	●
Total phosphate: See Phosphate PO_4													
Water hardness, RH residual hardness													
●	14683	**0.075 - 0.750 °d 0.50 - 5.00 mg/l Ca**	16	4	250 404	25	–	–	●	●	●	●	–
Water hardness, total hardness													
●	00961	**0.7 - 30.1 °d, 5 - 215 mg/l Ca**	16	1	252 039	25	–	–	●	●	●	●	●
Zinc Zn													
●	00861	**0.025 - 1.000 mg/l Zn**	16	2	252 049	25	–	–	●	●	●	●	●
●	14566	**0.20 - 5.00 mg/l Zn**	16	0.5	250 417	25	✔	–	●	●	●	●	●
■	14832	**0.05 - 2.50 mg/l Zn**	10	5	250 451	90	–	–	–	●	●	●	–
	06146	Extracting agent, required			250 452	180							

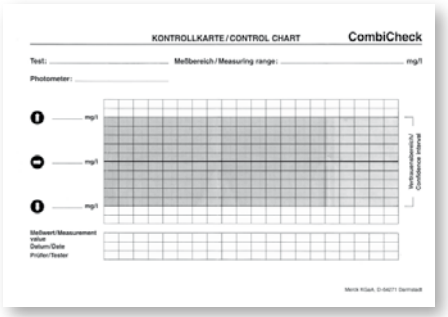
● = Cell Tests ■ = Reagent tests TC = Cuvette Tests TP = Powder Pillows CC = CombiCheck SW = Saltwater ml = Sample volume (photoLab®) 1) Ø 16, 28 □ 10, 20, 50

CombiCheck

CombiCheck solutions are ready-to-use multi-parameter standards. Each package contains a standard solution as well as a stocking solution. Both solutions can be used for analytical quality assurance directly **without dilution**.

- The standard solution is used to check the accuracy of the results for the complete system: procedure – analytical method – reagents – photometer.
- The stocking solution is used to check sample-dependent influences (MatrixCheck) by measuring the recovery rate, and to determine the most suitable sample preparation method.

The maximum number of determinations that can be made with a **CombiCheck** standard solution depends on the test set used. With the stocking solution, 280 determinations are possible.
Please see the test kit brochure for more information.



Storage: +2 … +8 °C (35.6 … 46.4 °F)

CombiCheck

Parameter	Concentration	Suitable for test set model	Max. no. of determinations
14676 CombiCheck 10			250 482
Ammonium	4.00 mg/l NH_4-N	A6/25 14558	90 90
Chloride	25.0 mg/l Cl	14730	90
COD	80 mg/l CSB	C3/25 14540	30 30
Nitrate	2.5 mg/l NO_3-N	14556 14773	45 60
Phosphate	0.80 mg/l PO_4-P	P6/25 14543 14848	18 18 9
Sulfate	100 mg/l SO_4	14548 14791 00617	18 40 48
14675 CombiCheck 20			250 483
Ammonium	12.0 mg/l NH_4-N	14544	180
Chloride	60 mg/l Cl	14730	90
COD	750 mg/l CSB	C4/25 14541	30 30
Nitrate	9.0 mg/l NO_3-N	N2/25 14542 14563 14773 14942 09713	90 60 90 60 60 180
Phosphate	8.0 mg/l PO_4-P	P7/25 14729	90 90
Sulfate	500 mg/l SO_4	14564	90

CombiCheck

Parameter	Concentration	Suitable for test set model	Max. no. of determinations
14677 CombiCheck 30			250 484
Cadmium	0.500 mg/l Cd	14834	19
Copper	2.00 mg/l Cu	14553 14767	19 19
Iron	1.00 mg/l Fe	14549 14761 00796	19 9 12
Manganese	1.00 mg/l Mn	14770 00816	9 13
14692 CombiCheck 40			250 485
Aluminum	0.75 mg/l Al	14825	19
Nickel	2.00 mg/l Ni	14554 14785	19 19
Lead	2.00 mg/l Pb	14833 09717	19 11
Zinc	2.00 mg/l Zn	14566	190
14695 CombiCheck 50			250 486
Ammonium	1.00 mg/l NH_4-N	14739 14752	19 19
Nitrogen	5.0 mg/l N_{ges}	14537 00613	9 9
COD	20.0 mg/l CSB	14560	32
14696 CombiCheck 60			250 487
COD	250 mg/l CSB	14690 14895	48 48
Chloride	125 mg/l Cl	14897	96
14689 CombiCheck 70			250 488
Ammonium	50.0 mg/l NH_4-N	14559 00683	950 480
COD	5,000 mg/l CSB	14555	95
Nitrogen	50.0 mg/l N_{Total}	14763	95
14738 CombiCheck 80			250 489
COD	1,500 mg/l CSB	14691	48
Nitrate	25.0 mg/l NO_3-N	14764	190
Phosphate	15.0 mg/l PO_4-P	14729 P7/25	95 95

Accessories

Standard Solutions

Standard solutions with limited stability, to be freshly prepared at regular intervals:

- Free chlorine
- Bound chlorine
- Formaldehyde
- Hydrazine
- Hydrogen peroxide
- Hydrogen sulfide
- Phenol
- Silicon
- Sulfide
- Sulfite
- Anionic surfactants

Standard Solutions

Parameter	Conc. in mg/l	Amount in ml	Model	Order No.
Aluminum	1000	500	19770	250 460
Ammonium	1000	500	19812	250 461
AOX	20	85 (8-16 Checks)	00680	252 026
Lead	1000	500	19776	250 462
Boron	1000	500	19500	250 463
BOD	210	10 bottles for 10 x 1l	00718	252 030
Cadmium	1000	500	19777	250 464
Calcium	1000	500	19778	250 465
Chloride	1000	500	19897	250 466
Chromium	1000	500	19779	250 467
Chromate	1000	500	19780	250 468
COD 160	100	30	KCSB 100	250 356
COD 1500	400	30	KCSB 400	250 357
Iron	1000	500	19781	250 469
Fluoride	1000	500	19814	250 470
Potassium	1000	500	70230	252 471
Silicic acid (Silicon)	1000	500	70236	252 472
Copper	1000	500	19786	250 473
Manganese	1000	500	19789	250 474
Nickel	1000	500	19792	250 475
Nitrate	1000	500	19811	250 476
Nitrite	1000	500	19899	250 477
Phosphate	1000	500	19898	250 478
Silver	1000	500	19797	250 479
Sulfate	1000	500	19813	250 480
TOC	1000	100	09017	250 499
Zinc	1000	500	19806	250 481

PhotoCheck

AQA/IQC: Comprehensive testing aid for optics and measurement linearity

The stable colored solutions are used for checking the filter and the wavelength settings 445 nm/446 nm, 520 nm/ 525 nm as well as 690 nm. With 4 solutions for each wavelength, correct wavelength setting and linearity of absorbance can be tested. Testing is easy and convenient via menu-guided function.

PipeCheck

Testing aid for the right pipetting volume

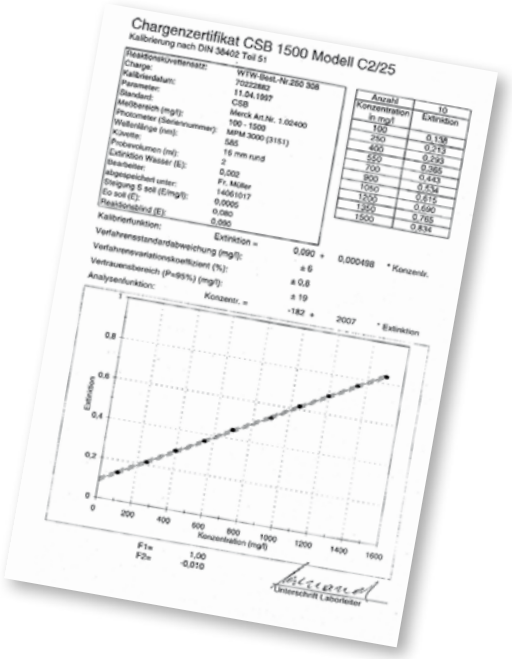
The appropriate test solution is diluted with distilled water using the pipette to be checked, and the extinction of the dilute solution is compared with that of a reference solution. Pipettes with a variation in volume of more than ±2.5% must be regarded as being faulty.

Ordering Information

Model		Order No.
PhotoCheck 14693*	Testing equipment for photoLab®	250 490
PipeCheck 14962	Testing equipment for pipette volume	250 498

*) also available for pHotoFlex on demand

General Information



- The current **analytical procedure** is included in each package.
- Certificates for test sets ■ and ● can be found on the WTW homepage www.WTW.com.
- **Storage:** Unless otherwise noted, the test set can be stored at **+15 to +25 °C (59 to 77 °F)**.
- WTW recommends regularly checking reagents and photometers, e.g. with **PhotoCheck** and **CombiCheck.**
- Barcoded cell tests are marked with ●; these are pre-prepared rapid tests, with only **one** measuring range. The cell is "round", with an outer diameter of 16 mm.
- Barcoded reagent tests are marked with ■. The measuring range information applies to the total useable measuring range for this method without sample dilution and normally involves changing a (rectangular) cuvette.
- All reagent tests require either reaction vessels, or RK 14/25 empty cuvettes and rectangular cuvettes
- Not all types of single-use cells can be recognized by photoLab®; WTW recommends the use of PMMA cuvettes (Order no. 250 607).
- The designations **TC** and **TP** stand for new test sets without lot certificate, that are suited for pHotoFlex®. **TC** are cell tests in 16 mm (0.63 in) cuvettes; **TP** are powder tests and are measured in round cells of 16 mm or 28 mm (0.63 in or 1.1 in) according to their measuring range.
- 16 mm round cells are not suitable for repeated use and are not to be used with reagent tests.
- In some tests a second citation form is given for the measuring ranges, e.g. nitrate as nitrate (NO_3) and as nitrate nitrogen (NO_3-N). Other optional expressions (citations) are contained in the analysis instructions for the instruments.
- Tests requiring a **digestion** (e.g. COD) are marked with the **digestion** temperature and time (e.g. 148 °C/ 298.4 °F , 2 h). Thermoreactors from WTW are equipped with appropriate programs. Crack tests are available for digestion of heavy metal and total nitrogen (***see WTW Product Details).***

The specifications for DIN/ISO/EN/US EPA are mentioned in the WTW Product Details.

Reagent-free Tests

% transmittance
0 – 100 % T, 10, 20, 50 mm cuvette (self-absorption).

FAU turbidity
(EN ISO 7027) Determination of turbidity
Turbidity is caused in liquids by suspended particles. These undissolved finely dispersed particles can be measured by the resulting reduction of light intensity when either passing through the liquid, or by scattered light.
According to EN ISO 7027, all instruments that measure at 860 nm are suitable. The results are given in FAU units (Formazin Attenuation Units) for a measurement with light passing through at 180°.

Extinction / Absorbance
According to the Lambert-Beer law, the extinction $E=\varepsilon(\lambda)\cdot c\cdot d$ is proportional to the concentration of substances contained in the water. The proportionality constant $\varepsilon(\lambda)$ depends on the wavelength. These constants, and other data required for the determination of water parameters, are stored in contemporary photometers as method data. The basic quantity measured is and remains the extinction.

Coloration
(EN ISO 7887: 1994)
If pure water is observed in transmitted light it appears to have a weak blue coloration. This coloration can change in the presence of contaminants to form a wide range of colorations. Natural waters usually have a yellow-brown color due to iron or clay particles or humic matter. (A green coloration can be produced by algae.) The "true" color of water is determined after filtration through a 0.45 µm filter.
Normally, most yellow-brown waters and the outflows of municipal sewage treatment plants can be measured at 436 nm. The outflows of industrial wastewater treatment plants show no sharp and distinctive extinction maxima. For the investigation of such water it is obligatory to measure at 436 nm (mercury line); the two other measuring wavelengths 525 nm and 620 nm can, depending on the filter used, vary slightly from these wavelengths. For discontinuous measurements the standard permits the use of filter photometers with a spectral bandwidth of < 20 nm for measurements at 436 nm, 525 nm and 620 nm. Thus, instruments with 445 nm and 520 nm interference filters with a bandwidth of 10 nm are also suitable. For comparability with the standard methods, however, a spectrophotometer is required. The results are presented in m^{-1} together with the measuring wavelength, spectral bandwidth, water temperature and pH.
In some publications the result is given in DFZ (translucent coloration number), which is identical with the m^{-1} result.
(DIN ISO 6271: 19988)
To determine the color of clear liquids, the color number with the platinum-cobalt scale (Hazen color number, APHA color number) is used. Spectrophotometers are mentioned as being suitable for measuring the stock solutions at 430 nm, 455 nm, 480 nm and 510 nm. According to the standard, the measurement itself is carried out with a color comparator that allows a visual comparison.

Chrome-plating bath
Reagent-free measurement of the self-coloration of an electroplating bath: 5 ml of the sample are pipetted into a 100 ml volumetric flask, filled up to the mark with distilled water and mixed well. 4 ml of the diluted sample are pipetted into a 100 ml volumetric flask, filled up to the mark with distilled water and mixed well. 5 ml of the 1:500 dilution are placed in a screw-cap glass and 5 ml 40% sulfuric acid are added. The glass is sealed and the contents mixed well. The solution is transferred into a rectangular cuvette for the measurement.

Nickel-plating bath
Reagent-free measurement of the self-coloration of an electroplating bath: 5 ml of the sample are pipetted into a round cuvette and 5 ml 40% sulfuric acid are added. The cuvette is sealed and the contents mixed. The solution is transferred into a rectangular cuvette for the measurement.

Copper-plating bath
Reagent-free measurement of the self-coloration of an electroplating bath: 25 ml of the sample are pipetted into a 100 ml volumetric flask, filled up to the mark with distilled water and mixed well. 5 ml of the diluted sample are placed in a screw-cap glass and 5 ml 40% sulfuric acid are added. The glass is sealed and the contents mixed well. The solution is transferred into a rectangular cuvette for the measurement.

SAC – Spectral Absorption Coefficient
The spectral absorption coefficient generally known as SAC (unit:1/m) and measured photometrically being the sum of dissolved organic water components: In drinking water, the SAC is commonly measured at a wavelength of 436 nm; within the wastewater industry at 254 nm. A separation has to be made between clear and turbid samples. It has to be considered that the determination as a sum parameter can only be applied usefully when assuming that the composition of the water content is not subject to extreme variations. SAC methods are available as part of the photoLab® 6000 series.