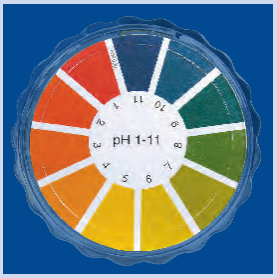
Rapid Tests

Water Analysis

Test papers and test strips







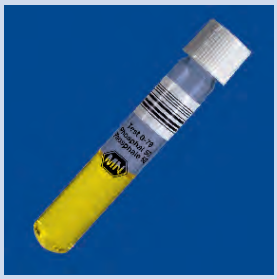
Colorimetric and titrimetric test kits







Photometric water analysis and IQC







Customer service

We are pleased to advise you!

If you have any questions concerning our program of rapid tests, or if you are looking for solutions to a special application, please feel free to contact us:

Technical support and customer service	+49 24 21 / 969-332
	csc@mn-net.com
Product management Water Analysis	+49 24 21 / 969-166
Product management Filtration and Rapid Tests	+49 24 21 / 969-166

Visit our Water Analysis pages: ***www.mn-net.com***



How to contact us:

Germany and world-wide

Tel.	+49 24 21 / 969-0
Fax	+49 24 21 / 969-199 or -198
E-Mail	sales@mn-net.com

Switzerland

Tel.	+41 62 388 55 00
Fax	+41 62 388 55 05
E-Mail	sales-ch@mn-net.com

France

Tel.	+33 388 68 22 68
Fax	+33 388 51 76 88
E-Mail	sales-fr@mn-net.com

Rapid Tests from MACHEREY-NAGEL

New products

Test papers

QUANTOFIX® Nitrate 100 ..... **28**

VISOCOLOR®

***VISOCOLOR® ECO* Chlorine 1** **61**

***VISOCOLOR® ECO* Silica HR** **70**

VISOCOLOR® FISH **77**



***VISOCOLOR®* analysis case for soil analysis with PF-3 Soil** **78**



Compact photometer PF-12*Plus* **80**

Compact photometer PF-3 Drinking water / Soil / COD **86**

NANOCOLOR®

***NANOCOLOR*® $^{UV}/_{VIS}$ II** **94**



***NANOCOLOR*® total Chromium 2** **115**
***NANOCOLOR*® Hardness Ca / Mg** **120**
***NANOCOLOR*® Nickel 4** **123**



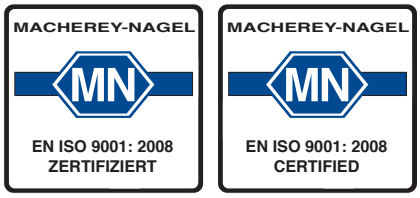
***NANOCOLOR*® analysis cases** **134**

Rapid Tests from MACHEREY-NAGEL

Approved

Certified in accordance to EN ISO 9001:2008

Our certified quality system and consistent quality standards assure products with constant high quality.



Competent

Over 100 years of experience

For over 100 years MACHEREY-NAGEL has been manufacturing test papers in Germany, controlling the entire value chain from R&D to after sales service. Over this time, our experience and our love for our products has resulted in satisfied customers all over the world. With our state of the art technology and proven products, MACHEREY-NAGEL customers are prepared to meet any analytical challenge in the future.

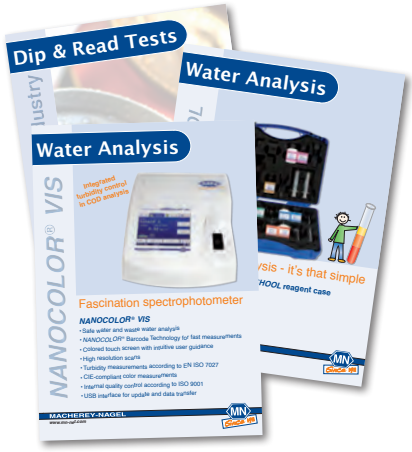


Extensive technical support

In addition to high quality products, customer care and service is core factor of MACHEREY-NAGEL's success. Our highly educated and trained customer service representatives, both in the field and in our service centers provide friendly expert help for any technical question you may have. We will be more than happy to support you in finding a solution for your analytical challenge.

Free product information, flyers and seminars

We provide a wide range of information on our products, ranging from detailed instructions, flyers and brochures with background information to additional sources on our web page. Additionally, we offer seminars in Germany and many other parts of the world – of course free of charge. Thus, customers can stay up to date of recent developments and gain a high level of expertise in their analytical work.



Informative

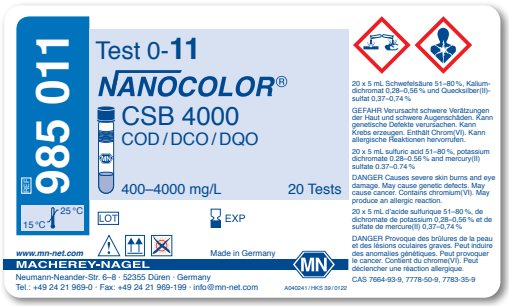
Material safety data sheets (reach conform)

Already, MACHEREY-NAGEL complies to the new GHS labeling on many of our products and you can get all relevant MSDS online, also in new GHS format free of charge. Just go to ***www.mn-net.com/MSDS*** and download the information you need.

Clear labelling of products

All our products that contain hazardous substances are of course labeled with all required information in accordance to international classification and labeling standards. You will even find many products that already comply to the new GHS labeling (1272/2008/EC). Thus, customers can feel confident to know all necessary details about the products they work with, which makes using MACHEREY-NAGEL products especially safe and convenient.

In addition, we supply you with all other necessary information on the product, such as storage conditions, shelf life, lot numbers and disposal advice, to provide you with the highest level of safety and comfort.



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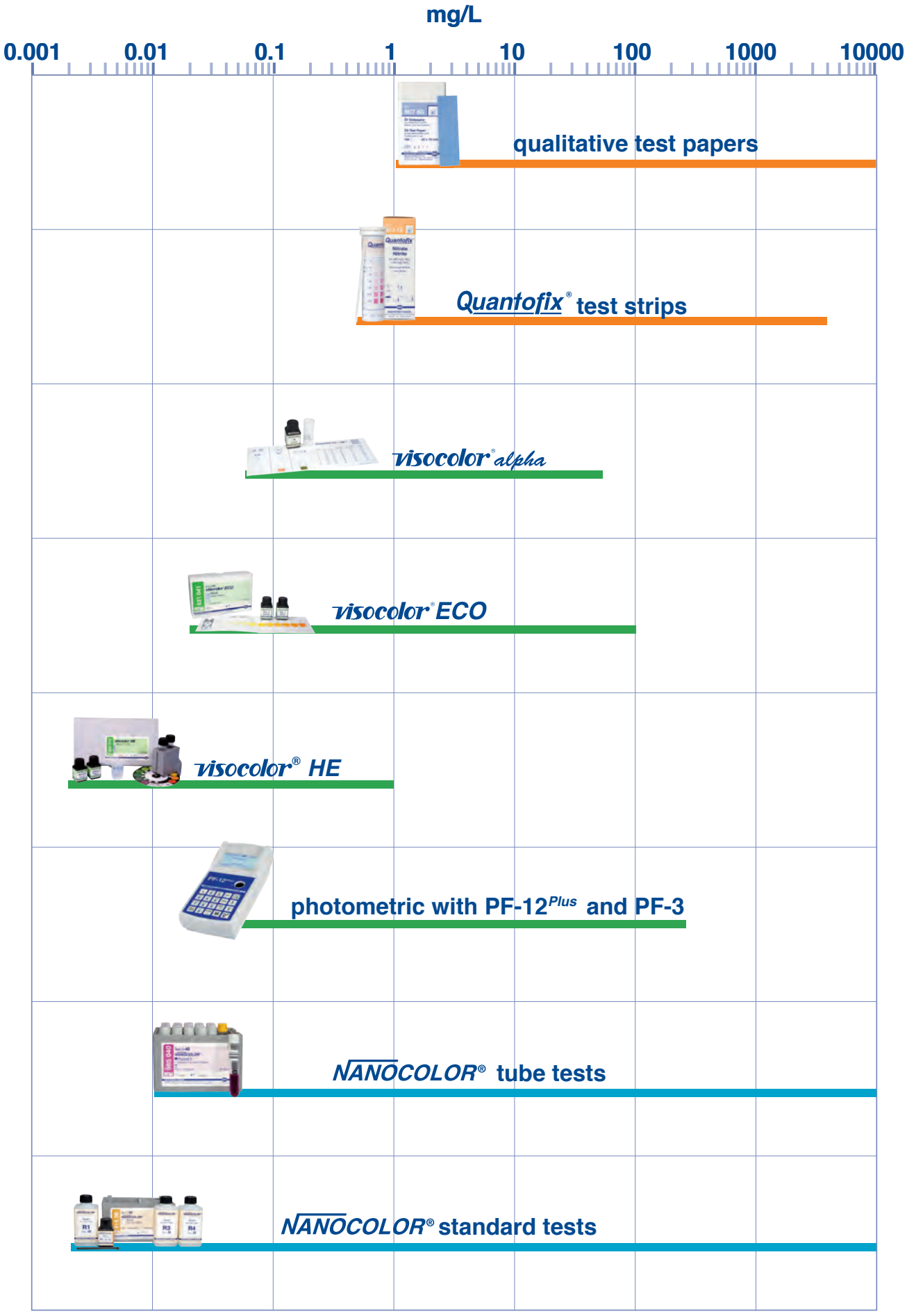
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Rapid Tests from MACHEREY-NAGEL

Ranges of application



Applications

Agriculture and floriculture (soil analysis)



	Copper
	Cyanide
	Hardness
	Iron
	Magnesium
	Nitrate
Ammonium	Nitrite
Calcium	pH
Carbonate hardness	Phosphate
Chloride	Potassium
Chlorine	

Aquaculture and fish farming



	Hardness
	Iron
	Magnesium
	Manganese
	Nitrate
	Nitrite
Ammonium	Oxygen
Calcium	pH
Carbonate hardness	Phosphate
Cyanide	Sulfide

Boiler feed water



	Hydrazine
	Iron
	Magnesium
	Oxygen
	pH
	Phosphate
Calcium	Residual hardness
Carbonate hardness	Silica
Chloride	Sulfate
Copper	Sulfite
DEHA	Zinc
Hardness	

Breweries



	Copper
	Detergents
	Hardness
	Hydrazine
	Iron
	Magnesium
Alkalinity	Manganese
Aluminum	Nitrate
Ammonium	Nitrite
Calcium	pH
Carbonate hardness	Phosphate
Chloride	Residual hardness
Chlorine	Sulfate

Cement and concrete production



	Carbonate hardness
	Chloride
	Chromium / Chromate
	Hardness
	Magnesium
	Nitrate
Ammonium	pH
Calcium	Sulfate

Chemical industry



	Hardness
	Hydrazine
	Iron
	Magnesium
	Manganese
	Nickel
Alkalinity	Nitrate
Ammonium	Nitrite
Calcium	Oxygen
Carbonate hardness	pH
Chloride	Phosphate
Chlorine	Potassium
Chromium / Chromate	Residual hardness
Copper	Silica
Cyanide	Sulfate
DEHA	Sulfide
Detergents	Sulfite
Fluoride	Zinc

Rapid Tests from MACHEREY-NAGEL

Applications

Cooling water



	Hardness
	Iron
	Magnesium
	Manganese
	Nitrate
	pH
Calcium	Phosphate
Carbonate hardness	Residual hardness
Chloride	Sulfate
Chlorine	

Drinking water



	Copper
	Cyanide
	Fluoride
	Hardness
	Iron
	Magnesium
Aluminum	Manganese
Ammonium	Nickel
Calcium	Nitrate
Carbonate hardness	Nitrite
Chloride	pH
Chlorine	Sulfate
Chromium / Chromate	

Electroplating industry



	Copper
	Cyanide
	Iron
	Nitrate
	Nitrite
	pH
Aluminum	Phosphate
Ammonium	Sulfate
Calcium	Sulfide
Chloride	Sulfite
Chlorine	Zinc
Chromium / Chromate	

Food and beverage industries



	Fluoride
	Hardness
	Iron
	Magnesium
	Manganese
	Nitrate
Aluminum	Nitrite
Ammonium	pH
Calcium	Phosphate
Carbonate hardness	Residual hardness
Chloride	Sulfate
Chlorine	Sulfide
Chromium / Chromate	Sulfite
Copper	Zinc
Cyanide	

Industrial waste water



	Detergents
	Iron
	Manganese
	Nitrate
	Nitrite
	Oxygen
Aluminum	pH
Ammonium	Phosphate
Choride	Sulfate
Chlorine	Sulfide
Chromium / Chromate	Sulfite
Copper	Zinc
Cyanide	

Leather industry



	Hardness
	Iron
	Magnesium
	Manganese
	Nitrate
	pH
Ammonium	Phosphate
Calcium	Residual hardness
Chloride	Sulfate
Chromium	

Applications

Metal processing industry



	Detergents
	Iron
	Manganese
	Nickel
	Nitrate
	Nitrite
Aluminum	pH
Ammonium	Phosphate
Chloride	Silver
Chlorine	Sulfate
Chromium / Chromate	Sulfide
Cyanide	Sulfite
Copper	Zinc

Milk industry



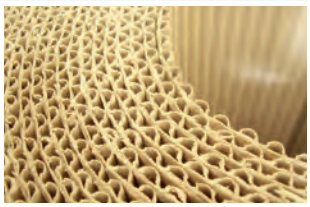
	Hardness
	Iron
	Magnesium
	Manganese
	Nitrate
	pH
Calcium	Phosphate
Carbonate hardness	Residual hardness
Chloride	Sulfate
Chlorine	

Municipal waste water



	COD
	Nitrate
	Nitrite
	total Nitrogen
	pH
Ammonium	Phosphate
BOD_5	TOC

Paper industry



	Carbonate hardness
	Chlorine
	Hardness
	Magnesium
	pH
	Residual hardness
Calcium	

Photo industry



	Chromium / Chromate
	Copper
	Cyanide
	Detergents
	Hardness
	Iron
Alkalinity	Magnesium
Calcium	Nitrite
Carbonate hardness	Oxygen
Chloride	pH
Chlorine	

Pool and spa care



	Ammonium
	Bromine
	Carbonate Hardness
	Chlorine
	Cyanuric acid
	pH
Aluminum	

Surface water and sea water



	Hardness
	Iron
	Magnesium
	Manganese
	Nickel
	Nitrate
Aluminum	Nitrite
Ammonium	Oxygen
Calcium	pH
Carbonate hardness	Phosphate
Chloride	Residual hardness
Chlorine	Sulfate
Cyanide	Sulfide
Detergents	Zinc

Textile industry



	Chromium / Chromate
	Copper
	Hardness
	Magnesium
	Nickel
	pH
Aluminum	Potassium
Alkalinity	Residual hardness
Calcium	Sulfide
Carbonate hardness	Sulfite
Chlorine	Zinc

Test strips and test papers

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Test strips and test papers

pH-Fix test strips

Unmatched pH testing enjoyment



Fast results

pH-Fix test strips allow fast pH testing directly at the point of interest. The easy Dip & Read procedure provides a reliable result within 10 seconds. Provided with a complete high quality color chart, pH-Fix does not need calibration and is immediately ready for use.

Patented color fixed indicator

The patented pH-Fix technology ensures optimal usability of the test strips. During production, the indicator is fixed to the test paper. The dye does not wash out so clothes stay clean and samples remain pure.

Easy and safe

For careful testing of dangerous, poisonous or aggressive liquids, pH-Fix test strips have the optimal design. The long plastic handle effectively protects the user from contact with the sample.

PEHANON®

Ideal pH test for colored samples



Accurate pH values

PEHANON® is a special pH test strip that unifies the pH indicator and the color chart on one strip. Any sample color has the same effect on both, the reference colors and the reactive pad. This ensures unadulterated and accurate readings in colored solutions.

Safe use

An invisible hydrophobic barrier just above the top color field prevents capillary action of the test solution beyond. The handle remains dry and clean. The user is safely protected from the sample.

Economic test

PEHANON® allows the pH determination without a separate color chart. Workers and machinists can use single strips instead of complete packs, which makes this test ideal for occasions, where many people have to perform the test in different locations.

pH indicator papers

Standard pH testing



pH indicator paper reels · general purpose pH determination

pH indicator papers have been on the market for decades and are the appreciated standard for many applications. For each pH value these papers show a single color which can be matched with the color scale at intervals of 0.2–1 pH unit.

Duotest · improved accuracy

These indicator papers show two different colors for each pH value at intervals of 0.3–1 pH unit. This allows more accurate reading and good estimation of intermediate values.

Tritest · most precise pH determination

For most precise reading, these papers show three different colors for each full pH unit. This ensures optimal color differences and allows good estimation of intermediate values.

Test strips and test papers

QUANTOFIX® test strips

Dip & Read tests for many substances

Fast results

QUANTOFIX® tests can be used for a large variety of different substances. In most cases, an easy Dip & Read procedure provides reliable results in 10–120 seconds.

Easy to use

All QUANTOFIX® tests are ready to use kits. They are calibrated and contain all necessary equipment and reagents. As “lab in the pocket” they are easy to use for professional analysts as well as chemical laymen.

Precise readings

The color charts are adjusted and checked using certified standard solutions. The user can be sure to receive accurate readings whenever he tests.



QUANTOFIX® Relax test strip reader

Perfect vision – exact results

Highest precision

The QUANTOFIX® Relax test strip reader is a revolutionary step in test strip analysis. The system provides users with entirely quantitative results across the complete measuring range, leading to higher accuracy and no in-between value guesswork. Thus customers can assure and back-up their decision making.

Objective results

The system is not influenced by external lighting conditions or human color perception. Therefore, the QUANTOFIX® Relax can generate reproducible results independent of the operator. So, working with the system increases reliability and comfort.

Easy result administration

The QUANTOFIX® Relax offers easy data storage and immediate print-outs using the inbuilt printer. Data can be easily transferred to a computer as well, thus providing a complete package for efficient, quick and comfortable data administration. Hence, the QUANTOFIX® Relax helps customers to document results easily while saving time in order to focus on their core business.



OEM-presentation

High quality products customized to your needs

Good quality – good image

Our partners highly appreciate private label products that boost the awareness for their business. The high quality of our products combined with the brand name of our partner build an invincible basis for success.

Easy creation of branded artwork

Our professional in-house design group creates private label artwork that meets and often exceeds the highest expectations. This ensures the consistent high quality of the finished goods and makes creating your own brand as easy as 1-2-3.

Successful none-compete products

We produce OEM tests for many different markets. Based on a close cooperation with our partners we convert their ideas with our underlying technology into optimum solutions. Together, we develop unique, innovative products that are highly profitable.

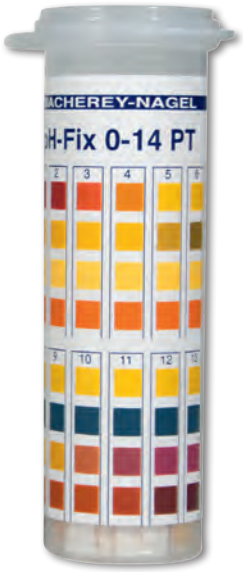


pH indicator papers

pH-Fix

pH-Fix – Unmatched pH test strips





pH-determination quick, easy, safe

With pH-Fix test strips, you can test the pH value quickly and easily directly at the point of interest. The strips are ready to use at any time and don't need any calibration, set-up or maintenance. Therefore, pH determination with pH-Fix test strips is very easy, regardless of your experience or chemical background.

Safe analysis by long plastic handle

The long plastic handle safely protects you from coming into contact with the sample. Thus, testing toxic, dangerous or aggressive substances is safely possible.

Several test pads for exact results

pH-Fix indicator test strips feature up to 4 different indicator pads that cover the whole pH range from 0–14. You can chose from a total of 14 different measuring ranges to find the ideal strip for your application. The brilliant color scale is optimally matched and aligned to the test pads on the strips, resulting in quick, easy and safe pH determination.

No bleeding due to color bounded indicator dyes

In contrast to common indicator papers, the indicator dyes in pH-Fix test strips are chemically bound to the test pads. This patented technology safely prevents bleeding of dyes into the sample, even in highly alkaline solutions. Your sample is not contaminated by indicator dyes. Consequently, you can use the solution for further analysis.

The special non-bleeding technology provides additional benefits for you:

- Even in weakly buffered solutions, a safe and reliable pH determination becomes possible, as the strips can be immersed for a long time until the final reaction color has developed
- The colors of the individual test pads don't bleed and mix, which assures exact comparison to the color scale
- Your sample is not contaminated by indicator dyes



Long plastic handle



Brilliant color scale



No bleeding

Redesigned packages for easy handling

Smart corner

The corner prevents jamming of test strips when closing the cover. The user enjoys a maximum of comfort. By simply skew hold the test strips fall into the smart corner and don´t get jammed. The classic flat box can be concluded easily.

PlopTop tubes - clever packaging for our best seller

The specially engineered PlopTop tubes can be opened and closed with just your thumb. Thus, working with pH-Fix becomes even more comfortable and easier. Design and material guarantee a high degree of stability. The tube is virtually unbreakable and stands firmly on any surface. As the tube is higher than the length of the strips, jamming of test strips when closing the tube are effectively prevented. Thus, you can easily close the tube at any time.







pH indicator papers

pH-Fix

CE-mark for medical applications

Some pH-Fix test strips are tested and approved for medical applications and carry a CE-mark for in-vitro-diagnostics 98/79/EG or medical products 93/42/EWG. They meet the special demands of health care professionals and ensure safe results for medical pH-testing.

ISO 13485 certified

As a medical device manufacturer, MACHEREY-NAGEL is certified according to the medical device directive ISO 13485. We are among the few manufacturers that can offer pH-tests with CE-mark for professional use as well as for patient self testing.

Easy determination of body acidity

The urine pH-value generally reflects the personal diet but can also be influenced by a large variety of medications available from different manufacturers.

Checking pH of gastric juice

Aspirate obtained after placing a nasogastric tube must be acidic. The pH is checked to ensure the correct placement of the nasogastric tube prior to the administration of feed or medication.

pH-control during pregnancy

A change in vaginal pH-value is an indicator for bacterial infection. During pregnancy, such infection may untreated lead to premature birth.

Quick-check of dialyzer reuse

Acid containing reagents are used for the disinfection of dialyzers. pH-Fix 3.6–6.1 is an easy and reliable tool to ensure, that the cleaning agent is completely rinsed out prior to the next use.

pH-Fix products according to the IVD directive 98/79/EG:

pH-Fix 4.5–10.0	for pH determination of urine, as well suitable for self-testing
pH-Fix 4.5–10.0 PT and pH-Fix 2.0–9.0	for pH determination of gastric juice
pH-Fix 3.1–8.3	for pH determination of saliva
pH-Fix 3.6–6.1 and pH-Fix 3.6–6.1 PT	for pH determination of vaginal secretion

pH-Fix products according to the directive for medical products 93/42/EWG:

pH-Fix 3.6–6.1 and pH-Fix 3.6–6.1 PT: for pH determination of rinsing solution after the disinfection of dialyzers



Ordering information

Test	Gradation	REF
Classic flat box with 100 test strips 6 x 85 mm		
pH-Fix 0–14	0 · 1 · 2 · 3 · 4 · 5 · 6 · 7 · 8 · 9 · 10 · 11 · 12 · 13 · 14	**921 10**
pH-Fix 0.0–6.0	0 · 0.5 · 1.0 · 1.5 · 2.0 · 2.5 · 3.0 · 3.5 · 4.0 · 4.5 · 5.0 · 5.5 · 6.0	**921 15**
pH-Fix 2.0–9.0 CE [2]	2.0 · 2.5 · 3.0 · 3.5 · 4.0 · 4.5 · 5.0 · 5.5 · 6.0 · 6.5 · 7.0 · 7.5 · 8.0 · 8.5 · 9.0	**921 18**
pH-Fix 4.5–10.0 CE [1]	4.5 · 5.0 · 5.5 · 6.0 · 6.5 · 7.0 · 7.5 · 8.0 · 8.5 · 9.0 · 9.5 · 10.0	**921 20**
pH-Fix 6.0–10.0	6.0 · 6.4 · 6.7 · 7.0 · 7.3 · 7.6 · 7.9 · 8.2 · 8.4 · 8.6 · 8.8 · 9.1 · 9.5 · 10.0	**921 22**
pH-Fix 7.0–14.0	7.0 · 7.5 · 8.0 · 8.5 · 9.0 · 9.5 · 10.0 · 10.5 · 11.0 · 11.5 · 12.0 · 12.5 · 13.0 · 13.5 · 14.0	**921 25**
pH-Fix 0.3–2.3	0.3 · 0.7 · 1.0 · 1.3 · 1.6 · 1.9 · 2.3	**921 80**
pH-Fix 1.7–3.8	1.7 · 2.0 · 2.3 · 2.6 · 2.9 · 3.2 · 3.5 · 3.8	**921 90**
pH-Fix 3.1–8.3 CE [3]	3.1 · 3.5 · 3.9 · 4.3 · 4.7 · 5.1 · 5.5 · 5.9 · 6.3 · 6.7 · 7.1 · 7.5 · 7.9 · 8.3	**921 35**
pH-Fix 3.6–6.1 CE [4] [5]	3.6 · 4.1 · 4.4 · 4.7 · 5.0 · 5.3 · 5.6 · 6.1	**921 30**
pH-Fix 5.1–7.2	5.1 · 5.4 · 5.7 · 6.0 · 6.3 · 6.6 · 6.9 · 7.2	**921 40**
pH-Fix 6.0–7.7	6.0 · 6.4 · 6.7 · 7.0 · 7.3 · 7.7	**921 50**
pH-Fix 7.5–9.5	7.5 · 7.9 · 8.2 · 8.4 · 8.6 · 8.8 · 9.1 · 9.5	**921 60**
pH-Fix 7.9–9.8	7.9 · 8.3 · 8.6 · 8.9 · 9.1 · 9.4 · 9.8	**921 70**
PlopTop tube with 100 test strips 6 x 85 mm		
pH-Fix 0–14 PT	0 · 1 · 2 · 3 · 4 · 5 · 6 · 7 · 8 · 9 · 10 · 11 · 12 · 13 · 14	**921 11**
pH-Fix 3.6–6.1 PT CE [4] [5]	3.6 · 4.1 · 4.4 · 4.7 · 5.0 · 5.3 · 5.6 · 6.1	**921 31**
pH-Fix 4.5–10.0 PT CE [2]	4.5 · 5.0 · 5.5 · 6.0 · 6.5 · 7.0 · 7.5 · 8.0 · 8.5 · 9.0 · 9.5 · 10.0	**921 21**

CE: Authorised for pH determination of
[1] urine [2] gastric juice [3] saliva [4] vaginal secretion after IVD directive 98/79/EG
[5] rinsing solution after disinfection of dialyzers according to the directive for medical products 93/42/EWG

pH indicator papers

PEHANON®

PEHANON® – pH measurement in colored samples

PEHANON® is a special pH indicator test strip that unifies the pH indicator and the reference colors on one strip and has the following benefits:

Any sample color has the same effect on both the reference colors and the reactive pad. This ensures unadulterated readings in colored solutions. The user can be sure to get accurate pH values.

An invisible hydrophobic barrier just above the top color field prevents capillary action of the test solution beyond. The handle will remain dry and clean whatever the sample is. This makes using the strip very safe.

pH values can be determined without a separate color chart. Workers and machinists can use single strips instead of complete packs with color chart, which makes PEHANON® economic.

Ordering information

Test	Gradation	Presentation	REF
PEHANON® 1–12	1 · 2 · 3 · 4 · 5 · 6 · 7 · 8 · 9 · 10 · 11 · 12	200 strips 11 x 100 mm	**904 01**
PEHANON® 0–1.8	0 · 0.3 · 0.6 · 0.8 · 1.0 · 1.2 · 1.5 · 1.8	200 strips 11 x 100 mm	**904 11**
PEHANON® 1.0–2.8	1.0 · 1.3 · 1.6 · 1.8 · 2.0 · 2.2 · 2.5 · 2.8	200 strips 11 x 100 mm	**904 12**
PEHANON® 1.8–3.8	1.8 · 2.1 · 2.4 · 2.7 · 3.0 · 3.2 · 3.5 · 3.8	200 strips 11 x 100 mm	**904 13**
PEHANON® 2.8–4.6	2.8 · 3.1 · 3.4 · 3.6 · 3.8 · 4.0 · 4.3 · 4.6	200 strips 11 x 100 mm	**904 14**
PEHANON® 3.8–5.5	3.8 · 4.0 · 4.2 · 4.4 · 4.6 · 4.9 · 5.2 · 5.5	200 strips 11 x 100 mm	**904 15**
PEHANON® 4.0–9.0	4.0 · 4.5 · 5.0 · 5.5 · 6.0 · 6.5 · 7.0 · 7.5 · 8.0 · 8.5 · 9.0	200 strips 11 x 100 mm	**904 24**
PEHANON® 5.2–6.8	5.2 · 5.5 · 5.7 · 5.9 · 6.1 · 6.3 · 6.5 · 6.8	200 strips 11 x 100 mm	**904 16**
PEHANON® 6.0–8.1	6.0 · 6.3 · 6.6 · 6.9 · 7.2 · 7.5 · 7.8 · 8.1	200 strips 11 x 100 mm	**904 17**
PEHANON® 7.2–8.8	7.2 · 7.4 · 7.6 · 7.8 · 8.0 · 8.2 · 8.5 · 8.8	200 strips 11 x 100 mm	**904 19**
PEHANON® 8.0–9.7	8.0 · 8.2 · 8.4 · 8.6 · 8.8 · 9.1 · 9.4 · 9.7	200 strips 11 x 100 mm	**904 20**
PEHANON® 9.5–12.0	9.5 · 10.0 · 10.5 · 11.0 · 11.5 · 12.0	200 strips 11 x 100 mm	**904 21**
PEHANON® 10.5–13.0	10.5 · 11.0 · 11.5 · 12.0 · 12.5 · 13.0	200 strips 11 x 100 mm	**904 22**
PEHANON® 12.0–14.0	12.0 · 12.5 · 13.0 · 13.5 · 14.0	200 strips 11 x 100 mm	**904 23**

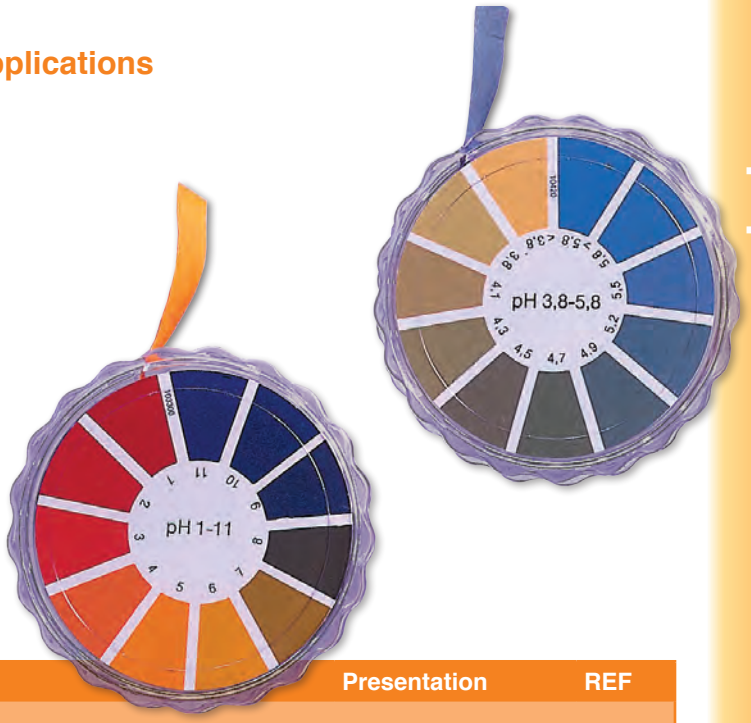


pH indicator papers – standard for many applications

pH indicator papers have been on the market for decades and are the standard for many applications. For each pH value these papers show a single color which can be matched with the color scale at intervals of 0.2–1 pH.

The characteristic features of pH indicator papers are:

- pH indicators are supplied in plastic reels that ensure long-term stability and protection against many external influences. The indicator paper will always be ready-to-use when needed.
- pH indicators are manufactured from high quality filter papers from MACHEREY-NAGEL. Combined with our ISO 9001 quality control scheme this ensures optimal quality. The user will always get reliable readings.
- The colors of the color scales are specially mixed to perfectly match the reaction color of the indicator papers. This makes the reading of results easy and accurate.



Ordering information

Test	Gradation	Presentation	REF
Universal indicator papers			
Universal indicator paper 1–11	1 · 2 · 3 · 4 · 5 · 6 · 7 · 8 · 9 · 10 · 11	reel of 5 m x 7 mm	**902 01**
Universal indicator paper 1–11	1 · 2 · 3 · 4 · 5 · 6 · 7 · 8 · 9 · 10 · 11	refill pack of 3 reels	**902 02**
Universal indicator paper 1–11	1 · 2 · 3 · 4 · 5 · 6 · 7 · 8 · 9 · 10 · 11	booklet of 100 strips 10 x 70 mm	**902 03**
Universal indicator paper 1–14	1 · 2 · 3 · 5 · 6 · 7 · 8 · 9 · 10 · 12 · 14	reel of 5 m x 7 mm	**902 04**
Universal indicator paper 1–14	1 · 2 · 3 · 5 · 6 · 7 · 8 · 9 · 10 · 12 · 14	refill pack of 3 reels	**902 24**
Special indicator papers			
Special indicator paper 0.5–5.5	0.5 · 1.0 · 1.5 · 2.0 · 2.5 · 3.0 · 3.5 · 4.0 · 4.5 · 5.0 · 5.5	reel of 5 m x 7 mm	**902 05**
Special indicator paper 0.5–5.5	0.5 · 1.0 · 1.5 · 2.0 · 2.5 · 3.0 · 3.5 · 4.0 · 4.5 · 5.0 · 5.5	refill pack of 3 reels	**902 25**
Special indicator paper 3.8–5.8	<3.8 · 3.8 · 4.1 · 4.3 · 4.5 · 4.7 · 4.9 · 5.2 · 5.5 · 5.8 · >5.8	reel of 5 m x 7 mm	**902 06**
Special indicator paper 3.8–5.8	<3.8 · 3.8 · 4.1 · 4.3 · 4.5 · 4.7 · 4.9 · 5.2 · 5.5 · 5.8 · >5.8	refill pack of 3 reels	**902 26**
Special indicator paper 4.0–7.0	4.0 · 4.3 · 4.6 · 4.9 · 5.2 · 5.5 · 5.8 · 6.1 · 6.4 · 6.7 · 7.0	reel of 5 m x 7 mm	**902 07**
Special indicator paper 4.0–7.0	4.0 · 4.3 · 4.6 · 4.9 · 5.2 · 5.5 · 5.8 · 6.1 · 6.4 · 6.7 · 7.0	refill pack of 3 reels	**902 27**
Special indicator paper 5.4–7.0	<5.4 · 5.4 · 5.7 · 6.0 · 6.2 · 6.4 · 6.7 · 7.0 · >7.0	reel of 5 m x 7 mm	**902 08**
Special indicator paper 5.4–7.0	<5.4 · 5.4 · 5.7 · 6.0 · 6.2 · 6.4 · 6.7 · 7.0 · >7.0	refill pack of 3 reels	**902 28**
Special indicator paper 5.5–9.0	5.5 · 6.0 · 6.5 · 7.0 · 7.5 · 8.0 · 8.5 · 9.0	reel of 5 m x 7 mm	**902 09**
Special indicator paper 5.5–9.0	5.5 · 6.0 · 6.5 · 7.0 · 7.5 · 8.0 · 8.5 · 9.0	refill pack of 3 reels	**902 29**
Special indicator paper 6.4–8.0	<6.4 · 6.4 · 6.6 · 6.8 · 7.0 · 7.2 · 7.4 · 7.6 · 7.8 · 8.0 · >8.0	reel of 5 m x 7 mm	**902 10**
Special indicator paper 6.4–8.0	<6.4 · 6.4 · 6.6 · 6.8 · 7.0 · 7.2 · 7.4 · 7.6 · 7.8 · 8.0 · >8.0	refill pack of 3 reels	**902 30**
Special indicator paper 7.2–9.7	<7.2 · 7.2 · 7.5 · 7.8 · 8.1 · 8.4 · 8.7 · 9.0 · 9.3 · 9.7 · >9.7	reel of 5 m x 7 mm	**902 11**
Special indicator paper 7.2–9.7	<7.2 · 7.2 · 7.5 · 7.8 · 8.1 · 8.4 · 8.7 · 9.0 · 9.3 · 9.7 · >9.7	refill pack of 3 reels	**902 31**
Special indicator paper 8.0–10.0	8.0 · 8.2 · 8.4 · 8.7 · 9.0 · 9.2 · 9.6 · 10.0	reel of 5 m x 7 mm	**902 12**
Special indicator paper 8.0–10.0	8.0 · 8.2 · 8.4 · 8.7 · 9.0 · 9.2 · 9.6 · 10.0	refill pack of 3 reels	**902 32**
Special indicator paper 9.0–13.0	9.0 · 9.5 · 10.0 · 10.5 · 11.0 · 11.5 · 12.0 · 12.5 · 13.0	reel of 5 m x 7 mm	**902 13**
Special indicator paper 9.0–13.0	9.0 · 9.5 · 10.0 · 10.5 · 11.0 · 11.5 · 12.0 · 12.5 · 13.0	refill pack of 3 reels	**902 33**
Special indicator paper 12.0–14.0	12.0 · 12.5 · 13.0 · 13.5 · 14.0	reel of 5 m x 7 mm	**902 14**
Special indicator paper 12.0–14.0	12.0 · 12.5 · 13.0 · 13.5 · 14.0	refill pack of 3 reels	**902 34**
Multipacks			
pH-Set U-10	Box with 10 different reels of pH indicator paper (2 reels pH 1–11 and 1 reel each of pH 0.5–5.5; pH 3.8–5.8; pH 5.4–7.0; pH 5.5–9.0; pH 6.4–8.0; pH 8.0–10.0; pH 9.0–13.0; pH 12.0–14.0)		**902 19**
TRI-BOX	Plastic dispenser with 3 reels of special indicator paper each (1 reel each of pH 0.5–5.5; pH 5.5–9.0; pH 9.0–13.0)		**902 18**

pH indicator papers

Duotest and Tritest

Duotest – two indicator zones for higher accuracy

Duotest indicator paper features two different indicator zones on one single paper. The zones are separated by a hydrophobic barrier, which effectively prevents mixing of the reaction colors and increases mechanical stability. Clear color differences allow you to safely estimate intermediate values, which in turn increases measurement accuracy.

Tritest – three indicator zones for highest precision

Tritest indicator paper has three different indicator zones on one single paper. The three zones guarantee optimal color differences and safe determination of in-between values. Tritest indicator papers are available for a pH range from 1–11 and feature 1 pH unit increments.

Two options are available:

a) Tritest in a reel (without hydrophobic barrier)
Width 10 mm, three indicator zones right next to each other, no partition

b) Tritest L in a reel (with 2 hydrophobic barriers)
Width 14 mm, three indicator zones, separated by two hydrophobic barriers. Even in strongly alkaline solutions, the colors of the zones do not mix.



Ordering information

Test	Gradation	Presentation	REF
Duotest			
Duotest 1–12	1 · 2 · 3 · 4 · 5 · 6 · 7 · 8 · 9 · 10 · 11 · 12	reel of 5 m x 10 mm	**903 01**
Duotest 1–12	1 · 2 · 3 · 4 · 5 · 6 · 7 · 8 · 9 · 10 · 11 · 12	refill pack of 3 reels	**903 11**
Duotest 1.0–4.3	1.0 · 1.3 · 1.6 · 1.9 · 2.2 · 2.5 · 2.8 · 3.1 · 3.4 · 3.7 · 4.0 · 4.3	reel of 5 m x 10 mm	**903 02**
Duotest 1.0–4.3	1.0 · 1.3 · 1.6 · 1.9 · 2.2 · 2.5 · 2.8 · 3.1 · 3.4 · 3.7 · 4.0 · 4.3	refill pack of 3 reels	**903 12**
Duotest 3.5–6.8	3.5 · 3.8 · 4.1 · 4.4 · 4.7 · 5.0 · 5.3 · 5.6 · 5.9 · 6.2 · 6.5 · 6.8	reel of 5 m x 10 mm	**903 03**
Duotest 3.5–6.8	3.5 · 3.8 · 4.1 · 4.4 · 4.7 · 5.0 · 5.3 · 5.6 · 5.9 · 6.2 · 6.5 · 6.8	refill pack of 3 reels	**903 13**
Duotest 5.0–8.0	5.0 · 5.3 · 5.6 · 5.9 · 6.2 · 6.5 · 6.8 · 7.1 · 7.4 · 7.7 · 8.0	reel of 5 m x 10 mm	**903 04**
Duotest 5.0–8.0	5.0 · 5.3 · 5.6 · 5.9 · 6.2 · 6.5 · 6.8 · 7.1 · 7.4 · 7.7 · 8.0	refill pack of 3 reels	**903 14**
Duotest 7.0–10.0	7.0 · 7.3 · 7.6 · 7.9 · 8.2 · 8.5 · 8.8 · 9.1 · 9.4 · 9.7 · 10.0	reel of 5 m x 10 mm	**903 05**
Duotest 7.0–10.0	7.0 · 7.3 · 7.6 · 7.9 · 8.2 · 8.5 · 8.8 · 9.1 · 9.4 · 9.7 · 10.0	refill pack of 3 reels	**903 15**
Duotest 9.5–14.0	9.5 · 10.0 · 10.5 · 11.0 · 11.5 · 12.0 · 12.5 · 13.0 · 13.5 · 14.0	reel of 5 m x 10 mm	**903 06**
Duotest 9.5–14.0	9.5 · 10.0 · 10.5 · 11.0 · 11.5 · 12.0 · 12.5 · 13.0 · 13.5 · 14.0	refill pack of 3 reels	**903 16**
pH-Set D 10	Collection of Duotest indicator papers (2 reels of 1–12; 3.5–6.8; 5.0–8.0; 7.0–10.0; 1 reel of 1.0–4.3 and 9.5–14.0)		**903 19**
Tritest			
Tritest pH 1–11	1 · 2 · 3 · 4 · 5 · 6 · 7 · 8 · 9 · 10 · 11	reel of 5 m x 10 mm	**905 01**
Tritest pH 1–11	1 · 2 · 3 · 4 · 5 · 6 · 7 · 8 · 9 · 10 · 11	refill pack of 3 reels	**905 02**
Tritest L pH 1–11	1 · 2 · 3 · 4 · 5 · 6 · 7 · 8 · 9 · 10 · 11	reel of 6 m x 14 mm	**905 10**
Tritest L pH 1–11	1 · 2 · 3 · 4 · 5 · 6 · 7 · 8 · 9 · 10 · 11	refill pack of 3 reels	**905 11**



UNISOL liquid indicators

UNISOL are indicator solutions that are directly applied to the sample. The resulting color of the sample is compared to a color chart that is included in the kit. UNISOL indicator solutions are especially suitable for pH measurement in non-buffered samples like pure water or surface water. In these samples, other indicator papers find their limit of applicability.



Ordering information

Type	Range	Gradation	Presentation	REF
UNISOL indicator solutions				
UNISOL 410*	pH 4.0–10.0	0.5	100 mL in drop bottle, color scale,1 plastic cuvette MN 13/72	**910 02**
UNISOL 113*	pH 1.0–13.0	1.0	100 mL in drop bottle, color scale,1 plastic cuvette MN 13/72	**910 31**
UNISOL accessories				
Plastic cuvettes MN 13/72			pack of 5	**910 39**

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

Indicator papers without color scale

Simple acid / base determination

These products are simple, completely impregnated indicator papers. They indicate if the pH of solution is above or below the point of color change. They are useful to distinguish between acids and bases.



Ordering information

Test	Measuring range	Color change	Presentation	REF
Brilliant yellow paper	6.7–7.9	yellow → red	box of 200 strips 20 x 70 mm	**907 01**
Congo paper MN 816 N*	5.0–3.0	red → blue	reel of 5 m x 7 mm	**907 02**
Congo paper MN 816 N*	5.0–3.0	red → blue	refill pack of 3 reels	**907 03**
Congo paper MN 616 T*	5.0–3.0	red → blue	box of 200 strips 20 x 70 mm	**907 04**
Congo paper MN 260 HE*	5.0–3.0	red → blue	box of 200 strips 20 x 70 mm	**907 05**
Litmus paper blue	8.0–5.0	blue → red	reel of 5 m x 7 mm	**911 06**
Litmus paper blue	8.0–5.0	blue → red	refill pack of 3 reels	**911 16**
Litmus paper blue	8.0–5.0	blue → red	booklet of 100 strips 10 x 70 mm	**911 26**
Litmus paper neutral	5.0–8.0	red ← violet → blue	reel of 5 m x 7 mm	**911 07**
Litmus paper neutral	5.0–8.0	red ← violet → blue	refill pack of 3 reels	**911 17**
Litmus paper neutral	5.0–8.0	red ← violet → blue	booklet of 100 strips 10 x 70 mm	**911 27**
Litmus paper red	5.0–8.0	red → blue	reel of 5 m x 7 mm	**911 08**
Litmus paper red	5.0–8.0	red → blue	refill pack of 3 reels	**911 18**
Litmus paper red	5.0–8.0	red → blue	booklet with 100 strips 10 x 70 mm	**911 28**
Nitrazine yellow paper	6.0–7.0	yellow → violet-blue	box of 200 strips 20 x 70 mm	**907 11**
Phenolphthalein paper	8.3–10.0	white → red	roll of 5 m x 7 mm	**907 12**
Phenolphthalein paper	8.3–10.0	white → red	refill pack of 3 reels	**907 13**

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

Test strips for semi-quantitative determinations

Description of individual parameters and tests

QUANTOFIX® – Quick, easy, safe

QUANTOFIX® test strips meet all requirements of a modern rapid test. They are immediately ready-to-use and can be utilized right away at the point of interest. To run a test you don't need any equipment or accessories. Thus, you safe time and work more economically.



Ordering information

Test	Gradation	REF
QUANTOFIX® Active oxygen	0 · 4 · 8 · 15 · 25 mg/L KMPS	**913 49**
QUANTOFIX® Aluminum* [1]	0 · 5 · 20 · 50 · 200 · 500 mg/L Al^{3+}	**913 07**
QUANTOFIX® Ammonium* [1]	0 · 10 · 25 · 50 · 100 · 200 · 400 mg/L NH_4^+	**913 15**
QUANTOFIX® Arsenic 10* [1]	0 · 0.01 · 0.025 · 0.05 · 0.1 · 0.5 mg/L $As^{3+/5+}$	**913 34**
QUANTOFIX® Arsenic 50* [1]	0 · 0.05 · 0.1 · 0.5 · 1.0 · 1.7 · 3.0 mg/L $As^{3+/5+}$	**913 32**
QUANTOFIX® Arsenic Sensitive* [1]	0 · 0.005 · 0.01 · 0.025 · 0.05 · 0.1 · 0.25 · 0.5 mg/L $As^{3+/5+}$	**913 45**
QUANTOFIX® Ascorbic acid	0 · 50 · 100 · 200 · 300 · 500 · 700 · 1000 · 2000 mg/L vitamin C	**913 14**
QUANTOFIX® Calcium* [1] [2]	0 · 10 · 25 · 50 · 100 mg/L Ca^{2+}	**913 24**
QUANTOFIX® Carbonate hardness	0 · 3.8 · 7.5 · 12.5 · 18.8 · 25.0 °e	**913 23**
QUANTOFIX® Chloride	0 · 500 · 1000 · 1500 · 2000 · ≥ 3000 mg/L Cl^-	**913 21**
QUANTOFIX® Chlorine* [1]	0 · 1 · 3 · 10 · 30 · 100 mg/L Cl_2	**913 17**
QUANTOFIX® Chlorine Sensitive CE	0 · 0.1 · 0.5 ·1 ·3 ·10 mg/L Cl_2	**913 39**
QUANTOFIX® Chromate* [1]	0 · 3 · 10 · 30 · 100 mg/L CrO_4^{2-}	**913 01**
QUANTOFIX® Cobalt	0 · 10 · 25 · 50 · 100 · 250 · 500 · 1000 mg/L Co^{2+}	**913 03**
QUANTOFIX® Copper	0 · 10 · 30 · 100 · 300 mg/L $Cu^{+/2+}$	**913 04**
QUANTOFIX® Cyanide* [1]	0 · 1 · 3 · 10 · 30 mg/L CN^-	**913 18**
QUANTOFIX® EDTA	0 · 100 · 200 · 300 · 400 mg/L EDTA	**913 35**
QUANTOFIX® Formaldehyde* [1]	0 · 10 · 20 · 40 · 60 · 100 · 200 mg/L HCHO	**913 28**
QUANTOFIX® Glucose	0 · 50 · 100 · 250 · 500 · 1000 · 2000 mg/L glucose	**913 48**
QUANTOFIX® Glutaraldehyde CE	0 · 0.5 · 1 · 1.5 · 2 · 2.5 % glutaraldehyde	**913 43**
QUANTOFIX® Total iron 100	0 · 2 · 5 · 10 · 25 · 50 · 100 mg/L $Fe^{2+/3+}$	**913 44**
QUANTOFIX® Total iron 1000	0 · 5 · 20 · 50 · 100 · 250 · 500 · 1000 mg/L $Fe^{2+/3+}$	**913 30**
QUANTOFIX® LubriCheck	0 · 15 · 50 · 75 · 130 · 200 mmol/L KOH	**913 36**
QUANTOFIX® Molybdenum* [1]	0 · 5 · 20 · 50 · 100 · 250 mg/L Mo^{6+}	**913 25**
QUANTOFIX® Nickel	0 · 10 · 25 · 50 · 100 · 250 · 500 · 1000 mg/L Ni^{2+}	**913 05**
QUANTOFIX® Nitrate 100 NEW!	0 · 5 · 10 · 25 · 50 · 75 · 100 mg/L NO_3^-	**913 51**
QUANTOFIX® Nitrate / Nitrite	0 · 10 · 25 · 50 · 100 · 250 · 500 mg/L NO_3^- 0 · 1 · 5 · 10 · 20 · 40 · 80 mg/L NO_2^-	**913 13**
QUANTOFIX® Nitrite	0 · 1 · 5 · 10 · 20 · 40 · 80 mg/L NO_2^-	**913 11**
QUANTOFIX® Nitrite 3000	0 · 0.1 · 0.3 · 0.6 · 1 · 2 · 3 g/L NO_2^-	**913 22**
QUANTOFIX® Nitrite / pH	0 · 1 · 5 · 10 · 20 · 40 · 80 mg/L NO_2^- pH 6.0 · 6.4 · 6.7 · 7.0 · 7.3 · 7.6 · 7.9 · 8.2 · 8.4 · 8.6 · 8.8 · 9.0 · 9.3 · 9.6	**913 38**
QUANTOFIX® Peracetic acid 50 CE	0 · 5 · 10 · 20 · 30 · 50 mg/L peracetic acid	**913 40**
QUANTOFIX® Peracetic acid 500 CE	0 · 50 · 100 · 200 · 300 · 400 · 500 mg/L peracetic acid	**913 41**
QUANTOFIX® Peracetic acid 2000 CE	0 · 500 · 1000 · 1500 · 2000 mg/L peracetic acid	**913 42**
QUANTOFIX® Peroxide 25	0 · 0.5 · 2 · 5 · 10 · 25 mg/L H_2O_2	**913 19**
QUANTOFIX® Peroxide 100 CE	0 · 1 · 3 · 10 · 30 · 100 mg/L H_2O_2	**913 12**
QUANTOFIX® Peroxide 1000	0 · 50 · 150 · 300 · 500 · 800 · 1000 mg/L H_2O_2	**913 33**
QUANTOFIX® Phosphate* [1]	0 · 3 · 10 · 25 · 50 · 100 mg/L PO_4^{3-}	**913 20**
QUANTOFIX® Potassium [1]	0 · 200 · 400 · 700 · 1000 · 1500 mg/L K^+	**913 16**
QUANTOFIX® QUAT	0 · 10 · 25 · 50 · 100 · 250 · 500 · 1000 mg/L benzalkonium-chloride	**913 37**
QUANTOFIX® Silver	0 · 1 · 2 · 3 · 5 · 7 · 10 g/L Ag^+	**913 50**
QUANTOFIX® Sulfate	< 200 · > 400 · > 800 · > 1200 · > 1600 mg/L SO_4^{2-}	**913 29**

Presentation: Container with 100 test strips 6 x 95 mm

[1] The tests are supplied complete with all reagents required for the determination

[2] Presentation: Container with 60 test strips [3] Presentation: Container with 25 test strips

CE: CE-marked according to the directive for medical products 93/42/EWG

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

Test strips for semi-quantitative determinations

Description of individual parameters and tests

Test	Gradation	REF
QUANTOFIX® Sulfite	0 · 10 · 25 · 50 · 100 · 250 · 500 · 1000 mg/L SO_3^{2-}	**913 06**
QUANTOFIX® Tin	0 · 10 · 25 · 50 · 100 · 250 · 500 mg/L Sn^{2+}	**913 09**
QUANTOFIX® Zinc* [1)]	0 · 2 · 5 · 10 · 25 · 50 · 100 mg/L Zn^{2+}	**913 10**
QUANTOFIX® Multi-stick for aquarium owners	total hardness 0 · 6.3 · 12.5 · 18.8 · 25.0 · 31.3 °e carbonate hardness 0 · 3.8 · 7.5 · 12.5 · 18.8 · 25.0 °e pH 6.4 · 6.8 · 7.2 · 7.6 · 8.0 · 8.4	**913 26** **913 27** [3)]

Presentation: Container with 100 test strips 6 x 95 mm
[1)] The tests are supplied complete with all reagents required for the determination
[2)] Presentation: Container with 60 test strips [3)] Presentation: Container with 25 test strips
CE: CE-marked according to the directive for medical products 93/42/EWG
* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

QUANTOFIX® Active oxygen — REF 913 49

This test strip is for the fast and easy determination of active oxygen or potassium monopersulfate (MPS) respectively, e.g. in swimming pools. The easy Dip & Read procedure provides reliable results within 30 seconds.

So-called active oxygen is used in swimming pools as an alternative to chlorine for disinfection purposes. Therefore MPS is often added to the water.

The respective content can be easily determined with the test strip to assure a safe disinfection.

Type:	test strips
Range:	0 · 4 · 8 · 15 · 25 mg/L KMPS
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change	yellow → green

QUANTOFIX® Aluminum — REF 913 07

This test allows the quick and easy determination of aluminum in solutions. It comes with all necessary reagents so that the measurement can be started immediately. A reliable result is obtained within 2 minutes.

Aluminum is the third most abundant element in the earth's crust. In nature, aluminium only occurs in chemical compounds. In early stages of water treatment, aluminum compounds called alums are used as coagulation aids.

QUANTOFIX® Aluminum is used to check the integrity of the filtering system.

Type:	test strips and reagents
Range:	0 · 5 · 20 · 50 · 200 · 500 mg/L Al^{3+}
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	pink → red

QUANTOFIX® Ammonium — REF 913 15

This test allows the quick and easy determination of ammonium in solutions. It comes with all necessary reagents so that the measurement can be started immediately. A reliable result is obtained within 10 seconds.

In nature, ammonia results from the biological decay of organic matter. High concentrations can be found in rural, farming areas where fertilizers are regularly used. Also, industrial effluents may contain ammonia in higher levels. Ammonia itself is relatively harmless. Depending on the pH, however, part of the ammonium is transformed to the aggressive NH_3-gas, which is poisonous to aquatic life. Ammonium levels > 1 mg/L are not suitable for fish.

As an indicator for decomposition of animal or vegetable substances, control of ammonium is also important for the water supply.

Type:	test strips and reagents
Range:	0 · 10 · 25 · 50 · 100 · 200 · 400 mg/L NH_4^+
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	bright yellow → orange

QUANTOFIX® Arsenic 10 — REF 913 34

This test allows the quick and easy determination of arsenic in solutions. It comes with all necessary reagents so that the measurement can be started immediately. A reliable result is obtained within 10 minutes.

As a naturally occurring element, arsenic is widely distributed in the Earth's crust. In the natural environment it is most frequently present as inorganic arsenic compound in combination with sulphur or oxygen. Organic arsenic compounds can be used as pesticides.

Arsenic is toxic and causes skin diseases, keratosis and melanoma. Therefore, arsenic levels in drinking water have to be monitored thoroughly.

The WHO recommends a threshold value for drinking water of 0.01 mg/L. This concentration can reliably be monitored with QUANTOFIX® Arsenic 10.

Type:	test strips and reagents
Range:	0.01 · 0.025 · 0.05 · 0.1 · 0.5 mg/L $As^{3+/5+}$
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → yellow-brown

Test strips for semi-quantitative determinations

Description of individual parameters and tests

QUANTOFIX® Arsenic 50 — REF 913 32

Similar to QUANTOFIX® Arsenic 10 but different range.

Type:	test strips and reagents
Range:	0 · 0.05 · 0.1 · 0.5 · 1.0 · 1.7 · 3.0 mg/L $As^{3+/5+}$
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → yellow-brown

QUANTOFIX® Arsenic Sensitive — REF 913 45

Similar to QUANTOFIX® Arsenic 10 but more sensitive and faster.

Type:	test strips and reagents
Range:	0 · 0.005 · 0.01 · 0.025 · 0.05 · 0.1 · 0.25 · 0.5 mg/L $As^{3+/5+}$
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → yellow-brown



QUANTOFIX® Ascorbic acid — REF 913 14

This test strip is for the rapid and reliable determination of ascorbic acid in food. The easy Dip & Read procedure provides a reliable result within 30 seconds.

Ascorbic acid or vitamin C is naturally found in many foods and vegetables. It is also added to juices or fruits as stabilizing and reducing agent. QUANTOFIX® Ascorbic acid allows the quick and easy determination of vitamin C in fruit juices as well as on fresh cut surfaces of fruits and vegetables.

Type:	test strips
Range:	0 · 50 · 100 · 200 · 300 · 500 · 700 · 1000 · 2000 mg/L vitamin C
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	yellow → green-blue

QUANTOFIX® Calcium — REF 913 24

This test allows the quick and easy determination of calcium in solutions. The kit contains with all necessary reagents so that the measurement can be started immediately. A reliable result is obtained within 1 minute.

Calcium is an important element in nutrition and is therefore tested in foodstuff. It is essential for the building of human bones. Lack of calcium in the daily diet may lead to osteoporosis. The recommended consumption is about 1000 mg/day.

In combination with magnesium, calcium is responsible for water hardness.

Type:	test strips and reagents
Range:	0 · 10 · 25 · 50 · 100 mg/L Ca^{2+}
Sufficient for:	60 tests
Shelf life:	at least 2.5 years after production
Color change:	yellow → red

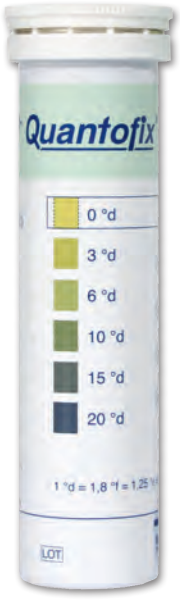
QUANTOFIX® Carbonate hardness — REF 913 23

This test strip is for the fast and reliable determination of alkalinity or carbonate hardness in water. The easy Dip & Read procedure provides a reliable result within 30 seconds.

Carbonate hardness or alkalinity is a measure for the water's pH buffer capacity. If the carbonate hardness is higher, addition of acids or bases will have a lower influence on the resulting pH. Sudden and rapid pH changes of the water are avoided.

QUANTOFIX® Carbonate hardness is used for the quick and easy control of water in swimming pools and aquariums.

Type:	test strips
Range:	0 · 3.8 · 7.5 · 12.5 · 18.8 · 25.0 °e
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	bright green → blue





Test strips for semi-quantitative determinations

Description of individual parameters and tests

QUANTOFIX® Chloride — REF 913 21

This test strip is for the fast and reliable determination of chloride in solutions. The easy Dip & Read procedure provides a reliable result within 1 minute.

Chloride ions occur in all natural waters. Their concentration depends on the geological and local situation. In waste waters and polluted rivers the chloride concentration can reach high values. In combination with sodium, chloride forms NaCl or table salt.

Type:	test strips
Range:	0 · 500 · 1000 · 1500 · 2000 · ≥ 3000 mg/L Cl^-
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production at 2–8 °C
Color change:	brown → yellow

QUANTOFIX® Chlorine — REF 913 17

This test allows the quick and easy determination of chlorine in solutions. It comes with all necessary reagents so that the measurement can be started immediately. A reliable result is obtained within 1 minute.

Chlorine is widely used for disinfection of swimming pools, water mains and water reservoirs. Dosed correctly, harmful microorganisms are safely destroyed, many impurities removed and the growth of algae is prevented. Electroplaters use chlorine for the detoxification of cyanide-containing waste.

Regular checking of the chlorine concentration is essential to keep it at the desired level. Excessive chlorine not only impairs the smell and taste of water but can also be hazardous.

In water chlorine occurs either free or bound for example as chloramines. Total chlorine is the sum of both levels.

For the sensitive determination of chlorine in swimming pools we recommend our swimming pool tests (s. page 38)

Type:	test strips and reagents
Range:	0 · 1 · 3 · 10 · 30 · 100 mg/L Cl_2
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → red-violet

QUANTOFIX® Chlorine Sensitive — REF 913 39

This test allows the quick and easy detection of low levels of total chlorine (total chloramines). The easy Dip & Read procedure provides reliable results within 30 seconds.

In dialysis centres QUANTOFIX® Chlorine Sensitive is used to check feed water. Low levels of total chlorine (total chloramines) are necessary to ensure optimal function of further water purification such as reversed osmosis. It also provides a fast and convenient means to test for residual chlorine in rinse water after disinfection.

Type:	test strips
Range:	0 · 0.1 · 0.5 · 1 · 3 · 10 mg/L Cl_2
Sufficient for:	100 tests
Shelf life:	at least 2 years after production
Color change:	yellow → violett

QUANTOFIX® Chromate — REF 913 01

This test allows the quick and easy determination of chromate in solutions. It includes all necessary reagents so that the measurement can be started immediately. A reliable result is obtained within 30 seconds.

Many chromate compounds are poisonous and carcinogenic. They are used for example in chrome plating and tanning. QUANTOFIX® Chromate is used for the easy monitoring of water discharged from such plants.

Type:	test strips and reagents
Range:	0 · 3 · 10 · 30 · 100 mg/L CrO_4^{2-}
Sufficient for:	100 tests
Shelf life:	at least 2 years after production
Color change:	white → violet



QUANTOFIX® Cobalt — REF 913 03

This test strip is for the fast and reliable determination of cobalt in solutions. The easy Dip & Read procedure provides a reliable result within 20 seconds.

Cobalt is also used for metal alloys and can in other compounds be part of catalysts. QUANTOFIX® Cobalt is used to monitor waste water and for non-destructive testing of materials.

Type:	test strips
Range:	0 · 10 · 25 · 50 · 100 · 250 · 500 · 1000 mg/L Co^{2+}
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → green-blue

QUANTOFIX® Copper — REF 913 04

This test strip is for the fast and reliable determination of copper in solutions. The easy Dip & Read procedure provides a reliable result within 20 seconds.

Copper or copper-compounds are used for electroplating processes, the production of water pipes etc. QUANTOFIX® Copper is used for the quick and easy monitoring of electroplating solutions, waste water, tap water and in many other applications.

Type:	test strips
Range:	0 · 10 · 30 · 100 · 300 mg/L $Cu^{+/2+}$
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → red-violet

Test strips for semi-quantitative determinations

Description of individual parameters and tests

QUANTOFIX® Cyanide — REF 913 18

This test allows the quick and easy determination of cyanide in solutions. It includes all necessary reagents so that the measurement can be started immediately. A reliable result is obtained within 3 minutes.

Cyanide is extremely poisonous. The lethal dose is 1 mg/kg weight. Careful control of the cyanide concentration is therefore essential, whenever cyanides are used for industrial processes like for example electroplating or gold-mining. Cyanide control is also important during the production of fruit-brandies made from stone fruits.

Type:	test strips and reagents
Range:	0 · 1 · 3 · 10 · 30 mg/L CN^-
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → violet



QUANTOFIX® EDTA — REF 913 35

This test strip is for the fast and reliable determination of EDTA, NTA and other complexing agents in solutions. The easy Dip & Read procedure provides a reliable result within 15 seconds.

Complexing agents like EDTA (Ethylendiaminetetraacetate) or NTA (Nitrilotriacetic acid) have replaced phosphates as additives in washing and cleaning solutions. QUANTOFIX® EDTA is therefore ideal to check the concentration of washing and cleaning solutions.

In proteomics labs EDTA is also used to regenerate Ni- and Co-precharged chromatography columns (HPLC columns) which are used to purify recombinant proteins. Prior to the successive analysis, QUANTOFIX® EDTA is used to control if EDTA has completely rinsed out. This may dramatically reduce the rinse time and therefore increase the throughput and the capacity.

The following complexing agents can also be determined: nitrilotriacetic acid (NTA), cyclohexanedinitrilo-(1,2)-tetraacetic acid, diethyltrinitrilopentaacetic acid, bis(aminoethyl) glykol-ether-*N,N,N',N'*-tetraacetic acid.
Conversion factor: 1 mg/L EDTA = 0.7 mg/L NTA

Type:	test strips
Range:	0 · 100 · 200 · 300 · 400 mg/L EDTA
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	red → yellow

QUANTOFIX® Formaldehyde — REF 913 28

This test allows the quick and easy determination of formaldehyde. It comes with all necessary reagents so that the measurement can be started immediately. A reliable result is obtained within 1 minute.

Formaldehyde is used for a large variety of products, ranging from shampoo to clothes. In large quantities it is used as raw material in the chemical industry. Formaldehyde is poisonous and can cause allergic reactions as well as irritations of skin, eyes and air passages. If such reactions are observed after contact with suspicious substances it may be useful to control the formaldehyde concentration.

In closed cooling or heating circuits formaldehyde is used as biocide. Here, QUANTOFIX® Formaldehyde serves to easily monitor the system.

Type:	test strips and reagents
Range:	0 · 10 · 20 · 40 · 60 · 100 · 200 mg/L HCHO
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	beige → blue-violet

QUANTOFIX® Glucose — REF 913 48

This test strip is for the easy and reliable detection of glucose in solutions. The simple Dip & Read procedure provides reliable results within 30 seconds.

Glucose is a major part in most foods, in potatoes for example, the glucose content is an important quality criterion.

Type:	test strips
Range:	0 · 50 · 100 · 250 · 500 · 1000 · 2000 mg/L glucose
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	yellow → blue-green

QUANTOFIX® Glutaraldehyde — REF 913 43

This test strip is for the fast and reliable determination of glutaraldehyde in solutions. The easy Dip & Read procedure provides reliable results in 20 seconds.

Glutaraldehyde is a strong disinfectant. It is, for example, often used in healthcare and medical engineering to disinfect surgical instruments and equipment. QUANTOFIX® Glutaraldehyde allows to check whether the glutaraldehyde concentration is sufficient for proper disinfection. Thus, a safe disinfection is ensured.

Type:	test strips
Range:	0 · 0.5 · 1 · 1.5 · 2 · 2.5 % glutaraldehyde
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	bright orange → magenta

Test strips for semi-quantitative determinations

Description of individual parameters and tests

QUANTOFIX® Total iron 1000 REF 913 30

Without additional reagents – easy Dip & Read procedure

This test is designed for easily determining total iron in solutions. The easy Dip & Read procedure provides reliable results within 20 seconds.

In various industries, iron is used for pipes and containers. Iron determination is an important corrosion indicator. In drinking water, iron is not desirable, as it leads to unpleasant odors and brownish discolorations.

Type:	test strips
Range:	0 · 5 · 20 · 50 · 100 · 250 · 500 · 1000 mg/L Fe^{2+}/Fe^{3+}
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → dark red

QUANTOFIX® Total iron 100 REF 913 44

Without additional reagents – easy Dip & Read procedure

Similar to QUANTOFIX® Total iron 1000, but with higher sensitivity and a reaction time of 60 seconds.

Type:	test strips
Range:	0·2·5·10·25·50·100 mg/L Fe^{2+}/Fe^{3+}
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → blue-purple



QUANTOFIX® LubriCheck REF 913 36

Using this test strip the concentration of cooling lubricants can quickly be determined. The easy Dip & Read procedure provides a reliable result within 1 minute.

Cooling lubricants are used when metal parts are being machined (drilling, cutting...). Using QUANTOFIX® LubriCheck the concentration of the cooling lubricant can easily be checked on the spot. This ensures optimal cooling and lubrication and at the same time optimal quality of the work piece. The measurement with QUANTOFIX® LubriCheck is rapid and reliable and can easily be performed by chemically untrained persons. Other methods used so far either require sensitive instruments (measurement of the refraction index) or have to be performed in the laboratory (determination after digestion).

The concentration is detected and given as mmol/L KOH. Using a factor the result can easily be transferred to the concentration of the cooling lubricant.

Type:	test strips
Range:	0 · 15 · 50 · 75 · 130 · 200 mmol/L KOH
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	yellow → blue

QUANTOFIX® Molybdenum REF 913 25

This test allows the quick and easy determination of molybdenum in solutions. It includes all necessary reagents so that the measurement can be started immediately. A reliable result is obtained within 1 minute.

Molybdenum tests are mainly used for coolant water and boiler feed water. Here, molybdenum salts act as corrosion inhibitors, either directly or as part of an anticorrosive additive. The careful control of the molybdenum level is important to ensure optimal corrosion prevention. Also, the level of the anticorrosive additive can be easily controlled.

Type:	test strips and reagents
Range:	0 · 5 · 20 · 50 · 100 · 250 mg/L Mo^{6+}
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → green

QUANTOFIX® Nickel REF 913 05

This test strip is for the fast and reliable determination of nickel in solutions. The easy Dip & Read procedure provides a reliable result within 30 seconds.

Nickel is used in metal plating processes and for metal alloys. Metal parts that come into contact with skin are tested with QUANTOFIX® Nickel to prevent allergic reactions. The test is also used for the easy monitoring of electroplating solutions and industrial waste water.

Type:	test strips
Range:	0 · 10 · 25 · 50 · 100 · 250 · 500 · 1000 mg/L Ni^{2+}
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → bright red

Test strips for semi-quantitative determinations

Description of individual parameters and tests

QUANTOFIX® Nitrate 100 NEW! REF 913 51

This test is the highly sensitive version of QUANTOFIX® Nitrate / Nitrite. It allows to detect nitrate down to 5 mg/L. The warning pad for nitrite detects concentrations down to 0.5 mg/L. This test is especially useful for dairy industry where low levels of nitrate need to be monitored.

Type:	test strips
Range:	0 · 5 · 10 · 25 · 50 · 75 · 100 mg/L NO_3^-
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	yellow → red-violet

QUANTOFIX® Nitrate / Nitrite REF 913 13

This test strip is for the fast and reliable determination of nitrate and nitrite in solutions. The easy Dip & Read procedure provides a reliable result within 1 minute.

Nitrite is an undesired byproduct in cooling lubricants. It allows the formation of carcinogenic compounds. Cooling lubricants are therefore regularly tested for nitrite.

In natural and drinking water nitrite can lead to infant mortality and kill aquatic life. The EPA primary drinking water standard is 1 mg/L.

Nitrate is a byproduct of biological decay from plant and animal matter. High concentrations can be found in rural, farming areas where fertilizers are regularly used. Also, industrial effluents may contain nitrate in higher levels. The EU threshold value is 50 mg/L and can safely be controlled with QUANTOFIX® Nitrate / Nitrite. Farmers use this test to control the nitrogen content in soil to estimate the amount of fertilizer needed. In ponds and aquariums nitrate is often tested instead of ammonium to control the water quality.

Type:	test strips
Range:	0 · 10 · 25 · 50 · 100 · 250 · 500 mg/L NO_3^- 0 · 1 · 5 · 10 · 20 · 40 · 80 mg/L NO_2^-
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → red-violet



QUANTOFIX® Nitrite REF 913 11

Similar to QUANTOFIX® Nitrate / Nitrite but only the nitrite test.

Type:	test strips
Range:	0 · 1 · 5 · 10 · 20 · 40 · 80 mg/L NO_2^-
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → red-violet

QUANTOFIX® Nitrite 3000 REF 913 22

Similar to QUANTOFIX® Nitrate / Nitrite but only the nitrite test and different range.

Type:	test strips
Range:	0 · 0.1 · 0.3 · 0.6 · 1 · 2 · 3 g/L NO_2^-
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	yellow → red

QUANTOFIX® Nitrite / pH REF 913 38

This test allows the quick and easy determination of nitrite and pH in cooling lubricants. The easy Dip & Read procedure provides a reliable result within 1 minute.

When metal parts are machined (drilling, cutting, ...) cooling lubricants or coolants are indispensable to guarantee the quality of the work piece as well as the lifetime of the machines.

QUANTOFIX® Nitrite / pH is for the rapid and reliable control of two important parameters in cooling lubricants.

The Nitrite test is an indicator for bacterial growth in the cooling lubricant cycle. It allows early counteractive measures and therefore increases the lifetime of the cooling lubricant. Thus, significant cost savings are possible.

A weekly determination of the nitrite concentration is also recommended to protect workers from carcinogenic nitrosamine. High levels of nitrite in the cooling lubricant foster the formation of this carcinogenic compound.

The pH test is specially optimized for the demands of cooling lubricant analysis. Short testing cycles allow an early detection of pH changes. Counteractive measures can be performed to keep the pH at the optimal level. This ensures optimal protection against corrosion, inhibits bacterial growth and therefore reduces maintenance costs.

Type:	test strips
Range:	0 · 1 · 5 · 10 · 20 · 40 · 80 mg/L NO_2^- pH 6.0 · 6.4 · 6.7 · 7.0 · 7.3 · 7.6 · 7.9 · 8.2 · 8.4 · 8.6 · 8.8 · 9.0 · 9.3 · 9.6
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → red-violet (NO_2^-) yellow/orange → violet/red (pH)

Test strips for semi-quantitative determinations

Description of individual parameters and tests

QUANTOFIX® Peracetic acid 50 REF 913 40

This test strip is for the fast and reliable determination of peracetic acid in solutions. The easy Dip & Read procedure provides safe results within 30 seconds.

Peracetic acid is a popular and widely used disinfectant. It is, for example, frequently used to disinfect packages in the beverage industry. After disinfection, packages are rinsed to wash out any remaining disinfectant. QUANTOFIX® Peracetic acid can check quickly and easily, if the disinfectant has been removed completely.

QUANTOFIX® Peracetic acid is specific to peracetic acid and does not, when adhering to the testing procedures, yield results for hydrogen peroxide.

Type:	test strips
Range:	0 · 5 · 10 · 20 · 30 · 50 mg/L peracetic acid
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → blue



QUANTOFIX® Peracetic acid 500 REF 913 41

Similar to QUANTOFIX® Peracetic acid 50 but different range.

Type:	test strips
Range:	0 · 50 · 100 · 200 · 300 · 400 · 500 mg/L peracetic acid
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	yellow → green

QUANTOFIX® Peracetic acid 2000 REF 913 42

Similar to QUANTOFIX® Peracetic acid 50 but different range.

Type:	test strips
Range:	0 · 500 · 1000 · 1500 · 2000 mg/L peracetic acid
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	bright yellow → red

QUANTOFIX® Peroxide 25 REF 913 19

This test strip is for the fast and reliable determination of peroxide in solutions. The easy Dip & Read procedure provides a reliable result within 15 seconds.

Hydrogen peroxide (H_2O_2) is one of the most powerful oxidizers known. Its disinfectant capabilities are higher than for chlorine (Cl_2) or chlorine dioxide (ClO_2). It is extensively used in the food and dairy industries. Here, peroxide tests are used to ensure that residual peroxide sanitizer has been fully purged from packages prior to the filling. This guarantees that the product has the optimal quality and is free from peroxide.

In chemical laboratories QUANTOFIX® Peroxide 25 is used to check organic solvents, because peroxide containing solvents may explode when heated. Moisten the test pad with the solvent and allow it to dry. After drying, add a drop of distilled water to the test pad. If the test pad remains white the solvent is free of peroxides and can safely be used.

Type:	test strips
Range:	0 · 0.5 · 2 · 5 · 10 · 25 mg/L H_2O_2
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → blue



QUANTOFIX® Peroxide 100 REF 913 12

Similar to QUANTOFIX® Peroxide 25 but different range.

Type:	test strips
Range:	0 · 1 · 3 · 10 · 30 · 100 mg/L H_2O_2
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → blue

QUANTOFIX® Peroxide 1000 REF 913 33

Similar to QUANTOFIX® Peroxide 25 but different range.

Type:	test strips
Range:	0 · 50 · 150 · 300 · 500 · 800 · 1000 mg/L H_2O_2
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → brown

Test strips for semi-quantitative determinations

Description of individual parameters and tests

QUANTOFIX® Phosphate — REF 913 20

This test allows the quick and easy determination of phosphate in solutions. It includes all necessary reagents so that the measurement can be started immediately. A reliable result is obtained within 90 seconds.

In surface water, the presence of high phosphate concentrations may indicate domestic waste discharge, fertilizer run-off or the presence of industrial effluents or detergents. The phosphate content of surface water has direct consequences for its ability to support growth of certain organisms. Very high phosphate intake may lead to an eutrophication of rivers and lakes leading finally to the death of aquatic life.

In the maintaining of cooling or heating systems QUANTOFIX® Phosphate is used for the rapid and reliable control of corrosion inhibitors

Type:	test strips and reagents
Range:	0 · 3 · 10 · 25 · 50 · 100 mg/L PO_4^{3-} (only ortho phosphate)
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → blue-green



QUANTOFIX® Potassium — REF 913 16

This test allows the quick and easy determination of potassium in solutions. It includes all necessary reagents so that the measurement can be started immediately. A reliable result is obtained within 1 minute.

The natural potassium content in ground water is generally about 1–2 mg/L K. Higher values may indicate fecal contaminations, but can also originate from potassium fertilizers. For the growth of plants and animals potassium is an essential factor. Especially in agriculture the determination of potassium therefore gains increasing importance.

Type:	test strips and reagents
Range:	0 · 200 · 400 · 700 · 1000 · 1500 mg/L K^+
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	yellow → orange

QUANTOFIX® QUAT — REF 913 37

This test strip is for the fast and reliable determination of quaternary ammonium compounds (QUAT) in solutions. The easy Dip & Read procedure provides a reliable result within 15 seconds.

Quaternary ammonium compounds are frequently used for the disinfection of medical devices, surfaces and closed cooling cycles. Using QUANTOFIX® QUAT, it can easily be controlled if the concentration of the disinfectant is sufficient. This ensures an optimal disinfection.
The test is calibrated for benzalkonium chloride. The packing insert contains conversion factors for many other quaternary ammonium compounds.

Test papers for quaternary ammonium compounds: see also INDIQUAT (see page 36)

Type:	test strips
Range:	0 · 10 · 25 · 50 · 100 · 250 · 500 · 1000 mg/L benzalkonium chloride
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	yellow → blue-green

QUANTOFIX® Silver — REF 913 50

This test strip is for the fast and easy determination of silver in solutions.

After dipping the test strip into the sample a comparison with the color scale provides a reliable result within 20 seconds.

The fixation is the final process in the development of movies and photos, during which excess silver is being washed out. The silver content of the fixing bath can be easily monitored with these test strips.

Type:	test strips
Range:	0 · 1 · 2 · 3 · 5 · 7 · 10 g/L Ag^+
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	yellow → brown



Test strips for semi-quantitative determinations

Description of individual parameters and tests

QUANTOFIX® Sulfate — REF 913 29

This test strip is for the fast and reliable determination of sulfate in solutions. The easy Dip & Read procedure provides a reliable result within 2 minutes.

Sulfate is regularly found in natural waters. In cooling water and ion exchange systems sulfate must be monitored to prevent the formation of calcium sulfate (gypsum). The sulfate determination is also of importance to evaluate the aggressiveness of water towards concrete. In the beverage industry it is tested because of its effect on odor and taste.

Type:	test strips
Range:	< 200 · > 400 · > 800 · >1200 · > 1600 mg/L SO_4^{2-}
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	red → yellow

QUANTOFIX® Sulfite — REF 913 06

This test strip is for the fast and reliable determination of sulfite in solutions. The easy Dip & Read procedure provides a reliable result within 20 seconds.

In process and boiler water, sulfite is used as an oxygen scavenger. To avoid overdosage, the concentration needs to be controlled regularly. These tests are also used to control the sulfite concentration in foodstuff treated with sulphur compounds (SO_2, HSO_3^-, SO_3^{2-}) for longer shelf-life. In the process of wine making the control of sulfite is important to monitor production and quality of the wine.

Type:	test strips
Range:	0 · 10 · 25 · 50 · 100 · 250 · 500 · 1000 mg/L SO_3^{2-}
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → salmon



QUANTOFIX® Tin — REF 913 09

This test strip is for the fast and reliable determination of tin in solutions. The easy Dip & Read procedure provides a reliable result within 5 seconds.

In the beverage industry QUANTOFIX® Tin is used to control canned juices or food. Depending on the storage conditions and the quality of the tin plating, significant quantities of tin may get into the product, causing a negative aftertaste. The control of tin ensures the optimal quality of the food.

Type:	test strips
Range:	0 · 10 · 25 · 50 · 100 · 250 · 500 mg/L Sn^{2+}
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	white → dark blue

QUANTOFIX® Zinc — REF 913 10

This test allows the quick and easy determination of zinc in solutions. It includes all necessary reagents so that the measurement can be started immediately. A reliable result is obtained within 30 seconds.

Zinc provides an effective protective coating for steel (galvanized coatings) and is useful as an alloying agent. QUANTOFIX® Zinc is used to regularly check the plating baths in metal plating industry. Zinc salts are useful as corrosion inhibitors in cooling water treatment formulations. Here, the zinc concentration is monitored to ensure an optimal process.

Type:	test strips and reagents
Range:	0 · 2 · 5 · 10 · 25 · 50 · 100 mg/L Zn^{2+}
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	orange → red

QUANTOFIX® Multi stick for aquarium owners — REF 913 26 / 913 27

This test strip is for the fast and reliable determination of the water quality in aquariums. Within 60 seconds the easy Dip & Read procedure provides important information on the total alkalinity (carbonate hardness), total hardness and pH. The water quality can be improved at an early stage ensuring a good health of fish.

Type:	test strips
Range:	0 · 6.3 · 12.5 · 18.8 · 25.0 · 31.3 °e (total hardness) 0 · 3.8 · 7.5 · 12.5 · 18.8 · 25.0 °e (carbonate hardness) pH 6.4 · 6.8 · 7.2 · 7.6 · 8.0 · 8.4
Sufficient for:	100 (REF 913 26) or 25 tests (REF 913 27)
Shelf life:	at least 2.5 years after production
Color change:	green → red (total hardness) bright green → blue (carbonate hardness) yellow → red (pH)

Test strips for semi-quantitative determinations

Automated reader for test strips

QUANTOFIX® Relax



Optimized strip reading

The QUANTOFIX® Relax is a revolutionary step in test strip analysis. With this new system, MACHEREY-NAGEL offers an entirely objective way to read QUANTOFIX® test strips, making the system particularly suitable if results are critical to your decision making. The system simplifies testing procedures and the decision processes by eliminating the subjectivity of visual readings and by providing higher accuracy. Especially if you test large numbers of strips, the QUANTOFIX® Relax helps and supports you with easy result administration and quick testing procedures. Additionally, the QUANTOFIX® Relax allows you to get actual quantitative results – no gradation and estimation of in-between values is necessary.

The QUANTOFIX® Relax can change the way you work and test. The system enables you to focus on your core processes and is the perfect tool for your testing procedures.

Highest precision

- Quantitative results across the complete measuring range
- Higher accuracy and no in-between value guesswork
- Assure your decision making

Objective readings

- No influence of external light or human color perception
- Reproducible results independent of the operator
- Increase safety and comfort

Easy result administration

- Immediate print outs
- Data can be transferred to a computer
- Save time to focus on your core business

Optimized usability

Auto start



Place the strip on the instrument, the measurement starts automatically. So, operating is clean and easy.

Easily change tests



Select five different tests as your favorites out of a large variety of tests programmed into the instrument. With just two dips on the screen you can quickly change between your favorite tests.

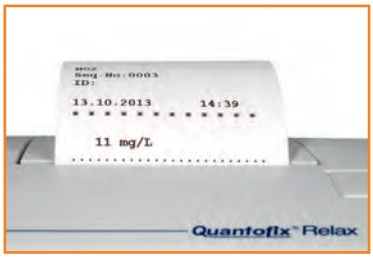
Optimized result administration

Interface options



The instrument features an USB as well as an RS232 interface. It can easily be connected to existing laboratory information systems and also to PCs.

Printer



The result is printed using a fast and silent internal printer. Thus, you can easily staple the results to production files for later check or QC procedures.

Memory for 200 measurements



Up to 200 measurements can be stored. Using internal functions, positive readings are easily filtered out, enabling further diagnosis whenever necessary.

Test strips for semi-quantitative determinations

Automated reader for test strips

Technical data

Instrument memory	200 test results including sample ID
Interface	User: touch screen, alphanumeric input, password protection Computer: USB and RS 232 interface for connection to PC, PS/2 interface for connection of key-board and / or barcode scanner
Dimensions / Weight	Depth: 20 cm (7.9 inches) / Width: 16 cm (6.3 inches) / Height: 7.5 cm (3.0 inches) Weight: 710 g (1.90 lb), (w/o batteries and power supply)
Power requirements	110–240 V AC, automatic Battery powered operation (optional) with 6 AA batteries
Operation	Temperature range: 5–40 °C (41–104 °F) Humidity range: 20–80 % relative humidity, non condensing Calibration: automatic, self calibrating
Capacity	50 strips per hour

Ordering information

Test	Range	REF
Spare parts and accessories		
Reflectometer QUANTOFIX® Relax, suitable for evaluation of QUANTOFIX® test strips incl. power supply, adapter, manual and 1 roll of printer paper		**913 46**
Case for reflectometer QUANTOFIX® Relax, for individual combination with QUANTOFIX® Relax, 3 rolls of printer paper, 6 QUANTOFIX® tubes, 6 batteries, power supply and accessories		**930 889**
Printer paper for QUANTOFIX® Relax		**930 65**
Barcode scanner for QUANTOFIX® Relax		**930 74**
Tests calibrated on the instrument that can be run with the instrument software		
QUANTOFIX® Ammonium*	10–350 mg/L NH_4^+	**913 15**
QUANTOFIX® Ascorbic acid	50–1000 mg/L vitamin C	**913 14**
QUANTOFIX® Chlorine Sensitive	0.1–10 mg/L Cl_2	**913 39**
QUANTOFIX® Formaldehyde*	10–200 mg/L HCHO	**913 28**
QUANTOFIX® Glucose	50–2000 mg/L glucose	**913 48**
QUANTOFIX® Nitrate 100	3–100 mg/L NO_3^-	**913 51**
QUANTOFIX® Nitrate/Nitrite	10–500 mg/L NO_3^- / 0.5–80 mg/L NO_2^-	**913 13**
QUANTOFIX® Nitrite	0.5–80 mg/L NO_2^-	**913 11**
QUANTOFIX® Peracetic acid 50	5–50 mg/L peracetic acid	**913 40**
QUANTOFIX® Peracetic acid 500	50–500 mg/L peracetic acid	**913 41**
QUANTOFIX® Peracetic acid 2000	500–2000 mg/L peracetic acid	**913 42**
QUANTOFIX® Peroxide 25	0.5–25 mg/L H_2O_2	**913 19**
QUANTOFIX® Peroxide 100	1–100 mg/L H_2O_2	**913 12**
QUANTOFIX® Peroxide 1000	50–1000 mg/L H_2O_2	**913 33**
QUANTOFIX® Phosphate*	3–80 mg/L PO_4^{3-}	**913 20**
QUANTOFIX® Sulfite	10–500 mg/L SO_3^{2-}	**913 06**
pH-Fix 0–14	pH 1.0–13.0	**921 10**
pH-Fix 0.0–6.0	pH 0.5–6.0	**921 15**
pH-Fix 2.0–9.0	pH 2.0–9.0	**921 18**
pH-Fix 3.6–6.1	pH 3.6–6.1	**921 30**
pH-Fix 4.5–10.0	pH 4.5–10.0	**921 20**
pH-Fix 6.0–10.0	pH 6.0–10.0	**921 22**
pH-Fix 6.0–7.7	pH 6.0–7.7	**921 50**
pH-Fix 7.0–14.0	pH 7.0–13.5	**921 25**
Together with the QUANTOFIX® Relax, test strips may not be used for any medical application.		
* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.		

Additional tests will be added to the instrument successively based on customer demand. If you are interested in a specific test for the QUANTOFIX® Relax, please contact your local distributor or MACHEREY-NAGEL directly.

Test strips for semi-quantitative determinations

Description of individual parameters and tests

Special test strips and test papers

The tests in this special selection are designed for special analytical questions and provide solutions for specific requirements. Most strips feature high quality color scales for semi-quantitative determinations, while some are just quantitative in nature.

Similar to all our other test strips and papers, the tests mentioned below are very easy to use, especially user friendly and they provide results within seconds.



Table of applications

Determination of	Test paper / test strips	Gradation	REF
Ammonium / Ammonia	Ammonia Test	0 · 0.5 · 1 · 3 · 6 mg/L NH_4^+	**907 14**
Chlorine	Chlorine Test	10 · 50 · 100 · 200 mg/L Cl_2	**907 09**
Fluoride ions	Fluoride Test	0 · 2 · 5 · 10 · 20 · 50 · 100 mg/L F^-	**907 34**
Halide ions	Saltesmo	0 · 0.25 · 0.5 · 1 · 2 · 3 · 4 · 5 g/L NaCl	**906 08**
Humidity in air (relative)	Moisture indicator*	20 · 30 · 40 · 50 · 60 · 70 · 80 %	**908 01**
	Moisture indicator*	8 %	**908 901**
	Moisture indicator without cobalt chloride	8 %	**908 903**
Ozone content in air	Ozone Test	< 90 · 90–150 · 150–210 · > 210 µg/m³ O_3	**907 36**
QUATS	INDIQUAT	on request	**909 000 – 909 002**
Silver	Ag-Fix	0 · 0.5 · 1 · 2 · 3 · 5 · 7 · 10 g/L Ag^+ pH 4 · 5 · 6 · 7 · 8	**907 41**
Swimming pool parameters	Cyanuric Acid Test	see page 38	**907 10**
	Swimming Pool Test 3 in 1	see page 38	**907 52**
	Swimming Pool Test 5 in 1	see page 38	**907 59**
Water hardness	AQUADUR®	see page 35	

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

Ammonia Test — REF 907 14

This test strip is for the fast and reliable determination of ammonium, respectively ammonia, in solutions. The easy Dip & Read procedure provides safe results within 40 seconds.

Ammonium / ammonia is harmful to fish and other aquatic life in aquariums. This test shows the amount of ammonium quickly and easily. Thus, the aquarium can be kept in good condition and fish stay healthy.

Type:	test strips
Range:	0 · 0.5 · 1 · 3 · 6 mg/L NH_4^+
Sufficient for:	25 tests
Shelf life:	at least 2.5 years after production
Color change:	bright yellow → blue

Ag-Fix — REF 907 41

This test strip is for the fast and reliable determination of silver in fixing baths. The easy Dip & Read procedure provides a reliable result within 30 seconds.

Fixing is the final step in the development of photos and films. Excess silver halides are washed from the photographic layer. To ensure proper operation of the bath, the silver content as well as the pH have to be checked regularly.

Type:	test strips
Range:	0 · 0.5 · 1 · 2 · 3 · 5 · 7 · 10 g/L Ag^+ pH: 4 · 5 · 6 · 7 · 8
Sufficient for:	100 tests
Shelf life:	at least 2.5 years after production
Color change:	yellow → brown (silver) yellow → blue (pH)

Test strips for semi-quantitative determinations

Description of individual parameters and tests

AQUADUR®

AQUADUR® are test strips for the determination of water hardness. Clear color changes from green to red ensure an accurate readout. Individually sealed AQUADUR® test strips can perfectly be combined with promotion activities to inform customers about the necessity of water softeners. Instructions for use are printed on the seal. Due to the clear design with green / red indication, the result can be read without color chart.

The hardness of water depends on its content of calcium and magnesium salts. The total sum of these salts determines the hardness of water. In the USA, it is expressed in terms of ppm (mg/L) $CaCO_3$.

Water is often simply classified as “soft water“, or “hard water“ etc. The following values generally apply to these terms:

below 50 ppm $CaCO_3$ – very soft water

50–120 ppm $CaCO_3$ – soft water

120–240 ppm $CaCO_3$ – medium hard water

240–360 ppm $CaCO_3$ – hard water

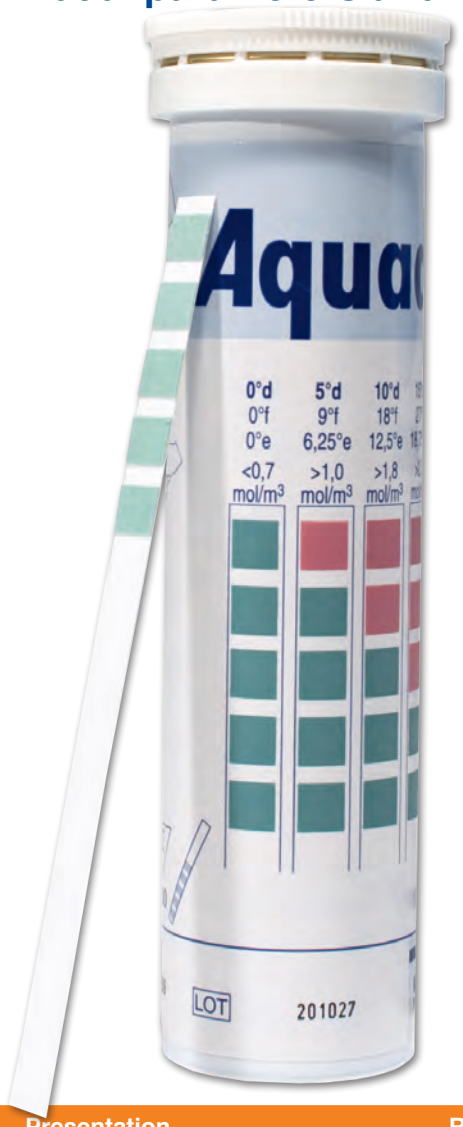
above 360 ppm $CaCO_3$ – very hard water

AQUADUR® Sensitive REF 912 10

This test allows the rapid and reliable detection of very low water hardness. The easy Dip & Read procedure provides a reliable result within 20 seconds.

In dialysis centres AQUADUR® Sensitive is used to check feed water. Low levels of water hardness are necessary to ensure optimal function of further water purification such as reversed osmosis.

This test is CE-marked according to the directive for medical products 93/42/EWG for use in dialysis.



Ordering information

Gradation	Color change	Presentation	REF
< 54 · > 90 · > 180 · > 270 · > 360 · > 450 ppm $CaCO_3$	green → red	Box of 100 test strips 6 x 95 mm	**912 01**
< 54 · > 72 · > 126 · > 252 · > 378 ppm $CaCO_3$	green → red	Box of 100 test strips 6 x 95 mm	**912 20**
< 54 · > 72 · > 151.2 · > 252 ppm $CaCO_3$	green → red	Box of 100 test strips 6 x 95 mm	**912 39**
< 54 · > 90 · > 180 · > 270 · > 360 · > 450 ppm $CaCO_3$	green → red	1000 test strips 5 x 75 mm, individually sealed (22 x 95 mm) with scale	**912 23**
< 54 · > 72 · > 126 · > 252 · > 378 ppm $CaCO_3$	green → red	1000 test strips 5 x 75 mm, individually sealed (22 x 95 mm) with scale	**912 24**
< 54 · > 72 · > 151.2 · > 252 · > 378 ppm $CaCO_3$	green → red	1000 test strips 5 x 75 mm, individually sealed (22 x 95 mm) with scale	**912 40**
< 54 · > 90 · > 180 · > 270 · > 360 · > 450 ppm $CaCO_3$	green → red	5000 test strips, without scale	**912 21**
< 54 · > 72 · > 126 · > 252 · > 378 ppm $CaCO_3$	green → red	5000 test strips, without scale	**912 22**
< 54 · > 90 · > 180 · > 270 · > 360 · > 450 ppm $CaCO_3$	green → red	Set of 3 individually sealed test strips, pack of 50 sets	**912 902**
AQUADUR® Sensitive			
0 · 5.4 · 10.8 · 19.8 ppm $CaCO_3$ CE	light beige → blue	Box of 100 test strips 6 x 95 mm	**912 10**
CE: CE-marked according to the directive for medical products 93/42/EWG			



Test strips for semi-quantitative determinations

Description of individual parameters and tests

Chlorine Test — REF 907 09

This test paper allows the quick and easy determination of chlorine in solutions. The easy Dip & Read procedure provides a reliable result within a few seconds.

Chlorine is widely used for disinfection. Dosed correctly, harmful microorganisms are safely destroyed, many impurities removed and the growth of algae is prevented. Chlorine Test is used to monitor the concentration of disinfection baths.

Type:	test paper
Range:	10 · 50 · 100 · 200 mg/L Cl_2
Presentation:	reel of 5 m length
Shelf life:	at least 2 years after production
Color change:	white → dark blue



Fluoride Test — REF 907 34

This test paper is for the quick and easy determination of fluoride in solutions. It includes all necessary reagents so that the measurement can be started immediately. A reliable result is obtained within 2 minutes.

The test can also be used for the detection of dangerous hydrofluoric acid that is used in the production of computer chips.

Type:	test paper with reagents
Range:	0 · 2 · 5 · 10 · 20 · 50 · 100 mg/L F^-
Sufficient for:	30 tests
Shelf life:	at least 2 years after production
Color change:	red → white

INDIQUAT — REF 909 000–909 002

This test paper allows the quick and easy determination of QUAT-based disinfectants in solutions. The easy Dip & Read procedure provides a reliable result within 10 seconds.

Quaternary ammonium compounds (QUAT) identifies a group of chemicals that are used for the disinfection of medical devices and surfaces. They are usually supplied as concentrates that have to be diluted prior to use. The concentration of these dilutions can easily be controlled with INDIQUAT.

INDIQUAT is only manufactured in customer presentation and on request. Alternatively, QUANTOFIX® QUAT (see page 30) can be used for the rapid and reliable detection of quaternary ammonium compounds.

Type:	test paper
Range:	on request
Presentation:	reel of 5 m length
Shelf life:	at least 2 years after production



Moisture indicator — REF 908 01

This test is used for the quick and easy determination of the relative atmospheric humidity. The paper is simply exposed to the atmosphere in question. When the color of the pad does not change anymore, the humidity can be read off.

Moisture sensitive goods e.g. electronics and optical systems have to be stored at low atmospheric humidity. They are usually packed in sealed plastic bags together with a desiccant.

Moisture indicators are used to control if the desiccants is active and if moisture is effectively kept away from the goods.

Type:	self-adhesive label
Range:	20 · 30 · 40 · 50 · 60 · 70 · 80 % r.H.
Presentation:	box of 12 adhesive labels
Color change:	pink ↔ blue

Moisture indicator — REF 908 901

Similar to REF 908 01 but only for 8 % r.H.

Type:	test paper
Sensitivity:	8 % r.H.
Presentation:	pack of 1000 indicators, 60 x 35 mm
Color change:	pink ↔ blue

Test strips for semi-quantitative determinations

Description of individual parameters and tests

Non-toxic moisture indicator without cobalt chloride
REF 908 903

This test is similar to REF 908 901 with one important difference:

The patented moisture indicator is free from carcinogenic and toxic material. The clear color change from red to yellow ensures precise readings.

Established humidity indicators are based on cobalt chloride ($CoCl_2$), which has been found to be carcinogenic and toxic. Contact to these types of indicators represents a health and safety risk to staff involved in handling and packing.

The patented non-toxic moisture indicator eliminates these risks and increase safety.

Type:	test paper
Sensitivity:	8 % r.H.
Presentation:	pack of 1000 indicators, 60 x 35 mm
Color change:	yellow ↔ red

Ozone Test
REF 907 36

This test is used for the quick and easy determination of ozone in air. The test strip is placed in the open air at a wind-shielded location. A reliable result is obtained within 10 minutes.

Ozone is a toxic gas that is formed on sunny days from oxygen and nitrogen oxides. It causes headache, cough and other irritations of the respiratory tract. It is often recommended, that sensitive persons stop physical activities (i.e. jogging) at concentrations >180 µg/m^3.

The ozone concentration varies locally. Using Ozone Test the concentration can be measured directly at the point of interest.

Type:	test strips
Range:	< 90 · 90–150 · 150–210 · > 210 µg/m^3 ozone
Sufficient for:	12 tests
Shelf life:	at least 1.5 years after production
Color change:	white → brown



Saltesmo
REF 906 08

This test paper allows the quick and easy determination of chloride, bromide and iodide in solutions. The test disc is simply punched with an enclosed needle and put into the sample. A reliable result is obtained within 2 minutes.
Sodium chloride is common table salt (NaCl). Saltesmo is used for the detection of salt water in ships and for salt determination in foodstuffs.

Type:	test discs
Range:	0 · 0.25 · 0.5 · 1 · 2 · 3 · 4 · 5 g/L NaCl
Sufficient for:	30 tests
Shelf life:	at least 1.5 years after production
Color change:	red → yellow



Test strips for semi-quantitative determinations

Description of individual parameters and tests

Swimming Pool Test 5 in 1 — REF 907 59

This test allows the quick and easy determination of the water quality in swimming pools. The test strip is dipped into the pool and moved back and forth 5 times. A reliable result is obtained within 30 seconds.

The test provides valuable results about the water hardness, the total alkalinity, free and total chlorine and pH. Monitoring of the water quality allows adjusting the dosage of water conditioners in good time. The pool remains nice and clean.

Type:	test strips
Range:	0 · 100 · 250 · 500 · 1000 mg/L $CaCO_3$ (total hardness) 0 · 0.5 · 1 · 3 · 5 · 10 mg/L Cl_2 (free chlorine) 0 · 1 · 3 · 5 · 10 mg/L Cl_2 (total chlorine) 0 · 80 · 120 · 180 · 240 mg/L $CaCO_3$ (alkalinity) pH 6.4 · 6.8 · 7.2 · 7.6 · 8.4
Sufficient for:	50 tests
Shelf life:	at least 2 years after production
Color change:	blue → red (total hardness) yellow → violet (total chlorine) yellow → violet (free chlorine) light green → dark green (alkalinity) yellow → red (pH value)

Swimming Pool Test 3 in 1 — REF 907 52

Similar to Swimming Pool test 5 in 1 but only with test pads for alkalinity, free chlorine and pH.

Cyanuric Acid Test — REF 907 10

This test strip is for the fast and reliable determination of cyanuric acid in swimming pools. The test strip is simply dipped into the water and moved back and forth five times. After 30 seconds safe results can be read by simply comparing the strip with the color chart.

Strong sun shine (UV radiation) on swimming pool water decomposes chlorine very quickly. Cyanuric acid stabilizes chlorine in swimming pool water, inhibits decomposition and thus ensures the water's safe and proper disinfection.

Type:	test strips
Range:	0 · 50 · 100 · 150 · 300 mg/L cyanuric acid
Sufficient for:	25 tests
Shelf life:	at least 2.5 years after production
Color change:	orange → red



Test papers for qualitative determinations

Description of individual parameters and tests

Qualitative test papers

Test papers allow the qualitative determination of ions and chemical compounds.

They are used to detect if compounds tested for are present above the specific detection limit. Some of the papers have specific applications.



Table of applications

Determination of	Test paper / Test strips	Presentation	REF
Alkaline phosphatase in milk	Phosphatesmo MI	box of 50 test strips 10 x 95 mm	**906 12**
Aluminum ions (Al^{3+})	Aluminum test paper	box of 100 strips 20 x 70 mm	**907 21**
Ammonia, ammonium ions (NH_3, NH_4^+)	Ammonium test paper*	box of 200 strips 20 x 70 mm	**907 22**
Antimony ions (Sb^{3+})	Antimony test paper	box of 200 strips 20 x 70 mm	**907 23**
Arsenic, arsine (As, AsH_3)	Arsenic test paper* = mercury bromide paper	box of 200 strips 20 x 70 mm	**907 62**
Bismuth ions (Bi^{3+})	Bismuth test paper	box of 200 strips 20 x 70 mm	**907 33**
Blood traces (Peroxidase)	Peroxtesmo KM	box of 25 sheets 15 x 30 mm	**906 05**
Boric acid, borates (H_3BO_3, BO_3^{3-})	Turmeric paper	box of 200 strips 20 x 70 mm	**907 47**
Chlorine, free halogens	Chlortesmo Potassium iodide starch paper (see below)	box of 200 strips 20 x 70 mm	**906 03**
Chromium, chromate (Cr(VI), CrO_4^{2-})	Chromium test paper	box of 200 strips 20 x 70 mm	**907 24**
Cobalt ions (Co^{2+})	Cobalt test paper	box of 100 strips 20 x 70 mm	**907 28**
Copper, copper ions (Cu, Cu^+, Cu^{2+})	Cuprotesmo	box of 40 sheets 40 x 25 mm	**906 01**
Copper(II) ions (Cu^{2+})	Copper test paper	box of 200 strips 20 x 70 mm	**907 29**
Cyanide, hydrocyanic acid (CN^-, HCN)	Cyantesmo*	reel of 5 m length	**906 04**
Fluorides, hydrogen fluorides (F^-, H_2F_2)	Fluoride test paper	box of 200 strips 20 x 70 mm	**907 50**
Halogens, especially free chlorine	Chlortesmo	box of 200 strips 20 x 70 mm	**906 03**
Hydrogen sulfide (H_2S), sulfide ions (S^{2-})	Lead acetate paper*	roll of 5 m length refill pack of 3 rolls booklet with 100 strips 10 x 75 mm	**907 44** **907 45** **907 46**
	Sulfide test paper	roll of 5 m length	**907 61**
Iron(II) ions (Fe^{2+})	Dipyridyl paper	box of 200 strips 20 x 70 mm	**907 25**
Iron ions (Fe^{2+}, Fe^{3+})	Iron test paper	box of 100 strips 20 x 70 mm	**907 26**
Lactoperoxidase in milk	Peroxtesmo MI	box of 100 strips 15 x 15 mm	**906 27**
Lead, lead ions (Pb, Pb^{2+})	Plumbtesmo	box of 40 sheets 40 x 25 mm	**906 02**
Mastitis	Udder test paper	PE bag with 20 sheets	**907 48**
Nickel(II) ions (Ni^{2+})	Nickel test paper	box of 200 strips 20 x 70 mm	**907 30**
Nitrate and nitrite (NO_3^-, NO_2^-)	Nitratesmo	reel of 5 m length	**906 11**
Nitrite ions (NO_2^-), nitrous acid (HNO_2), ozone (O_3)	Potassium iodide starch paper MN 816 N (normal sensitivity)	reel of 5 m length refill pack of 3 rolls booklet of 100 strips 10 x 75 mm	**907 54** **907 55** **907 56**
	Potassium iodide starch paper MN 616 T (for spot tests)	box of 200 strips 20 x 70 mm	**907 58**
Oil in water and soil	Oil test paper	box of 100 strips 20 x 70 mm	**907 60**
Peroxidase in foodstuffs	Peroxtesmo KO*	box of 100 sheets 15 x 15 mm	**906 06**
Peroxidase in milk	Peroxtesmo MI	box of 100 sheets 15 x 15 mm	**906 27**
Potassium ions (K^+)	Potassium test paper	box of 200 sheets 20 x 70 mm	**907 27**
Protein residues	INDIPRO*	box of 60 test sticks 10 x 95 mm and reagents	**907 65**
Reducing agents, SO_2, sulfite ions	Potassium iodate starch paper	reel of 5 m length	**907 53**
Silver ions (Ag^+)	Silver test paper	box of 200 strips 20 x 70 mm	**907 32**
Sulphur dioxide (SO_2), sulfite ions	Sulfite test paper	box of 100 strips 20 x 70 mm	**907 63**
Sperm, acid phosphatase	Phosphatesmo KM	box of 25 sheets 15 x 30 mm	**906 07**
Vat dyes, end-point of conversion	Indanthrene yellow paper	box of 200 strips 20 x 70 mm	**907 51**
Water on the bottom of fuel tanks	AQUATEC test sticks	box of 100 strips 10 x 200 mm	**907 42**
Water in org. solutions	Watesmo	reel of 5 m length	**906 09**
Water distribution in butter	Wator	box of 50 sheets 78 x 40 mm	**906 10**
Zirconium ions (Zr^{4+})	Zirconium test paper	box of 100 strips 20 x 70 mm	**907 21**

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

Test papers for qualitative determinations

Description of individual parameters and tests

Aluminum test paper — REF 907 21

The test paper allows the quick and easy detection of aluminum. In the presence of aluminum (Al^{3+}) it shows bright red spots on a yellow background.
Using a different procedure, the test paper can be used for the determination of zirconium.

Type:	test paper
Limit of sensitivity:	10 mg/L Al^{3+}
Sufficient for:	100 tests
Color change:	yellow → bright-red

Ammonium test paper — REF 907 22

The test paper can be used for the rapid detection of ammonium ions as well as for gaseous ammonia. The white paper turns brownish-yellow in the presence of ammonium ions or NH_3. This test paper is specific for the determination of NH_4^+.

Type:	test paper
Limit of sensitivity:	10 mg/L NH_4^+
Sufficient for:	200 tests
Color change:	white → brownish-yellow

Antimony test paper — REF 907 23

The test paper allows the quick and easy detection of antimony [Sb(III)]. In the presence of antimony [Sb(III)] it shows orange-red spots on a yellow background. Pentavalent antimony, i.e. Sb(V), has to be reduced to Sb(III) with metallic magnesium.

This test paper is specific for antimony.

Type:	test paper
Limit of sensitivity:	5 mg/L Sb^{3+}
Sufficient for:	200 tests
Color change:	yellow → orange-red

AQUATEC — REF 907 42

This test allows the quick and easy measurement of the water amount at the bottom of petrol and fuel oil tanks.

In petrol and fuel oil tanks water accumulates over time forming a layer at the bottom. To measure this layer the PE strip is fixed onto a flat steel sheet so that the lower ends coincide. It is then lowered into the tank with a tin cord until it reaches the bottom. Any water present beneath the fuel will dissolve the blue layer (testing time about 15–20 seconds). The thickness of the water layer corresponds to the colorless part of the strip.

Type:	test strips
Limit of sensitivity:	depending on the geometry of the tank, about 1–2 mm water layer
Sufficient for:	100 tests
Color change:	blue → colorless

Arsenic test paper (Mercury(II)bromide paper) — REF 907 62

This test paper allows the easy detection of arsine (AsH_3) in the gas phase. Arsenic in solutions has to be converted into AsH_3 with Zn/acid and purged from the solution. The arsine is detected directly at the boundary layer between water and air.

Arsenic test paper is used for the easy determination of arsenic in grape must and wine. For the determination of arsine in compartment air the test paper is moistened with acetic anhydride.

Type:	test paper
Limit of sensitivity:	0.5 µg As
Sufficient for:	200 tests
Color change:	white → brown-black

Bismuth test paper — REF 907 33

This test paper allows the quick detection of bismuth. In the presence of bismuth ions (Bi^{3+}) it shows an orange-red discoloration on a pale-yellow background.

Type:	test paper
Limit of sensitivity:	60 mg/L Bi^{3+} (Nitric acid > 3 % leads to reduced sensitivity)
Sufficient for:	200 tests
Color change:	pale-yellow → orange-red

Chlortesmo — REF 906 03

This test paper allows the quick and easy detection of free halogens (chlorine, bromine, iodine). Free nitrous acid HNO_2 (not nitrite ions) interferes, but can be destroyed by addition of amidosulfuric acid.

Type:	test paper
Limit of sensitivity:	1 mg/L Cl_2
Sufficient for:	200 tests
Color change:	pale-yellow → blue



Test papers for qualitative determinations

Description of individual parameters and tests

Chromium test paper — REF 907 24

This test paper allows the quick and easy detection of chromate (CrO_4^{3-}). Cr(III) ions must be converted to chromate prior to the detection.

For non-destructive testing of materials apply a drop of acid solution (1 part hydrochloric acid 37 % + 4 parts hydrogen peroxide 3 %) to the degreased surface. After 10–30 seconds add a drop sodiumhydroxyde (NaOH). Press the test paper onto the precipitate then put it into diluted sulfuric acid. In the presence of chromium, a violet spot appears. With this procedure chromium contents > 0.1 % are safely detected.

Type:	test paper
Limit of sensitivity:	2 mg/L Cr^{3+} or 5 mg/L CrO_4^{2-}
Sufficient for:	200 tests
Color change:	white → violet

Cobalt test paper — REF 907 28

This test paper allows the quick and easy detection of cobalt (Co^{2+}).

For non-destructive testing of materials apply a drop of acid solution (50 mL hydrogen peroxide 3 % + 7.5 mL o-phosphoric acid 85 % + 5 mL hydrochloric acid 37 %) to the degreased surface. After 30–60 seconds absorb the liquid with the test paper. In the presence of cobalt a blue color appears. The intensity of the color varies according to the concentration. With this procedure cobalt contents > 0.5 % are safely detected.

Type:	test paper
Limit of sensitivity:	25 mg/L Co^{2+}
Sufficient for:	100 tests
Color change:	white → blue

Copper test paper — REF 907 29

This test paper allows the quick and easy detection of copper. It is specific for Cu^{2+}.

Note: For the determination of copper on surfaces and in alloys, checking for pores in metallic coatings on copper, for criminal trace investigations (projectiles), and for the detection of copper-containing pesticides on plants, fruit or vegetables we recommend the specific and highly sensitive paper Cuprotesmo (REF 906 01, page 41) with a sensitivity of 0.05 µg.

Type:	test paper
Limit of sensitivity:	20 mg/L Cu^{2+}
Sufficient for:	200 tests
Color change:	white → green

Cuprotesmo — REF 906 01

This test paper allows the quick and easy detection of copper(I) and copper(II) ions. It is used for the detection of copper and copper salts on surfaces and in ash, for the detection of pores in metallic coatings on copper containing materials, in criminal trace investigations (bullets), and for the detection of copper-containing pesticides on fruit and vegetables. The test paper is specific for copper.

Type:	test paper
Limit of sensitivity:	0.05 µg on surfaces, 3–5 mg/L Cu in solutions
Sufficient for:	40 tests
Color change:	yellow-white → pink-purple

Cyantesmo — REF 906 04

This test paper allows the quick and easy detection of hydrocyanic acid and cyanides in aqueous solutions and extracts. They are for example formed in the manufacture of fruit brandies and are toxic even in low concentrations. To detect cyanides in solution, a drop of concentrated sulfuric acid is added to 10 mL sample. Hydrocyanic acid gas is formed and can be detected at the boundary layer between water and air.

Type:	test paper
Limit of sensitivity:	0.2 mg/L hydrocyanic acid (HCN)
Presentation:	reel of 5 m length
Color change:	pale-green → blue



Dipyridyl paper — REF 907 25

The test paper allows the sensitive and specific detection of Fe(II) ions. Even small amounts of Fe(II) can safely be detected in the presence of large amounts of Fe(III).

Type:	test paper
Limit of sensitivity:	2 mg/L Fe^{2+}
Sufficient for:	200 tests
Color change:	white → red

Test papers for qualitative determinations

Description of individual parameters and tests

Fluoride test paper — REF 907 50

The test paper allows the fast detection of fluoride ions in solutions containing hydrochlorid acid. It is suitable for the safe and easy detection of dangerous hydrofluoric acid, which is used for example in computer chip production.

Type:	test paper
Limit of sensitivity:	20 mg/L F^-
Sufficient for:	200 tests
Color change:	pink → yellow-white



Indanthrene yellow paper — REF 907 51

The test paper allows the easy determination of hydrosulfite (sodium dithionite) in alkaline solution. It is used to determine the endpoint in the conversion of vat dyes to the leuco form. Because of the special purpose, indanthrene yellow paper is also called hydrosulfite paper.

Type:	test paper
Limit of sensitivity:	alkaline sodium dithionite traces
Sufficient for:	200 tests
Color change:	yellow ↔ blue



INDIPRO — REF 907 65

The test paper allows the detection of protein contamination on surfaces and tools coming in contact with food. The test kit consists of 60 test strips with reagents.

Type:	test strips and reagents
Limit of sensitivity:	50 µg BSA (bovine serum albumin)
Sufficient for:	60 tests
Color change:	yellow → green

Iron test paper — REF 907 26

This test paper is used for the fast detection of iron ions (Fe^{2+} and Fe^{3+}). In contrast to Dipyridyl paper it reacts with Fe(II) as well as Fe(III) ions. For the specific detection of Fe(II) please use Dipyridyl paper (REF 907 25, page 41).

Type:	test paper
Limit of sensitivity:	10 mg/L Fe^{2+} or Fe^{3+}
Sufficient for:	100 tests
Color change:	yellow-white → red-brown

Lead acetate paper — REF 907 44

The test paper allows the quick and easy detection of hydrogen sulfide. This gas occurs in the processing of raw oil. It is toxic even in low concentrations. Therefore, critical points are carefully checked. Sulfide containing solutions also give a positive reaction.

Lead acetate is toxic and the test paper needs to be declared as hazardous. The technically equivalent Sulfide test paper (REF 907 61, page 45) is a non-toxic and safe alternative.

Type:	test paper
Limit of sensitivity:	1 drop of a solution containing 5 mg/L sulfide (S^{2-}) shows a positive reaction
Presentation:	reel of 5 m length
Color change:	white → brown-black

This test paper is also available as refill pack with 3 reels (REF 907 45) and as booklet with 100 strips (REF 907 46).

Mastitis

see Udder test paper, page 46

Mercury bromide paper

see Arsenic test paper, page 40

Nickel test paper — REF 907 30

This test paper allows the quick and easy detection of nickel.

For non-destructive testing of materials apply a drop of 3 % nitric acid (1 part nitric acid 85 %, 5 parts water) to the degreased surface. After 1 minute absorb the liquid with the test paper. With this procedure nickel contents > 0.5 % are safely detected.

Type:	test paper
Limit of sensitivity:	10 mg/L Ni^{2+}
Sufficient for:	200 tests
Color change:	white → red

Test papers for qualitative determinations

Description of individual parameters and tests

Nitratesmo — REF 906 11

This test paper allows the reliable detection of nitrate and nitrite. It shows different colors for the two ions.

Type: test paper
Limit of sensitivity: 10 mg/L nitrate (NO_3^-), 5 mg/L nitrite (NO_2^-)
Presentation: reel of 5 m length
Color change: Nitrate: white → red (dip test paper into sample and afterwards into sulphuric acid 96 %)
Nitrite: white → yellow (dip test paper into sample and afterwards into hydrochloric acid 5 mol/L)

Oil test paper — REF 907 60

This test paper allows the fast and reliable detection of oil contaminations of water and soil. The sensitivity largely depends on the nature of the respective hydrocarbon. For detection of oil in soil, press the paper firmly against the soil to be tested and rinse with clear water. To determine oil in water, move the paper back and forth a few times in the sample. In case of volatile hydrocarbons, the color reaction of the test paper has to be evaluated immediately.

Substance	Color change	
	lower limit mg/L of water	clearly detectable mg/L of water
Petroleum ether (b. p. 40–80 °C)	250	400
Gasoline (high octane)	10	25
Fuel oil	5	10
Lubricating oil	1	5

Type: test paper
Limit of sensitivity: see table
Sufficient for: 100 tests
Color change: pale blue → dark blue



Peroxtesmo KM — REF 906 05

This test paper allows the fast and sensitive detection of blood traces. In criminal investigations it is used as a quick screening test.

The test paper uses the pseudo-peroxidatic effect of blood. The material in question is allowed to soak in water for about 1 minute. Then the test paper is pressed to the sample. Blood traces lead to a distinct discoloration within a few seconds. The test papers are individually sealed in plastic. This ensures safe results at any time.

Type: test paper
Limit of sensitivity: blood traces
Sufficient for: 25 tests
Color change: white → blue

Peroxtesmo KO — REF 906 06

This test paper allows the quick and easy detection of peroxidase in food. It is used in the food processing industry to evaluate the quality of canned food.

A drop of the sample is put onto the test paper. Alternatively, the paper can be pressed to freshly cut surfaces. In the presence of peroxidase a blue to blue-green color appears within 2 minutes.

Type: test paper
Limit of sensitivity: peroxidase traces
Sufficient for: 100 tests
Color change: white → blue-green

Peroxtesmo MI — REF 906 27

This test paper allows the specific detection of lactoperoxidase in milk. In the dairy industry the test is used for the quick and easy quality control of ultra heat treated (UHT) milk. In contrast to the alternative guaiacol method, Peroxtesmo MI is odorless and non-toxic.

A drop of milk is put onto the test paper. If the paper remains white, the ultra heat treatment process is completed.

Type: test paper
Limit of sensitivity: 3 % raw milk in UHT milk
Sufficient for: 100 tests
Color change: white → blue

Test papers for qualitative determinations

Description of individual parameters and tests

Phosphatesmo KM — REF 906 07

The test paper allows the quick and easy detection of sperm. In criminal investigations it is used as a rapid screening test.

The paper is specific for acid phosphatase. The material in question is allowed to soak in physiological saline solution for about 1 minute. Then the material is placed on the paper. In presence of acid phosphatase the paper turns violet. The reaction is not a suitable substitute for the microscopic determination of live spermatozoa.

The test papers are individually sealed in plastic. This ensures clear results at any time.

Type:	test paper
Limit of sensitivity:	sperm traces
Sufficient for:	25 tests
Color change:	white → violet



Phosphatesmo MI — REF 906 12

This test strip allows the specific detection of alkaline phosphatase in milk. In the dairy industry the test is used for the quick and easy quality control of pasteurized milk.

The strip is dipped into the milk and incubated at 36 °C. If the paper remains white, the pasteurization is complete. The test should be stored at 2–8 °C to ensure optimal results.

Type:	test paper
Limit of sensitivity:	0.5 % raw milk in pasteurized milk or 300 U/L alkaline phosphatase in UHT milk
Sufficient for:	50 tests
Color change:	white → yellow



Plumbtesmo — REF 906 02

The test paper allows the quick and easy detection of lead on surfaces including metal surfaces, dishes, ceramics and toys. In criminal investigations it is used to search for traces of bullets.

The surface in question is moistened with distilled water. The test paper is pressed against the surface for about 2 minutes. In the presence of lead the paper turns pink to dark purple.

Type:	test paper
Limit of sensitivity:	5 mg/L Pb^{2+}
Sufficient for:	40 tests
Color change:	yellow-white → pink-purple

Test papers for qualitative determinations

Description of individual parameters and tests

Potassium test paper — REF 907 27

The test paper allows the quick and easy detection of potassium. Rubidium, caesium and thallium(I) give the same reaction. Sodium and heavy metal ions decrease the sensitivity. The leaflet describes a method to eliminate these interferences.

Type:	test paper
Limit of sensitivity:	250 mg/L K^+
Sufficient for:	200 tests
Color change:	bright yellow → orange

Potassium iodate starch paper — REF 907 53

The test paper allows the fast detection of sulfite and sulphur dioxide. The paper is used in food analyzing laboratories. The reaction is as follows:

$$2\ IO_3^- + 5\ SO_3^{2-} + 2\ H^+ \rightarrow 5\ SO_4^{2-} + I_2 + H_2O$$

Sulphurous acid or sulfites reduce potassium iodate to free iodine. With starch, iodine gives a characteristic blue-black color. For a detection of sulfite with highly sensitivity we recommend Sulfite test paper (REF 907 63, page 46)

Type:	test paper
Limit of sensitivity:	5 mg/L SO_2
Presentation:	reel of 5 m length
Color change:	white → blue-black

Potassium iodide starch paper

This test paper allows the quick and easy detection of strong oxidizers like nitrite and free chlorine. It is also used to control diazotization reactions. Nitrite or free chlorine oxidize potassium iodide to form elemental iodine which reacts with starch to a blue-violet complex.

Potassium iodide starch paper may be used by dipping it into the sample or by applying drops of the sample to the paper.

MN 816 N standard grade — **REF 907 54**

MN 616 T recommended for spot tests — **REF 907 58**

Type:	test paper
Limit of sensitivity:	1 mg/L NO_2^- / 1 mg/L free Cl_2
Presentation:	reel of 5 m length (907 54) or box of 200 strips (907 58)
Color change:	white → blue-violet

The standard grade is also available as refill (REF 907 55) and booklet with 100 strips (REF 907 56).

Silver test paper — REF 907 32

The test paper allows the quick and easy detection of silver ions. These cause red-violet spots on a salmon background. The leaflet describes a method to eliminate interferences of Hg, Cu, Au, Pt and Pd.

Type:	test paper
Limit of sensitivity:	20 mg/L Ag^+
Sufficient for:	40 tests
Color change:	salmon → red-violet

Sulfide test paper — REF 907 61

The test paper allows the easy and reliable detection of hydrogen sulfide. This gas occurs in the processing of raw oil. It is toxic even in low concentrations. Therefore, critical points are carefully checked. Sulfide ions in solution also give a positive reaction.

The frequently used Lead acetate paper (REF 907 44, page 42) is toxic and needs to be declared as hazardous. Sulfide test paper provides an alternative which is non toxic and safe.

Type:	test paper
Limit of sensitivity:	1 drop of a solution containing 5 mg/L sulfide (S^{2-}) shows a positive reaction
Presentation:	roll of 5 m length
Color change:	white → brown-black



Test papers for qualitative determinations

Description of individual parameters and tests

Sulfite test paper — REF 907 63

The test paper allows the quick and easy detection of sulfite and sulfur dioxide. In food analyzing laboratories it is used to detect sulfite in meat products. In medical diagnostics it is used as a quick test on sulfite oxidase deficiency.

Type:	test paper
Limit of sensitivity:	10 mg/L Na_2SO_3
Sufficient for:	100 tests
Color change:	white → pink-red

Turmeric paper — REF 907 47

The test paper allows the quick and easy detection of boric acid and borates. It is impregnated with curcumin, the yellow dye extracted from the roots of curcuma tinctoria (yellow ginger). The paper is dipped into the sample containing hydrochloric acid (pH 1–2). Afterwards it is allowed to dry. In presence of borate the paper turns orange to red. Dipping into conc. sodium hydroxide causes a green-black color. In the absence of borate, sodium hydroxide leads to a brown-red color.
Oxidizing substances and iodide interfere.

Type:	test paper
Limit of sensitivity:	20 mg/L B (100 mg/L H_3BO_3)
Sufficient for:	200 tests
Color change:	yellow → red;



Udder test paper — REF 907 48

The test paper allows the quick and easy detection of the pH of milk. It is used as a screening test on mastitis. Milk of infected cattle must not be sold.

All four tits of the udder require testing. A drop of milk is placed on the test zone. For healthy cows the color turns to yellow-red (pH 6.4–6.6). A green (pH 7) or blue (pH 8) color indicates mastitis. If the indicator remains yellow, the pH of the milk is about 6.3. This finding is likewise pathological and requires further diagnostic or therapeutic action.

Type:	test paper
Limit of sensitivity:	mastitis traces
Sufficient for:	20 x 4 tests
Color change:	yellow → green → blue

Watesmo — REF 906 09

The test paper allows the quick and easy detection of water and water vapor. On contact with water the paper changes color from light blue to dark blue. The reaction is not reversible. Even after drying, the contact with water can clearly be proved.

The test paper is used to control the leak-tightness of tubing or to detect condensed water. It can also be used to control if sensitive products like electronics come into contact with water. This helps to detect unjustified complaints.

In chemical laboratories the test paper is used to control solvents. If the paper remains uncolored after evaporation of the solvent, the solvent is anhydrous. In reactions sensitive to water it can then safely be used.

For the detection of water vapor in gas streams the paper is moistened with anhydrous isopropanol. The gas stream is directed on the paper. The presence of water vapor is indicated by a blue color.

Type:	test paper
Limit of sensitivity:	H_2O traces
Presentation:	reel of 5 m length
Color change:	light blue → dark blue

Test papers for qualitative determinations

Description of individual parameters and tests

Wator — REF 906 10

The test paper allows the quick and easy determination of the water distribution in butter. It is a special presentation of Watesmo for the dairy industry.

On contact with water the paper develops dark spots. Size and number of these spots are correlated to the distribution of water in butter. This is evaluated with a 5-point evaluation chart described in DIN 10 311.

For water detection for other applications we recommend Watesmo (REF 906 09, page 46).

Type:	test paper
Limit of sensitivity:	H_2O traces
Sufficient for:	50 tests
Color change:	light blue → dark blue



Zirconium test paper — REF 907 21

This test paper allows the quick and easy detection of zirconium. When used in accordance with the instructions, the test paper shows red-violet spots against a yellow background. The color reaction is specifically for zirconium; only hafnium interfere.

The Zirconium test paper can also be used for the determination of aluminum by following the instructions applicable to the aluminum test paper.

Type:	test paper
Limit of sensitivity:	20 mg/L Zr^{4+}
Sufficient for:	100 tests
Color change:	yellow → red-violet

Test strips and test papers

Combinations of several test papers and test strips

Test paper analysis case

- **Individual packaging for any testing needs**
- **Stable and rugged case with premium foam inlay**
- **Easy storage and transport**



Test paper analysis case **REF 913 990**

We have designed the test paper analysis case for your individual testing needs. You can equip the case with your personal selection of our pH indicator papers, pH-Fix test strips, as well as all our strips and papers for semi-quantitative and qualitative determinations.

Simple and fast analysis all in one case

- You can also fit all the products featured in our focus flyers for different applications.
- Our smallest case solution fits all strips and papers from the vast MACHEREY-NAGEL test paper and test strip range.

Empty case for individual needs

- The case can be equipped with almost any test from the MACHEREY-NAGEL Rapid Test product line
- Individual combinations of up to



· 9 test strips tubes / 5 reagent bottles
· 2 reagent vessels, 4 measuring spoons and 1 beaker



· 2 classics flat boxes of pH-Fix
· 1 test paper reel



· 1 PlopTop tube pH-Fix PT
· 1 test paper box

Customized case solutions

Catering to individual customer needs is of great importance to MACHEREY-NAGEL. Even though our case solutions already provide a high level of flexibility, we recognize that some customers may have specific requirements outside our existing case solutions. Therefore, we offer entirely individual solutions with a foam inlay designed exactly to your specifications and testing needs. Starting at a minimum of 50 cases, we can provide you with a case that perfectly fits your personal requirements. In addition to a special inlay, we also offer readily packed cases starting at a minimum quantity of 50 cases as well.

Thus, within our highly flexible case range, we can provide virtually any customer with the perfect testing and transportation solution.

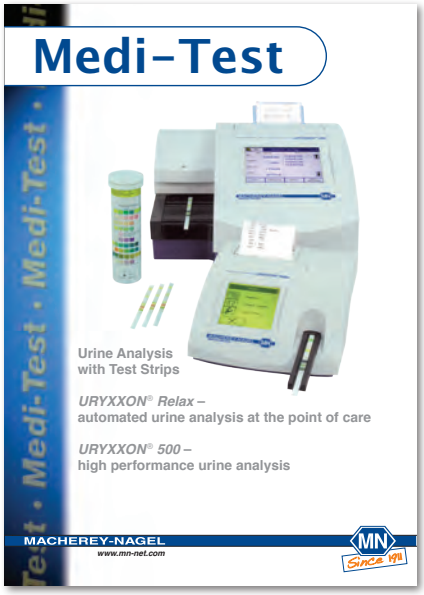
For additional case solutions with *VISOCOLOR*® test kits, see page 72.



Medi-Test urine analysis test strips

The use of urine test strips is acknowledged as modern screening method in medical practice. With these non-invasive tests important information on the health status of the patient is rapidly obtained. The urine sample is easily drawn and can immediately be investigated with a test strip. Thus one obtains within minutes a result, which facilitates the decision for further diagnostic and therapeutic action.

- Urine test strips offer a rapid survey of the health status of a patient
- Urine chemistry – rapid and reliable



DiaQuant® test strips for dialysis

In dialysis, reliable on-site chemical testing is a critical factor for patient safety. Accurate and quick testing is also fundamental to run a dialysis center effectively and successfully.

The new DiaQuant® line from MACHEREY-NAGEL is designed for the dialysis environment. Our proven technology makes testing reliable and accurate, thus providing a safe environment for your patients.

Fast results

Health care professionals use DiaQuant® tests for a variety of different substances. The product group offers a complete range of testing equipment for disinfection and water supply. All tests follow an easy Dip & Read procedure and provide reliable results in 5–10 seconds.

Easy to use

All DiaQuant® tests are ready-to-use kits. They are pre-calibrated and do not need further equipment or reagents. As “lab in the pocket” they are easy to use for any health care professional.

Precise readings

The color charts are adjusted and checked using standard solutions. Users can be sure to receive accurate readings whenever they test.



If you are interested in our programme of test strips and reflectometers for in-vitro medical diagnostics, please contact us.

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Test kits for water analysis

VISOCOLOR® test kits and reagent cases



Compact and flexible

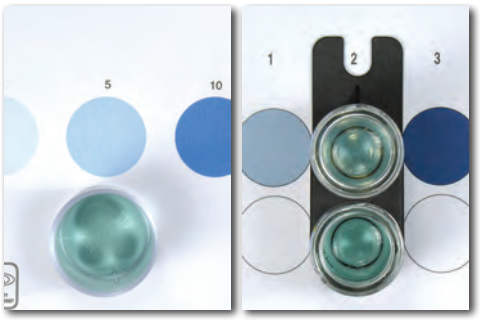
- Complete mini-laboratories with reagents and accessories for water analysis
- Chemical analysis without additional accessories and without the need for any prior experience in chemistry
- Suitable for analysis in labs or directly on-site
- 3 product lines with different accuracies, precisions and sensitivities for universal use depending on the analytical requirement
- Various measuring methods and detection principles for all parameters from acidity to zinc
- *VISOCOLOR*® reagent cases as portable laboratories with individual combinations of different test kits

Simple and precise



- Comfortable test procedures since test kits are based on simple chemical-analytical methods like colorimetry and titration
- Instructions in different languages and with pictograms for safe and simple test performance
- Color-coded reagent bottles for clear identification of reagents
- Fast-dissolving reagents save time and facilitate the daily work – no crushing of tablets and no stirring of reaction solutions are necessary

Reliable and safe



- Reliable and comparable results – the reaction principles of *VISOCOLOR*® tests are based on internationally acknowledged regulations like DIN-, EN-, ISO- and EPA standards
- Maximum safety for the user and easy disposal of used reagents by avoiding of dangerous and environmentally hazardous substances
- Low susceptibility to interferences, high selectivity with regards to the substance to be analyzed as well as compensation of turbidities and colors guarantee reliable results
- Additional increase of accuracy and reproducibility by photometric determination of *VISOCOLOR*® *ECO* tests with the photometers PF-3 and PF-12 / PF-12^{Plus}

VISOCOLOR® alpha tests use colorimetric, as well as titrimetric procedures. Use of multicomponent reagents results in a very convenient, rapid and safe handling, because often only one reagent is needed for each test.

The reagent bottles are packed in practical blister packs. The cardboard back is used for opening and closing the package, and also provides all information required for the test: instructions for use in 6 languages with pictograms, as well as a color comparison chart for colorimetric evaluations. The blister packs of the *VISOCOLOR® alpha* test kits have a punched hole for convenient storage or display in showrooms or at sales counters.

Colorimetric tests

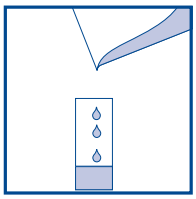
Principle:
Colorimetry with color comparison card

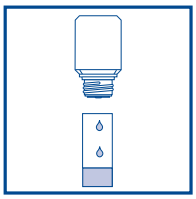
- Visual evaluation
- Environment-friendly
- Cost-efficient
- Convenient handling, as easy as test strips
- Accurate results
- Handy packages
- With pictogram instructions
- Reagent bottles with clear dosing instructions

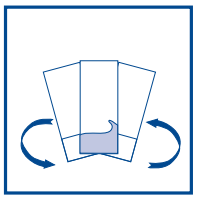


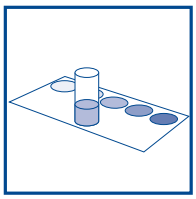
Test kit consists of plastic pack with:

- Sample tube with 5 mL ring mark
- Color coded bottles with liquid or powder reagents
- Measuring spoon for accurate dosage of solid reagents
- Color scale with at least 5 gradations


Fill the sample


Add reagent


Mix


Analyze

Titration test kits

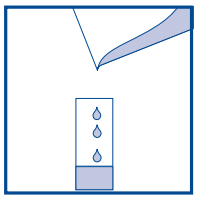
Principle:
Titration with drop counting

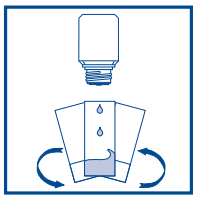
- Visual evaluation
- Environment-friendly
- Cost-efficient
- Convenient handling, as easy as test strips
- Accurate results
- Indicator and titration solution in one dropping bottle
- Handy packages
- With pictogram instructions
- Reagent bottles with clear dosing instructions

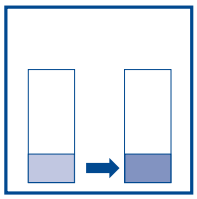


Test kit consists of plastic pack with:

- Sample tube with 5 mL ring mark
- One dropping bottle with mixture of indicator and titration solution


Fill the sample


Add reagent and mix


Color change

Count the drops: 1 drop = 1 measuring unit

Test kits for water analysis

VISOCOLOR® ECO

VISOCOLOR® ECO presents a product group of colorimetric and titrimetric test kits which avoids hazardous substances wherever possible. With *VISOCOLOR® ECO* even water constituents with low limiting values can be determined with sufficient accuracy. All *VISOCOLOR® ECO* test kits are packed in an environment-friendly box and contain easy to understand instructions in 6 languages.

Colorimetric test kits

Principle:
Colorimetry with color comparison card

- Visual and photometric evaluation
- Environment-friendly
- Economic
- Convenient handling
- Higher accuracy and sensitivity
- With pictogram instructions
- Reagent bottles with clear dosing instructions
- Compensation of turbidity and colors
- Refill packs available



Test kit consists of cardboard box with:

- 2 measuring tubes 20 mm diameter with screw caps
- Holder for the measuring tubes
- Color coded bottles with liquid or powder reagents
- Graduated plastic syringe 5 mL for convenient sample dosage
- Measuring spoon for accurate dosage of solid reagents
- Color comparison card with at least 5 gradations

Titration test kits

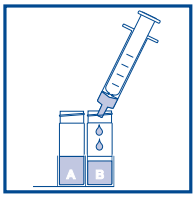
Principle:
Titration with drop counting

- Visual evaluation
- Environment-friendly
- Economic
- Convenient handling
- Higher accuracy and sensitivity
- Clearer color change due to separated dropping reagents
- Reagent bottles with clear dosing instructions

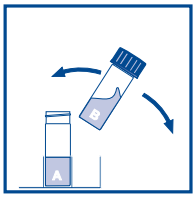


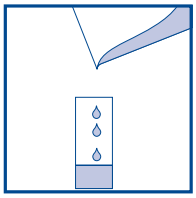
Test kit consists of cardboard box with:

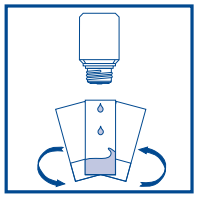
- Sample tube with 5 mL ring mark
- Graduated plastic syringe 5 mL for convenient sample dosage
- Dropping bottle(s) with indicator solution
- Dropping bottle(s) with titration solution

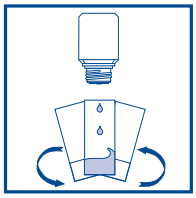

Fill the sample


Add reagent

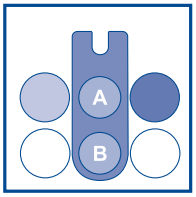

Mix


Fill the sample

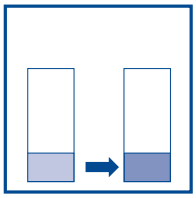

Add indicator and mix


Add titration solution and mix


Wait



Analyze


Color change

VISOCOLOR® HE test kits are highly sensitive colorimetric test kits. In comparison with conventional *VISOCOLOR®* kits, their sensitivity is enhanced by increasing the length of the test tube and the use of highly sensitive reagents. This technique allows a 10-fold to 100-fold increase in sensitivity. Each *VISOCOLOR® HE* test kit is packed in a robust plastic box which contains the comparator block with color comparison disk and all required reagents. The *VISOCOLOR®* titration test kits are based on principles of volumetric analysis. On the gradated syringe the results can be read off in mg/L or in alternative dimensions.

Colorimetric test kits

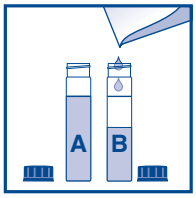
Principle:
High sensitivity colorimetry with comparator block and color comparison disc

- Visual evaluation
- Environment-friendly
- Convenient handling
- Highest accuracy due to extremely narrow gradation
- Highest sensitivity down to 0.002 mg/L due to longer measuring tubes
- Reagent bottles with clear dosing instructions
- Compensation of turbidity and colors
- Refill packs available

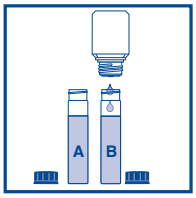


Test kit consists of plastic box with:

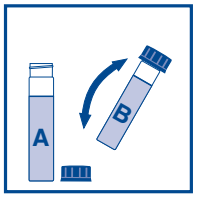
- 2 measuring tubes 20 mm diameter with screw caps
- Comparator block with color comparison disk
- Color coded bottles with liquid or powder reagents
- Measuring spoon for accurate dosage of solid reagents
- Beaker for convenient sample dosage



Fill the sample

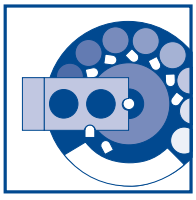


Add reagent



Mix


Wait


Analyze

Titration test kits

Principle:
High sensitive volumetric analysis with graduated syringe

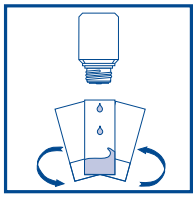
- Visual evaluation
- Convenient handling
- Highest accuracy due to narrowly graduated syringe
- Reagent bottles with clear dosing instructions
- Clearer color change due to separated dropping reagents
- Refill packs available



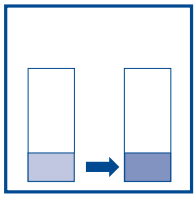
Test kit consists of cardboard box with:

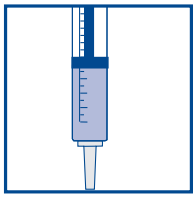
- Sample tube with 5 mL ring mark
- Graduated syringe for precise reagent dosage
- Bottle(s) with indicator solution
- Bottle(s) with titration solution


Fill the sample


Add reagent and mix


Titration solution


Color change


Analyze

Test kits for water analysis

VISOCOLOR® program

VISOCOLOR® tests kits are complete plastic boxes with all reagents and accessories for a test.
Refill packs are for the replacement of used reagents in a test kit or reagent case. They don't come with a color chart or accessories.

Ordering information

Test	Range (visual)	Type	No of tests	REF test kit	REF refill pack
Acidity AC 7* (base capacity)	0.2–7.2 mmol/L H^+ [1]	*HE*	200	**915 006**	**915 206**
Alkalinity AL 7* (total)	0.2–7.2 mmol/L OH^- [1]	*HE*	200	**915 007**	**915 207**
Alkalinity TA [2] [3]	0.10–5.00 mmol/L H^+	*ECO*	100	–	**931 204**
Alkalinity (p/m value) see Carbonate hardness C 20					
Aluminum	0.10–0.50 mg/L Al^{3+}	*ECO*	50	**931 006**	**931 206**
Ammonium 15*	0.5–15 mg/L NH_4^+	*ECO*	50	**931 010**	**931 210**
Ammonium*	0.2–3 mg/L NH_4^+	*alpha*	50	**935 012**	–
Ammonium 3*	0.2–3 mg/L NH_4^+	*ECO*	50	**931 008**	**931 208**
Ammonium*	0.02–0.50 mg/L NH_4^+	*HE*	110	**920 006**	**920 106**
Bromine [2] [3]	0.10–13.00 mg/L Br_2	*ECO*	200	–	**931 211**
Calcium CA 20*	0.6–25.0 °e / 0.1–3.6 mmol/L Ca^{2+} [1]	*HE*	200	**915 010**	**915 210**
Calcium*	1 drop ≙ 5 mg/L Ca^{2+}	*ECO*	100	**931 012**	–
Carbonate hardness	1 drop ≙ 1.25 °e ≙ 17.8 mg/L $CaCO_3$	*alpha*	100	**935 016**	–
Carbonate hardness	1 drop ≙ 1.25 °e ≙ 17.8 mg/L $CaCO_3$	*ECO*	100	**931 014**	–
Carbonate hardness C 20* (p-/m value)	0.6–25.0 °e / 0.2–7.2 mmol/L H^+ [1]	*HE*	200	**915 003**	**915 203**
Chloride*	1–60 mg/L Cl^-	*ECO*	90	**931 018**	**931 218**
Chloride CL 500*	5–500 mg/L Cl^- [1]	*HE*	300	**915 004**	**915 204**
Chlorine, free	0.25–2.0 mg/L Cl_2	*alpha*	150	**935 019**	–
Chlorine 1, free + total NEW!	0.1–2.0 mg/L Cl_2	*ECO*	150	**931 035**	**931 235**
Chlorine 2, free + total*	0.1–2.0 mg/L Cl_2	*ECO*	150	**931 015**	**931 215**
free Chlorine 2	0.1–2.0 mg/L Cl_2	*ECO*	150	**931 016**	**931 216**
Chlorine 6, free + total [2] [3]	0.05–6.00 mg/L Cl_2	*ECO*	200	–	**931 217**
free Chlorine 6 [2] [3]	0.05–6.00 mg/L Cl_2	*ECO*	400	–	**931 219**
Chlorine	0.02–0.60 mg/L Cl_2	*HE*	160	**920 015**	**920 115**
Chlorine + pH see Swimming pool					
Chlorine dioxide*	0.2–3.8 mg/L ClO_2	*ECO*	150	**931 021**	**931 221**
Chromium(VI)*	0.02–0.50 mg/L Cr(VI)	*ECO*	140	**931 020**	**931 220**
Copper	0.1–1.5 mg/L Cu^{2+}	*ECO*	100	**931 037**	**931 237**
Copper	0.04–0.50 mg/L Cu^{2+}	*HE*	150	**920 050**	**920 150**
Cyanide*	0.01–0.20 mg/L CN^-	*ECO*	100	**931 022**	**931 222**
Cyanide*	0.002–0.04 mg/L CN^-	*HE*	50	**920 028**	**920 128**
Cyanuric acid*	10–100 mg/L Cya	*ECO*	100	**931 023**	**931 223**
DEHA* (diethylhydroxylamine)	0.01–0.30 mg/L DEHA	*ECO*	125	**931 024**	**931 224**
Fluoride [2] [3]	0.1–2.0 mg/L F^-	*ECO*	150	–	**931 227**
total Hardness*	1 drop ≙ 1.25 °e ≙ 17.8 mg/L $CaCO_3$	*alpha*	100	**935 042**	–
total Hardness*	1 drop ≙ 1.25 °e ≙ 17.8 mg/L $CaCO_3$	*ECO*	110	**931 029**	–
total Hardness H 20 F*	0.6–25.0 °e / 0.1–3.6 mmol/L Ca^{2+} [1]	*HE*	200	**915 005**	**915 205**
total Hardness H 2*	0.06–2.5 °e / 0.01–0.36 mmol/L Ca^{2+} [1]	*HE*	200	**915 002**	**915 202**
residual Hardness *	0.05–0.37 °e	*alpha*	200	**935 080**	–
Hydrazine*	0.05–0.40 mg/L N_2H_4	*ECO*	130	**931 030**	**931 230**
Iron 1*	0.04–1.0 mg/L Fe	*ECO*	200	**931 025**	**931 225**

The measurement range of photometric determination with PF-3 and PF-12/PF-12*Plus* can be different to visual range.

[1] For titration test kits the range can be increased with additional reagent syringe.
[2] only for the photometric determination with PF-12 / PF-12*Plus*
[3] only for the photometric determination with PF-3
[4] based on the chemical procedures of the German Standard Methods (DEV)

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

Test kits for water analysis

VISOCOLOR® program

Test	Range (visual)	Type	No of tests	REF test kit	REF refill pack
Iron 2	0.04–1.0 mg/L Fe	*ECO*	100	**931 026**	**931 226**
Iron	0.01–0.20 mg/L Fe	*HE*	300	**920 040**	**920 140**
Manganese*	0.1–1.5 mg/L Mn	*ECO*	70	**931 038**	**931 238**
Manganese*	0.03–0.50 mg/L Mn	*HE*	100	**920 055**	**920 155**
Nickel*	0.1–1.5 mg/L Ni^{2+}	*ECO*	150	**931 040**	**931 240**
Nitrate*	2–50 mg/L NO_3^-	*alpha*	100	**935 065**	**–**
Nitrate*	1–120 mg/L NO_3^-	*ECO*	110	**931 041**	**931 241**
Nitrite*	0.05–1.0 mg/L NO_2^-	*alpha*	200	**935 066**	**–**
Nitrite*	0.02–0.5 mg/L NO_2^-	*ECO*	120	**931 044**	**931 244**
Nitrite*	0.005–0.10 mg/L NO_2^-	*HE*	150	**920 063**	**920 163**
pH 5–9*	pH 5.0–9.0	*alpha*	200	**935 075**	**–**
pH 4.0–9.0*	pH 4.0–9.0	*ECO*	400	**931 066**	**931 266**
pH 4.0–10.0*	pH 4.0–10.0	*HE*	500	**920 074**	**920 174**
pH 6.0–8.2 [2) 3)]	pH 6.0–8.2	*ECO*	150	**–**	**931 270**
Phosphate*	2–20 mg/L PO_4^{3-}	*alpha*	70	**935 079**	**–**
Phosphate*	0.2–5 mg/L PO_4-P	*ECO*	80	**931 084**	**931 284**
Phosphate*	0.05–1.0 mg/L P	*HE*	300	**920 082**	**920 182**
Phosphate* (DEV) [4)]	0.01–0.25 mg/L P	*HE*	100	**920 080**	**920 180**
Potassium*	2–15 mg/L K^+	*ECO*	60	**931 032**	**931 232**
Residual hardness	see Hardness (residual)				
Oxygen*	1–10 mg/L O_2	*ECO*	50	**931 088**	**931 288**
Oxygen SA 10*	0.2–10 mg/L O_2 [1)]	*HE*	100	**915 009**	**915 209**
Silica* / silicon	0.2–3.0 mg/L SiO_2	*ECO*	80	**931 033**	**931 233**
Silica* / silicon	0.01–0.30 mg/L Si	*HE*	120	**920 087**	**920 187**
Silica HR 200* [3)] NEW!	10–200 mg/L SiO_2	*ECO*	100	**–**	**931 234**
Sulfate*	25–200 mg/L SO_4^{2-}	*ECO*	100	**931 092**	**931 292**
Sulfide*	0.1–0.8 mg/L S^{2-}	*ECO*	90	**931 094**	**931 294**
Sulfite*	1 drop ≙ 1 mg/L SO_3^{2-}	*ECO*	60	**931 095**	**–**
Sulfite SU 100*	2–100 mg/L SO_3^{2-} [1)]	*HE*	100	**915 008**	**915 208**
Swimming pool* (Chlorine + pH)	0.1–2.0 mg/L Cl_2 pH 6.9–8.2	*ECO*	150 150	**931 090**	**931 290**
Zinc*	0.5–3 mg/L Zn^{2+}	*ECO*	120	**931 098**	**931 298**

The measurement range of photometric determination with PF-3 and PF-12/PF-12^{Plus} can be different to visual range.

[1)] For titration test kits the range can be increased with additional reagent syringe.
[2)] only for the photometric determination with PF-12 / PF-12^{Plus}
[3)] only for the photometric determination with PF-3
[4)] based on the chemical procedures of the German Standard Methods (DEV)

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.



Test kits for water analysis

Analytical principles

Colorimetry

In colorimetric procedures advantage is taken of the fact that certain reagents form colored compounds with the substances to be determined. The intensity of the color is directly related to the concentration of the substance in question. For example in the case of the *VISOCOLOR® ECO* Nitrite, the reagents form a blue-red dye with nitrite. The resulting color intensity is proportional to the concentration of nitrite. In the case of pH measurements the use of specific indicator mixtures permits the formation of a characteristic color for each pH value. The reaction colors obtained are compared with a range of standards in a sample vessel called comparator. As soon as the reaction color has been matched to a comparison color, the result can be read from the comparator or color charts.

Volumetric analysis (titration)

For certain substances it is difficult or even impossible to convert them to compounds which can be colorimetrically evaluated. In many of these cases titrimetric methods are used for analysis. This measuring principle is bases on the following idea: In volumetric analysis, individual drops of a titration solution are added to a defined volume of sample solution. The active substance in the titration solution reacts with the substance to be determined in the sample. After complete reaction further addition of titration solution would cause an excess of the active substance. The point of complete reaction (end point or equivalence point) is visualized by the color change of an indicator added to the sample.

Description of individual parameters and tests

Acidity

H^+

In natural unpolluted waters mainly carbonic acid but also humic acids are present. With this test kit, all acids, i. e. also those present in industrial waters, can be determined.

Reaction basis:
Titrimetric determination of acids with sodium hydroxide solution against the p-indicator (Reaction basis according to DIN 38409-H7).

Note:
To differentiate between mineral acids and carbonic acid, the sample should be titrated against the m-indicator from the test kit *VISOCOLOR® HE* Carbonate hardness C 20.

VISOCOLOR® HE Acidity AC 7 **REF 915 006**
Refill pack **REF 915 206**

Type:	titration test kit
Range (visual):	0.2–7.0 mmol/L H^+ 1 gradation mark = 0.2 mmol/L H^+
Sufficient for:	about 200 tests with an average acid content of 4.0 mmol/L H^+
Shelf life:	at least 2 years after production
Sea water suitability:	yes

Alkalinity (total)

OH^-

All compounds which cause a pH increase above pH 7 are determined, e.g. hydroxide, carbonate, hydrogen carbonate etc.

Reaction basis:
(a) Photometric determination with bromophenol blue at 2 different wavelengths

(b) Titrimetric alkalinity determination with hydrochloric acid against the m-indicator (Reaction basis according to DIN 38409-H7).

Note:
To differentiate between hydroxide, carbonate and hydrogen carbonate you should use the test kit *VISOCOLOR® HE* Carbonate hardness C 20 (see German Standard Methods DIN 38 409-H7).

VISOCOLOR® ECO Alkalinity TA **REF 931 204**

Type:	reagent set for photometric determination
Ranges	
PF-12^{Plus}:	0.10–5.00 mmol/L H^+ or 5–250 mg/L $CaCO_3$
PF-3:	0.10–5.00 mmol/L H^+ or 5–250 mg/L $CaCO_3$
Reaction basis:	(a) photometry
Sufficient for:	100 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes

A visual determination is not possible.



VISOCOLOR® HE Alkalinity AL 7 **REF 915 007**
Refill pack **REF 915 207**

Type:	titration test kit
Range (visual):	0.2–7.2 mmol/L OH^- 1 gradation mark = 0.2 mmol/L OH^-
Reaction basis:	(b) titration
Sufficient for:	about 200 tests with an average acid content of 4.0 mmol/L OH^-
Shelf life:	at least 2 years after production
Sea water suitability:	yes

Aluminum

Al^{3+}

Aluminum is the most common metal in our anthroposphere and behind oxygen and silica the most common element of the earth's crust. Because of its big affinity to oxygen, aluminum does not exist in elemental form in nature, but in different oxidized compounds.

For drinking water, the WHO recommends a threshold value of 0.2 mg/L Al^{3+}. In accordance to the EU council guideline 98/83/EEC, the threshold value for drinking water is 0.2 mg/L Al^{3+}. In natural waters, the concentration of aluminum compounds is usually low, but waste water can contain aluminum in higher concentrations, e.g. at electroplating companies or paper mills. Different national regulations tolerate 2–3 mg/L Al^{3+} in effluents from various industries (metal, electroplating and printing industries).

Reaction basis:
Colorimetric determination with chromazurol S.

***VISOCOLOR*® *ECO* Aluminum** **REF 931 006**
Refill pack **REF 931 206**

Type:	colorimetric test kit
Range (visual):	0 · 0.10 · 0.15 · 0.20 · 0.25 · 0.30 · 0.40 · 0.50 mg/L Al^{3+}
Sufficient for:	50 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes, after dilution (1+9)



Ammonium

NH_4^+

Ammonium ions occur primarily in domestic waste waters, but frequently also in industrial waste waters. In surface and ground waters, ammonium ions indicate decomposition of animal or vegetable matter. Control of the ammonium values is therefore important to the water supply, as a contamination indicator.

Reaction basis:
DEV procedure: in alkaline medium ammonium ions react with chlorine to form chloroamines which in the presence of a catalyst form a blue colored indophenol with phenols (Reaction basis according to DIN 38406-E5).

Primary amines react like ammonium ions resulting in high results.

Chlorine-consuming substances can lower the result or even inhibit the reaction depending on their concentration.

***VISOCOLOR*® *alpha* Ammonium** **REF 935 012**

Type:	colorimetric test kit
Range (visual):	0 · 0.2 · 0.5 · 1 · 2 · 3 mg/L NH_4^+
Sufficient for:	50 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes, after dilution (1+9)

***VISOCOLOR*® *ECO* Ammonium 15** **REF 931 010**
Refill pack **REF 931 210**

Type:	colorimetric test kit
Ranges	
visual:	0 · 0.5 · 1 · 2 · 3 · 5 · 7 · 10 · 15 mg/L NH_4^+
PF-12 / PF-12^{Plus}:	0.5–8.0 mg/L NH_4^+
Sufficient for:	50 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes, after dilution (1+9)

***VISOCOLOR*® *ECO* Ammonium 3** **REF 931 008**
Refill pack **REF 931 208**

Type:	colorimetric test kit
Ranges	
visual:	0 · 0.2 · 0.3 · 0.5 · 0.7 · 1 · 2 · 3 mg/L NH_4^+
PF-12 / PF-12^{Plus}:	0.1–2.50 mg/L NH_4^+
PF-3:	0.1–2.5 mg/L NH_4^+
Sufficient for:	50 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes, after dilution (1+9)

***VISOCOLOR*® *HE* Ammonium** **REF 920 006**
Refill pack **REF 920 106**

Type:	highly sensitive test kit
Range (visual):	0.0 · 0.02 · 0.04 · 0.07 · 0.10 · 0.15 · 0.20 · 0.30 · 0.40 · 0.50 mg/L NH_4^+
Sufficient for:	110 tests
Shelf life:	at least 1 year after production
Sea water suitability:	no

Bromine

Br_2

Due to their high reactivity bromine and chlorine are suitable for the disinfection of pools and cooling towers. Both bromine and chlorine are biocides. However, using bromine instead of chlorine the typical swimming pool smell does not appear. Moreover, appropriate bromine compounds show a more efficient disinfection at high pH values and cause minor corrosions. Therefore chlorine is more frequently replaced by bromine.

Nonetheless, bromine is a very toxic and caustic element. Wrong dosage may cause irritations of skin, eyes and mucosa, even at low concentrations. Hence, a proper application and regular controls are necessary.

***VISOCOLOR*® *ECO* Bromine** **REF 931 211**

Type :	reagent set for photometric determination
Ranges	
PF-12 / PF-12^{Plus}:	0.10–13.00 mg/L Br_2
PF-3:	0.10–13.00 mg/L Br_2
Sufficient for:	200 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes

A visual determination is not possible.

Test kits for water analysis

Description of individual parameters and tests

Calcium

Ca^{2+}

Calcium is widely distributed in nature in rocks and in water. Water containing calcium and magnesium causes problems in industry as well as in households, since during boiling calcium carbonate precipitates as detrimental boiler scale. Additionally, calcium ions inhibit soap foaming.

Reaction basis:
Complexometric titration after precipitation of the magnesium salts (Reaction basis according to DIN 38406-E3).

***VISOCOLOR® ECO* Calcium** **REF 931 012**

Type:	titration test kit
Range (visual):	1 drop = 5 mg/L Ca^{2+}
Sufficient for:	about 100 tests with an average calcium concentration of 50 mg/L Ca^{2+}
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes, after dilution (1+4)



***VISOCOLOR® HE* Calcium CA 20** **REF 915 010**
Refill pack **REF 915 210**

Type:	titration test kit
Range (visual):	0.6–25.0 °e or 0.1–3.6 mmol/L Ca^{2+}
Sufficient for:	about 200 tests with an average calcium hardness of 12.5 °e or 1.8 mmol/L Ca^{2+}
Shelf life:	at least 2 years after production
Sea water suitability:	yes, after dilution (1+4)

Carbonate hardness

CO_3^{2-}

Carbonate hardness is the part of calcium and magnesium ions which are present as carbonate or hydrogen carbonate.

Reaction basis:
The determination is preformed as titration with hydrochloric acid against a mixed indicator, which changes color at pH 4.5 (Reaction basis according to DIN EN ISO 9963-1 C24).

Normally the carbonate hardness is smaller than the total hardness. If the carbonate hardness is larger than the total hardness, you should trace the origin of this abnormal conditions, e.g. discharge of alkali hydrogen carbonates or high buffer capacity.

***VISOCOLOR® alpha* Carbonate hardness** **REF 935 016**

Type:	titration test kit
Range (visual):	1 drop ≙ 1.25 °e ≙ 17.8 mg/L $CaCO_3$
Sufficient for:	about 100 tests with an average hardness of 12.5 °e
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes

***VISOCOLOR® ECO* Carbonate hardness** **REF 931 014**

Type:	titration test kit
Range (visual):	1 drop ≙ 1.25 °e ≙ 17.8 mg/L $CaCO_3$
Sufficient for:	about 100 tests with an average hardness of 12.5 °e
Shelf life:	at least 2 years after production
Sea water suitability:	yes



***VISOCOLOR® HE* Carbonate hardness C 20**
REF 915 003
Refill pack **REF 915 203**

Type:	titration test kit
Range (visual):	0.6–25.0 °e or 0.2–7.0 mmol/L H^+
Sufficient for:	about 200 tests with an average hardness of 12.5 °e or 3.6 mmol/L H^+
Shelf life:	at least 2 years after production
Sea water suitability:	yes

With this test kit you can also determine the partial alkalinity (p-value) in addition to the carbonate hardness (m-value).

Carbonic acid

CO_2

Carbonic acid is a natural component of water acidity. Determination is performed with the test kit *VISOCOLOR®* Acidity AC 7 (see page 58).

Chloride

Cl^-

Chloride ions occur in all natural waters. Their concentration depends on geological and regional factors. In waste waters and polluted rivers, chloride concentrations can reach high values.

Reaction bases:
(a) Mercurimetric titration

(b) Mercury(II) thiocyanate method

***VISOCOLOR® ECO* Chloride** **REF 931 018**
Refill pack **REF 931 218**

Type:	colorimetric test kit
Ranges visual:	1 · 2 · 4 · 7 · 12 · 20 · 40 · 60 mg/L Cl^-
PF-12 / PF-12^{Plus}:	1–50 mg/L Cl^-
Reaction basis:	(b) Mercury(II) thiocyanate method
Sufficient for:	90 tests
Shelf life:	at least 1 year after production
Sea water suitability:	no

VISOCOLOR® HE Chloride CL 500 **REF 915 004**
Refill pack **REF 915 204**

Type:	titration test kit
Range (visual):	5–500 mg/L Cl^- 1 gradation mark = 5 mg/L Cl^-
Reaction basis:	(a) Mercurimetric titration
Sufficient for:	about 300 tests with an average chloride ion concentration of 200 mg/L Cl^-
Shelf life:	at least 2 years after production
Sea water suitability:	yes, after dilution (1+49)



Chlorine

Cl_2

The addition of chlorine to swimming pools, water reservoirs and water mains is an approved procedure to rid the water of germs. With the correct dose harmful microorganisms are destroyed, many impurities removed and the growth of algae is prevented. However it is imperative that the chlorine content is regularly checked, since excessive chlorine not only impairs the smell and taste of the water but can be hazardous. One distinguishes between free chlorine and bound chlorine (chloroamines); the sum of both is called total chlorine.

Reaction basis:
At a pH value of 5–6 free chlorine reacts with *N,N*-diethyl-1,4-phenylene diamine (DPD) to form a red-violet dye. In the presence of iodide ions the content of total chlorine can be determined, too. (Reaction basis according to DIN ISO 7393 G4-2).

The determination of free chlorine includes the concentrations of bromine, bromoamine, chloroamine, iodine and in part chlorine dioxide.

1.0 mg/L Cl_2 ≙ 2.3 mg/L Br_2 ≙ 3.6 mg/L I_2

Higher-valency manganese compounds simulate free chlorine.

Note:
When measuring the chlorine content in swimming pools it is recommended to check the pH value as well. For this purpose we supply combination test kits *VISOCOLOR® ECO* Swimming pool (page 71).

VISOCOLOR® alpha Chlorine, free **REF 935 019**

Type:	colorimetric test kit
Range (visual):	0.25 · 0.5 · 1.0 · 1.5 · 2.0 mg/L Cl_2
Sufficient for:	150 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes

VISOCOLOR® ECO Chlorine 1, free + total **REF 931 035**
Refill pack **REF 931 235**
Higher safety – without hazardous substances NEW!

Type:	colorimetric test kit
Ranges	
visual:	< 0.1 · 0.1 · 0.2 · 0.3 · 0.4 · 0.6 · 0.9 · 1.2 · 2.0 mg/L Cl_2
PF-12/ PF-12^{Plus}:	0.05–2.00 mg/L Cl_2
PF-3:	0.05–2.00 mg/L Cl_2
Sufficient for:	150 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes

VISOCOLOR® ECO Chlorine 2, free + total **REF 931 015**
Refill pack **REF 931 215**

Type:	colorimetric test kit
Ranges	
visual:	< 0.1 · 0.1 · 0.2 · 0.3 · 0.4 · 0.6 · 0.9 · 1.2 · 2.0 mg/L Cl_2
PF-12 / PF-12^{Plus}:	0.05–2.00 mg/L Cl_2
PF-3:	0.05–2.00 mg/L Cl_2
Sufficient for:	150 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	no



VISOCOLOR® ECO free Chlorine 2 **REF 931 016**
Refill pack **REF 931 216**

Type:	colorimetric test kit
Ranges	
visual:	< 0.1 · 0.1 · 0.2 · 0.3 · 0.4 · 0.6 · 0.9 · 1.2 · 2.0 mg/L Cl_2
PF-12 / PF-12^{Plus}:	0.05–2.00 mg/L Cl_2
PF-3:	0.05–2.00 mg/L Cl_2
Sufficient for:	150 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	no

VISOCOLOR® ECO Chlorine 6, free + total REF 931 217

Type:	reagent set for photometric determination
Ranges	
PF-12 / PF-12^{Plus}:	0.05–6.00 mg/L Cl_2
PF-3:	0.05–6.00 mg/L Cl_2
Sufficient for:	200 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes

A visual determination is not possible.

VISOCOLOR® ECO free Chlorine 6 REF 931 219

Type:	reagent set for photometric determination
Ranges	
PF-12 / PF-12^{Plus}:	0.05–6.00 mg/L Cl_2
PF-3:	0.05–6.00 mg/L Cl_2
Sufficient for:	400 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes

A visual determination is not possible.

VISOCOLOR® HE Chlorine REF 920 015
Refill pack REF 920 115

Type:	highly sensitive test kit
Range (visual):	0.0 · 0.02 · 0.04 · 0.06 · 0.10 · 0.15 · 0.20 · 0.30 · 0.40 · 0.60 mg/L Cl_2
Sufficient for:	160 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes



Chlorine dioxide ClO_2

Chlorine dioxide is being used as a universal disinfecting reagent, replacing chlorine especially in drinking and swimming pool water processing. Not only does it possess a significantly higher oxidizing power than chlorine but moreover, the formation of toxic THMs (trihalomethanes) is avoided when using chlorine dioxide as the oxidizing agent.

Reaction basis:
Chlorine dioxide reacts, like chlorine, with DPD (*N,N*-diethyl-1,4-phenylenediamine) at a pH value of 5–6 to form a red-violet dye. An additional step makes this test kit even suitable for the determination of chlorine dioxide in presence of chlorine.

VISOCOLOR® ECO Chlorine dioxide REF 931 021
Refill pack REF 931 221

Type:	colorimetric test kit
Ranges	
visual:	0.2 · 0.4 · 0.6 · 0.8 · 1.1 · 1.7 · 2.3 · 3.8 mg/L ClO_2
PF-12 / PF-12^{Plus}:	0.20–3.80 mg/L ClO_2
PF-3:	0.10–3.80 mg/L ClO_2
Sufficient for:	150 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	no

Chromate CrO_4^{2-}

Chromium compounds can be present in industrial waste waters in trivalent form [chromium(III) ions] and in hexavalent form (chromate and dichromate ions). In order to determine the total chromium all other valencies must be oxidized to chromium(VI). Each test kit is equipped with a detailed description.

Reaction basis:
In sulfuric acid chromate ions react with diphenylcarbazide to form a red-violet dye. (Reaction basis according to DIN 38405-D24).

VISOCOLOR® ECO Chromium(VI) REF 931 020
Refill pack REF 931 220

Type:	colorimetric test kit
Ranges	
visual:	0.02 · 0.05 · 0.10 · 0.15 · 0.20 · 0.30 · 0.40 · 0.50 mg/L Cr(VI)
PF-12 / PF-12^{Plus}:	0.04–1.00 mg/L Cr(VI)
Sufficient for:	140 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes



Copper

Cu^{2+}

In water, copper(II) can be found in dissolved as well as in undissolved form. Copper(I) compounds and undissolved copper(II) compounds are not determined unless they are decomposed with concentrated nitric acid prior to the test.

Reaction basis:
In weakly alkaline medium copper(II) ions react with cuprizone forming a blue color complex.

***VISOCOLOR® ECO* Copper**	**REF 931 037**
Refill pack	**REF 931 237**
Type:	colorimetric test kit
Ranges visual:	0 · 0.1 · 0.2 · 0.3 · 0.5 · 0.7 · 1.0 · 1.5 mg/L Cu^{2+}
PF-12 / PF-12^{Plus}:	0.1–5 mg/L Cu^{2+}
Sufficient for:	100 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes

***VISOCOLOR® HE* Copper**	**REF 920 050**
Refill pack	**REF 920 150**
Type:	highly sensitive test kit
Range (visual):	0.0 · 0.04 · 0.07 · 0.10 · 0.15 · 0.20 · 0.25 · 0.30 · 0.40 · 0.50 mg/L Cu^{2+}
Sufficient for:	100 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes



Cyanide

CN^-

Cyanide ions are very toxic because they block the iron of the respiratory enzyme and thus inhibit oxygen transport. For humans 1 mg cyanide per kg body weight is considered lethal.

Reaction basis:
Cyanide ions react with chlorine to form cyanogen chloride, which then opens a pyridine ring to form glutaconedialdehyde. By aldol condensation with barbituric acid, a violet polymethine dye is produced.

This test detects free cyanide and cyanide complexes which can be destroyed with chlorine. If interfering substances like heavy metal complexes, thiocyanate, sulfide, dyes or aromatic amines are present, a distillation according to DIN 38 405-D 13–2–2 must precede the cyanide test.

For the determination of easily released and total cyanide as well as for the determination of cyanide in stone fruit spirits, please contact MACHEREY-NAGEL for special instructions.

***VISOCOLOR® ECO* Cyanide**	**REF 931 022**
Refill pack	**REF 931 222**
Type:	colorimetric test kit
Ranges visual:	0 · 0.01 · 0.02 · 0.03 · 0.05 · 0.07 · 0.10 · 0.15 · 0.20 mg/L CN^-
PF-12 / PF-12^{Plus}:	0.01–0.20 mg/L CN^-
Sufficient for:	100 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes, after dilution (1+3)



***VISOCOLOR® HE* Cyanide**	**REF 920 028**
Refill pack	**REF 920 128**
Type:	highly sensitive test kit
Range (visual):	0.0 · 0.002 · 0.004 · 0.007 · 0.010 · 0.015 · 0.020 · 0.025 · 0.030 · 0.040 mg/L CN^-
Sufficient for:	50 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes

Cyanuric acid

Cya

Chlorine for disinfection in swimming pools is degraded by intensive UV radiation. A common stabilizer for chlorine in swimming pools is cyanuric acid. Chloroisocyanic acid is also used directly as a disinfecting agent. Due to legal regulations, as good and careful pool managers, many private and public owners use rapid tests for frequent monitoring of cyanuric acid.

Reaction basis:
Turbidity measurement

Cyanuric acid forms a fine precipitate with a triazine derivative.

The turbidity caused by this reaction can be measured visually or photometrically to determine the cyanuric acid concentration.

Turbidities interfere and must be filtered prior to the analysis.

***VISOCOLOR® ECO* Cyanuric acid**	**REF 931 023**
Refill pack	**REF 931 223**
Type:	turbidity test kit
Ranges	
visual:	10 · 15 · 20 · 30 · 40 · 60 · 80 · 100 mg/L Cya
PF-12 / PF-12^{Plus}:	10–100 mg/L Cya
PF-3:	10–100 mg/L Cya
Sufficient for:	100 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes

DEHA (Diethylhydroxylamine)

DEHA

In boiler feed water treatments, the carcinogenic hydrazine is more and more replaced by diethylhydroxylamine (DEHA) to remove oxygen.

Reaction basis:
Measurement of the reduction properties of DEHA for iron(III) ions and determination of the iron(II) ions formed. Strictly observe the temperature and reaction time since they strongly influence the color intensity.

Iron(II) ions interfere. A modified test procedure eliminate this source of error.

***VISOCOLOR® ECO* DEHA**	**REF 931 024**
Refill pack	**REF 931 224**
Type:	colorimetric test kit
Range (visual):	0 · 0.01 · 0.03 · 0.05 · 0.10 · 0.15 · 0.20 · 0.25 · 0.30 mg/L DEHA
Sufficient for:	125 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes



Dithionite

$S_2O_4^{2-}$

Dithionites ($S_2O_4^{2-}$), above all sodium dithionite (so-called hydrosulfite), are important aids in dyeing, textile and paper industries due to their reducing properties. They are especially used for vat dyeing, for bleaching of wood-based paper, sugar, sirup, gelatine, starche, molasses, saccharine juice, soap, technical fats, as decolorant for textiles, for desilvering of used fixing baths etc. Dithionite can be determined using a special method with *VISOCOLOR® HE* Sulfite SU 100. Please contact MACHEREY-NAGEL for special instructions.

Fluoride

F^-

Normally, the content of fluoride in surface and ground water is lower than 1 mg/L. Permanent consumption of water containing more than 2 mg/L fluoride can cause a drinking water fluorese (a stained discoloration of the tooth enamel). On the other hand a content of fluoride lower than 0.5 mg/L could lead to an increased cavity risk. The optimal content of fluoride in drinking water is about 1 mg/L. To avoid cavity problems, in some countries the content of fluoride in drinking water is increased artificially. However, WHO and EC drinking water regulations recommend a threshold value of 1.5 mg/L F^-.

In some European countries, the threshold value for mineral water is also 1.5 mg/L F^-. For water used in the preparation of baby food a threshold value of 0.7 mg/L F^- is recommended. Natural mineral waters with a fluoride content of more than 5 mg/L must be labelled with a warning.

Reaction basis:
Photometric determination of fluoride with 1,8-dihydroxy-2-(4-sulfophenylazo)naphthalene-3,6-disulfonic acid (SPADNS) with the photometers PF-3 and PF-12 / PF-12^{Plus}.

***VISOCOLOR® ECO* Fluoride**	**REF 931 227**
Type:	reagent set for photometric determination
Ranges	
PF-12 / PF-12^{Plus}:	0.1–2.0 mg/L F^-
PF-3:	0.1–2.0 mg/L F^-
Sufficient for:	150 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes, after distillation

A visual determination is not possible.

Hardness (total and residual)

°e

The total hardness of water is based on its content of alkaline earth ions (calcium and magnesium ions). This content depends on the geological conditions and may vary considerably. Knowledge of the total hardness is important for the use of water in industrial as well as municipal applications, e.g. in the household as wash water or as boiler feed water in industry.

Reaction bases:
(a) Complexometric titration
in accordance with DIN 38406 E3 and DIN 38409 H6.

(b) Colorimetry with a mixed indicator
Copper(II) ions can delay or (in higher concentrations) even block the color change of the indicator. For this reason allow enough water to run through copper pipes prior to sampling.

VISOCOLOR® *alpha* total Hardness — REF 935 042

Type:	titration test kit
Range (visual):	1 drop ≙ 1.25 °e ≙ 17.8 mg/L $CaCO_3$
Reaction basis:	(a) titration
Sufficient for:	100 tests with an average hardness of 12.5 °e
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes, after dilution (1+29)

VISOCOLOR® *ECO* total Hardness — REF 931 029

Type:	titration test kit
Range (visual):	1 drop ≙ 1.25 °e ≙ 17.8 mg/L $CaCO_3$
Reaction basis:	(a) titration
Sufficient for:	110 tests with an average hardness of 12.5 °e
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes, after dilution (1+29)



VISOCOLOR® *HE* total Hardness H 20 F — REF 915 005
Refill pack — REF 915 205

Type:	titration test kit
Range (visual):	0.6–25.0 °e or 0.1–3.6 mmol/L Ca^{2+} 1 gradation mark = 0.625 °e = 0.1 mmol/L Ca^{2+}
Reaction basis:	(a) titration
Sufficient for:	about 200 tests with an average hardness of 12.5 °e or 1.8 mmol/L Ca^{2+}
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes, after dilution (1+29)

VISOCOLOR® *alpha* residual Hardness — REF 935 080

Type:	colorimetric test kit
Range (visual):	0.00 · 0.05 · 0.10 · 019 · 0.38 °e
Reaction basis:	(b) colorimetry
Sufficient for:	200 tests
Shelf life:	at least 1 year after production
Sea water suitability:	no

VISOCOLOR® *HE* total Hardness H 2 — REF 915 002
Refill pack — REF 915 202

Type:	titration test kit
Range (visual):	0.06–2.50 °e or 0.01–0.36 mmol/L Ca^{2+} 1 gradation mark = 0.06 °e or 0.01 mmol/L Ca^{2+}
Reaction basis:	(a) titration
Sufficient for:	200 tests with an average hardness of 1.25 °e or 0.18 mmol/L Ca^{2+}
Shelf life:	at least 1.5 years after production
Sea water suitability:	no

VISOCOLOR® *ECO* additive reagent Z-1 — REF 931 929

to eliminate copper ions during determination of total hardness

Hydrazine

N_2H_4

Hydrazine is used to destroy residual oxygen in boiler feed water and condensate water, for example in power plants, to avoid corrosion of the boiler casing. Reaction products are merely nitrogen gas and water, thus the salt load of the water is kept low.

Because of its highly reactive properties, hydrazine is also used as fuel in aviation and astronautics.

Hydrazine is toxic and has a highly toxic effect on water organisms. Hydrazine can be absorbed through the skin. Therefore, water and waste water with potential content of hydrazine must be monitored and tested.

Reaction basis:
DIN method: In acidic solution hydrazine reacts with 4-dimethylaminobenzaldehyde to form a yellow/orange colored compound (Reaction basis according to DIN 38413-P1).

VISOCOLOR® *ECO* Hydrazine — REF 931 030
Refill pack — REF 931 230

Type:	colorimetric test kit
Ranges visual:	0 · 0.05 · 0.10 · 0.15 · 0.20 · 0.25 · 0.30 · 0.40 mg/L N_2H_4
PF-12 / PF-12^{Plus}:	0.05–0.40 mg/L N_2H_4
Sufficient for:	130 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes

Hydrosulfite

$S_2O_4^{2-}$

see Dithionite, page 64

Iron

Fe

Natural waters as well as waste waters often contain some iron. It can be present as Fe(II) or Fe(III) ions if the pH value of the water is below 3 or if the water is free of oxygen. At higher pH values Fe(III) forms an insoluble oxyhydrate. Frequently the sample is in a transition state with finely dispersed iron oxides. In waste water and natural water containing humic acids iron is often present in the form of a complex salt. The *VISOCOLOR*® test kits only determine iron which is present in dissolved form as Fe^{2+} or Fe^{3+} ions. Iron complexes are not covered unless they are decomposed by oxidation with nitric acid and sulfuric acid.

Reaction basis:
Triazin-Methode: iron(II) ions react with a triazine derivative to form a violet complex. Iron(III) ions are reduced and thus also determined.

***VISOCOLOR*® *ECO* Iron 1** **REF 931 025**
Refill pack **REF 931 225**

Type:	colorimetric test kit
Ranges	
visual:	0 · 0.04 · 0.07 · 0.10 · 0.15 · 0.20 · 0.30 · 0.50 · 1.0 mg/L Fe
PF-12 / PF-12^{Plus}:	0.04–2.00 mg/L Fe
PF-3:	0.04–2.00 mg/L Fe
Sufficient for:	200 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes

***VISOCOLOR*® *ECO* Iron 2** **REF 931 026**
Refill pack **REF 931 226**

Type:	colorimetric test kit
Ranges	
visual:	0 · 0.04 · 0.07 · 0.10 · 0.15 · 0.20 · 0.30 · 0.50 · 1.0 mg/L Fe
PF-12 / PF-12^{Plus}:	0.04–2.00 mg/L Fe
PF-3:	0.04–2.00 mg/L Fe
Sufficient for:	100 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes

***VISOCOLOR*® *HE* Iron** **REF 920 040**
Refill pack **REF 920 140**

Type:	highly sensitive test kit
Range (visual):	0.0 · 0.01 · 0.02 · 0.03 · 0.04 · 0.05 · 0.07 · 0.10 · 0.15 · 0.20 mg/L Fe
Sufficient for:	300 tests
Shelf life:	at least 2 years after production
Sea water suitability:	no



Magnesium

Mg^{2+}

In order to differentiate between the hardness constituents calcium and magnesium one can determine the total hardness (see hardness, page 65) and the calcium hardness (see calcium, page 60). The difference of both is the magnesium content – an important parameter in food and building industries.

Manganese

Mn

Natural waters contain manganese in the divalent, soluble form as well as in colloidal tri- and tetravalent states. Valencies are interchangeable due to oxidation-reduction reactions taking place in the water. The test procedure determines all oxidation states of manganese.

Reaction basis:
In alkaline solution manganese ions react with formaldoxime to form an orange-red complex. (Reaction basis according to DIN 38406-E2).

***VISOCOLOR*® *ECO* Manganese** **REF 931 038**
Refill pack **REF 931 238**

Type:	colorimetric test kit
Ranges	
visual:	0 · 0.1 · 0.2 · 0.3 · 0.5 · 0.7 · 0.9 · 1.2 · 1.5 mg/L Mn
PF-12 / PF-12^{Plus}:	0.1–5.0 mg/L Mn
Sufficient for:	70 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes

***VISOCOLOR*® *HE* Manganese** **REF 920 055**
Refill pack **REF 920 155**

Type:	highly sensitive test kit
Range (visual):	0.0 · 0.03 · 0.06 · 0.10 · 0.15 · 0.20 · 0.25 · 0.30 · 0.40 · 0.50 mg/L Mn
Sufficient for:	100 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	no



Nickel

Ni^{2+}

Nickel can be present in industrial waste water. It occurs as the divalent ion or as a nickel complex.

Reaction basis:
In ammonia solution nickel ions react with diacetyldioxime after oxidation with bromine to form a reddish-brown dye. Insoluble nickel compounds (e.g. nickel cyanide, nickel carbonate) and the nickel cyano complexes are not determined.

***VISOCOLOR*® *ECO* Nickel** **REF 931 040**
Refill pack **REF 931 240**

Type:	colorimetric test kit
Ranges	
visual:	0 · 0.1 · 0.2 · 0.3 · 0.5 · 0.7 · 0.9 · 1.2 · 1.5 mg/L Ni^{2+}
PF-12 / PF-12^{Plus}:	0.04–5.0 mg/L Ni^{2+}
Sufficient for:	150 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes, after dilution (1+9)



Nitrate

NO_3^-

Nitrates occur in most ground and surface waters in concentrations of up to 20 mg/L. In addition to mere geological influences, nitrate concentrations can also increase due to agricultural sources (fertilisers). The *VISOCOLOR*® test kits are intended for the determination of nitrate in surface and drinking water and in industrial waste waters which do not contain high concentrations of interfering ions.

Reaction basis:
Nitrate is reduced to nitrite with an inorganic reducing agent. Nitrite is then diazotised with an aromatic amine and simultaneously coupled to form an azo dye.

***VISOCOLOR*® *alpha* Nitrate** **REF 935 065**

Type:	colorimetric test kit
Range (visual):	2 · 8 · 15 · 30 · 50 mg/L NO_3^-
Sufficient for:	100 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes

***VISOCOLOR*® *ECO* Nitrate** **REF 931 041**
Refill pack **REF 931 241**

Type:	colorimetric test kit
Ranges	
visual:	0 · 1 · 3 · 5 · 10 · 20 · 30 · 50 · 70 · 90 · 120 mg/L NO_3^-
PF-12 / PF-12^{Plus}:	4–60 mg/L NO_3^-
PF-3:	4–60 mg/L NO_3^-
Sufficient for:	110 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes

Nitrite

NO_2^-

In surface waters nitrite ions are generally present in low concentrations. Their presence in ground water is less common. In waste waters nitrite frequently occurs, even in fairly high concentrations.

Reaction basis:
Sulfanilamide / sulfanilic acid is diazotized by nitrite in acidic solution. The diazonium salt is coupled with a naphthylamine to form an intensively colored azo dye.

***VISOCOLOR*® *alpha* Nitrite** **REF 935 066**

Type:	colorimetric test kit
Range (visual):	0.05 · 0.10 · 0.25 · 0.5 · 1.0 mg/L NO_2^-
Sufficient for:	200 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes

***VISOCOLOR*® *ECO* Nitrite** **REF 931 044**
Refill pack **REF 931 244**

Type:	colorimetric test kit
Ranges	
visual:	0 · 0.02 · 0.03 · 0.05 · 0.07 · 0.1 · 0.2 · 0.3 · 0.5 mg/L NO_2^-
PF-12 / PF-12^{Plus}:	0.02–0.50 mg/L NO_2^-
Sufficient for:	120 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes



***VISOCOLOR*® *HE* Nitrite** **REF 920 063**
Refill pack **REF 920 163**

Type:	highly sensitive test kit
Range (visual):	0.0 · 0.005 · 0.010 · 0.015 · 0.02 · 0.03 · 0.04 · 0.06 · 0.08 · 0.10 mg/L NO_2^-
Sufficient for:	150 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes

Description of individual parameters and tests

Oxygen

O_2

The solubility of oxygen in water depends on the temperature, the pressure and other water components. The oxygen content of water at the time of sampling is often quoted as the percentage of possible saturation.

Reaction basis:
Oxygen determination according to Winkler: in alkaline solution dissolved oxygen oxidises manganese(II) ions to higher-valent manganese hydroxides. In a strongly acidic medium these form manganese(III) ions which can be determined either titrimetrically or colorimetrically after addition of a color reagent.

VISOCOLOR® ECO Oxygen — REF 931 088
Refill pack — REF 931 288

Type:	colorimetric test kit
Ranges	
visual:	0 · 1 · 2 · 3 · 4 · 6 · 8 · 10 mg/L O_2
PF-12 / PF-12^{Plus}:	1–8 mg/L O_2
Sufficient for:	50 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes

When ordering this test kit for the first time, you also need an oxygen bottle, REF 915 498

VISOCOLOR® HE Oxygen SA 10 — REF 915 009
Refill pack — REF 915 209

Type:	titration test kit, according to DIN EN 25 813
Range (visual):	0.2–10 mg/L O_2 1 gradation mark = 0.2 mg/L
Sufficient for:	about 100 tests with an average oxygen content of 9 mg/L
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes



In combination with the BOD_5 accessories package (REF 916 918) and the BOD_5 nutrient mixture without N-allylthiourea (ATU) (REF 918 994) or the BOD_5 nutrient mixture Plus with ATU (REF 918 995) this test kit can also be used for determination of the BOD_5 (sufficient for 25–50 samples). Preparation of the samples is performed using the so-called dilution principle according to DIN ISO 1899-1-H51.

pH value

pH

The pH value indicates whether a water reacts acidic, alkaline or neutral. It is determined by the concentration of hydrogen ions. All biological processes in water are tied to specific pH ranges. For municipal and industrial applications, too, the control of specific pH limits is important since e.g. the efficiency of sewage plants or the corrosive potential of tap water on pipes depend in the pH value. Contrary to pH indicator papers, *VISOCOLOR®* pH test kits can also be used to determine accurate pH values in weakly buffered sample solutions.

Reaction basis:
A special mixture of indicator dyes shows a characteristic color for every pH value within the range of the kit.

The favorable ratio between sample volume and amount of indicator minimizes the indicator error (acid-base-error). This allows reliable pH measurements in weakly buffered solutions as well. High contents of neutral salts and colloids as well as organic solvent concentrations above 10 % can cause wrong results.

VISOCOLOR® alpha pH 5–9 — REF 935 075

Type:	colorimetric test kit
Range (visual):	pH 5.0 · 5.5 · 6.0 · 6.5 · 7.0 · 7.5 · 8.0 · 8.5 · 9.0
Sufficient for:	200 tests
Shelf life:	at least 3 years after production
Sea water suitability:	yes

VISOCOLOR® ECO pH 4.0–9.0 — REF 931 066
Refill pack — REF 931 266

Type:	colorimetric test kit
Range (visual):	pH 4.0 · 5.0 · 6.0 · 6.5 · 7.0 · 7.5 · 8.0 · 8.5 · 9.0
Sufficient for:	400 tests
Shelf life:	at least 3 years after production
Sea water suitability:	yes

VISOCOLOR® ECO pH 6.0–8.2 — REF 931 270

Type:	reagent set for photometric determination
Ranges	
PF-12 / PF-12^{Plus}:	pH 6.1–8.4
PF-3:	pH 6.1–8.4
Sufficient for:	150 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes

A visual colorimetric determination is not possible.

VISOCOLOR® HE pH 4.0–10.0 — REF 920 074
Refill pack — REF 920 174

Type:	highly sensitive test kit
Range (visual):	pH 4.0 · 5.0 · 5.5 · 6.0 · 6.5 · 7.0 · 7.5 · 8.0 · 8.5 · 9.0 · 10.0
Sufficient for:	500 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes

For the determination of the pH value, see also Swimming pool page 71

Phosphate

PO_4^{3-}

The phosphate content in surface water has direct consequences for its ability to support the growth of certain organisms. Since increasing quantities of phosphates are being fed through domestic waste waters into rivers and lakes, these waters have a tendency towards eutrophication. Exact data about the phosphate content are important for boiler water and feed water. Precise dosing of phosphates in these waters can inhibit formation of boiler scale. Pyro-, meta- and polyphosphates are not determined with *VISOCOLOR*® test kits. The determination of total phosphate requires a decomposition prior to the test.

Reaction basis:
Ammonium molybdate reacts with phosphate ions to form phosphomolybdic acid which is reduced to molybdenum blue (Reaction basis according to DIN EN ISO 6878-D11).

VISOCOLOR® alpha Phosphate **REF 935 079**

Type:	colorimetric test kit
Range (visual):	2 · 5 · 10 · 15 · 20 mg/L PO_4^{3-}
Sufficient for:	70 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes

VISOCOLOR® ECO Phosphate **REF 931 084**
Refill pack **REF 931 284**

Type:	colorimetric test kit
Ranges visual:	0 · 0.2 · 0.3 · 0.5 · 0.7 · 1 · 2 · 3 · 5 mg/L PO_4-P
PF-12 / PF-12^{Plus}:	0.2–5.0 mg/L PO_4-P
PF-3:	0.2–5.0 mg/L PO_4-P
Sufficient for:	90 tests
Shelf life:	at least 3 years after production
Sea water suitability:	yes



VISOCOLOR® HE Phosphate **REF 920 082**
Refill pack **REF 920 182**

Type:	highly sensitive test kit
Range (visual):	0.0 · 0.05 · 0.10 · 0.15 · 0.20 · 0.3 · 0.4 · 0.6 · 0.8 · 1.0 mg/L P
Sufficient for:	300 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes

VISOCOLOR® HE Phosphate (DEV) **REF 920 080**
Refill pack **REF 920 180**

Type:	highly sensitive test kit
Range (visual):	0.0 · 0.01 · 0.02 · 0.03 · 0.05 · 0.07 · 0.10 · 0.15 · 0.20 · 0.25 mg/L P
Sufficient for:	100 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes



Phosphonate

PO_x

Phosphonates are used as complexing agents for softening process and cooling water. They can be determined with *NANOCOLOR*® *NanOx* Metal and *VISOCOLOR*® *ECO* Phosphate. Please ask for our special instructions.

Potassium

K^+

The natural potassium content in ground water is generally about 1–2 mg/L K^+. Higher values may indicate faecal contaminations, but can also originate from potassium fertilizers. For the growth of plants and animals, potassium is an essential factor. Especially in agriculture the determination of potassium therefore gains increasing importance.

Reaction basis:
Potassium reacts with sodium tetraphenylborate to form a precipitate. Under defined conditions this turbidity can be used for concentration measurements.

Turbidities interfere and have to be filtered prior to the test. Good reproducibility is obtained for drinking, surface and ground water. For polluted waste waters low potassium values may be measured.

VISOCOLOR® ECO Potassium **REF 931 032**
Refill pack **REF 931 232**

Type:	turbidity test kit
Range visual:	2 · 3 · 4 · 6 · 8 · 10 · 15 mg/L K^+
PF-12 / PF-12^{Plus}:	2–25 mg/L K^+
PF-3:	2–15 mg/L K^+
Sufficient for:	60 tests
Shelf life:	at least 3 years after production
Sea water suitability:	yes, after dilution (1+1)

Test kits for water analysis

Description of individual parameters and tests

Residual hardness

°e

see hardness (total and residual), page 65

Silica / silicon

SiO_2

Natural water contains silica in different amounts, depending on the geological conditions. The silica occurs partly as soluble silicate, partly colloidal as polysilicic acids. The silica content in water for medium and high pressure boilers may not exceed certain limits. Therefore, in power plants constant measurement of the silica content is required.

Reaction basis:
In acidic solution soluble silica or silicates react with ammonium molybdate to form yellow silicomolybdic acid, which is reduced to silico-molybdenum blue with a reducing agent. (Reaction basis according to DIN EN ISO 16264-H57).

***VISOCOLOR® ECO* Silica**	**REF 931 033**
Refill pack	**REF 931 233**
Type:	colorimetric test kit
Ranges	
visual:	0 · 0.2 · 0.4 · 0.6 · 1.0 · 1.5 · 2.0 · 2.5 · 3.0 mg/L SiO_2
PF-12 / PF-12^{Plus}:	0.2–3.0 mg/L SiO_2
Sufficient for:	80 tests
Shelf life:	at least 3 years after production
Sea water suitability:	yes



***VISOCOLOR® ECO* Silica HR 200** NEW!	**REF 931 234**
Type:	reagent set for photometric determination
Ranges	
PF-12 / PF-12^{Plus}:	10–200 mg/L SiO_2
PF-3:	10–200 mg/L SiO_2
Sufficient for:	100 tests
Shelf life:	at least 3 years after production
Sea water suitability:	yes

A visual colorimetric determination is not possible.

***VISOCOLOR® HE* Silicon**	**REF 920 087**
Refill pack	**REF 920 187**
Type:	highly sensitive test kit
Range (visual):	0.0 · 0.01 · 0.02 · 0.03 · 0.05 · 0.07 · 0.10 · 0.15 · 0.20 · 0.30 mg/L Si
Sufficient for:	120 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes

Sodium

Na^+

About 2.43 % of the uppermost crust of the earth, with a thickness of 16 km, consist of chemically bonded sodium. It is the 6th most abundant element on our planet. In rocks and minerals it is mostly present as silicate (e.g. soda feldspar or albite) and as sodium chloride (rocksalt), but also as carbonate, nitrate (especially chile salpeter) and cryolite as well as in many other minerals. Each ton of sea water contains an average of 27 kg common salt (10.6 kg sodium), so, sodium makes up for 77 % of all salts present in sea water. Under the assumption, that in natural waters beside sodium mainly calcium and magnesium can occur as cations, it is easily possible to determine the sodium content using *VISOCOLOR®* titration test kits. Please ask for the respective special instructions.

Sulfate

SO_4^{2-}

The determination of sulfate ions is of special importance to evaluate the aggressiveness of a water towards concrete. Sulfate, a component of natural water, is formed in many manufacturing processes and is found in waste waters even after neutralization.

Reaction basis:
Sulfate reacts with barium ions forming a precipitate of barium sulfate. Under defined conditions this turbidity can be used for concentration measurements.

Turbidities of the sample interfere and have to be filtered. Good reproducibility is obtained for drinking, surface and ground water. For polluted waste waters low concentrations are measured.

***VISOCOLOR® ECO* Sulfate**	**REF 931 092**
Refill pack	**REF 931 292**
Type:	turbidity test kit
Ranges	
visual:	25 · 30 · 35 · 40 · 50 · 60 · 70 · 80 · 100 · 120 · 150 · 200 mg/L SO_4^{2-}
PF-12 / PF-12^{Plus}:	20–200 mg/L SO_4^{2-}
Sufficient for:	100 tests
Shelf life:	at least 3 years after production
Sea water suitability:	yes, after dilution (1+49)

Sulfide

S^{2-}

In water sulfides can be present as dissolved hydrogen sulfide or as hydrosulfide or sulfide ions.

Reaction basis:
N,N-Dimethyl-1,4-phenylene diamine reacts with hydrogen sulfide to form an unstable compound which rearranges to leucomethylene blue. Oxidation with iron(III) ions yields methylene blue.

***VISOCOLOR*® *ECO* Sulfide**	**REF 931 094**
Refill pack	**REF 931 294**
Type:	colorimetric test kit
Ranges	
visual:	0.1 · 0.2 · 0.3 · 0.4 · 0.5 · 0.6 · 0.7 · 0.8 mg/L S^{2-}
PF-12 / PF-12*Plus*:	0.05–0.80 mg/L S^{2-}
Sufficient for:	90 tests
Shelf life:	at least 3 years after production
Sea water suitability:	yes



Sulfite

SO_3^{2-}

Sulfite ions are not present in natural, unpolluted waters, however they often appear in large quantities in industrial waste waters (e.g. paper mills, dye works).

Reaction basis:
Titrimetric determination by addition of iodine solution and reverse titration of unused iodine with sodium thiosulfate.

Oxidizing and reducing substances interfere.

***VISOCOLOR*® *ECO* Sulfite**	**REF 931 095**
Type:	titration test kit
Range (visual):	1 drop = 1 mg/L SO_3^{2-}
Sufficient for:	60 tests with an average Sulfite concentration of 10 mg/L SO_3^{2-}
Shelf life:	at least 1 year after production
Sea water suitability:	yes

***VISOCOLOR*® *HE* Sulfite SU 100**	**REF 915 008**
Refill pack	**REF 915 208**
Type:	titration test kit
Range (visual):	2–100 mg/L SO_3^{2-} 1 gradation mark = 2 mg/L SO_3^{2-}
Sufficient for:	100 tests with an average Sulfite content of 100 mg/L SO_3^{2-}
Shelf life:	at least 3 years after production
Sea water suitability:	yes

Swimming pool

Cl_2 pH

Chlorination of water in swimming pools with chlorine or chlorine compounds takes place within certain limits. One distinguishes between free chlorine and bound chlorine (chloroamines); the sum of both is called total chlorine. The content of free chlorine should be between 0.3 and 0.6 mg/L. Chlorination alters the pH value of the swimming pool water. The ideal pH value is pH 7.4. This prevents formation of malodorous pollutants and irritants to the mucous membrane, and prevents damage to the water treatment system.

Reaction basis:
Free chlorine reacts with *N,N*-diethyl-1,4-phenylene diamine (DPD) to form a red-violet dye. The pH value is determined with phenol red as indicator.

For test kits for the determination of chlorine alone see *VISOCOLOR*® Chlorine (see page 61)

***VISOCOLOR*® *ECO* Swimming pool**	**REF 931 090**
Refill pack	**REF 931 290**
Type:	colorimetric test kit
Range (visual):	< 0.1 · 0.2 · 0.3 · 0.4 · 0,6 · 0.9 · 1.2 · 2.0 mg/L Cl_2 pH 6.9 · 7.2 · 7.4 · 7.6 · 7.8 · 8.2
Sufficient for:	150 tests each
Shelf life:	at least 1.5 years after production
Sea water suitability:	no

Zinc

Zn^{2+}

Zinc is one of the most often used metals for surface finishing. Its content in waste water from e.g. electroplating companies has to be monitored regularly.

Reaction basis:
At a pH of 8.5–9.5 zinc ions react with zincon to form a color complex. Acidic, alkaline and buffered samples have to be adjusted to pH 9 for the test.

***VISOCOLOR*® *ECO* Zinc**	**REF 931 098**
Refill pack	**REF 931 298**
Type:	colorimetric test kit
Ranges	
visual:	0 · 0.5 · 1 · 2 · 3 mg/L Zn^{2+}
PF-12 / PF-12*Plus*:	0.1–3.0 mg/L Zn^{2+}
Sufficient for:	120 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes, after dilution (1+9)



Reagent cases

Combinations of different *VISOCOLOR*® test kits

Reagent cases for all purposes

- **Rugged cases with premium foam inlays**
- **Pre-packed or empty cases for individual solutions**
- **With and without photometer**

MACHEREY-NAGEL reagent cases are flexible tools for all areas of water and soil analysis. The cases are ideal for testing water bodies, for fish farming and a wide variety of other applications within the area of environmental management and water monitoring.

The reagent cases enable users to get results fast and directly at the point of interest. Previous chemical knowledge or experience is not required to run any of the tests or to use the cases effectively.

The cases include all necessary test instructions and analytical accessories for especially easy and convenient handling

Reagent cases for water analysis without photometer

- **Easy to handle mini-lab**
- **Exact and accurate determination**
- **Expandable with *VISOCOLOR*® *ECO* test kits**
- **Compact case for extensive analysis**
- **Also for highly sensitive *VISOCOLOR*® *HE* tests**
- **Infinite options**

VISOCOLOR® _ECO_ reagent case, empty **REF 931 303**

The empty *VISOCOLOR*® *ECO* reagent case allows the case to be equipped in an individual and highly flexible way with 8 different *VISOCOLOR*® *ECO* test kits.

In addition to the colorimetric and titrimetric *VISOCOLOR*® *ECO* tests the reagent case can be equipped with *VISOCOLOR*® *ECO* turbidity tests for potassium, cyanuric acid and sulphate as well. Furthermore the cases can be equipped with the *VISOCOLOR*® *ECO* Oxygen test including the necessary oxygen flask.



REF 931 301

VISOCOLOR® reagent case, empty **REF 931 305**

The empty *VISOCOLOR*® reagent case enable you to freely combine every combination of *VISOCOLOR*® tests, pH indicator papers, pH-Fix test strips, qualitative test papers and semi-quantitative QUANTOFIX® test strips.

Additionally, the case can be equipped with *VISOCOLOR*® *ECO* turbidity tests for potassium, cyanuric acid and sulfate as well as with the *VISOCOLOR*® *ECO* or *VISOCOLOR*® *HE* Oxygen test including oxygen flask.



REF 931 304

Combinations of different *VISOCOLOR*® test kits

VISOCOLOR® *ECO* reagent case — REF 931 301

For mobile use with test instructions for visual determination, analytical accessories and the following tests:

VISOCOLOR® _ECO_ test kits:

Ammonium	0.2–3 mg/L NH_4^+
Carbonate Hardness	1 drop ≙ 1.25 °e
total Hardness	1 drop ≙ 1.25 °e
Nitrate	1–120 mg/L NO_3^-
Nitrite	0.02–0.5 mg/L NO_2^-
pH	pH 4.0–9.0
Phosphate	0.2–5 mg/L P

VISOCOLOR® reagent case — REF 931 304

For mobile use with test instructions for colorimetric and titrimetric determinations with *VISOCOLOR*® tests, analytical accessories as well as the following test kits:

VISOCOLOR® _ECO_ test kits:

Ammonium 3	0.2–3 mg/L NH_4^+
Nitrite	0.02–0.5 mg/L NO_2^-
Phosphate	0.2–5 mg/L P
pH 4.0–9.0	pH 4.0–9.0

VISOCOLOR® _HE_ test kits:

Alkalinity AL 7	0.2–7.0 mmol/L
total Hardness H 20 F	0.6–25.0 °e
Oxygen SA 10	0.2–10.0 mg/L O_2

Ordering information

Type		REF
VISOCOLOR® *ECO* reagent case (empty)	For individual combination of up to 8 test kits of type *VISOCOLOR*® *ECO*	**931 303**
VISOCOLOR® *ECO* reagent case*	Ammonium, carbonate hardness, total hardness, nitrate, nitrite, pH, phosphate	**931 301**
VISOCOLOR® reagent case (empty)	For combination with products Rapid Tests and the *VISOCOLOR*® lines	**931 305**
VISOCOLOR® reagent case*	Alkalinity, ammonium, total hardness, nitrite, pH, phosphate, oxygen, temperature	**931 304**

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

Reagent cases with photometer PF-12*Plus*

NEW!

- **The all-rounder for any purposes**
- **Increased accuracy and reproducibility**
- **Infinite options**



VISOCOLOR® reagent case with PF-12*Plus*, without test kits — REF 914 351

The premium foam inlay of the empty *VISOCOLOR*® reagent case with PF-12*Plus* incl. instrument manual allows the case to be equipped in an individual and highly flexible way with every combination of the *VISOCOLOR*® tests as well as pH indicator papers, pH-Fix test strips, qualitative test papers and semi-quantitative QUANTOFIX® test strips.

VISOCOLOR® reagent case for environmental analysis — REF 914 353

Reagent case with photometer PF-12*Plus* incl. instrument manual, *VISOCOLOR*® *ECO* test instructions as well as test instructions for titration test kits, analytical accessories and the following test kits:

VISOCOLOR® _ECO_ test kits:

Ammonium 15	0.5–15 mg/L NH_4^+
Iron	0.04–1.0 mg/L Fe
Nitrate	1–120 mg/L NO_3^-
Nitrite	0.02–0.5 mg/L NO_2^-
Phosphate	0.2–5 mg/L P
pH 4.0–9.0	pH 4.0–9.0

VISOCOLOR® _HE_ test kits:

Carbonate hardness C 20	0.6–25.0 °e
total Hardness H 20 F	0.6–25.0 °e

Ordering information

Type		REF
VISOCOLOR® reagent case with PF-12*Plus*	For individual combination with products from the Rapid Tests and *VISOCOLOR*® lines	**914 351**
VISOCOLOR® reagent case for environmental analysis*	Ammonium, carbonate hardness, iron, total hardness, nitrate, nitrite, pH, phosphate	**914 353**

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

Reagent cases

Combinations of different *VISOCOLOR*® test kits

Reagent cases with photometer PF-3

- **Handy and compact**
- **Maximum flexibility**
- **Numerous applications**

Catering to our customer needs, the compact photometer PF-3 is available in multiple versions for different applications. For every version we offer empty cases with PF-3 for individual equipment and a large number of pre-packed reagent cases with PF-3, reagents and accessories.

PF-3 Pool

Together with the following *VISOCOLOR*® *ECO* tests, the PF-3 Pool is perfectly suited for analysis of the most important parameters for swimming pools:

***VISOCOLOR*® *ECO* tests:**

Alkalinity TA	5–250 mg/L $CaCO_3$
Chlorine 2, free + total	0.05–2.00 mg/L Cl_2
Free Chlorine 2	0.05–2.00 mg/L Cl_2
Chlorine 6, free + total	0.05–2.00 mg/L Cl_2
Free Chlorine 6	0.05–2.00 mg/L Cl_2
Cyanuric acid	10–100 mg/L Cya
pH 6.0–8.2	6.10–8.40

PF-3 Pool empty case **REF 934 102**

Reagent case with PF-3 Pool for individual combination with *VISOCOLOR*® *ECO* tests for the most important parameters in the swimming pool sector.

PF-3 Cl_2 · pH · Cya · TA (Cl_2 liquid) **REF 934 118**

Reagent case with PF-3 Pool and *VISOCOLOR*® *ECO* tests for swimming pool analysis. The test *VISOCOLOR*® *ECO* Chlorine contains liquid reagents.

PF-3 Cl_2 · pH · Cya · TA (Cl_2 solid) **REF 934 119**

Reagent case with PF-3 Pool and *VISOCOLOR*® *ECO* tests for swimming pool analysis. The test *VISOCOLOR*® *ECO* Chlorine contains solid reagents, which show a high stability and a long shelf life.



PF-3 Drinking Water

This PF-3 version is suited for the easy and fast determination of drinking water with the following *VISOCOLOR*® *ECO* tests:

***VISOCOLOR*® *ECO* tests:**

Chlorine 2, free + total	0.05–2.00 mg/L Cl_2
Free Chlorine 2	0.05–2.00 mg/L Cl_2
Chlorine 6, free + total	0.05–2.00 mg/L Cl_2
Free Chlorine 6	0.05–2.00 mg/L Cl_2
Chlorine dioxide	0.10–3.80 mg/L ClO_2
Iron 1	0.04–2.00 mg/L Fe
Iron 2	0.04–2.00 mg/L Fe
Fluoride	0.1–2,0 mg/L F^-
pH 6.0–8.2	6.10–8.40

PF-3 Drinking Water, empty case **REF 934 402**

Reagent case with PF-3 Drinking Water for individual combination with *VISOCOLOR*® *ECO* tests.

PF-3 Cl_2 · pH · F^- · Fe · ClO_2 (Cl_2 liquid) **REF 934 124**

Reagent case with PF-3 Drinking Water and pre-packed *VISOCOLOR*® *ECO* tests for determination of the most important parameters for drinking water. The test *VISOCOLOR*® *ECO* Chlorine contains liquid reagents.

PF-3 Cl_2 · pH · F^- · Fe · ClO_2 (Cl_2 solid) **REF 934 125**

Reagent case with PF-3 Drinking Water and *VISOCOLOR*® *ECO* tests for drinking water parameters. The test *VISOCOLOR*® *ECO* Chlorine contains solid reagents, which show a high stability and a long shelf life.

PF-3 Soil NEW!

The PF-3 Soil is perfectly suited for the mobile analysis of the following soil parameters:

***VISOCOLOR*® *ECO* tests:**

Ammonium 3	0.1–2.5 mg/L NH_4^+
Potassium	2–15 mg/L K^+
Nitrate	4–60 mg/L NO_3^-
Phosphate	0.6–15.0 mg/L PO_4^{3-}

PF-3 Soil, empty case **REF 934 202**

Reagent case with PF-3 Soil, which can be equipped with *VISOCOLOR*® *ECO* tests for soil analysis.

PF-3 NH_4^+ · K^+ · NO_3^- · PO_4^{3-} **REF 934 210**

The reagent case PF-3 Soil includes the mentioned *VISOCOLOR*® *ECO* tests for soil analysis and offers an ideal basis for the fast determination of important soil parameters.

Combinations of different *VISOCOLOR*® test kits

PF-3 COD NEW!

Togehter with the proven *NANOCOLOR*® tube tests, the PF-3 COD is perfectly suited for COD analysis.

PF-3 COD, empty case **REF 934 302**

Reagent case with PF-3 COD for mobile COD analysis.

PF-3 COD *NANOCOLOR*® reagent case **REF 919 212**

Reagent case with PF-3 COD, which provides room for 3 *NANOCOLOR*® tests and 1 heating block *NANOCOLOR*® *VARIO C2*.



Ordering information

Type		REF
PF-3 Pool for swimming pools		
Reagent case with photometer PF-3 Pool for individual combination (without reagents)		
PF-3 Pool empty case	for individual combination of *VISOCOLOR*® *ECO* tests	**934 102**
Reagent case with photometer PF-3 Pool, with *VISOCOLOR*® *ECO* reagents*		
PF-3 Cl_2 · pH · Cya · TA	chlorine 2 (liquid), free and total, pH 6.0–8.2, cyanuric acid, alkalinity TA	**934 118**
PF-3 Cl_2 · pH · Cya · TA	chlorine 6 (solid), free and total, pH 6.0–8.2, cyanuric acid, alkalinity TA	**934 119**
PF-3 Drinking water for drinking water analysis		
Reagent case with photometer PF-3 Drinking Water for individual combination (without reagents)		
PF-3 Drinking water empty case	for individual combination of *VISOCOLOR*® *ECO* tests	**934 402**
Reagent case with photometer PF-3 Drinking Water, with *VISOCOLOR*® *ECO* reagents*		
PF-3 Cl_2 · pH · F^- · Fe · ClO_2	chlorine 2 (liquid), free and total, pH 6.0–8.2, fluoride, iron 2, chlorine dioxide	**934 124**
PF-3 Cl_2 · pH · F^- · Fe · ClO_2	chlorine 6 (solid), free and total, pH 6.0–8.2, fluoride, iron 2, chlorine dioxide	**934 125**
PF-3 Soil for soil analysis		
Reagent case with photometer PF-3 Soil for individual combination (without reagents)		
PF-3 Soil empty case	for individual combination of *VISOCOLOR*® *ECO* tests	**934 202**
Reagent case with photometer PF-3 Soil, with *VISOCOLOR*® *ECO* reagents*		
PF-3 NH_4-N · K^+ · NO_3^- · PO_4-P	nitrate, potassium, ammonium 3, phosphate	**934 210**
PF-3 COD for COD analysis		
Reagent case with photometer PF-3 COD for individual combination (without reagents)		
PF-3 COD empty case	suitable as transport case	**934 302**
PF-3 COD *NANOCOLOR*® reagent case	for individual combination of 3 *NANOCOLOR*® tests and 1 heating block *NANOCOLOR*® *VARIO C2*	**919 212**

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

For further information about the PF-3, see page 86

For further information about reagent cases with PF-3, please ask for the corresponding focus flyer.

Reagent cases

VISOCOLOR® SCHOOL

Water analysis – it's that simple

- **Easy test procedures**
- **Safe results**
- **Flexible applications**
- **Incredible value**





***VISOCOLOR*® SCHOOL reagent case** **REF 933 100**

The *VISOCOLOR*® *SCHOOL* reagent case is especially designed for schools and caters to the needs of both students and teachers. All reagents are approved to be used in schools in Germany (GUV-SR 2004 directive) and can be disposed of easily just down the drain without any harm to the environment.

***VISOCOLOR*® SCHOOL reagents:**

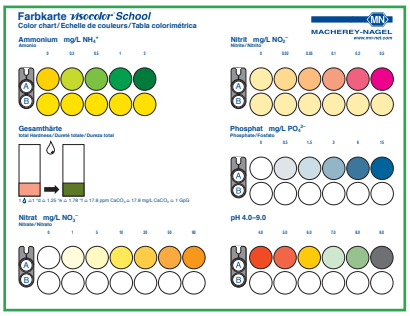
Ammonium	0.2–3 mg/L NH_4^+
Nitrate	1–90 mg/L NO_3^-
Nitrite	0.02–0.5 mg/L NO_2^-
Phosphate	0.5–15 mg/L PO_4^{3-}
pH	4.0–9.0
Total hardness	1 drop ≙ 17.8 mg/L $CaCO_3$

The newly developed tests are based on our proven *VISOCOLOR*® system and were developed as high quality *VISOCOLOR*® *SCHOOL* product line specifically for schools.

Great features – incredible price

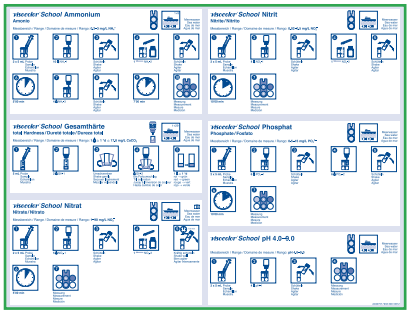
- Maximum safety due to exact labeling of all reagents
- Safe results using color and turbidity compensation
- High sensitivity down to the values of German drinking water standards
- Safe for the environment and easy disposal of used tests

High accuracy



- Color matching with all-in-one color scale
- Compensation of turbidity and colors
- Reaction principles based on international standards

Simple and safe



- Easy test procedures with pictogram instructions
- Color-coded reagent bottles
- No additional accessories required

Extensive manual



- Background information about the parameters
- Declaration of the reaction basis as well as reaction equation
- Data about interferences

Optionally, the case can be equipped with a pack of pH-Fix or QUANTOFIX® test strips as well.

Ordering information

Type	for the determination of	REF
VISOCOLOR® *SCHOOL* reagent case*	ammonium, nitrate, nitrite, phosphate, pH, total hardness	**933 100**
VISOCOLOR® *SCHOOL* refill pack*	ammonium, nitrate, nitrite, phosphate, pH, total hardness	**933 200**
VISOCOLOR® *SCHOOL* color chart		**933 300**
VISOCOLOR® *SCHOOL* manual (German / English)		**933 150**

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

Reliable and fast for fisheries waters

- **Tough and easy to handle mini-lab**
- **Determination of classic water parameters**
- **Analysis even without previous chemical knowledge**
- **Color-coded reagents**

NEW!



Reagent case *VISOCOLOR® FISH* REF 933 101

The *VISOCOLOR® FISH* reagent case is developed for the requirements in analysis of fisheries waters. The flexible and though reagent case is especially suited for mobile analysis directly at the point of interest. Beside the needed accessories, the *VISOCOLOR® FISH* reagent case is equipped with 6 tests for colorimetric and titrimetric determination of the following classic parameters:

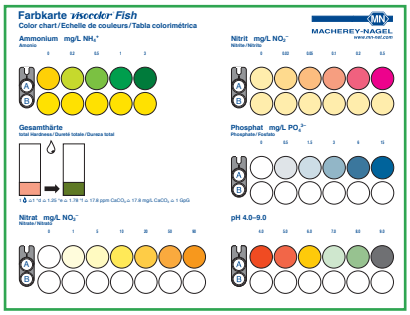
***VISOCOLOR® FISH* reagents:**

Ammonium	0.2–3 mg/L NH_4^+
Nitrate	1–90 mg/L NO_3^-
Nitrite	0.02–0.5 mg/L NO_2^-
Phosphate	0.5–15 mg/L PO_4^{3-}
pH	4.0–9.0
Total hardness	1 drop ≙ 17.8 mg/L CaCO

Highest flexibility

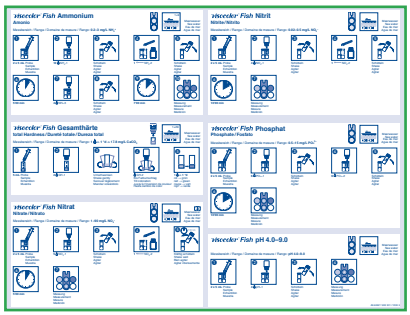
- Reliable and fast determination of fisheries waters with only one reagent case
- High stability due to a tough case with chemical resistant foam inlay
- Compact dimensions for your analysis needs at the point of interest
- Safe results for keeper of rivers as well as private individuals

Accurate and safe



- Reliable color matching of all tests with one color scale
- Color- and turbidity compensation
- Clearly labeled reagents for maximum safety

Fast and easy



- Exact pictogram instructions
- Color-coded reagents and easy test procedures
- Comfortable disposal of used tests

VISOCOLOR® FISH manual



- Detailed manual with background information
- Description of all included parameters
- Declaration of the reaction basis as well as equation
- Data about interferences

Ordering information

Type	for the determination of	REF
VISOCOLOR® FISH reagent case*	ammonium, nitrate, nitrite, phosphate, pH, total hardness	**933 101**
VISOCOLOR® FISH refill pack*	ammonium, nitrate, nitrite, phosphate, pH, total hardness	**933 201**
VISOCOLOR® FISH color chart		**933 301**
VISOCOLOR® FISH manual (German / English)		**933 151**

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

Reagent cases

VISOCOLOR® reagent cases for soil analysis



Soil analysis made easy

- **Easy sample preparation**
- **Fast evaluation of nutrients in soil**
- **Convenient and reliable determination in the field**

Universal use

Depending on the parameter to be determined, the soil extracts are prepared with Calcium-Acetate-Lactate (CAL) or with $CaCl_2$ solution. If required by national regulations or because of local geological conditions, the *VISOCOLOR*® reagent case for soil analysis can also be used with other extraction solutions.

Soil analysis in no time

- Manual with background information
- Ideal combination of test papers and colorimetric test kits
- Incl. additional analytical tools, such as scale, sieve etc.

In addition to the reagent case, various *VISOCOLOR*® reagents can also be used for soil analysis. Please request information about suitable extraction solutions

VISOCOLOR® reagent case for soil analysis

REF 931 601

Thorough analysis is a corner stone to support and maintain healthy, productive and biologically active soil. To effectively and efficiently plan all measures that affect the soil (fertilization, liming, etc.) it is crucial to determine the important soil parameters first. The *VISOCOLOR*® reagent case for soil analysis is the perfect companion for economical, fast and convenient soil analysis, both in the field or in your laboratory, including the following tests:

QUANTOFIX® test strips:

• Ammonium	10–400 mg/L NH_4^+
• Nitrate / Nitrite	10–500 mg/L NO_3^- / 1–80 mg/L NO_2^-

***VISOCOLOR*® *ECO* tests:**

• Potassium	2–15 mg/L K^+

***VISOCOLOR*® *HE* tests:**

• Phosphate	1–20 mg P/100 g
• pH	4.0–10.0

pH-Fix test strips:

• pH	2.0–9.0

VISOCOLOR® reagent case for soil analysis with PF-3 Soil

REF 934 220

The newest version of the *VISOCOLOR*® reagent case for soil analysis includes, beside reagents and accessories, also the compact photometer PF-3 Soil.

The PF-3 Soil comprises the important soil parameters ammonium, potassium, nitrate and phosphate. It is ideally suited for mobile analysis right at the point of interest.

The *VISOCOLOR*® reagent case with PF-3 Soil offers an optimum combination of the PF-3 with *VISOCOLOR*® test kits and provides with a quick and reliable information on soil quality. The reagent case contains the following test kits:

QUANTOFIX® test strips:

• Nitrate/Nitrite	10–500 mg/L NO_3^- / 1–80 mg/L NO_2^-

***VISOCOLOR*® *ECO* tests:**

• Ammonium 3	0.1–2.5 mg/L NH_4-N
• Potassium	2–15 mg/L K^+
• Nitrate	4–60 mg/L NO_3^-
• Phosphate	0.6–15.0 mg/L PO_4^{3-}

pH-Fix test strips:

• pH	2.0–9.0

NEW!





VISOCOLOR® reagent cases for soil analysis

Ordering information

Type	REF
Reagent case for soil analysis without photometer	
VISOCOLOR® reagent case for soil analysis*, incl. reagents and accessories for sample preparation	**931 601**
Reagent case for soil analysis with photometer PF-3	
Reagent case with photometer PF-3 Soil*, incl. reagents, without accessories for sample preparation	**934 210**
VISOCOLOR® reagent case for soil analysis* with photometer PF-3 Soil, incl. reagents and accessories for sample preparation	**934 220**
Consumables	
$CaCl_2$ stock solution*	**914 612**
CAL stock solution	**914 614**
VISOCOLOR® *HE* pH 4.0–10.0	**920 174**
VISOCOLOR® *HE* Phosphorus in soil*	**920 183**
Color comparison disc *VISOCOLOR*® *HE* pH 4.0–10.0	**920 374**
Color comparison disc *VISOCOLOR*® *HE* Phosphorus in soil	**920 383**
Pyrophosphate solution 3 x 30 mL	**914 611**
VISOCOLOR® *ECO* Potassium*	**931 232**
QUANTOFIX® Ammonium*	**913 15**
QUANTOFIX® Nitrate / Nitrite	**913 13**
Folded filters MN 616 1/4	**53 20 18**
pH-Fix 2.0–9.0	**921 18**
VISOCOLOR® *ECO* Ammonium 3*	**931 208**
VISOCOLOR® *ECO* Nitrate*	**931 241**
VISOCOLOR® *ECO* Phosphate*	**931 284**
Manual for *VISOCOLOR*® case for soil analysis (German / English /French / Spanish)	**914 602**

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

Customized case solutions

Catering to individual customer needs is of the great importance to MACHEREY-NAGEL. Even though our case solutions already provide a high level of flexibility, we recognize that some customers may have specific requirements outside our existing case solutions. Therefore, we offer entirely individual solutions with a foam inlay designed exactly to your specifications and testing needs. Starting at a minimum of 50 cases, we can provide you with a case that perfectly fits your personal requirements. In addition to a special inlay, we also offer readily packed cases starting at a minimum quantity of 50 cases as well.

Thus, within our highly flexible case range, we can provide virtually any customer with the perfect testing and transportation solution.

For a case solution for test strip and test papers without *VISOCOLOR*® test kits, see page 48.



Photometer for water analysis

Compact photometer PF-12*Plus*

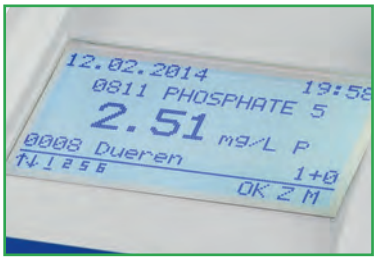
Increased flexibility

- **More than 100 preprogrammed methods**
- **Nephelometric turbidity measurements**
- **Backlit graphic display with intuitive userguidance**
- **Determination of correction values**
- **USB interface for data transfer, update and power supply**



Save time and make your lab work easier

Backlit graphic display with self-explanatory userguidance



- All tests and menu items can be activated fast and easily

Results within seconds

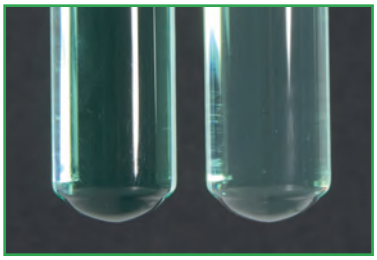
- The progessively designed optics is insensitive to external light and makes measuring straightforward

Preprogrammed tests and photometric basic functions

- More than 100 preprogrammed *VISOCOLOR*® *ECO* tests and *NANOCOLOR*® tube tests and photometric basic functions: Absorbance, transmission, factor, turbidity and standard

Experience precision and increase accuracy

Highest accuracy



- Warning of potential interferences by fully automatic turbidity control measurement with 90° (NTU-check)

Measurement without cuvette slot cover

- The state-of-the-art optical system is insensitive to external light and allows straightforward measurements

Self-explanatory user guidance

- The new icon-based menu guidance allows an intuitive and self-explanatory use of the PF-12*Plus*
- Operation without complex and time-consuming training

Assure results

Documentation of results according to GLP

- Individual entries of sample number, sample location and dilution

Clear memory management

- GLP-conform storage of results with all supplementary information such as date, time, sample number, sample location and dilution
- Fast and easy access to stored results and data sets

Convenient data export



- *NANOCOLOR*® software DVD included in delivery
- Easy transfer of results to PC
- Data export directly to MS EXCEL
- Recording of calibration curves to program user-defined methods

Internal quality control according to ISO 9001

- Fulfill supervisor and authority requirements
- Fast and easy self-monitoring of photometric accuracy with *NANOCONTROL* NANOCHECK (REF 925 701)

Photometer for water analysis

Compact photometer PF-12*Plus*

Be mobil and enjoy versatility

Works under any condition



- Variable power supply for mobile use: Standard and rechargeable batteries for more than 2000 off the line measurements
- Power saving auto-off function after 5, 10, 15 or 20 minutes
- Waterproof housing (IP 68)
- Optimized battery indicator

Individual mini-labs



- Portable reagent cases with photometer PF-12*Plus*
- Cost-efficient refill packs available
- Photometric analysis of *VISOCOLOR*® *ECO* tests can be combined with pH indicator papers, pH-Fix test strips, qualitative test papers, QUANTOFIX® test strips and accessories

Free programming of user-defined methods

- Programmable for 50 user-defined methods

Please find further information and examples of reagent cases with photometer PF-12*Plus* on page 73



Photometer for water analysis

Compact photometer PF-12*Plus*

Technical data

Type:	Filter photometer with microprocessor control, self-test and auto-calibration Wavelength range 340–860 nm
Optics:	Automatic filter wheel with 7 interference filters Insensitive to external light–no light shield required
Wavelengths:	345 / 436 / 470 / 540 / 585 / 620 / 690 nm plus 1 compartment for an additional filter
Wavelength accuracy:	± 2 nm, bandwidth at half transmission 10–12 nm
Light source:	Xenon lamp
Detector:	Silicon photodiode
Blank value:	Automatic
Measuring modes:	Over 100 preprogrammed tests (*NANOCOLOR*® tube tests and *VISOCOLOR*® *ECO* tests) Absorbance, transmission, factor, standard 50 freely programmable methods
Photometric range:	± 3 E
Photometric accuracy:	± 1 %
Stability:	< 0.002 E/h
Cuvette holder:	Round tubes 16 mm OD
Data memory:	1000 results, GLP conform
Display:	Backlit graphic display, 64 x 128 pixels All important data at a glance: Result in respective unit, date, time, sample number, sample location and dilution
Operation:	Display userguidance, plastic foil keyboard Test selection via test number or parameter lists 12 languages (de, en, fr, es, it, nl, hu, pl, pt, cz, id, si)
Quality Control:	With *NANOCONTROL* NANOCHECK
Interface:	USB 2.0
Update:	Via Internet / PC, free of charge
Operating range:	0–50 °C, up to 90 % relative humidity
Power supply:	Via USB power supply, standard or rechargeable batteries
Housing:	Waterproof, IP 68
Dimensions:	215 x 100 x 65 mm
Weight:	0.7 kg
Warranty:	2 years

CE This device complies with the following directives:
- 2006/95/EG - Low-Voltage Directive
- 2004/108/EG - EMC-Directive



Ordering information

Description	REF
Compact photometer PF-12*Plus* incl. software DVD, manual, 4 batteries, 4 empty test tubes, funnel, beaker, syringe, USB cabel, calibration cuvette and certificate in rugged case	**919 250**
Akku pack	**919 201**
USB power suppy	**919 220**
Charger	**919 221**

Test	Ranges	Test no	Wavelength	No of tests	REF
VISOCOLOR® ECO					
Alkalinity TA	5–250 mg/L $CaCO_3$	5-04	436 / 585	100	**931 204**
Ammonium 3*	0.1–2.5 mg/L NH_4^+	5-08	690	50	**931 208**
Ammonium 15*	0.5–8.0 mg/L NH_4^+	5-10	585	50	**931 210**
Bromine	0.10–13.00 mg/L Br_2	5-11	540	200	**931 211**
Chloride*	1–50 mg/L Cl^-	5-18	470	90	**931 218**
Chlorine 1, free + total	0.05–2.00 mg/L Cl_2	5-35	540	150	**931 235**
Chlorine 2, free + total*	0.05–2.00 mg/L Cl_2	5-15	540	150	**931 215**
free Chlorine 2	0.05–2.00 mg/L Cl_2	5-16	540	150	**931 216**
Chlorine 6, free + total	0.05–6.00 mg/L Cl_2	5-17	540	200	**931 217**
free Chlorine 6	0.05–6.00 mg/L Cl_2	5-19	540	400	**931 219**
Chlorine dioxide*	0.20–3.80 mg/L ClO_2	5-21	540	150	**931 221**
Chromium(VI)*	0.04–1.00 mg/L CrO_4^{2-}	5-20	540	140	**931 220**
Copper	0.1–5.0 mg/L Cu^{2+}	5-37	585	100	**931 237**
Cyanide*	0.01–0.20 mg/L CN^-	5-22	585	100	**931 222**
Cyanuric acid*	10–100 mg/L Cya	5-23	540	100	**931 223**
Fluoride	0.1–2.0 mg/L F^-	5-27	585	150	**931 227**
Hydrazine*	0.05–0.40 mg/L N_2H_4	5-30	436	130	**931 230**
Iron 1*	0.04–2.00 mg/L Fe	5-25	540	200	**931 225**
Iron 2	0.04–2.00 mg/L Fe	5-26	540	100	**931 226**
Manganese*	0.1–5.0 mg/L Mn^{2+}	5-38	436	70	**931 238**
Nickel*	0.04–5.00 mg/L Ni^{2+}	5-40	470	150	**931 240**
Nitrate*	4–60 mg/L NO_3^-	5-41	436	110	**931 241**
Nitrite	0.02–0.50 mg/L NO_2^-	5-44	540	120	**931 244**
Oxygen*	1–8 mg/L O_2	5-88	540	50	**931 288**
pH 6.0–8.2	pH 6.1–8.4	5-70	436/540	150	**931 270**
Phosphate*	0.2–5.0 mg/L PO_4-P 0.6–15 mg/L PO_4^{3-}	5-84	690	80	**931 284**
Potassium*	2–25 mg/L K^+	5-32	690	60	**931 232**
Silica*	0.2–3.0 mg/L SiO_2	5-33	690	80	**931 233**
Silica HR 200* (with special filter)	10–200 mg/L SiO_2	5-34	450	100	**931 234**
Sulfate*	20–200 mg/L SO_4^{2-}	5-92	436	100	**931 292**
Sulfide*	0.05–0.80 mg/L S^{2-}	5-94	620	90	**931 294**
Zinc	0.1–3.0 mg/L Zn^{2+}	5-98	620	120	**931 298**
***NANOCOLOR®* tube tests**					
Aluminium 07	0.02–0.70 mg/L Al^{3+}	0-98	540	19	**985 098**
Ammonium 3*	0.04–2.30 mg/L NH_4-N 0.05–3.00 mg/L NH_4^+	0-03	690	20	**985 003**
Ammonium 10*	0.2–8.0 mg/L NH_4-N 0.2–10 mg/L NH_4^+	0-04	690	20	**985 004**
Ammonium 50*	1–40 mg/L NH_4-N 1–50 mg/L NH_4^+	0-05	690	20	**985 005**
Ammonium 100*	4–80 mg/L NH_4-N 5–100 mg/L NH_4^+	0-08	585	20	**985 008**
Ammonium 200*	30–160 mg/L NH_4-N 40–200 mg/L NH_4^+	0-06	585	20	**985 006**
AOX 3*	0.1–3.0 mg/L AOX 0.01–0.30 mg/L AOX	0-07	470	20	**985 007**
BDO_5*	0.5–12.0 mg/L O_2	8-22	470	25–50	**985 822**
BDO_5-TT*	0.5–7.5 mg/L O_2	8-25	436	11–21	**985 825**
Cadmium 2	0.05–2.00 mg/L Cd^{2+}	0-14	540	10–19	**985 014**
Carbonate hardness 15	1.0–18.0 °e 0.4–5.4 mmol/L H^+	0-15	436/585	20	**985 015**
Chloride 50*	0.5–50.0 mg/L Cl^-	0-21	470	20	**985 021**

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

Photometer for water analysis

Compact photometer PF-12^{Plus}

Test	Ranges	Test no	Wavelength	No of tests	REF
Chloride 200*	5–200 mg/L Cl^- 0.10–1.00 g/L Cl^-	0-19	470	20	**985 019**
Chlorine / Ozon 2*	0.05–2.50 mg/L Cl_2 0.05–2.00 mg/L O_3	0-17	540	20	**985 017**
Chlorine dioxide 5	0.15–5.00 mg/L ClO_2	0-18	540	20	**985 018**
Chromate 5	0.05–2.00 mg/L Cr(VI) 0.1–4.0 mg/L CrO_4^{2-}	0-24	540	20	**985 024**
total Chromium 2*	0.05–2.00 mg/L Cr	0-59	540	20	**985 059**
COD 40*	2–40 mg/L O_2	0-27	345	20	**985 027**
COD 60*	5–60 mg/L O_2	0-22	345	20	**985 022**
COD 160*	15–160 mg/L O_2	0-26	436	20	**985 026**
COD 160 Hg-free*	15–160 mg/L O_2	0-26	436	20	**963 026**
COD 300*	50–300 mg/L O_2	0-33	436	20	**985 033**
COD 600*	50–600 mg/L O_2	0-30	620	20	**985 030**
COD 1500*	100–1500 mg/L O_2	0-29	620	20	**985 029**
COD 4000*	400–4000 mg/L O_2	0-11	620	20	**985 011**
COD 10000*	1.00–10.00 g/L O_2	0-23	620	20	**985 023**
COD 15000*	1.0–15.0 g/L O_2	0-28	620	20	**985 028**
COD 60000*	5.0–60.0 g/L O_2	0-12	620	20	**985 012**
org. Complexing agents 10 (Screeningtest)	0.5–10.0 mg/L I_{BiC}	0-52	540	10–19	**985 052**
Copper 7	0.10–7.00 mg/L Cu^{2+}	0-54	585	20	**985 054**
Cyanide 08*	0.02–0.80 mg/L CN^-	0-31	585	20	**985 031**
DEHA 1 (Diethylhydroxylamine)	0.05–1.00 mg/L DEHA	0-35	540	20	**985 035**
Ethanol 1000	0.10–1.00 g/L EtOH	8-38	620	23	**985 838**
Fluoride 2	0.1–2.0 mg/L F^-	0-40	620	20	**985 040**
Formaldehyde 8*	0.1–8.0 mg/L HCHO	0-41	585	20	**985 041**
Formaldehyde 10	0.20–10.00 mg/L HCHO	0-46	436	10–19	**985 046**
Hardness Ca / Mg	1.25–25.0 °e 5–50 mg/L Mg^{2+} 0.2–3.6 mmol/L 10–100 mg/L Ca^{2+}	0-44	540	20	**985 044**
Hardness 20	1.25–25.0 °e 5–50 mg/L Mg^{2+} 0.2–3.6 mmol/L 10–100 mg/L Ca^{2+}	0-43	540	20	**985 043**
HC 300* (hydrocarbons)	0.5–5.6 mg/L HC 30–300 mg/kg HC	0-57	436	20	**985 057**
Iron 3*	0.10–3.00 mg/L Fe	0-37	540	20	**985 037**
Lead 5*	0.10–5.00 mg/L Pb^{2+}	0-09	540	20	**985 009**
Manganese 10*	0.1–10.0 mg/L Mn^{2+}	0-58	470	20	**985 058**
Methanol 15	0.2–15.0 mg/L MeOH	8-59	620	23	**985 859**
Molybdenum 40*	1.0–30.0 mg/L Mo (VI) 1.6–50.0 mg/L MoO_4	0-56	345	20	**985 056**
Nickel 4*	0.10–7.00 mg/L Ni^{2+}	0-71	470	20	**985 071**
Nickel 7*	0.10–7.00 mg/L Ni^{2+}	0-61	470	20	**985 061**
Nitrate 8*	0.30–8.00 mg/L NO_3-N 1.3–35.0 mg/L NO_3^-	0-65	345	20	**985 065**
Nitrate 50*	0.3–22.0 mg/L NO_3-N 2–100 mg/L NO_3^-	0-64	345	20	**985 064**
Nitrate 250*	4–60 mg/L NO_3-N 20–250 mg/L NO_3^-	0-66	345	20	**985 066**
Nitrite 2*	0.003–0.460 mg/L NO_2-N 0.02–1.50 mg/L NO_2^-	0-68	540	20	**985 068**

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

Test	Ranges	Test no	Wavelength	No of tests	REF
Nitrite 4*	0.1–4.0 mg/L NO_2-N 0.3–13.0 mg/L NO_2^-	0-69	540	20	**985 069**
total Nitrogen TN_b 22*	0.5–22.0 mg/L N	0-83	345	20	**985 083**
total Nitrogen TN_b 60*	3–60 mg/L N	0-92	345	20	**985 092**
total Nitrogen TN_b 220*	5–220 mg/L N	0-88	345	20	**985 088**
Organic acids 3000*	30–3000 mg/L CH_3COOH 0.5–50.0 mmol/L CH_3COOH	0-50	470	20	**985 050**
Oxygen 12*	0.5–12.0 mg/L O_2	0-82	436	22	**985 082**
Peroxide 2	0.03–2.00 mg/L H_2O_2	8-71	620	10–19	**985 871**
pH 6.5–8.2	pH 6.1–8.4	0-72	436/540	100	**918 72**
Phenolic index 5*	0.2–5.0 mg/L phenol	0-74	470	10–19	**985 074**
ortho and total Phosphate 1*	0.05–1.50 mg/L P 0.2–5.0 mg/L PO_4^{3-}	0-76	690	20	**985 076**
ortho and total Phosphate 5*	0.20–5.00 mg/L P 0.5–15.0 mg/L PO_4^{3-}	0-81	690	20	**985 081**
ortho and total Phosphate 15*	0.30–15.00 mg/L P 1.0–45.0 mg/L PO_4^{3-}	0-80	690	20	**985 080**
ortho and total Phosphate 45*	5.0–50.0 mg/L P 15–150 mg/L PO_4^{3-}	0-55	690	20	**985 055**
ortho and total Phosphate 50*	10.0–50.0 mg/L P 30–150 mg/L PO_4^{3-}	0-79	436	19	**985 079**
POC 200 (acides polycarboxyliques)	20–200 mg/L	0-70	436	20	**985 070**
Potassium 50*	2–50 mg/L K^+	0-45	690	20	**985 045**
residual Hardness 1	0.03–1.25 °e 0.004–0.180 mmol/L	0-84	540	20	**985 084**
Silver 3	0.20–3.00 mg/L Ag^+	0-49	620	20	**985 049**
Starch 100*	5–100 mg/L Starch	0-85	540	19	**985 085**
Sulfate 200*	10–200 mg/L SO_4^{2-}	0-86	436	20	**985 086**
Sulfate 1000*	200–1000 mg/L SO_4^{2-}	0-87	436	20	**985 087**
Sulfide 3*	0.05–3.00 mg/L S^{2-}	0-73	620	20	**985 073**
Sulfite 10*	0.2–10.0 mg/L SO_3^{2-}	0-89	436	20	**985 089**
Sulfite 100*	5–100 mg/L SO_3^{2-}	0-90	470	19	**985 090**
Surfactants: Anionic surfactants 4*	0.20–4.00 mg/L MBAS	0-32	620	20	**985 032**
Surfactants: Cationic surfactants 4*	0.20–4.00 mg/L CTAB	0-34	620	20	**985 034**
Surfactants: Nonionic surfactants 15*	0.3–15.0 mg/L Triton® X-100	0-47	620	20	**985 047**
Thiocyanate 50*	0.5–50.0 mg/L SCN^-	0-91	470	20	**985 091**
TOC 25*	2.0–25.0 mg/L C	0-93	585	10	**985 093**
TOC 60*	10–60 mg/L C	0-94	585	10	**985 094**
TOC 600*	40–600 mg/L C	0-99	585	10	**985 099**
TTC / Sludge activity 150*	5–150 µg TPF 0.050–2.300 E	8-90	470	20	**985 890**
Zinc 4*	0.10–4.00 mg/L Zn^{2+}	0-96	620	20	**985 096**

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

Photometer for water analysis

Compact photometer PF-3

Small – Strong – Smart

- **Simple operation**
- **Intuitive menu guidance**
- **Backlit graphic display**
- **Water proof according to IP 68**



The smart solution for special applications

The new compact photometer PF-3 is the smallest member of the MACHEREY-NAGEL photometer family. The instrument is the logical addition to our product portfolio and perfectly fits our tradition of reliability, user friendliness and innovation.

At the core of the PF-3, there are premium high precision optics with especially selected LEDs and first-rate interference filters. As the PF-3 is equipped with three different wavelengths, it will be available in multiple versions for different applications. You can find a complete list with all available versions at ***www.mn-net.com/PF-3***.

Convenient operation

Backlit graphic display with intuitive menu guidance



- Test selection within seconds
- Only 3 menu levels
- Intuitive menu structure using just 4 buttons

Mobile and tough

Ideal for analysis even under adverse conditions



- Water proof according to IP 68
- Shock-resistant optics
- Variable power supply
  - Batteries
  - Rechargeable batteries
  - USB interface
  - Accu pack
- Small, handy and easily portable

Fast and reliable results

Innovative technology and excellent optics



- Specially selected LEDs
- High quality interference filters
- Measurements without cuvette slot cover

Flexible tests systems

***VISOCOLOR® ECO* and *NANOCOLOR®* round tubes**



- High range of pre-packed reagent cases
- Usage of further test kits
- Different measurement ranges available

Photometer for water analysis

Compact photometer PF-3

Future-proof test selection

Extendable irrespection of the initial configuration



- Easy downloads via the internet
- Free additional test selection
- Full use of the system without additional costs

Safe data management

Large memory and free of charge software



- Stores up to 50 results
- Easy data transfer via mini USB interface
- Free software for easy data management

Technical data

Type:	LED photometer with microprocessor control, self-test and auto calibration
Optics:	LED + interference filters Insensitive to external light for quick measurements without cuvette slot cover
Wavelengths:	Depending on version, 3 wavelengths possible Pool / Drinking Water: 450 nm, 530 nm, 590 nm Soil: 365 nm, 450 nm and 660 nm COD: 365 nm, 450 nm and 595 nm
Wavelength accuracy:	± 2 nm, bandwidth at half transmission 10–12 nm
Number of filters:	3
Light source:	LED
Detector:	Silicon photodiode
Measuring modes:	Pre-programmed tests (*NANOCOLOR*® tube tests and *VISOCOLOR*® *ECO* tests)
Cuvette slot:	Tubes 16 mm OD
Memory:	50 results
Display:	Backlit graphic display, 64 x 128 pixels All important data at a glance: Result with unit, date, time
Operation:	Self-explanatory menu guidance, plastic foil keypad Test selection via parameter lists
Interface:	Mini-USB
Update:	Free of charge via internet / PC
Operating range:	5–50 °C, up to 90 % rel. humidity
Power supply:	3 AA batteries, rechargeable batteries, USB interface; optional internal accu-pack
Housing:	Water proof according to IP 68 (30 min, 1 m)
Dimensions :	170 x 95 x 68 mm
Weight:	0.5 kg
Warranty:	2 years
CE	This device complies with the following directives: - 2006/95/EG - Low-Voltage Directive - 2004/108/EG - EMC Directive

Photometer for water analysis

Compact photometer PF-3

Ordering information

Description	REF
PF-3 Pool	
Compact photometer PF-3 Pool, in a cardboard box, incl. manual, batteries and certificate	**919 340**
Compact photometer PF-3 Pool, in a case with foam inlay, incl. manual, batteries, certificate	**934 102**
PF-3 Drinking Water	
Compact photometer PF-3 Drinking Water, in a cardboard box, incl. manual, batteries and certificate	**919 343**
Compact photometer PF-3 Drinking Water, in a case with foam inlay, incl. manual, batteries, certificate	**934 402**
PF-3 Soil	
Compact photometer PF-3 Soil, in a cardboard box, incl. manual, batteries and certificate	**919 341**
Compact photometer PF-3 Soil, in a case with foam inlay, incl. manual, batteries, certificate	**934 202**
PF-3 COD NEW!	
Compact photometer PF-3 COD in a cardboard box, incl. manual, batteries and certificate	**919 342**
Compact photometer PF-3 COD, in a case with foam inlay, incl. manual, batteries, certificate	**934 302**
Accessories	
Mini USB cable for PF-3	**919 390**
Accu pack for PF-3	**919 391**
Manual for PF-3	**919 392**
VISOCOLOR® ECO test instructions for PF-3	**934 001**

Please find further information and examples of reagent cases with photometer PF-3 on page 74.



VISOCOLOR® *ECO* and *NANOCOLOR*® tests running on the PF-3

Test	Measurement range	Test number	Version	No. of tests	REF
VISOCOLOR*® *ECO					
Alkalinity TA	5–250 mg/L $CaCO_3$	5-04	Pool / Drinking Water	100	**931 204**
Ammonium 3*	0.1–2.5 mg/L NH_4^+	5-08	Soil	50	**931 208**
Bromine	0.10–13.00 mg/L Br_2	5-11	Pool / Drinking Water	200	**931 211**
Chlorine 1, free, total and combined	0.05–2.00 mg/L Cl_2	5-35	Pool / Drinking Water	150	**931 235**
Chlorine 2, free, total and combined*	0.05–2.00 mg/L Cl_2	5-15	Pool / Drinking Water	150	**931 215**
free Chlorine 2*	0.05–2.00 mg/L Cl_2	5-16	Pool / Drinking Water	150	**931 216**
Chlorine 6, free, total and combined*	0.05–6.00 mg/L Cl_2	5-17	Pool / Drinking Water	200	**913 217**
free Chlorine 6*	0.05–6.00 mg/L Cl_2	5-19	Pool / Drinking Water	400	**931 219**
Chlorine dioxide*	0.10–3.80 mg/L ClO_2	5-21	Pool / Drinking Water	150	**931 221**
Cyanuric acid*	10–100 mg/L Cya	5-23	Pool / Drinking Water	100	**931 223**
Fluoride	0.1–2.0 mg/L F^-	5-27	Pool / Drinking Water	150	**931 227**
Iron 1*	0.04–2.00 mg/L Fe	5-25	Pool / Drinking Water	150	**931 225**
Iron 2	0.04–2.00 mg/L Fe	5-26	Pool / Drinking Water	150	**931 226**
Nitrate*	4–60 mg/L NO_3^-	5-41	Soil	100	**931 241**
pH 6.0–8.2	6.10–8.40	5-70	Pool / Drinking Water	150	**931 270**
Phosphate*	0.2–5.0 mg/L PO_4-P	5-84	Soil	80	**931 284**
Potassium*	2–15 mg/L K^+	5-32	Soil	60	**931 232**
Silica HR 200*	10–200 mg/L SiO_2	5-34	Pool / Drinking Water	100	**931 234**
***NANOCOLOR*® tube tests**					
Ammonium 3*	0.05–3.00 mg/L NH_4^+	0-03	Soil	20	**985 003**
Ammonium 10*	0.20–10.0 mg/L NH_4^+	0-04	Soil	20	**985 004**
Ammonium 50*	1.0–50.0 mg/L NH_4^+	0-05	Soil	20	**985 005**
COD 40*	2–40 mg/L O_2	0-27	COD	20	**985 027**
COD 60*	5–60 mg/L O_2	0-22	COD	20	**985 022**
COD 160*	15–160 mg/L O_2	0-26	COD	20	**985 026**
COD 600*	50–600 mg/L O_2	0-30	COD	20	**985 030**
COD 1500*	100–1500 mg/L O_2	0-29	COD	20	**985 029**
COD 4000*	400–4000 mg/L O_2	0-11	COD	20	**985 011**
COD 10000*	1.00–10.00 g/L O_2	0-23	COD	20	**985 023**
COD 15000*	1.0–15.0 g/L O_2	0-28	COD	20	**985 028**
COD 60000*	5.0–60.0 g/L O_2	0-12	COD	20	**985 012**
Nitrate 50*	0.3–22.0 mg/L NO_3-N	0-64	Soil	20	**985 064**
ortho and total Phosphate 5*	0.20–5.00 mg/L PO_4-P	0-81	Soil	20	**985 081**
ortho and total Phosphate 15*	0.30–15.00 mg/L PO_4-P	0-80	Soil	20	**985 080**
Potassium 50*	2–50 mg/L K	0-45	Soil	20	**985 045**
* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.					

Additional tests and versions will be launched successively. You can find all your current options at ***www.mn-net.com/PF-3***.

The system for photometric water analysis

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The system for photometric water analysis

NANOCOLOR® photometer

incl. PC software

For universal use in water and waste water analysis



Save time

- Fast measurements by *NANOCOLOR*® barcode technology
- Preprogrammed tests and photometric basic functions
- Simple measurements without cuvette slot cover
- Clear display of all significant data and functions on the user-friendly touch screen

Experience precision

- Highly accurate measurements by high-quality optical components
- Self-explanatory user guidance
- Safe test procedures with test instructions presented as pictograms



Meet specifications

- Internal quality control in accordance to ISO 9001
- Documentation of results in accordance to GLP
- Clear memory management
- Convenient export of data and professional data and spectrum processing with *NANOCOLOR*® PC software

Enjoy flexibility

- Flexible measurements of different cuvettes without adapter
- Free programming of user defined applications
- Fast photometer update - free of charge

NANOCOLOR® heating blocks

For fast and safe sample digestions



Experienced and flexible

- Preprogrammed standard programs for all routine digestions
- Easy to program for user-defined methods
- Performance of all required digestions with only one instrument

Simple and fast

- Very short warm-up times
- Procedure of all routine digestions in only 30 minutes
- Simple operation via symbol keys

Controlled and safe

- Electronic temperature control and fully automatic calibration with the *NANOCOLOR*® T-Set
- Extra thick safety covers on the surface of the heating blocks as protection against contact
- Electronic protection against excess temperature



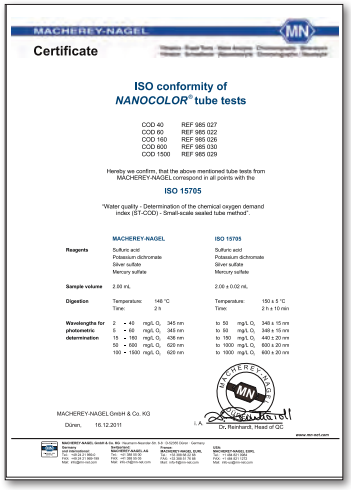
Reliable and versatile

- Constant digestion conditions with high temperature stability
- Suitable for all *NANOCOLOR*® digestion methods

The system for photometric water analysis

NANOCOLOR® tests

User-friendly and precise analysis


MACHEREY-NAGEL

Certificate

ISO conformity of
NANOCOLOR® tube tests

COD 40 REF 985 027
COD 60 REF 985 022
COD 160 REF 985 026
COD 600 REF 985 030
COD 1500 REF 985 029

Hereby we confirm, that the above mentioned tube tests from MACHEREY-NAGEL correspond in all points with the

ISO 15705

"Water quality - Determination of the chemical oxygen demand index (ST-COD) - Small-scale sealed tube method".

	MACHEREY-NAGEL	ISO 15705
Reagents	Sulfuric acid Potassium dichromate Silver sulfate Mercury sulfate	Sulfuric acid Potassium dichromate Silver sulfate Mercury sulfate
Sample volume	2.00 mL	2.00 ± 0.02 mL
Digestion	Temperature: 148 °C Time: 2 h	Temperature: 150 ± 5 °C Time: 2 h ± 10 min
Wavelengths for photometric determination	2 - 40 mg/L O_2 345 nm 5 - 60 mg/L O_2 345 nm 15 - 150 mg/L O_2 436 nm 50 - 600 mg/L O_2 620 nm 100 - 1500 mg/L O_2 620 nm	to 50 mg/L O_2 340 ± 15 nm to 50 mg/L O_2 340 ± 15 nm to 150 mg/L O_2 440 ± 20 nm to 1000 mg/L O_2 600 ± 20 nm to 1000 mg/L O_2 600 ± 20 nm

MACHEREY-NAGEL GmbH & Co. KG
Düren, 16.12.2011

i.A. Dr. Reinhard, Head of QC

Approved

- Reliable and comparable results - The reaction basis of *NANOCOLOR*® tests is based on internationally approved standard methods like DIN, EN, ISO, EPA and APHA.

Precise

- Easy handling and highest accuracy - All *NANOCOLOR*® tests contain accurately pre-dosed ready-to-use reagents and calibrated accessories.

Versatile

- The perfect test for every request - For all important parameters in water and waste water analysis, a large number of tests with different ranges is available.

Unique

- No confusion of different tests – Every *NANOCOLOR*® test box is equipped with a clearly identifiable color coded label.

Tube tests



Easy and fast measurements

- Using *NANOCOLOR*® bar coded test tubes, the measurement is automatically performed after inserting the cuvette into the cuvette slot.

Maximum safety for the user

- The contact with any dangerous chemicals is avoided because the measurement is performed directly in the test tube.

Standard tests



Highest sensitivity

- The use of rectangular cuvettes with 50 mm optical path allows the detection of minimum amounts of the detectable substance.

Highest accuracy

- The use of a large sample volume guarantees safe and reproducible results.

Accessories and service

The complete analysis from one source

- Wide range of analytical accessories and special chemicals
- Excellent service and technical support

The *NANOCONTROL* system



Analytical quality control for the complete analytical system

Coverage towards authorities and supervisors

- *NANOCOLOR*® T-Set
- *NANOCONTROL* NANOCHECK
- *NANOCONTROL* NANOTURB
- *NANOCONTROL* Standards

The system for photometric water analysis

NANOCOLOR® spectrophotometers

Spectrophotometer *NANOCOLOR*® *UV/VIS* II

NEW!



- **Revolutionary user experience**
- **Clever premium optics**
- **Comprehensive integrated quality control**
- **Advanced functions (scan, color, turbidity)**
- **Flexible interface options**

Smart photometry

MACHEREY-NAGEL is proud to present a brand new UV/VIS spectrophotometer for water analysis, the *NANOCOLOR*® *UV/VIS* II. The instrument revolutionizes laboratory work, as it fuses a high end analytical instrument with a user experience thus far only known in smartphones and tablets.

Due to the integrated color measurement and turbidity function, as well as the perfect integration of all our *NANOCOLOR*® tests, you can use the instrument for a wide variety of monitoring applications within water and waste water analysis.

Revolutionary user experience

Innovative and smart user guidance



- 10.1" 16:9 HD display
- Projective capacitive touch screen
- Menu guidance entirely based on icons

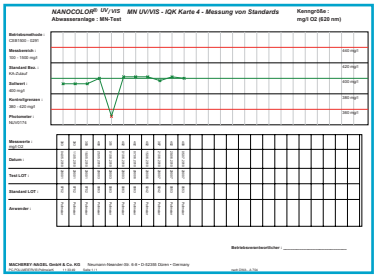
Safe and accurate results

Clever premium components

- 2 nm spectral bandwidth
- 2D barcode recognition
- Universal cuvette slot
- Reference detector technology (RDT)

Result safety and trust

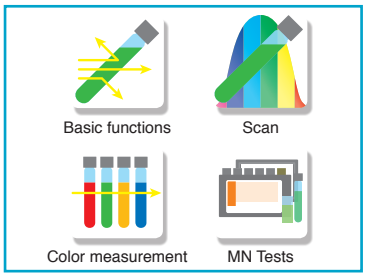
Comprehensive integrated quality control



- Extensive IQC functions
- Create and print control charts directly in the instrument
- Completely inbuilt equipment monitoring functions

Universal use and high safety within the entire field of water analysis

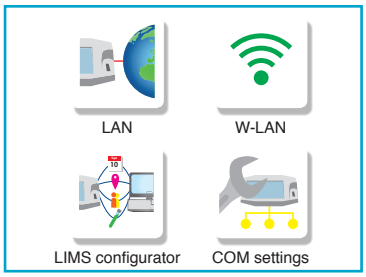
Advanced functions



- Seamless integration of the entire *NANOCOLOR*® system
- High quality live-scans with integrated analysis tool
- Full-fledged color measurements (CIE Lab, Hazen, Gardner, …)
- NTU turbidity measurement with automatic, optional turbidity check (NTU-Check, 0.1–1000 NTU)

Universal connectivity and data transmission

Versatile interface options



- Classic interfaces (USB, RS 232, LAN)
- W-LAN with access point function
- Integrated LIMS configurator
- Easily export results and screenshots

The system for photometric water analysis

NANOCOLOR® spectrophotometers

Technical data

	NANOCOLOR® UV/VIS II
Type	Spectrophotometer with reference detector technology (RDT)
Light sources	Halogen lamp (visible range) and deuterium lamp (UV range)
Optical system	Monochromator
Wavelength range	190–1100 nm
Wavelength accuracy	± 1 nm
Wavelength resolution	0.1 nm
Wavelength calibration	Automatic
Wavelength selection	Automatic, barcode, manual
Scan speed	900 nm or 1 complete scan in less than 1 min
Spectral bandwidth	2 nm
Photometric range	± 3.0 E in wavelength range 200–900 nm
Photometric accuracy	0.005 E at 0.0–0.5 E; 1 % at 0.5–2.0 E
Photometric linearity	< 0.5 % at 2 E; < 1 % at > 2 E
Stray light	< 0.05 %
Measuring modes	More than 200 preprogrammed tests, 100 optionally programmable methods, absorbance, transmission, factor, kinetics, 2-point calibration, scan, nephelometric turbidity measurement
Turbidity measurement	Nephelometric turbidity measurement, 0.1–1000 NTU
Cuvette holder	Test tubes 16 mm OD, rectangular cuvettes 2, 10, 20, 40, 50 mm
Data memory	16 GB Micro SDHC card, 5000 measured data sets, GLP conform
Display	HD display, anti-reflective cover glass with projected capacitive touch screen (PCAP) and background lighting
Operation	Barcode technology, icon-based menu guidance, touch screen
Languages	DE / EN / FR / ES / IT / PT / NL / PL / HU / CZ
External light	Insensitive, open cuvette slot
Interfaces	LAN, W-LAN, 2 x USB (Host) 1 x USB (Function) and RS 232
Update	Via Internet / PC and USB stick
Operating range	10–40 °C, max. 80 % relative humidity (without condensation)
Power supply	110–240 V, ~50/60 Hz
Dimensions L / W / H	400 / 440 / 170 mm
Weight	6.5 kg
Warranty	2 years
Declaration of conformity: CE This device complies with the following directives: - 2004/108/EC - EMC Directive	



The system for photometric water analysis

NANOCOLOR® spectrophotometers

Spectrophotometer *NANOCOLOR*® *VIS*

- **High-resolution scans**
- **Fast measurements**
- **Self-explanatory user guidance**
- **Safe processing of data and spectra**
- **Highest accuracy**

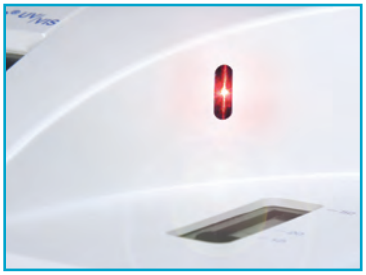


Spectrophotometers with reference detector technology (RDT)

The *NANOCOLOR*® *VIS* spectrophotometer is a compact microprocessor-controlled spectrophotometer with monochromator (VIS 340–1100 nm) for universal use in all areas of water and waste water analysis. This includes municipal and industrial waste water, drinking water, process water, surface water, ground water as well as cooling and boiler feed water. The *NANOCOLOR*® *VIS* spectrophotometer is also ideal for quality and process control in various industries (e. g. food and beverage).

Save time and make your lab work easier

Fast measurements by *NANOCOLOR*® barcode technology



- Fully automatic, instant cuvette detection by the built-in laser scanner allows simple and fast routine analysis.
- Selection of the test method and suitable wavelength, the actual measurement and storage of the measurement results are carried out automatically without having to use any other key.

Measurement without cuvette slot cover

- The state-of-the-art optical system is insensitive to external light and allows straightforward measurements

User-friendly touch screen

- All significant data and functions are clearly shown on the colored, backlit touch screen display.

Experience precision and increase accuracy

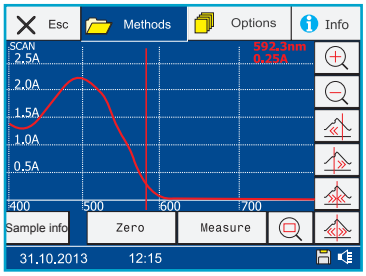
Self-explanatory user guidance

- All tests and menu items can be activated quickly and easily. The photometer can be operated without complex and time-consuming training.

Manual with test instructions, presented as pictograms

- Safe test procedures without complex instructions

Highly accurate measurements by high-quality optical components

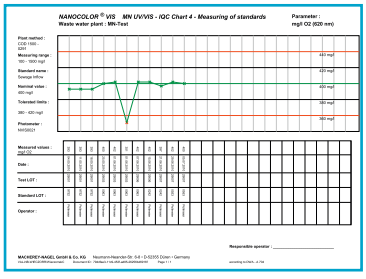


- Precision optics and reference detector technology (RDT) ensure accurate results.
- High resolution scans are recorded and shown on the display within seconds.

Assure results and meet specifications

IQC according to ISO 9001

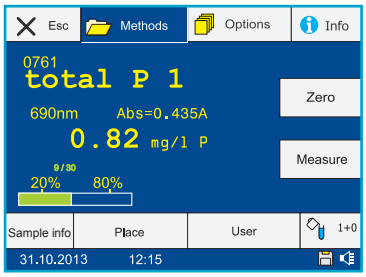
- Conformance to requirements of internal quality control (IQC) and protection towards supervisors and authorities.
- Fast and easy control of photometric accuracy of the *NANOCOLOR*® spectrophotometers with *NANOCONTROL* NANOCHECK (REF 925 701) by the user himself.
- Fully automatic creation of a printable IQC card 4



The system for photometric water analysis

NANOCOLOR® spectrophotometers

Documentation of results according to GLP



- Individual entries of sample information, sample location, user and dilution
- Graphic display of the results, relating to the measurement range and the 20–80 % range
- Integrated turbidity control
- GLP-conform storage of the measured results with all supplementary information such as date, time, sample number, sample location, user and dilution

Professional software for data and spectrum processing included

- Easy processing of transferred data and spectra either with the PC software for *NANOCOLOR*® spectrophotometers or with standard software.

Enjoy flexibility and be prepared for the future

No cuvette adapter required



- Round tubes (16 mm OD) and rectangular cuvettes (2, 10, 20, 40, 50 mm) can be used in the universal cuvette slot without any adapter.
- Small accessories are not required

Programmable for user defined applications

- Free programming of up to 100 user-defined methods within the complete wavelength range

Additional turbidity measurements with 180° transmitted light and 90° scattered light

- Performance of nephelometric turbidity measurements with 90° scattered light for low turbidity values in addition to the 180° transmittance method for high turbidity values.

Technical data

	NANOCOLOR® *VIS*
Type	Spectrophotometer with reference detector technology (RDT)
Light source	Halogen lamp
Optical system	Monochromator
Wavelength range	340–1100 nm
Wavelength accuracy	± 1 nm
Wavelength resolution	0.3 nm
Wavelength calibration	Automatic
Wavelength selection	Automatic, barcode, manual
Scan speed	900 nm or 1 complete scan in less than 1 min
Spectral bandwidth	< 4 nm
Photometric range	± 3.0 E in wavelength range 400–900 nm
Photometric accuracy	0.005 E at 0.0–0.5 E; 1 % at 0.5–2.0 E
Photometric linearity	< 0.5 % at 2 E; < 1 % at > 2 E
Stray light	< 0.5 %
Measuring modes	More than 150 preprogrammed tests, 100 optionally programmable methods, absorbance, transmission, factor, kinetics, 2-point calibration, scan, nephelometric turbidity measurement
Cuvette holder	Test tubes 16 mm OD, rectangular cuvettes 2, 10, 20, 40, 50 mm
Data memory	1000 measured data sets, GLP conform
Display	Colored LCD touch screen with background lighting
Operation	Barcode technology, display user guidance, touch screen
Languages	DE / EN / FR / ES / IT / PT / NL / PL / HU / CZ / TK
External light	Intensive, open cuvette slot
Interfaces	USB and bidirectional serial RS 232
Update	Via Internet / PC and USB stick
Operating range	10–40 °C , max. 80 % relative humidity (without condensation)
Power supply	12 V DC / 2.0 A
Dimensions L / W / H	325 / 215 / 115
Weight	2 kg
Warranty	2 years
Declaration of conformity: CE This device complies with the following directives: - 2006/95/EC - Low-Voltage Directive - 2004/108/EC - EMC Directive	

NANOCOLOR®

The system for photometric water analysis

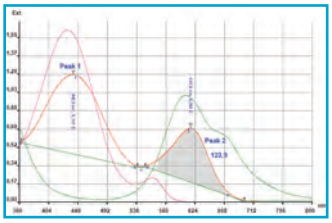
NANOCOLOR® spectrophotometers

PC software for *NANOCOLOR*® spectrophotometers · More power for your photometer

- **Convenient data export**
- **Automatic IQC functions**
- **Clear memory management**
- **Comprehensive facilities for spectrum analysis**
- **Data and spectra documentation in accordance to GLP**

Save time and make your lab work easier

Comprehensive spectrum analysis



- Automatic and manual peak analysis / integration requiring just a few mouse clicks, and an optional smoothing function
- Easy-to-view spectra using grid lines, zero line correction, and multi-color captions
- Detailed display using software-generated or manual scaling and zoom function
- Visual prioritizing of scans that are overlaid

Convenient export of data



- Quick and easy export of measuring data into standard formats such as MS Excel, OpenOffice, XML and semicolon-separated text
- Data allocation into separate tables according to sampling site, test number, date and user
- Convenient transfer of measuring data to database systems using the XML format

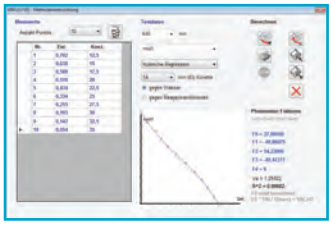
Meet specifications

Automatic IQC functions

- Forgery-proof generation of GLP-compliant test records
- Integrated testing of wavelength accuracy
- One-click check of UV and VIS lamp performance
- Scattered light test in accordance with DAB and Ph.Eur.
- Software-controlled check of photometric accuracy using *NANOCONTROL* NANOCHECK

Experience precision

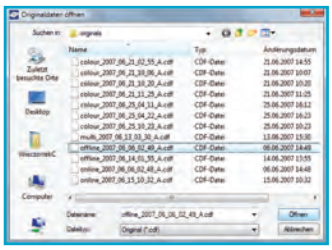
User-friendly creation of special methods



- PC-administered database for special methods to facilitate easy creation, processing and administration of your applications
- Convenient creation of special methods with linear and non-linear functions up to the 4th degree
- Direct storing of special methods in your photometer
- Creating and printing GLP-compliant measuring logs with calculated statistical parameters such as variation coefficients etc.

Secure results

Tamper-proof storage of all measured data



- Fully automatic creation of original files to achieve tamper-proof data storage in accordance with FDA 21 CFR Part 11
- Convenient restore function for inadvertently deleted measuring logs
- Secure encrypting of original files

Enjoy flexibility

Using the photometer with your PC

- Controlling the photometer via your PC
- Numerous additional measuring programs such as incorporation of scan kinetics, microbiological functions, multi-wavelength measuring, standard photometric methods
- Storing and exporting scans
- Calculation of spectral absorption coefficients
- Supporting the ANDI spectroscopy standard

System requirements:
Microsoft Windows 8.1, Windows Vista or Windows 7 , DVD-Rom drive, USB or RS-232 interface, VGA with at least 1024 x 768 pixels, MS Excel 2003 or later or OpenOffice 3.2

NANOCOLOR®

Ordering information

Description		REF
Spectrophotometers		
NANOCOLOR® *UV/VIS* II incl. quick reference guide, touch pen, protective covering, power cable, USB cable, USB stick, calibration cuvette, certificate and cleaning cloth		**919 600**
NANOCOLOR® *VIS* incl. software DVD, quick reference guide, manual, protective covering, power cable, USB cable, USB stick, calibration cuvette, certificate and cleaning cloth		**919 150**
Accessories	***NANOCOLOR*® *UV/VIS* II**	***NANOCOLOR*® *VIS***
Manual for *NANOCOLOR*® spectrophotometers	**919 601**	**919 101**
NANOCOLOR® USB stick	**919 123**	
Handheld scanner for *NANOCOLOR*® *UV/VIS*	**919 134**	
Quarz glass cuvette, 2 mm optical path	**919 122**	–
Quarz glass cuvette, 10 mm optical path	**919 120**	–
Quarz glass cuvette, 50 mm optical path	**919 121**	–
Flow cuvette, Quarz glass, 2 mm optical path	**919 127**	–
Flow cuvette, Quarz glass, 10 mm optical path	**919 626**	–
Flow cuvette, Quarz glass, 50 mm optical path	**919 149**	
Flow cuvette, glass, 10 mm optical path	**919 158**	
Cover over cuvette slot	–	**919 152**
Mains adaptor for *NANOCOLOR*® *VIS*	–	**919 156**
External battery pack for *NANOCOLOR*® *VIS*, incl. charger	–	**919 153**
Protective covering	**919 605**	**919 155**
Lamps		
Halogen lamp	**919 104**	**919 154**
Deuterium lamp	**919 103**	–
Software		
PC-Software for *NANOCOLOR*® spectrophotometers	**919 602**	**919 102**

More accessories see page 103



The system for photometric water analysis

Sipper pump for use with *NANOCOLOR*® spectrophotometers

NANOCOLOR® FP-100

- **Self-explanatory user guidance**
- **Variable use of different flow cuvette sizes**
- **Maximum performance in your lab**

Increased measurement speed and time-saving

- For large test series, especially when using rectangular cuvettes
- For special methods
- Simple activating / deactivating via the spectrophotometer

Maximized measurement accuracy

- The same optical conditions for zero and sample
- Proven *NANOCOLOR*® precision

Highest flexibility

- Using multiple cuvette sizes
- Variable pump / rinse and setting times



Technical data

Type	Membrane pump to use together with *NANOCOLOR*® spectrophotometers and *NANOCOLOR*® software
Display	Status information using 4 LEDs
Operation	Fully automatic via *NANOCOLOR*® spectrophotometer, alternatively via single-button-operation on the sipper or optional foot switch
Pump capacity	100 mL/min
Protection rating	IP 41
Max. suction lift	3 m water column
Max. pump lift	10 m water column
Interface	RS 232 bi-directional
Dimensions	190 x 130 x 95 mm
Weight	Ca. 550 g
Warranty	2 years
Declaration of conformity: CE This device complies with the following directives: - 2006/95/EC - Low-Voltage Directive - 2004/108/EC - EMC Directive	

Ordering information

Description	REF
Sipper pump	
Sipper pump *NANOCOLOR*® FP-100 for *NANOCOLOR*® spectrophotometers incl. power supply, support stand, tube and intake needle	**919 140**
Accessories	
RS232 connecting cable for the connection of sipper pump *NANOCOLOR*® FP-100 and *NANOCOLOR*® spectrophotometer	**919 141**
Intake needle for *NANOCOLOR*® FP-100	**919 142**
Support stand for *NANOCOLOR*® FP-100	**919 143**
Pedal for *NANOCOLOR*® FP-100	**919 144**
Mains adaptor for photometer *NANOCOLOR*® FP-100 / 500 D / 400 D / 350 D / 300 D/ 250 D / PT-3 / PF-11 (100–240 V~ to 9 V= /1500 mA)	**919 06**

NANOCOLOR® 500 D

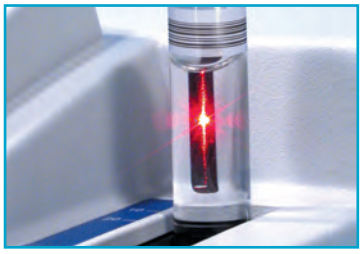
- **Backlit graphic display**
- **Fastest digital photometer on the market**
- **In-built battery**

User friendliness and safe operations

Future-proof

Adapted to our customers' current and future requirements, the digital photometer *NANOCOLOR*® 500 D is suitable for universal use in water and wastewater analysis. This includes municipal and industrial wastewater, drinking water, surface water, ground water as well as cooling and boiler water.

NANOCOLOR® Barcode Technology



Fully automatic, instant cuvette detection by the built-in laser scanner allows simple and fast routine analysis. Selection of the test method and suitable wavelength, the actual measurement and storage of the measurement result are carried out automatically without having to use any other key.

Up-to-date data processing

- Large data memory for up to 500 measurement values
  - · Automatic storage of all values or user-defined storage of specific values via keypad
  - · Memory storage optional
- Traceability of measured values
  - · Automatic assignment of date / time for every stored value
  - · Optional assignment of sample location / sample number
  - · Clear identification of values above or below the measuring range for stored values
- Free selection of individual values by method, sample location, sample number, date and time

Comfortable updating and data processing



- RS 232 C and USB interfaces
- Fast photometer update via Internet / PC
- GLP-compliant measurement documentation on PC or printer
- User-friendly data export software
  - · Data transfer in MS Excel / OpenOffice Calc etc.
  - · Recording of calibration curves for programming of user defined methods
- Direct print-out on the *NANOCOLOR*® thermal printer (REF 919 16)



In the field and in the lab

The standard built-in, robust high-performance battery with charge regulator allows continuous operation at 220 V (110 V) and up to 3000 on-site mains-independent measurements. The battery charge status is shown in the graphic display. In the power saving mode, the photometer switches itself off after 10, 20, … 120 min.

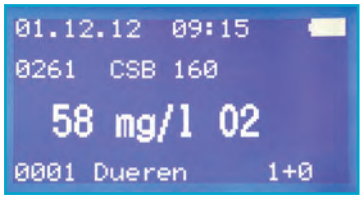
Universal cuvette holder

Round tubes (16 mm OD) and rectangular cuvettes (10, 20 and 50 mm) can be used without adapter.

Versatile – Flexible – Safe

- Over 100 preprogrammed tests with over 200 analysis programmes of MACHEREY-NAGEL
- Programmable for 100 user defined applications, linear and non-linear methods
- Automatic functional test and auto-calibration
- Professional photometric basic functions (extinction, transmission, measurement with factor, kinetics, twopoint calibration)

Everything at a glance



The modern, illuminated graphic display of the *NANOCOLOR*® 500 D with user guidance shows all important data at a glance.

- Measurement result, displayed directly in the required measuring unit
- Date / time
- Battery charge status
- Sample number (4 characters)
- Sample location (alphanumeric, 12 characters)
- Dilution
- Memory on / off

The system for photometric water analysis

NANOCOLOR® photometer

Technical data

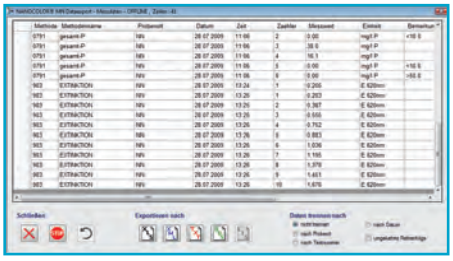
	NANOCOLOR® 500 D
Type	Single beam filter photometer with microprocessor control, self-test and auto-calibration, wavelength range 340–860 nm
Optics	Automatic filter wheel with 10 interference filters
Wavelengths	345 / 365 / 436 / 470 / 520 / 540 / 585 / 620 / 690 / 800 nm plus 2 compartments for additional filters
Wavelength accuracy	± 2 nm, bandwidth at half transmission 10 – 12 nm
Light source	Tungsten lamp
Detector	Silicon photodiode
Blank value	Automatic
Measuring modes	Over 100 preprogrammed tests, 100 freely programmable methods, extinction, transmission, factor, kinetics, two-point calibration
Measuring range	About 3 E, without sign
Photometric accuracy	± 1 %
Stability	< 0.002 E/h
Cuvette holder	Round tubes 16 mm OD; rectangular cuvettes 10, 20, 50 mm
Data memory	500 measurement data records, GLP-compliant
Display	Illuminated graphic display with user guidance, 64 x 128 pixels, 12 languages
Operation	Bar code technology, display user guidance, foilcovered push-buttons
Interfaces	USB and bidirectional serial RS 232
Update	Via Internet / PC
Operating range	0–50 °C, up to 90 % relative humidity
Power supply	100–240 V~, 50/60 Hz / 6 V, 3,2 Ah via built-in battery with charge regulator and mains power supply
Dimensions	227 x 282 x 105 mm
Weight	2.4 kg
Warranty	2 years
Declaration of conformity: CE This device complies with the following directives: - 2006/95/EC - Low-Voltage Directive - 2004/108/EC - EMC Directive	

NANOCOLOR® software for data export

Data export

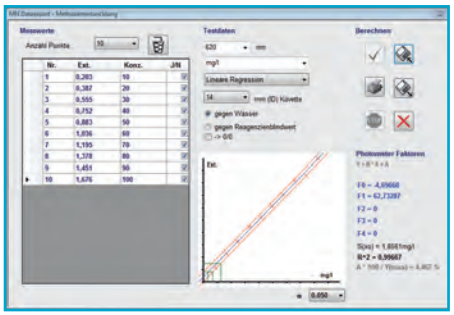
The fast availability and safe storage of analytical data with standard software is an important aspect in almost all laboratories. The *NANOCOLOR*® software for data export offers a direct (“online”) storage of the measurement results (for photometer *NANOCOLOR*® 500 D, 400 D, Linus, 350 D). For the photometers specified above, the PF-12^{Plus}, PF-12 and PF-3 as well as for the luminometer BioFix® Lumi-10 a read-out of the instrument memory (“offline”) with the *NANOCOLOR*® software for data export is possible.

Data storage



With the software you can transfer the data to other software formats for easy and convenient data management, analysis and storage. The software offers the possibility to store the measured data in different formats in order to work on or archive them in other software products. Supported formats include: XLS (Microsoft Excel), XML (data base format), TXT (text file ASCII) and ODS (OpenOfficeCalc)

Recording of calibration curves



The program allows automatic construction of calibration curves up to 4th degree and the calculation of all relevant statistical parameters such as coefficient of variation, standard deviation etc. and the preparation of calibration protocols.

Minimum system requirements

Microsoft Windows 8.1 or Windows Vista or Windows 7, DVD-Rom drive, USB or RS-232 interface, VGA with at least 1024 x 768 pixels, MS Excel 2003 or later or OpenOffice 3.2

Ordering information

Description	Pack of	REF
Photometer		
Universal photometer *NANOCOLOR*® 500 D incl. software DVD, manual, protective covering, mains adapter, data cable, USB cable and calibration cuvette in stable transport case	1	**919 500**
Analytical quality control		
NANOCONTROL NANOCHECK, test solutions for the determination of photometric accuracy	1	**925 701**
Special filters for photometers *NANOCOLOR*® 500 D / 400 D / 350 D / 300 D / 250 D		
Special filters incl. ex factory installation (wavelengths on request)	1	**919 850.2**
Manuals		
Manual for *NANOCOLOR*® 500 D	1	**919 501**
Cuvettes		
Calibration cuvette for *NANOCOLOR*® Photometer	1	**916 908**
Glass cuvettes, 5 mm optical path	2	**919 32**
Glass cuvettes, 10 mm optical path	2	**919 33**
Glass cuvettes, 20 mm optical path	2	**919 34**
Glass cuvettes, 50 mm optical path	1	**919 35**
Semi-micro cuvette, 50 mm optical path	1	**919 50**
Lids for glass cuvettes 10 mm	2	**919 41**
Lids for glass cuvettes 50 mm	2	**919 40**
Disposable plastic cuvettes, 10 mm optical path	100	**919 37**
Lamps		
Tungsten lamp for *NANOCOLOR*® 500 D / 400 D / 350 D / 300 D / 250 D	1	**919 787**
Protective coverings		
Protective covering for *NANOCOLOR*® 500 D / 400 D	1	**919 18**
Printer		
NANOCOLOR® thermal printer for *NANOCOLOR*® *UV/VIS** / *VIS** / 500 D / 400 D / 350 D / 300 D / 250 D and PF-11 **	1	**919 16**
Cable for *NANOCOLOR*® thermal printer for *NANOCOLOR*® *UV/VIS* / *VIS*	1	**919 133**
Paper for *NANOCOLOR*® thermal printer rolls of 58 mm width, core 12 mm, outer diameter 30 mm	5 rolls	**930 65**
Paper for *NANOCOLOR*® thermal printer rolls of 58 mm width, core 12 mm, outer diameter 45 mm	5 rolls	**930 71**
Software		
NANOCOLOR® software for data export for *NANOCOLOR*® 500 D / 400 D / 350 D / 300 D / 250 D and luminometer BioFix® Lumi-10	1 DVD	**919 02**
Zero modem cable, serial, 2x9 pin SUB-D socket, for *NANOCOLOR*® 500 D / 400 D / 350 D / 300 D / 250 D and photometer PF-10 / PF-11	1	**919 680**
Adapter, 9 pin SUB-D plug to 25 pin SUB-D socket	1	**919 681**
Power supply		
Mains adapter for *NANOCOLOR*® 500 D / 400 D / 350 D / 300 D / 250 D / PF-11; prim. 100–240 V ~; sec. 9 V = / 1500 mA	1	**919 06**
Rechargeable battery for photometers *NANOCOLOR*® 500 D / 400 D / 350 D	1	**919 914**

* Additional cable (REF 919 133) is required.

** Additional mains adaptor (REF 919 06) is required.

The system for photometric water analysis

NANOCOLOR® heating blocks

NANOCOLOR® *VARIO 4*, *VARIO C2* and *VARIO HC*

Heating blocks of the future

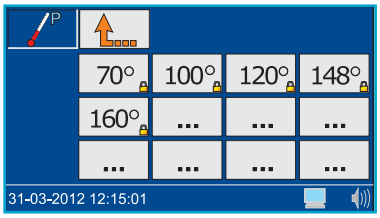
- **Touch screen with intuitive user guidance**
- **Lockable protective lids for maximum safety**
- **USB interfaces for state-of-the-art PC connection**
- **COD, total N and total P in just 30 minutes**
- **Internal quality control according to ISO 9001**

Experience flexibility

The ideal device for any purpose

NANOCOLOR® *VARIO C2* for low sample throughput
NANOCOLOR® *VARIO 4* for high sample throughput
NANOCOLOR® *VARIO HC* for fast sample digestion

Easy programming



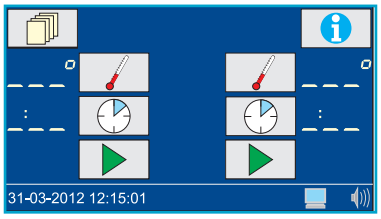
- 7 free memory locations between 4–160 °C (1 °C increments)
- 8 free memory locations between 0h:01min–9h:59min (1min increments)

Suitable for all *NANOCOLOR*® digestion methods

Application	Temperature	Time
COD (DIN ISO 15705)	148 °C	120 min
High-speed COD	160 °C	30 min
TOC	120 °C	120 min
Total nitrogen	120 °C	30 min
Total phosphorus	120 °C	30 min
Organic acids	100 °C	10 min
Total metals	120 °C	30 min
AOX	120 °C	30 min
Hydrocarbons	148 °C	120 min
Programmable, user-defined programs	40–160 °C	0h:01min – 9h:59min

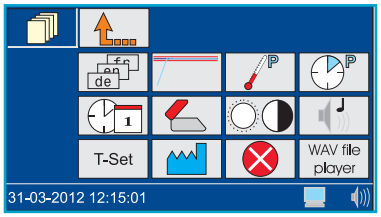
Save time

Standard programs and easy programming

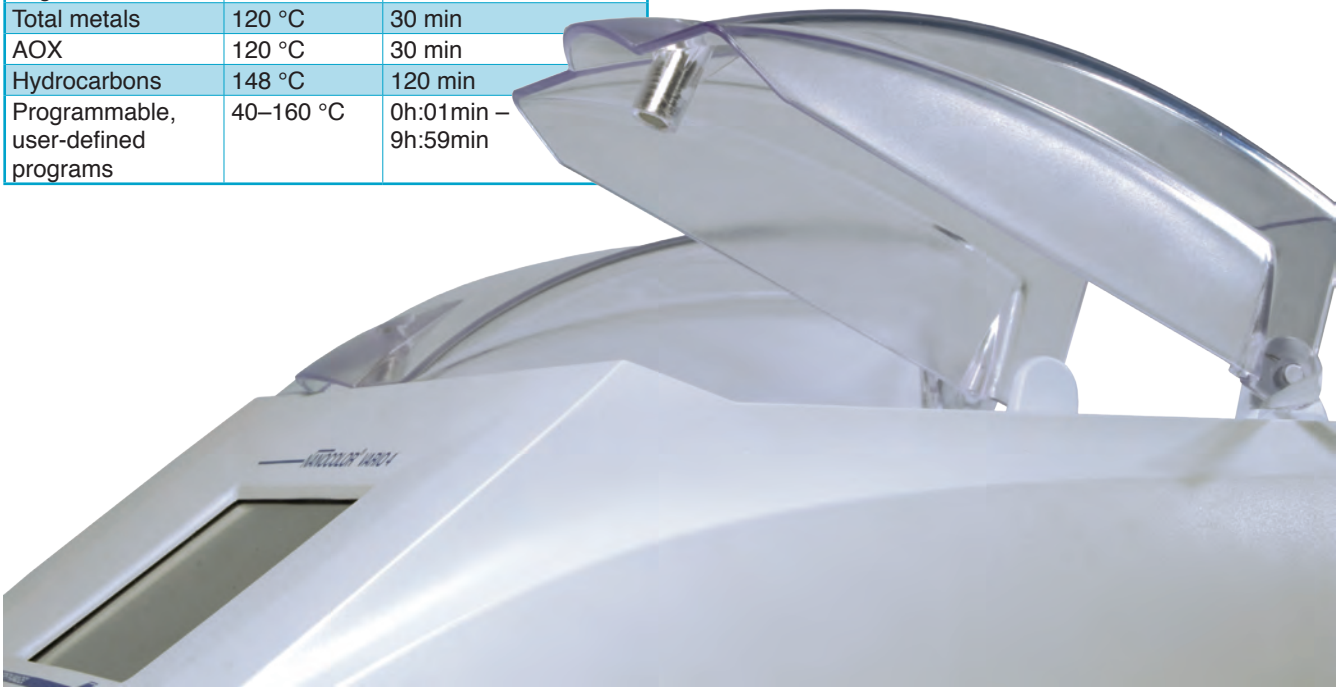


- 5 preprogrammed temperatures 70 / 100 / 120 / 148 / 160 °C
- 4 preprogrammed heating times 30 min / 60 min / 120 min / cont.

Self-explanatory user guidance



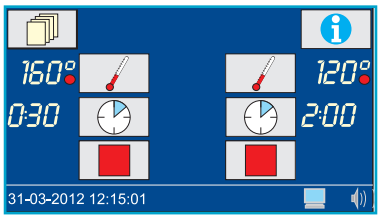
- User-friendly, bright touch screen
- Operation without time-consuming training
- Quick and easy selection of heating programs
- Convenient input via icons



The system for photometric water analysis

NANOCOLOR® heating blocks

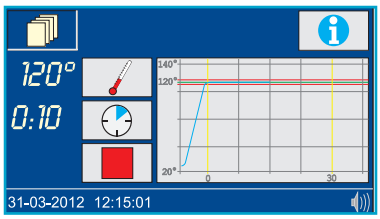
Time-saving procedures



- Extremely short warm-up times (from 20 to 160 °C in just 10 minutes)
- High-speed COD, total nitrogen, total phosphorus and total metals in just 30 minutes

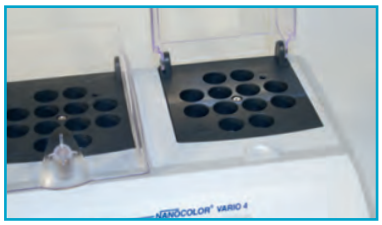
Be safe

Constant digestion conditions



- High temperature stability
- Electronic overheating protection
- Graphic display of heating curves

Maximum safety for the user



- Extra strong safety covers as contact protection (10 mm, replaceable) on the heating block surface
- Lockable protective lids
- Display alert in case of open protective lid

Meet specifications

Internal quality control according to ISO 9001

- Electronic temperature control and fully automatic calibration with the *NANOCOLOR*® T-Set (REF 919 917)
- Comply with demands of supervisors and authorities
- Heating curves to check temperature stability
- IQC function: Users can check and monitor temperatures as apart of their in-house quality control regiment using the *NANOCOLOR*® T-Set

NANOCOLOR® VARIO 4

- Simultaneous digestion of 24 samples
- Two independently usable heating units
- The most flexible solution

NANOCOLOR® VARIO C2

- Simultaneous digestion of 12 samples
- The ideal choice for small sample amounts
- Cost-effective quality

NANOCOLOR® VARIO HC

- Simultaneous digestion of 12 samples
- Active rapid cooling after digestion
- Heating unit with aerator



NANOCOLOR®

The system for photometric water analysis

NANOCOLOR® heating blocks

Technical data

	NANOCOLOR® heating blocks
Type	Programmable heating blocks for chemical-analytical digestions with 24 or 12 bores for test tubes with 16 mm OD (outer diameter) integrated protective lids
Display	Colored, backlit LCD touch screen
Operation	Display menu guidance via touch screen
Temperatures	5 preprogrammed temperatures 70 / 100 / 120 / 148 / 160 °C 7 free memory locations for individual temperature settings
Temperature range	40–160 °C (1 °C increments)
Temperature stability	± 1 °C (according to DIN, EN, ISO and EPA methods)
Warm-up time	from 20 °C to 160 °C within 10 minutes
Heating times	4 preprogrammed heating times 30 min / 60 min / 120 min / cont. 8 free memory locations for individual heating times
Time range	0h:01min–9h:59min (increments 0h:01min)
Safety	Replaceable safety covers as contact protection Lockable protective lids Overheating protection
Interfaces	Bidirectional serial RS 232, USB A (master) and USB B (slave)
Analytical quality control	With *NANOCOLOR*® T-Set (REF 919 917) optional fully automatic calibration and preparation of test certificates for instrument control and monitoring according to ISO 9001
Update	Via internet and USB stick
Power supply	110–230 V ~, 50/60 Hz
Power consumption	300 / 550 VA (*VARIO 4*) 150 / 300 VA (*VARIO C2*) 150 / 550 VA (*VARIO HC*)
Dimensions (W x D x H)	290 x 287 x 146 mm (*VARIO 4* and *VARIO HC*) 169 x 282 x 146 mm (*VARIO C2*)
Weight	approx. 3.2 kg (*VARIO 4* and *VARIO HC*) approx. ca. 2.0 kg (*VARIO C2*)
Warranty	2 years
Declaration of conformity: CE This device complies with the following directives: - 2006/95/EC - Low-Voltage Directive - 2004/108/EC - EMC Directive	

Ordering information

Description	Pack of	REF
Heating blocks		
NANOCOLOR® *VARIO 4* featuring 2 blocks with separate control, 2 x 12 bores for test tubes 16 mm OD, incl. power cable, 2 separate protective coverings, manual, data cable and software DVD	1	**919 300**
NANOCOLOR® *VARIO C2* 12 bores for test tubes 16 mm OD, incl. power cable, protective covering, manual, data cable and software DVD	1	**919 350**
NANOCOLOR® *VARIO C2* – version for metal analysis, with big bores – NEW! 8 bores for test tubes 16 mm OD and 2 bores for reaction tubes 22 mm OD, incl. power cable, protective covering, manual, data cable and software DVD	1	**919 350.1**
NANOCOLOR® *VARIO HC* – with cooling system – 12 bores for test tubes 16 mm OD and ventilator, incl. power cable, protective covering, manual, data cable and software-DVD	1	**919 330**
Accessories for decomposition in a heating block		
Protective covering for *NANOCOLOR*® *VARIO 4* / *VARIO C2* / *VARIO HC*, transparent	1	**919 310**
Safety cover sheet for *NANOCOLOR*® *VARIO 4* / *VARIO C2* / *VARIO HC*	1	**916 598**
Reducing adaptors 22 → 16 mm for *NANOCOLOR*® heating blocks	8	**919 916**

NANOCOLOR® T-Set

Calibrated temperature sensor with electronics for external temperature control, fully automatic calibration and preparation of a test certificate for instrument control and monitoring.



Controlled and safe



- Automatic temperature control and calibration of the heating blocks
- Universal thermometer for external temperature measurements
- Comfortable data transfer via USB or serial interface RS 232
- Easy generation of quality certificates in accordance to GLP with the *NANOCOLOR*® T-Set software

Operation

- Connect the RS 232 plug of the T-Set to the heating block
- Place the temperature sensor into the small bore located on the safety cover
- Select „T-Set“ in the menu
- Select the respective program

Technical data

Detector	PT 1000 (95 x 4 mm)
Accuracy	± 0.1 °C
Display	via LED-displays of the heating block and the *NANOCOLOR*® T-Set
Operation	via foil-covered symbol keys of the heating block and the *NANOCOLOR*® T-Set software
Temperature range	0–200 °C
Temperature stability	± 0.2 °C
Long term stability	± 0.1 °C
Interfaces	bidirectional serial RS 232
Operating range	0–50 °C, up to 90 % relative humidity
Power supply	via RS 232
Power consumption	max. 20 mW
Dimensions	112 mm (length)
Weight	ca. 60 g
Certificate	calibrated against adjusted thermometers
Warranty	2 years
Declaration of conformity: CE This device complies with the following directives: - 2004/108/EC - EMC Directive	

Ordering information

Description	Pack of	REF
NANOCOLOR® T-Set for electronic temperature control and calibration of heating blocks *NANOCOLOR*® *VARIO 4*, *VARIO C2*, *VARIO HC*	1	**919 917**
Adaptor T-Set 16 mm	1	**919 924**
Adaptor T-Set 13 mm	1	**919 925**
USB-serial-Adaptor for heating blocks *NANOCOLOR*® *VARIO 4, VARIO C2* and *VARIO HC* and *NANOCOLOR*® T-Set	1	**919 926**

The system for photometric water analysis

NANOCOLOR® tube tests

The perfect tool for routine analysis in sewage plants and industry

- Round tubes with pre-dosed reagents guarantee maximum safety even when using corrosive or toxic chemicals
- Pre-dosed reagents ensure high measurement accuracy
- Use of freeze-dried reagents by the use of instable chemicals
- Analytical security through high layer thickness (16 mm OD)
- Convenient handling – one tube for both reaction and measurement, no decanting necessary
- Time-saving method for routine analysis and process control



Ordering information

Test	Measuring ranges *NANOCOLOR*® *VIS*		Wave-lengths	No. of tests	REF
Alcohol, see Ethanol and Methanol					
Aluminum 07	0.02–0.70 mg/L Al^{3+}		540 nm	19	**985 098**
Ammonium 3*	0.04–2.30 mg/L NH_4-N	0.05–3.00 mg/L NH_4^+	690 nm	20	**985 003**
Ammonium 10*	0.2–8.0 mg/L NH_4-N	0.2–10.0 mg/L NH_4^+	690 nm	20	**985 004**
Ammonium 50*	1–40 mg/L NH_4-N	1–50 mg/L NH_4^+	690 nm	20	**985 005**
Ammonium 100*	4–80 mg/L NH_4-N	5–100 mg/L NH_4^+	585 nm	20	**985 008**
Ammonium 200*	30–160 mg/L NH_4-N	40–200 mg/L NH_4^+	585 nm	20	**985 006**
Anionic surfactants see Surfactants					
AOX 3*	0.1–3.0 mg/L AOX	0.01–0.30 mg/L AOX	470 nm	20	**985 007**
BOD_5* (in Winkler bottles)	2–3000 mg/L O_2		436 nm	25–50	**985 822**
BOD_5*-TT	0.5–3000 mg/L O_2		436 nm	22	**985 825**
Cadmium 2	0.05–2.00 mg/L Cd^{2+}		520 nm	10–19	**985 014**
Carbonate hardness 15	1.25–18.75 °e	0.4–5.4 mmol/L H^+	436/585 nm	20	**985 015**
Cationic surfactants see Surfactants					
Chloride 200*	5–200 mg/L Cl^-	0.10–1.00 g/L Cl^-	470 nm	20	**985 019**
Chloride 50*	0.5–50.0 mg/L Cl^-		470 nm	20	**985 021**
Chlorine / Ozone 2	0.05–2.50 mg/L Cl_2	0.05–2.00 mg/L O_3	540 nm	20	**985 017**
Chlorine dioxide 5	0.15–5.00 mg/L ClO_2		540 nm	20	**985 018**
Chromate 5	0.05–2.00 mg/L Cr(VI) 0.005–0.500 mg/L Cr(VI) [1]	0.1–4.0 mg/L CrO_4^{2-} 0.01–1.00 mg/L CrO_4^{2-} [1]	540 nm	20	**985 024**
total Chromium 2* NEW!	0.05–2.00 mg/L Cr	0.005–0.500 mg/L Cr [1]	540 nm	20	**985 059**
COD 40*	2–40 mg/L O_2		345 nm	20	**985 027**
COD 60*	5–60 mg/L O_2		345 nm	20	**985 022**
COD 160*	15–160 mg/L O_2		436 nm	20	**985 026**
COD 160* Hg-free	15–160 mg/L O_2		436 nm	20	**963 026**
COD 300*	50–300 mg/L O_2		436 nm	20	**985 033**
COD 600*	50–600 mg/L O_2		620 nm	20	**985 030**
COD 1500*	100–1500 mg/L O_2		620 nm	20	**985 029**
COD 4000*	400–4000 mg/L O_2		620 nm	20	**985 011**
COD 10000*	1.00–10.00 g/L O_2		620 nm	20	**985 023**
COD 15000*	1.0–15.0 g/L O_2		620 nm	20	**985 028**
COD 60000*	5.0–60.0 g/L O_2		620 nm	20	**985 012**
org. Complexing agents 10	0.5–10.0 mg/L I_{BiC}		540 nm	10–19	**985 052**
Copper 7	0.10–7.00 mg/L Cu^{2+}		585 nm	20	**985 054**
Cyanide 08*	0.02–0.80 mg/L CN^-	0.005–0.100 mg/L CN^- [1]	585/605 nm	20	**985 031**
DEHA 1 (diethylhydroxylamine)	0.05–1.00 mg/L DEHA		540 nm	20	**985 035**
Ethanol 1000	0.10–1.00 g/L EtOH	0.013–0.130 Vol. % EtOH	620 nm	23	**985 838**
Fatty acids see Organic acids					
Fluoride 2	0.1–2.0 mg/L F^-		620 nm	20	**985 040**
Formaldehyde 8*	0.1–8.0 mg/L HCHO		585 nm	20	**985 041**
Formaldehyde 10	0.20–10.00 mg/L HCHO	0.02–1.00 mg/L HCHO [1]	412 nm [3]	20	**985 046**
Hardness Ca / Mg NEW!	1.25–25.00 °e 0.2–3.6 mmol/L	5–50 mg/L Mg^{2+} 10–100 mg/L Ca^{2+}	540 nm	20	**985 044**
Hardness 20	1.25–25.00 °e 0.2–3.6 mmol/L	5–50 mg/L Mg^{2+} 10–100 mg/L Ca^{2+}	540 nm	20	**985 043**
HC 300* (Hydrocarbons)	0.5–5.6 mg/L HC	30–300 mg/kg HC	436 nm	20	**985 057**

Test	Measuring ranges *NANOCOLOR*® *VIS*		Wave-lengths	No. of tests	REF
Iron 3*	0.10–3.00 mg/L Fe	0.02–1.00 mg/L Fe [1)]	540 nm	20	**985 037**
Lead 5*	0.10–5.00 mg/L Pb^{2+}		520 nm	20	**985 009**
Manganese 10*	0.1–10.0 mg/L Mn	0.02–2.00 mg/L Mn [1)]	470 nm	20	**985 058**
Methanol 15	0.2–15.0 mg/L MeOH		620 nm	23	**985 859**
Molybdenum 40*	1.0–40.0 mg/L Mo(VI)	1.6–65.0 mg/L MoO_4^{2-}	345/365 nm	20	**985 056**
Nonionic surfactants, see Surfactants					
Nickel 4* NEW!	0.10–7.00 mg/L Ni^{2+}	0.02–1.00 mg/L Ni^{2+} [1)]	470 nm	20	**985 071**
Nickel 7*	0.10–7.00 mg/L Ni^{2+}	0.02–1.00 mg/L Ni^{2+} [1)]	470 nm	20	**985 061**
Nitrate 8*	0.30–8.00 mg/L NO_3-N	1.3–35.0 mg/L NO_3^-	365 nm	20	**985 065**
Nitrate 50*	0.3–22.0 mg/L NO_3-N	2–100 mg/L NO_3^-	365/385 nm	20	**985 064**
Nitrate 250*	4–60 mg/L NO_3-N	20–250 mg/L NO_3^-	365/385 nm	20	**985 066**
Nitrite 2*	0.003–0.460 mg/L NO_2-N	0.02–1.50 mg/L NO_2^-	540 nm	20	**985 068**
Nitrite 4	0.1–4.0 mg/L NO_2-N	0.3–13.0 mg/L NO_2^-	540 nm	20	**985 069**
total Nitrogen TN_b 22*	0.5–22.0 mg/L N		365/385 nm	20	**985 083**
total Nitrogen TN_b 60*	3–60 mg/L N		365 nm	20	**985 092**
total Nitrogen TN_b 220*	5–220 mg/L N		365/385 nm	20	**985 088**
Organic acids 3000*	30–3000 mg/L CH_3COOH	0.5–50.0 mmol/L CH_3COOH	470 nm	20	**985 050**
Oxygen 12*	0.5–12.0 mg/L O_2		436 nm	22	**985 082**
Ozone, see Chlorine / Ozone 2					
Peroxide 2	0.03–2.00 mg/L H_2O_2		620 nm	10–19	**985 871**
pH 6.5–8.2 [2)]	pH 6.5–8.2		436/540 nm	100	**918 72**
Phenolic index 5*	0.2–5.0 mg/L Phenol		520 nm	20	**985 074**
ortho and total Phosphate 1*	0.05–1.50 mg/L P 0.010–0.800 mg/L P [1)]	0.2–5.0 mg/L PO_4^{3-} 0.03–2.50 mg/L PO_4^{3-} [1)]	690 nm	20	**985 076**
ortho and total Phosphate 5*	0.20–5.00 mg/L P	0.5–15.0 mg/L PO_4^{3-}	690 nm	20	**985 081**
ortho and total Phosphate 15*	0.30–15.00 mg/L P	1.0–45.0 mg/L PO_4^{3-}	690 nm	20	**985 080**
ortho and total Phosphate 45*	5.0–50.0 mg/L P	15–150 mg/L PO_4^{3-}	690 nm	20	**985 055**
ortho and total Phosphate 50*	10.0–50.0 mg/L P	30–150 mg/L PO_4^{3-}	436 nm	19	**985 079**
POC 200	20–200 mg/L POC	2–40 mg/L KWI	436 nm	20	**985 070**
Potassium 50*	2–50 mg/L K^+		690 nm	20	**985 045**
Residual hardness 1	0.03–1.25 °e	0.004–0.180 mmol/L	540 nm	20	**985 084**
Silver 3	0.20–3.00 mg/L Ag^+		620 nm	20	**985 049**
Starch 100*	5–100 mg/L starch		540 nm	19	**985 085**
Sulfate 200*	10–200 mg/L SO_4^{2-}		436 nm	20	**985 086**
Sulfate 1000*	200–1000 mg/L SO_4^{2-}		436 nm	20	**985 087**
Sulfide 3*	0.05–3.00 mg/L S^{2-}		620 nm	20	**985 073**
Sulfite 10*	0.2–10.0 mg/L SO_3^{2-}	0.05–2.40 mg/L SO_3^{2-} [1)]	436 nm	20	**985 089**
Sulfite 100*	5–100 mg/L SO_3^{2-}		470 nm	19	**985 090**
Anionic surfactants 4*	0.20–4.00 mg/L MBAS	0.20–3.50 mg/L SDS	620 nm	20	**985 032**
Cationic surfactants 4*	0.20–4.00 mg/L CTAB		620 nm	20	**985 034**
Nonionic surfactants 15*	0.3–15.0 mg/L Triton® X-100		610/620 nm	20	**985 047**
Thiocyanat 50*	0.5–50.0 mg/L SCN^-		470 nm	20	**985 091**
Tin 3*	0.10–3.00 mg/L Sn		520 nm	18	**985 097**
TOC 25*	2.0–25.0 mg/L C		585 nm	10	**985 093**
TOC 60*	10–60 mg/L C		585 nm	10	**985 094**
TOC 600*	40–600 mg/L C		585 nm	10	**985 099**
TTC / Sludge activity 150*	5–150 µg TPF	0.050–2.300 E	470 nm	20	**985 890**
Zinc 4*	0.10–4.00 mg/L Zn^{2+}		620 nm	20	**985 096**

On other photometers than the *NANOCOLOR*® *VIS* measurement ranges can be different.

[1)] A more sensitive measuring range is possible by using 50 mm semi-micro cuvettes (REF 919 50)
[2)] without barcode
[3)] special filter necessary

* These products contain harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

The system for photometric water analysis

NANOCOLOR® standard tests

These test kits contain the necessary chemicals cost-efficiently prepared in individual bottles. To conduct a test, just fill 20 mL test solution into a 25 mL volumetric flask and add the reagents according to the included instructions.

After adding water up to the 25 mL mark, the solution is transferred to a rectangular cuvette for photometric measurement.

Advantages of this application:

- Safe observation of the reaction in the volumetric flask
- Highest precision and high sensitivity due to use of precision cuvettes with 50 mm thickness
- Higher measuring range due to use of different size cuvettes (10–50 mm)
- Measuring range can be enhanced easily by dilution in measuring flask
- High number of tests with one test set, especially with diluted test solutions



Ordering information

Test	Measuring range *NANOCOLOR*® *VIS*		Wavelength	No. of tests [2]	REF
Aluminum	0.01–1.00 mg/L Al^{3+}		540 nm	250	**918 02**
Ammonium*	0.01–2.0 mg/L NH_4-N	0.01–2.5 mg/L NH_4^+	690 nm	100	**918 05**
Chloride*	0.2–125 mg/L Cl^-		470 nm	250	**918 20**
Chlorine*	0.02–10.0 mg/L Cl_2		540 nm	250	**918 16**
Chlorine dioxide*	0.04–4.00 mg/L ClO_2		540 nm	50	**918 163**
Chromate*	0.01–3.0 mg/L Cr(VI)	0.01–6.0 mg/L CrO_4^{2-}	540 nm	250	**918 25**
Cobalt*	0.002–0.70 mg/L Co^{2+}		540 nm	250	**918 51**
Color (Hazen/DIN) [1]	5–500 mg/L Pt (Hazen)	0.2–20.0 1/m	436 nm	–	**Test 1-39**
Copper [4]	0.01–10.0 mg/L Cu^{2+}		585 nm	250	**918 53**
Cyanide*	0.001–0.50 mg/L CN^-		585 nm	250	**918 30**
Fluoride*	0.05–2.00 mg/L F^-		585 nm	500	**918 142**
Hydrazine*	0.002–1.50 mg/L N_2H_4		436 nm	220	**918 44**
Iron* [4]	0.01–15.0 mg/L Fe		470 nm	250	**918 36**
Manganese *[4]	0.01–10.0 mg/L Mn		470 nm	250	**918 60**
Nickel* [4]	0.01–10.0 mg/L Ni^{2+}		436 nm	250	**918 62**
Nitrate*	0.9–30.0 mg/L NO_3-N	4–140 mg/L NO_3^-	365/385 nm	100	**918 65**
Nitrate Z*	0.02–1.0 mg/L NO_3-N	0.1–5.0 mg/L NO_3^-	520 nm	500	**918 63**
Nitrite* [4]	0.002–0.30 mg/L NO_2-N	0.005–1.00 mg/L NO_2^-	520 nm	250	**918 67**
Phenol*	0.01–7.0 mg/L Phenol		470 nm	500	**918 75**
ortho Phosphate*	0.04–6.5 mg/L PO_4-P	0.1–20.0 mg/L PO_4^{3-}	690 nm	500	**918 77**
ortho Phosphate* [4]	0.2–17 mg/L PO_4-P	0.5–50 mg/L PO_4^{3-}	436 nm	500	**918 78**
Silica* [4]	0.01–5.00 mg/L Si 0.002–0.100 mg/L Si [3]	0.02–10.0 mg/L SiO_2 0.005–0.200 mg/L SiO_2 [3]	690 nm 800 nm	250	**918 48**
Sulfide*	0.01–3.0 mg/L S^{2-}		620/660 nm	250	**918 88**
Turbidity (formazine/DIN) [1]	1–100 TE/F (= FAU)	0.5–40.0 1/m	620/860 nm	–	**Test 1-92**
Turbidity [1] [5]	1–1000 NTU			–	**Test 9-06**
Zinc*	0.02–3.0 mg/L Zn^{2+}		620 nm	250	**918 95**

[1] A *NANOCOLOR*® standard test is not required. The original sample has to be measured without additional reagents.
[2] Maximum number, the actual number of tests depends on the sample volume.
[3] High sensitivity measurement
[4] Simplified procedure in a beaker is possible. Please ask for special instructions!
[5] Evaluation only possible with *NANOCOLOR*® *UV/VIS* II, *NANOCOLOR*® *UV/VIS* and *NANOCOLOR*® *VIS*

* These products contain harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

Special chemicals for *NANOCOLOR*® standard tests are described with the individual parameters and tests from page 112.

The system for photometric water analysis

NANOCOLOR® standard tests • extraction methods

Extraction methods are a special type of standard tests:

Some analytical procedures require application of two immiscible phases. By shaking in a separation funnel the color complex is transferred into the organic phase.

This method is used:

- To increase sensitivity when the color intensity is higher in the organic solvent
- To increase selectivity, i. e. only the color complex of the substance in question is soluble in the organic phase while interfering compounds remain in the aqueous phase
- When the color complex formed in the reaction is not soluble in water

The *NANOCOLOR*® analytical system mainly uses chlorinated hydrocarbons as organic phase which form the lower layer during extraction. Some analytical instructions prescribe two consecutive extractions to increase selectivity and eliminate interferences.

NANOCOLOR® standard tests with extraction methods

These tests cannot be evaluated with the photometer *NANOCOLOR*® 350 D and 250 D. The reagent sets 918 32 and 918 34 contain chlorinated hydrocarbons.

Ordering information

Test	Measuring range *NANOCOLOR*® photometers 500 D, 400 D, Linus, 300 D	Wavelength	No. of tests	REF
Cadmium* [1)]	0.002–0.50 mg/L Cd^{2+}	520 nm	25	**918 131**
Detergents anionic*	0.02–5.0 mg/L MBAS	620 nm	40	**918 32**
Detergents cationic*	0.05–5.0 mg/L CTAB	436 nm	100	**918 34**
Lead* [1)]	0.005–1.00 mg/L Pb^{2+}	520 nm	50	**918 101**
[1)] Additionally necessary is tetrachlorethylene p.a. or carbon tetrachloride p.a.				
* These products contain harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.				

Special chemicals for these *NANOCOLOR*® tests are described with the individual parameters and tests from page 112.

Accessories for *NANOCOLOR*® standard tests

Ordering information

Description	Pack of	REF
Accessories		
Glass cuvettes, 10 mm optical path	2	**919 33**
Glass cuvettes, 50 mm optical path	1	**919 35**
Semi-micro cuvette 50 mm for reduced analytical preparations and sensitive measurements	1	**919 50**
Lids for glass cuvettes 10 mm	2	**919 41**
Lids for glass cuvettes 50 mm	2	**919 40**
Disposable cuvettes, plastic, 10 mm optical path	100	**919 37**
Separation funnel 100 mL, glass, with NS glass tap and polyethylene stopper	2	**916 64**
Stand with clamps and bosses for 4 separation funnels, height 70 cm	1	**916 95**

Alcohol

see Ethanol, page 119, and Methanol, page 123

Aluminum

Al

Reaction basis:
In weakly acidic solution Aluminum ions react with eriochrome cyanine R to form a red-violet colored complex.

Strongly acidic and buffered samples have to be adjusted to pH 6. Turbid solutions have to be filtered (membrane filters 0.45 µm, REF 916 50).

***NANOCOLOR*® Aluminum 07** **REF 985 098**
Type: tube test 0-98
Measuring range: 0.02–0.70 mg/L Al^{3+}
Sufficient for: 19 tests
Shelf life: at least 1 year after production
Sea water suitability: yes

***NANOCOLOR*® Aluminum** **REF 918 02**
Type: standard test 1-02
Measuring range: 0.01–1.00 mg/L Al^{3+}
Sufficient for: 200 tests
Shelf life: at least 2 years after production
Sea water suitability: yes

Ammonium

NH_4^+

Reaction basis:
DIN method: At a pH value of about 12.6 ammonium ions react with hypochlorite and salicylate in the presence of sodium nitroprussiate as catalyst to form a blue indophenol.

Good reproducibility is obtained for weakly polluted waters. Heavy pollution causes errors, unless a distillation precedes the analysis. Strongly acidic and buffered samples have to be adjusted to pH 9–10 for the test using sodium hydroxide solution.

***NANOCOLOR*® Ammonium 3** **REF 985 003**
Type: tube test 0-03
Measuring range: 0.04–2.30 mg/L NH_4-N
0.05–3.00 mg/L NH_4^+
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: yes, after dilution (1+1)

***NANOCOLOR*® Ammonium 10** **REF 985 004**
Type: tube test 0-04
Measuring range: 0.2–8.0 mg/L NH_4-N
0.2–10.0 mg/L NH_4^+
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: yes

***NANOCOLOR*® Ammonium 50** **REF 985 005**
Type: tube test 0-05
Measuring range: 1–40 mg/L NH_4-N
1–50 mg/L NH_4^+
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: yes

***NANOCOLOR*® Ammonium 100** **REF 985 008**
Type: tube test 0-08
Measuring range: 4–80 mg/L NH_4-N
5–100 mg/L NH_4^+
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: yes

***NANOCOLOR*® Ammonium 200** **REF 985 006**
Type: tube test 0-06
Measuring range: 30–160 mg/L NH_4-N
40–200 mg/L NH_4^+
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: yes

***NANOCOLOR*® Ammonium** **REF 918 05**
Type: standard test 1-05
Measuring range: 0.01–2.0 mg/L NH_4-N
0.01–2.5 mg/L NH_4^+
Sufficient for: 100 tests
Shelf life: at least 1 year after production
Sea water suitability: no



Anionic surfactants

see Surfactants, page 130

AOX

Reaction basis:
DIN method: Adsorbable organically bound halogens (AOX) is an important sum parameter for the control of water quality. The AOX content represents the sum of organically bound halogens (chlorine, bromine, iodine) which are adsorbable to a suitable adsorbent (Reaction basis similar to DIN 38409-H22).

The pH-value of the sample must be between 3 and 5.

***NANOCOLOR*® AOX 3** **REF 985 007**

Type:	tube test 0-07
Measuring range:	0.1–3.0 mg/L AOX 0.01–0.30 mg/L AOX
Sufficient for:	20 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes, with 200 mL of rinsing solution

For further information about AOX see page 139.

BOD_5 (Biochemical oxygen demand)

Simple determination of the biochemical oxygen demand after 5 days (BOD_5) of undiluted samples without using a control in accordance with DIN EN 1899-2-H52! The oxygen enriched, undiluted sample is incubated in test tubes for 5 days at 20 ± 1°C in the dark. Determination of the dissolved oxygen after 5 days is based on the Winkler procedure, DIN EN 25813-G21

Reaction basis:
DIN method: the determination of the BOD_5 is carried out with the so-called dilution principle. The oxygen concentration is determined immediately after preparation of the sample and again after a five-day incubation in Winkler-flasks.

Simplified method: Incubation of the sample and oxygen determination after five days are conducted in the same cuvette.

Reaction basis for both methods analogous to DIN EN 1899-1-H51 and DIN EN 25813-G21.

***NANOCOLOR*® BOD_5** **REF 985 822**

Type:	in Winkler bottles, test 8-22
Measuring range:	2–3000 mg/L O_2
Sufficient for:	25–50 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes

***NANOCOLOR*® BOD_5-TT** **REF 985 825**

Type:	tube test 8-25
Measuring range:	0.5–3000 mg/L O_2
Sufficient for:	22 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes

For further information about BOD_5, please see page 140.

Bromine

Bromine and bromating reagents such as 1,3-dibromo-5,5-dimethylhydantoin (DBH) are used – like chlorine – for disinfecting swimming pool water.

For the determination of bromine you may use all *NANOCOLOR*® Chlorine tests (see page 114). A factor for conversion is given in the instructions.



Cadmium

Cd

Reaction bases:
(a) Cadion method: in alkaline solution cadmium ions react with cadion [1-(4-nitrophenyl)-3-(4-phenylazophenyl)-triazene] to form a red color complex, which is evaluated photometrically.

(b) Dithizone method: at a pH > 6 cadmium ions react with dithizone to form primary cadmium dithizonate, which is stable in strongly alkaline medium and dissolves in carbon tetrachloride (tetrachloromethane) highly sensitive with pink color. Interfering heavy metals are removed with dithizone in acidic medium.

***NANOCOLOR*® Cadmium 2** **REF 985 014**

Type:	tube test 0-14
Reaction basis:	(a) Cadion method
Measuring range:	0.05–2.00 mg/L Cd^{2+}
Sufficient for:	10–19 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes



***NANOCOLOR*® Cadmium** **REF 918 131**

Type:	standard test 1-13
Reaction basis:	(b) dithizone method
Measuring range:	0.002–0.50 mg/L Cd^{2+}
Sufficient for:	25 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	no

Carbonate hardness (Alkalinity)

CO_3^{2-}

Reaction basis:
Photometric determination is performed with bromophenol blue.

***NANOCOLOR*® Carbonate hardness 15** **REF 985 015**

Type:	tube test 0-15
Measuring range:	1.25–18.75 °e 0.4–5.4 mmol/L H^+
Sufficient for:	20 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes

Cationic surfactants

see Surfactants, page 130

Chloride

Cl^-

Reaction basis:
Chloride ions react with mercury(II) thiocyanate to form undissociated mercury(II) chloride. The liberated thiocyanate shows a blood-red coloration with iron(III) ions (Reaction basis according to DIN EN ISO 15682-D31).

***NANOCOLOR*® Chloride 50** **REF 985 021**

Type:	tube test 0-21
Measuring range:	0.5–50.0 mg/L Cl^-
Sufficient for:	20 tests
Shelf life:	at least 1 year after production
Sea water suitability:	no

***NANOCOLOR*® Chloride 200** **REF 985 019**

Type:	tube test 0-19
Measuring range:	5–200 mg/L Cl^- 0.10–1.00 g/L C^-
Sufficient for:	20 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes, after dilution (1+199)

***NANOCOLOR*® Chloride** **REF 918 20**

Type:	standard test 1-20
Measuring range:	0.2–125 mg/L Cl^-
Sufficient for:	220 tests
Shelf life:	at least 1 year after production
Sea water suitability:	no

Chlorine / Chlorine dioxide / Ozone

Cl_2 ClO_2 O_3

Reaction basis:
DIN EN ISO method: Free chlorine, total chlorine and ozone react with DPD (N,N-diethyl-1,4-phenylene diamine) to form a red-violet dye. By defined addition of iodide ions one can distinguish between the individual components (Reaction basis test 0-17 and test 1-16 according to DIN EN ISO 7393-G4-2; test 0-18 and test 1-163 according to DIN 38408-G5).

***NANOCOLOR*® Chlorine / Ozone 2** **REF 985 017**

Type:	tube test 0-17
Measuring range:	0.05–2.50 mg/L Cl_2 0.05–2.00 mg/L O_3
Sufficient for:	20 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes

***NANOCOLOR*® Chlorine** **REF 918 16**

Type:	standard tests 1-16
Measuring range:	0.02–10.0 mg/L Cl_2
Sufficient for:	250 tests
Shelf life:	at least 3 years after production
Sea water suitability:	yes

NANOCOLOR® Chlorine dioxide 5 — REF 985 018

Type: tube tests 0-18
Measuring range: 0.15–5.00 mg/L ClO_2
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: yes

Chlorine dioxide, like chlorine, reacts with DPD to form a red-violet dye. By using a special supplementary reagent, chlorine dioxide is determined selectively.



NANOCOLOR® Chlorine dioxide — REF 918 163

Type: standard test 1-163
Measuring range: 0.04–4.00 mg/L ClO_2
Sufficient for: 50 tests
Shelf life: at least 1.5 years after production
Sea water suitability: yes

Chlorine dioxide, like chlorine, reacts with DPD to form a red violet dye. For a simultaneous determination of chlorine, chlorine dioxide and chlorite we recommend the procedure Test 1-164. For an evaluation in accordance with drinking water specifications only the 50-mm rectangular cuvette can be applied.

Chromate — CrO_4^{2-}

Reaction basis:
In acidic medium, chromate ions react with diphenylcarbazide (lyophilised in the tube test) to form a red-violet colored complex. Chromium(III) ions are not determined unless they are converted to Cr(VI) by silver-catalysed oxidation with ammonium peroxodisulfate / sulfuric acid (Reaction basis according to DIN 38 405-D24).

NANOCOLOR® Chromate 5 — REF 985 024

Type: tube test 0-24
Measuring range: 0.1–4.0 mg/L CrO_4^{2-}
0.05–2.00 mg/L Cr(VI)
when using semi-micro cuvettes (REF 919 50):
0.01–1.00 mg/L CrO_4^{2-}
0.005–0.500 mg/L Cr(VI)
Sufficient for: 20 tests
Shelf life: at least 2 years after production
Sea water suitability: yes

NANOCOLOR® Chromate — REF 918 25

Type: standard test 1-25
Measuring range: 0.01–6.0 mg/L CrO_4^{2-}
0.01–3.0 mg/L Cr(VI)
Sufficient for: 250 tests
Shelf life: at least 2 years after production
Sea water suitability: yes

If you need to determine total chromium with the above reagent sets chromate, you require:

NANOCOLOR® *NanOx* Metal — REF 918 978

Sufficient for: approx. 150 tests
Shelf life: at least 1 year after production

empty reaction tubes 16 mm OD — REF 916 80
empty reaction tubes 22 mm OD — REF 916 22

Chromium (total) — Cr

Reaction basis:
In acidic medium, chromate ions react with diphenylcarbazide (lyophilised in the tube test) to form a red-violet colored complex. For determination of total chromium, an acid oxidation at 100–120 °C is necessary.

NANOCOLOR® total Chromium 2 — REF 985 059

NEW!

Type: tube test 0-59
Measuring range: 0.05–2.00 mg/L Cr
when using semi-micro cuvettes 50 mm (REF 919 50):
0.005–0.500 mg/L Cr
Sufficient for: 20 tests
Shelf life: at least 2 years after production
Sea water suitability: no

This test is a practical combination of digestion reagent, digestions vessels and pre-dosed tube tests for the determination of total chromium.

Cobalt — Co

Reaction basis:
At a pH > 5 cobalt(II) ions react with 4-[5-chloropyridyl-(2)-azo]-*m*-phenylene diamine (5-Cl-PADAB) to form a pink colored complex which, contrary to other heavy metal complexes, is also stable below pH 5.

NANOCOLOR® Cobalt — REF 918 51

Type: standard test 1-51
Measuring range: 0.002–0.70 mg/L Co^{2+}
No. of tests: 220 tests
Shelf life: at least 2 years after production
Sea water suitability: yes

COD (chemical oxygen demand)

COD

Reaction basis:
ISO method:

The chemical oxygen demand of water is determined by silver-catalyzed oxidation with potassium dichromate / sulfuric acid at 148 °C during a two hour period.

Using different chromate concentrations, one can cover different measuring ranges. For COD 40 / 60 / 160 / 300 the color decrease of the yellow dichromate ions is measured.

For COD 600 / 1500 / 4000 / 10000 / 15000 / 60000 the color increase of the green chromium(III) ions formed is evaluated.

If the chloride content exceeds 1500 mg/L the sample has to be diluted with COD-free water, or you may use the chloride complexing agent. Lower chloride concentrations are masked by the mercury(II) sulfate present in the test tubes.

The tests 0-27, 0-22, 0-26, 0-29 and 0-30 are in accordance with ISO 15705:2002.

Benefits of *NANOCOLOR*® tube tests in comparison to ISO 6060:

The new ISO 15705 is based on the same chemical reaction as the established ISO 6060. The water contents are oxidized by sulfuric acid and potassium dichromate in the presence of silver sulfate and mercury(II) sulfate. Compared with the ISO 6060, the new method, described in the ISO 15705 has significant advantages:

- Five times less mercury
- Comparably less other toxic and hazardous reagents
- All reagents are pre-dosed in round tubes
- Reduced risks for the user
- Reproducible results because of photometric determination

NANOCOLOR® COD 40 — REF 985 027

ISO

Type: test tubes 0-27
Measuring range: 2–40 mg/L O_2
Sufficient for: 20 tests
Shelf life: at least 1 year after production at 2–8 °C
Sea water suitability: no

NANOCOLOR® COD 60 — REF 985 022

ISO

Type: tube tests 0-22
Measuring range: 5–60 mg/L O_2
Sufficient for: 20 tests
Shelf life: at least 1 year after production at 2–8 °C
Sea water suitability: no

The high COD sensitivity of these tests requires a reduced amount of potassium dichromate. This also means that a reduced oxidizing power is present, possibly leading to a low result for the residual COD, which are often the hardest components to be digested.

NANOCOLOR® COD 160 — REF 985 026

ISO

Type: tube test 0-26
Measuring range: 15–160 mg/L O_2
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: no

NANOCOLOR® COD 160 Hg-free — REF 963 026

without use of toxic mercury salts

Type: tube test 0-26
Measuring range: 15–160 mg/L O_2
Sufficient for: 20 tests
Shelf life: at least 1 year after production at 2–8 °C
Sea water suitability: no

Chloride contents below 2000 mg/L are eliminated by a simple filtration pretreatment step using a special cartridge and do not interfere.

The reliable dichromate chemistry leads to reproducible and comparable results.



Description of individual parameters and tests

NANOCOLOR® COD 300 — REF 985 033

Type: tube test 0-33
Measuring range: 50–300 mg/L O_2
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: no

NANOCOLOR® COD 600 — REF 985 030

ISO

Type: tube test 0-30
Measuring range: 50–600 mg/L O_2
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: no

NANOCOLOR® COD 1500 — REF 985 029

ISO

Type: tube test 0-29
Measuring range: 100–1500 mg/L O_2
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: no

NANOCOLOR® COD 4000 — REF 985 011

Type: tube test 0-11
Measuring range: 400–4000 mg/L O_2
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: no

NANOCOLOR® COD 10000 — REF 985 023

Type: tube test 0-23
Measuring range: 1.00–10.00 g/L O_2
Sufficient for: 20 test
Shelf life: at least 1 year after production
Sea water suitability: no

NANOCOLOR® COD 15000 — REF 985 028

Type: tube test 0-28
Measuring range: 1.0–15.0 g/L O_2
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: no

NANOCOLOR® COD 60000 — REF 985 012

Type: tube test 0-12
Measuring range: 5.0–60.0 g/L O_2
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: no

Chloride complexing agent — REF 918 911

for COD determinations with chloride concentrations from 1000–7000 mg/L Cl^-
Sufficient for: 100–200 tests
Shelf life: at least 1.5 years after production

Cartridges for chloride elimination — REF 963 911

for removal of up to 2000 mg/L Cl^- per cartridge
Pack of: 10 cartridges
Shelf life: at least 1 year after production at 2–8 °C

COD-free water — REF 918 993

for control of measurements and dilution of water samples





Color / Coloration

1/m

Colors occurring in natural waters are usually in the yellow to brown range. Other colors (e. g. in waste water) are not completely covered.

Reaction basis:
For determination of the color intensity one uses the HAZEN scale, which is calibrated with platinum-cobalt chloride standards.

In accordance with DIN EN ISO 7887-C1-3 the coloration is measured as spectral absorption coefficient at 3 wavelengths: 436 nm, 525 nm, 620 nm. The color of the pure sample is measured without any reagents. *NANOCOLOR*® photometers are programmed with all necessary calibration data for the above determinations.

Turbidities have to be filtered (membrane filtration kit, REF 916 50). If you also need the turbidity value of your sample, you may calculate it from the difference of a measurement before and another after filtration.

***NANOCOLOR*® Color**
Type: no reagents required; test 1-39
Measuring range: 5–500 mg/L Pt
0.2–20.0 1/m
Sea water suitability: yes

Complexing agents (organic)

I_{BiC}

Reaction basis:
DIN method: Photometric determination of the decoloration of the bismuth-xylenol orange complex

The complexing agents are determined relative to the bismuth complexing index I_{BiC}. The following conversion factors apply:

1 mg/L I_{BiC} ≙ 1.4 mg/L EDTA (M = 292 g/mol) ≙ 1.0 mg/L NTA

This method is a screening test which covers strong complexing agents. If the result is positive, metals present in the sample may be partially or completely withdrawn from the photometric determination. In this case a digestion for the analysis of metals (e. g. with Crack set REF 918 08 or *NANOCOLOR*® *NanOx* Metal, REF 918 978) has to precede the photometric measurement (Reaction basis according to DIN 38409-H26).

***NANOCOLOR*® org. Complexing agents 10 (screening test)** **REF 985 052**
Type: tube test 0-52
Measuring range: 0.5–10.0 mg/L I_{BiC}
Sufficient for: 10–19 determinations
Shelf life: at least 1 year after production
Sea water suitability: yes, after dilution (1+19)

Copper

Cu

Reaction basis:
In weakly alkaline solution copper(II) ions react with cuprizone [oxalic acid bis(cyclohexylidene hydrazide)] to form a blue complex.

***NANOCOLOR*® Copper 7** **REF 985 054**
Type: tube test 0-54
Measuring range: 0.10–7.00 mg/L Cu^{2+}
Sufficient for: 20 tests
Shelf life: at least 2 years after production
Sea water suitability: yes



***NANOCOLOR*® Copper** **REF 918 53**
Type: standard test 1-53
Measuring range: 0.01–10.0 mg/L Cu^{2+}
Sufficient for: 250 tests
Shelf life: at least 2 years after production
Sea water suitability: yes

Reagents for lime precipitation **REF 918 939**
Reagent for eliminating interfering calcium (up to 20 g/L Ca^{2+}) for copper, nickel and zinc determinations.
Sufficient for: 20 tests
Shelf life: at least 2 years after production

Cyanide

CN^-

Reaction basis:
Cyanide ions react with chloroamine T to form cyanogen chloride which forms a polymethine dye with a pyridine derivative and barbituric acid. The test measures free cyanide and cyanide complexes which can be destroyed with chlorine (Reaction basis test 0-31 analog DIN EN ISO 14403-D6; test 1-30 analog DIN 38405-D13 + D14).

For determination of cyanide which can be easily liberated and for determination of total cyanide please ask for a special instruction from MACHEREY-NAGEL.

***NANOCOLOR*® Cyanide 08** **REF 985 031**

Type:	standard test 0-31
Measuring range:	0.02–0.80 mg/L CN^- when using semi-micro cuvettes 50 mm (REF 919 50): 0.005–0.100 mg/L CN^-
Sufficient for:	20 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes, after dilution (1+3)

***NANOCOLOR*® Cyanide** **REF 918 30**

Type:	standard test 1-30
Measuring range:	0.001–0.50 mg/L CN^-
Sufficient for:	250 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes

DEHA (diethylhydroxylamine)

DEHA

In boiler houses the carcinogenic hydrazine is more and more replaced by diethylhydroxylamine (DEHA) to remove oxygen.

Reaction basis:
Measurement of the reduction properties of DEHA for iron(III) ions and photometric determination of the iron(II) ions formed after 15 min heating to 100 °C.

Interferences caused by the presence of iron may be deducted by a difference measurement from the final result.

***NANOCOLOR*® DEHA 1** **REF 985 035**

Type:	tube test 0-35
Measuring range:	0.05–1.00 mg/L DEHA
Sufficient for:	20 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes

Detergents

see Surfactants, page 130

Ethanol

EtOH

Reaction basis:
The enzyme alcoholoxidase splits ethanol to form acetaldehyde and hydrogen peroxide. The peroxide formed reacts by catalytic oxidation of a chromogen with peroxidase to form a blue dye.

Applicable for spirits, beer and fruit juices. Strong oxidizing agents can cause high results.

***NANOCOLOR*® Ethanol 1000** **REF 985 838**

Type:	tube test 8-38
Measuring range:	0.10–1.00 g/L EtOH 0.013–0.130 Vol.% EtOH
Sufficient for:	23 tests
Shelf life:	at least 2 years after production at < 0 °C
Sea water suitability:	no

Fatty acids

HOAc

see Organic acids, page 125

Fluoride

F^-

Reaction bases:
(a) Fluoride shifts the color of the lanthanum-alizarin complex to violet. In a buffered solution the color shift can be measured photometrically.

(b) Photometric determination of fluoride ions with 1,8-dihydroxy-2-(4-sulfophenylazo)naphthalene-3,6-disulfonic acid (SPADNS)

***NANOCOLOR*® Fluoride 2** **REF 985 040**

Type:	tube test 0-40
Reaction basis:	(a) method with lanthanum-alizarin complex
Measuring range:	0.1–2.0 mg/L F^-
Sufficient for:	20 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes, after dilution (1+9)



***NANOCOLOR*® Fluoride** **REF 918 142**

Type:	standard test 1-42
Reaction basis:	(b) SPADNS-method
Measuring range:	0.05–2.00 mg/L F^-
Sufficient for:	200 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes, after distillation

NANOCOLOR®

Formaldehyde

HCHO

Formaldehyde has technically been produced for approx. 100 years and is used as raw material for resins, as binding material for wood-based panels (chipboards), for textile treatment, for disinfection and conservation and as raw material for medicinal products and explosives. Particularly in wood and chipboard industry the content of formaldehyde must be determined and threshold values must be observed. Chipboards are the main source for formaldehyde in living spaces.

Chipboards and other wood-based panels, like plywood or blockboards are often glued with binding materials based on formaldehyde which are easy and cheap to produce. To produce these binding materials, formaldehyde is spiked with urea, whereby water is formed, which dries afterwards. This process is reversible, so that during the life-time of such wood-based panels the influence of air humidity leads to a digestion of the binding material to formaldehyde and urea. The resulting formaldehyde gases out from the wood-based panel. This process takes place during the whole service life of the panel, as long as there is binding material in the panel.

The classification of wood-based panels is done with the standardised perforator method (DIN EN 120 – Wood-based panels – Determination of formaldehyde content, Extraction method called the perforator method).

Reaction bases:
(a) Chromotropic acid method: Formaldehyde reacts with chromotropic acid in sulfuric acid solution to form a violet dye.

(b) Acetylacetone method: Formaldehyde reacts with ammonium ions and acetylacetone to a yellow dye.

NANOCOLOR® Formaldehyde 8 — REF 985 041

Type:	tube test 0-41
Reaction basis:	(a) Chromotropic acid method
Measuring range:	0.1–8.0 mg/L HCHO
Sufficient for:	20 tests
Shelf life:	at least 2 years after production
Sea water suitability:	no

NANOCOLOR® Formaldehyde 10 — REF 985 046

Type:	tube test 0-46
Reaction basis:	(b) Acetylacetone method
Measuring range:	0.20–10.00 mg/L HCHO when using semi-micro cuvettes 50 mm (REF 919 50): 0.02–1.00 mg/L HCHO
Sufficient for:	20 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes

The comparability of the results obtained with the tube test *NANOCOLOR*® Formaldehyde 10 with the results measured with the standardised perforator method according to DIN EN 120 was checked and certified by the eph (Development and test laboratory for wood technology) in Dresden, Germany.

Total hardness

°e

Reaction basis:
Photometric determination of total hardness with phthalein purple.

NANOCOLOR® Hardness Ca / Mg — REF 985 044

NEW!

Type:	tube test 0-44
Measuring range:	1.25–25.00 °e 5–50 mg/L Mg^{2+} 10–100 mg/L Ca^{2+}
Sufficient for:	20 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes, after dilution (1+29)

NANOCOLOR® Hardness 20 — REF 985 043

Type:	tube test 0-43
Measuring range:	1.25–25.00 °e 5–50 mg/L Mg^{2+} 10–100 mg/L Ca^{2+}
Sufficient for:	20 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes, after dilution (1+29)

With the aid of a selective masking agent differentiation between calcium and magnesium is possible.



NANOCOLOR® residual Hardness 1 — REF 985 084

Type:	tube test 0-84
Measuring range:	0.03–1.25 °e 0.004–0.180 mmol/L
Sufficient for:	20 tests
Shelf life:	at least 1 year after production
Sea water suitability:	no

Hydrocarbons

HC

Reaction basis:
The determination of hydrocarbons is based on an MN-patented method without halogenated solvents. The extracting agent is *n*-pentane. After removal of polar substances, the extracting agent is evaporated and the test tube with the evaporation residue is connected with a COD test tube via a screwed joint. Finally, the hydrocarbons are oxidized as COD and determined photometrically.

***NANOCOLOR*® HC 300** **REF 985 057**

Type:	tube test 0-57
Measuring range:	0.5–5.6 mg/L HC 30–300 mg/kg HC after extraction from water or soil samples
Sufficient for:	20 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes

***NANOCOLOR*® HC 300** **REF 918 571**

Type:	Extraction kit for water samples Test 0-571
Sufficient for:	20 tests
Shelf life:	at least 1.5 years after production

***NANOCOLOR*® HC 300** **REF 918 572**

Type:	Extraction kit for soil samples Test 0-572
Sufficient for:	20 tests
Shelf life:	at least 1.5 years after production

For a detailed description see page 141.

Hydrazine

N_2H_4

Reaction basis:
DIN method: In acidic solution hydrazine reacts with 4-dimethylaminobenzaldehyde to form a yellow-orange compound.

***NANOCOLOR*® Hydrazine** **REF 918 44**

Type:	standard test 1-44
Measuring range:	0.002–1.50 mg/L N_2H_4
Sufficient for:	220 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes

Iron

Fe

Reaction bases:
(a) Triazine method: iron(II) ions react with a triazine derivative to form a violet colored complex.

(b) DIN method: iron(II) ions react with 1,10-phenanthroline to form an orange colored complex. This method determines dissolved and easily soluble iron compounds (Reaction basis according to DIN 38406-E1).

For differentiation between total iron and dissolved iron we recommend the following methods:

A: determination of the dissolved iron after filtration with the membrane filtration kit 0.45 µm (REF 916 50)

B: determination of total iron after digestion with *NANOCOLOR*® *NanOx* Metal (REF 918 978) or with *NANOCOLOR*® Crack Set (REF 918 08)

***NANOCOLOR*® Iron 3** **REF 985 037**

Now only 5 min reaction time!

Type:	tube test 0-37
Reaction basis:	(a) Triazine method
Measuring range:	0.10–3.00 mg/L Fe when using semi-micro cuvettes 50 mm (REF 919 50): 0.02–1.00 mg/L Fe
Sufficient for:	20 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes

***NANOCOLOR*® Iron** **REF 918 36**

Type:	standard test 1-36
Reaction basis:	(b) DIN method
Measuring range:	0.01–15.0 mg/L Fe
Sufficient for:	250 tests
Shelf life:	at least 3 years after production
Sea water suitability:	yes

A modified test procedure allows the determination of Fe^{2+}



ions in the presence of Fe^{3+}.

Lead

Pb

Reaction bases:
(a) PAR method: in the presence of cyanide, lead(II) ions react with 4-[pyridyl-(2)-azo]-resorcinol (PAR) to form a red dye. If interfering heavy metals are present, only the red lead complex is destroyed and the color decrease is measured photometrically.

(b) Dithizone method: at pH 7 to 9 in the presence of cyanide, lead(II) ions react with dithizone to form primary lead dithizonate, which is soluble in carbon tetrachloride with high selectivity yielding a pink solution (extraction method).

***NANOCOLOR*® Lead 5** **REF 985 009**

Type:	tube test 0-09
Reaction basis:	(a) PAR method
Measuring range:	0.10–5.00 mg/L Pb^{2+}
Sufficient for:	20 tests
Shelf life:	at least 1 year after production
Sea water suitability:	no



***NANOCOLOR*® Lead** **REF 918 101**

Type:	standard test 1-10
Reaction basis:	(b) Dithizone method
Measuring range:	0.005–1.00 mg/L Pb^{2+}
Sufficient for:	25 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	no

Lipophilic substances

HC

see Hydrocarbons, page 121 and page 141

Manganese

Mn

Reaction basis:
In alkaline solution manganese ions react with formaldoxime to form an orange-red complex (according to DIN 38406-E2).

***NANOCOLOR*® Manganese 10** **REF 985 058**

Type:	tube test 0-58
Measuring range:	0.1–10.0 mg/L Mn when using semi-micro cuvettes 50 mm (REF 919 50): 0.02–2.00 mg/L Mn
Sufficient for:	20 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes



***NANOCOLOR*® Manganese** **REF 918 60**

Type:	standard tests 1-60
Measuring range:	0.01–10.0 mg/L Mn
Sufficient for:	250 tests
Shelf life:	at least 3 years after production
Sea water suitability:	no

Methanol

MeOH

Reaction basis:
The enzyme alcoholoxidase splits methanol to form formaldehyde and hydrogen peroxide. The peroxide reacts by catalytic oxidation of a chromogen with peroxidase to form a blue color dye.

Suitable for the analysis of waste water, surface water and drinking water.

***NANOCOLOR*® Methanol 15** **REF 985 859**

Type: tube test 8-59
Measuring range: 0.2–15.0 mg/L MeOH
Sufficient for: 23 tests
Shelf life: at least 1 year after production at < 0 °C
Sea water suitability: no



Molybdenum

Mo

Reaction basis:
Molybdate ions react with thioglycolic acid to form a yellow color complex. Nitrite interferes with the determination and has to be destroyed with amidosulfuric acid (REF 918 973) prior to the analysis.

***NANOCOLOR*® Molybdenum 40** **REF 985 056**

Type: tube test 0-56
Measuring range: 1.0–40.0 mg/L Mo(VI)
1.6–65.0 mg/L MoO_4^{2-}
Sufficient for: 20 tests
Shelf life: at least 2 years after production
Sea water suitability: no

Nonionic Surfactants

see Surfactants, page 130

Nickel

Ni^{2+}

Reaction basis:
In alkaline solution nickel ions react with diacetyldioxime after oxidation to form a red-brown dye. Nickel cyanide and nickel cyanocomplexes are not determined. To remove interfering calcium, use the reagents for lime precipitation.

Nickel in complexes will not be detected. For the determination of total Nickel, a digestion with *NANOCOLOR*® *NanOx* Metal (REF 918 978) or with the digestion kit (REF 918 08) has to be carried out before.

***NANOCOLOR*® Nickel 4** **REF 985 071**

NEW!

Type: tube test 0-71
Measuring range: 0.10–7.00 mg/L Ni^{2+}
when using semi-micro cuvettes 50 mm (REF 919 50):
0.02–1.00 mg/L Ni^{2+}
Sufficient for: 20 tests
Shelf life: at least 2 years after production
Sea water suitability: yes, after dilution (1+9)

***NANOCOLOR*® Nickel 7** **REF 985 061**

Type: tube test 0-61
Measuring range: 0.10–7.00 mg/L Ni^{2+}
when using semi-micro cuvettes 50 mm (REF 919 50):
0.02–1.00 mg/L Ni^{2+}
Sufficient for: 20 tests
Shelf life: at least 2 years after production
Sea water suitability: yes, after dilution (1+9)

***NANOCOLOR*® Nickel** **REF 918 62**

Type: standard test 1-62
Measuring range: 0.01–10.0 mg/L Ni^{2+}
Sufficient for: 250 tests
Shelf life: at least 2 years after production
Sea water suitability: yes

Reagents for precipitation **REF 918 939**

Reagents for elimination of interfering calcium (up to 20 g/L Ca^{2+}) for copper, nickel and zinc determinations.
Sufficient for: 20 tests
Shelf life: at least 2 years after production

Nitrate

NO_3^-

Reaction bases:
(a) ISO method: in acidic solution nitrate ions react with 2,6-dimethylphenol to form 4-nitro-2,6-dimethylphenol, which can be evaluated photometrically.

Applicable for drinking, ground and weakly polluted surface water (Reaction basis according to DIN 38405-D9-2).

(b) Reduction method: first nitrate ions are reduced to form nitrite ions. In acidic solution these nitrite ions react with sulfanilic acid and 1-naphthylamine to form a red azo dye. Nitrite interferes (elimination with amidosulfuric acid).

NANOCOLOR® Nitrate 8 — REF 985 065

Type: tube test 0-65
Reaction basis: (a) ISO method
Measuring range: 0.30–8.00 mg/L NO_3-N
1.3–35.0 mg/L NO_3^-
Sufficient for: 20 tests
Shelf life: at least 2 years after production
Sea water suitability: no

NANOCOLOR® Nitrate 50 — REF 985 064

Type: tube test 0-64
Reaction basis: (a) ISO method
Measuring range: 0.3–22.0 mg/L NO_3-N
2–100 mg/L NO_3^-
Sufficient for: 20 tests
Shelf life: at least 2 years after production
Sea water suitability: no

NANOCOLOR® Nitrate 250 — REF 985 066

Type: tube test 0-66
Reaction basis: (a) ISO method
Measuring range: 4–60 mg/L NO_3-N
20–250 mg/L NO_3^-
Sufficient for: 20 tests
Shelf life: at least 2 years after production
Sea water suitability: no

NANOCOLOR® Nitrate — REF 918 65

Type: standard test 1-65
Reaction basis: (a) ISO method
Measuring range: 0.9–30.0 mg/L NO_3-N
4–140 mg/L NO_3^-
when using semi-micro cuvettes 50 mm (REF 919 50):
0.10–2.50 mg/L NO_3-N
0.50–11.10 mg/L NO_3^-
Sufficient for: 100 tests
Shelf life: at least 2 years after production
Sea water suitability: no

NANOCOLOR® Nitrate Z — REF 918 63

Type: standard test 1-63
Reaction basis: (b) Reduction method
Measuring range: 0.02–1.0 mg/L NO_3-N
0.1–5.0 mg/L NO_3^-
Sufficient for: 440 tests
Shelf life: at least 1.5 years after production
Sea water suitability: no

Amidosulfuric acid — REF 918 973

for elimination of interfering nitrite

Cartridges for chlorine elimination — REF 963 911

One cartridge is sufficient for removal of up to 2000 mg/L Cl^-
Pack of: 10 cartridges
Shelf life: at least 1 year after productionat 2–8 °C

Nitrite

NO_2^-

Reaction bases:
(a) DIN EN method: nitrite reacts with sulfanilamide and *N*-(1-naphthyl)-ethylene diamine (lyophilised) to form a red-violet azo dye (Reaction basis according to DIN EN 26777-D10).

(b) Sulfanilic acid method: in acidic solution sulfanilic acid is diazotized with nitrite. The diazonium salt is coupled with 1-naphthylamine to form a red dye.

NANOCOLOR® Nitrite 2 — REF 985 068

Type: tube test 0-68
Reaction basis: (a) DIN EN method
Measuring range: 0.003–0.460 mg/L NO_2-N
0.02–1.50 mg/L NO_2^-
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: yes



NANOCOLOR® Nitrite 4 — REF 985 069

Type: tube test 0-69
Reaction basis: (a) DIN EN method
Measuring range: 0.1–4.0 mg/L NO_2-N
0.3–13.0 mg/L NO_2^-
Sufficient for: 20 tests
Shelf life: at least 1.5 years after production
Sea water suitability: yes

NANOCOLOR® Nitrite — REF 918 67

Type: standard test 1-67
Reaction basis: (b) Sulfanilic acid method
Measuring range: 0.002–0.30 mg/L NO_2-N
0.005–1.00 mg/L NO_2^-
Sufficient for: 220 tests
Shelf life: at least 1.5 years after production
Sea water suitability: yes

Nitrite in cooling lubricants

The reagents for sample preparation allow to prepare nitrite ontaining samples for photometric measurement using a clarification precipitation (Carrez solutions 1+2).

Reagents for sample preparation by clarification precipitation **REF 918 937**

Reagents for removal of emulsions, turbidities and color prior to the test, e. g. for nitrite in cooling lubricants, seepage water from waste deposits etc.

Sufficient for: 30 tests
Shelf life: at least 2 years after production

Nitrogen (total) TN_b

Reaction basis:
DIN EN ISO method: all organic and inorganic nitrogen containing substances are oxidized to nitrate in acidic solution. In acidic solution nitrate ions react with 2,6-dimethylphenol to form 4-nitro-2,6-dimethylphenol, which can be evaluated photometrically (Reaction basis according to DIN 38405-D9).

A more detailed description of the digestion in a heating block can be found on page 135.

***NANOCOLOR*® total Nitrogen TN_b 22** **REF 985 083**
Type: tube test 0-83
Measuring range: 0.5–22.0 mg/L N
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: no

***NANOCOLOR*® total Nitrogen TN_b 60** **REF 985 092**
Type: tube test 0-92
Measuring range: 3–60 mg/L N
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: no

***NANOCOLOR*® total Nitrogen TN_b 220** **REF 985 088**
Type: tube test 0-88
Measuring range: 5–220 mg/L N
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: no

The complete tests contain *NANOCOLOR*® *NanOx* N digestion and compensation reagent as well as the corresponding nitrate tube tests.

Organic acids HOAc

Reaction basis:
The determination of organic acids is carried out in two steps:

1. Esterification of organic acids with ethylene glycol.
2. Conversion of the esters to hydroxamic acids, which subsequently react with iron (III) ions to form red colored complexes, which are determined photometrically.

The concentration of organic acids in waters is affected by biochemical processes. Therefore, the samples have to be determined rapidly after sampling (Reaction basis according to DIN EN 38414-S19).

Turbid solutions have to be filtered before the determination.

Digested sludge must be filtered (e.g. with folded filter MN 617 we, REF 535 018 or membrane filter 0.45 µm, REF 916 50) or centrifuged.

***NANOCOLOR*® Organic acids** **REF 985 050**
Type: tube test 0-50
Measuring range: 30–3000 mg/L CH_3COOH
0.5–50.0 mmol/L CH_3COOH
Sufficient for: 20 tests
Shelf life: at least 1.5 years after production
Sea water suitability: yes

Oxygen O_2

Reaction basis:
Oxygen reacts with manganese(II) ions and potassium iodide to form an equivalent amount of iodine, which is measured photometrically (Reaction basis according to DIN EN 25813-G21).

Good reproducibility is obtained when the tube test is filled to the brim (without air bubbles) at the sampling location in order to immediately bind the oxygen by chemical reaction. The photometric method thus provides a true alternative to the measurement with electrometric oxygen electrodes.

***NANOCOLOR*® Oxygen 12** **REF 985 082**
Type: tube tests 0-82
Measuring range: 0.5–12.0 mg/L O_2
Sufficient for: 22 tests
Shelf life: at least 2 years after production
Sea water suitability: yes



Ozone

O_3

see Chlorine, page 114

Peroxide

H_2O_2

Reaction basis:
Peroxides react by catalytic oxidation of a chromogen in the presence of peroxidase to form a blue dye.

***NANOCOLOR*® Peroxide 2** **REF 985 871**

Type:	tube test 8-71
Measuring range:	0.03–2.00 mg/L H_2O_2
Sufficient for:	10–19 tests
Shelf life:	at least 1 year after production at 2–8 °C
Sea water suitability:	yes



pH value

pH

Reaction basis:
Photometric determination of the pH value in water with phenol red as indicator

***NANOCOLOR*® pH 6.5–8.2** **REF 918 72**

Type:	tube test 0-72
Measuring range:	pH 6.5–8.2
Sufficient for:	100 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes

Phenol / Phenolic index

OH

Reaction bases:
(a) DIN method: photometric determination of phenols and other compounds capable of oxidative coupling, which form antipyrine dyes with 4-aminoantipyrine (Reaction basis according to DIN 38409-H16-3).

Oxidizing substances, reducing substances and cyanides interfere. For turbid waters and sea water analysis an additional extraction with isobutyl methyl ketone (MIBK) is necessary.

(b) Nitroaniline method: phenol reacts with diazotized 4-nitroaniline to form a red dye. The color can fluctuate between yellow, brown and red with other phenols. In addition to phenol most phenol derivatives are determined, too. For heavily polluted waters the phenols should first be separated by steam distillation.

***NANOCOLOR*® Phenolic index 5** **REF 985 074**

Type:	tube test 0-74
Reaction basis:	(a) DIN method
Measuring range:	0.2–5.0 mg/L phenolic index
Sufficient for:	20 test
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes, after extraction with isobutyl methyl ketone



Isobutyl methyl ketone **REF 918 929**

for color extraction, for the tube test, for difficult sample matrices

Sufficient for: 12–24 tests

***NANOCOLOR*® Phenol** **REF 918 75**

Type:	standard test 1-75
Reaction basis:	(b) nitroaniline method
Measuring range:	0.01–7.0 mg/L phenol
Sufficient for:	440 tests
Shelf life:	at least 3 years after production
Sea water suitability:	yes, after dilution (1+9)

Phosphate

PO_4^{3-}

Reaction bases:
(a) DIN method: ammonium molybdate reacts with orthophosphate ions to form phosphomolybdic acid. This is reduced to molybdenum blue. For the determination of total phosphate, an acidic oxidation at 100–120 °C must preceed to detect poly- and organic phosphates (Reaction basis according to DIN EN ISO 6878-D11).

Occasional precipitations after the digestion can be filtered off with membrane filters. In case of a high content of organic matter and/or organically bound phosphorus, we recommend digestion with *NANOCOLOR*® *NanOx* Metal (REF 918 978).

(b) Vanadate method: ortho phosphate ions react with molybdate/vanadate to form a yellow phosphate-molybdate-vanadate complex.

For the determination of total phosphate, an acidic oxidation at 100–120 °C must preceed to detect poly- and organic phosphates. Phosphorus compounds which are hard to oxidize can be digested with *NANOCOLOR*® *NanOx* Metal (REF 918 978).

Turbid solutions have to be filtered prior to the analysis of ortho phosphate. Strongly alkaline or strongly acidic sample solutions have to be adjusted to pH 3–10 for the test.

NANOCOLOR® ortho and total Phosphate 1
REF 985 076

Type:	tube test 0-76
Reaction basis:	(a) DIN method
Measuring range:	0.05–1.50 mg/L P (PO_4-P) 0.2–5.0 mg/L PO_4^{3-} when using semi-micro cuvettes 50 mm (REF 919 50): 0.010–0.800 mg/L P (PO_4-P) 0.03–2.50 mg/L PO_4^{3-}
Sufficient for:	20 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes (ortho P)

NANOCOLOR® ortho and total Phosphate 5
REF 985 081

Type:	tube test 0-81
Reaction basis:	(a) DIN method
Measuring range:	0.20–5.00 mg/L P (PO_4-P) 0.5–15.0 mg/L PO_4^{3-}
Sufficient for:	20 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes (ortho P)

NANOCOLOR® ortho and total Phosphate 15
REF 985 080

Type:	tube test 0-80
Reaction basis:	(a) DIN method
Measuring range:	0.30–15.00 mg/L P (PO_4-P) 1.0–45.0 mg/L PO_4^{3-}
Sufficient for:	20 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes (ortho P)



NANOCOLOR® ortho and total Phosphate 45
REF 985 055

Type:	tube test 0-55
Reaction basis:	(a) DIN method
Measuring range:	5.0–50.0 mg/L P (PO_4-P) 15–150 mg/L PO_4^{3-}
Sufficient for:	20 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes (ortho P)

NANOCOLOR® ortho and total Phosphate 50
REF 985 079

Type:	tube test 0-79
Reaction basis:	(b) Vanadate method
Measuring range:	10.0–50.0 mg/L P (PO_4-P) 30–150 mg/L PO_4^{3-}
Sufficient for:	19 tests
Shelf life:	at least 3 years after production
Sea water suitability:	yes (ortho P)

NANOCOLOR® ortho Phosphate
REF 918 77

Type:	standard test 1-77
Reaction basis:	(a) DIN method
Measuring range:	0.04–6.5 mg/L PO_4-P 0.1–20.0 mg/L PO_4^{3-}
Sufficient for:	440 tests
Shelf life:	at least 3 years after production
Sea water suitability:	yes

NANOCOLOR® ortho Phosphate
REF 918 78

Type:	standard test 1-78
Reaction basis:	(b) Vanadate method
Measuring range:	0.2–17 mg/L PO_4-P 0.5–50 mg/L PO_4^{3-}
Sufficient for:	440 tests
Shelf life:	at least 3 years after production
Sea water suitability:	yes

Determination of total phosphorus with *NANOCOLOR*® *NanOx* Metal

For phosphorus compounds which are difficult to oxidize, we recommend digestion with *NANOCOLOR*® *NanOx* Metal (REF 918 978).

For details concerning the digestion with *NANOCOLOR*® *NanOx* Metal in a heating block please see page 136.

This digestion is also used, when total phosphorus is to be determined with standard tests 1-77 or 1-78.

POC

POC

Polyoxycarboxylic acids (POC) are copolymers (e.g. from acrolein, acrylic acid, hydroxy- acrylic acid or maleic acid) with the general empirical formula $–[CH_2–CO]_n–OR$.

Polyacrylates are polymers based on the esters of acrylic acid with the general empirical formula $–[CH_2–CH–COOR]_n^-$.

Polyoxycarboxylic acids and Polyacrylates are substances with outstanding dispersing properties. Therefore, they are used in boiler feed and cooling water as reagents for hardness stabilization, to prevent coating generated by calcium carbonate.

Reaction basis:
Photometric turbidity measurement with Hyamine® 1622

***NANOCOLOR*® POC 200** **REF 985 070**

Type:	tube test 0-70
Measuring range:	20–200 mg/L POC AS 2020 20–200 mg/L POC HS 2020 20–200 mg/L Polystabil® DK 2–40 mg/L Polystabil® KWI
Sufficient for:	20 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	yes, after dilution (1+3)

Potassium

K^+

Reaction basis:
Potassium reacts with sodium tetraphenylborate to form an insoluble compound which can be measured as turbidity.

***NANOCOLOR*® Potassium 50** **REF 985 045**

Type:	tube test 0-45
Measuring range:	2–50 mg/L K^+
Sufficient for:	20 tests
Shelf life:	at least 2 years after production
Sea water suitability:	yes, after dilution (1+9)



Ammonium compensation reagent **REF 918 045**

Supplementary reagent for the test *NANOCOLOR*® potassium 50 for removal of interfering ammonium (up to 5 mg/L NH_4-N)

Residual hardness

°e

see total hardness, page 120

Sludge

TPF

see TTC, page 132

Silica / Silicon

SiO_2

Reaction basis:
DIN method: in acidic solution dissolved silica and silicates react with ammonium molybdate to form yellow silicomolybdic acid. This is reduced to a blue compound by addition of a reducing agent (Reaction basis according to DIN EN ISO 16264-H57).

It is important that the distilled water used for filling up or dilution is free of silica.

***NANOCOLOR*® Silica** **REF 918 48**

Type:	standard test 1-48
Measuring range:	0.005–10.0 mg/L SiO_2
Sufficient for:	250 tests
Shelf life:	at least 3 years after production
Sea water suitability:	yes

Silica-free water **REF 918 912**

for the analytical preparation, especially for minute concentrations of silicon, and for dilution of water samples

purity: < 0.005 mg/L SiO_2

Silver

Ag^+

Reaction basis:
Silver ions react with an indicator to form a blue dye.

Insoluble silver compounds like silver bromide, silver chloride, silver iodide, silver cyanide or silverthiocyanate are not detected with this test.

These compounds can be determined after pretreatment with *NANOCOLOR*® *NanOx* Metal (REF 918 978).

***NANOCOLOR*® Silver 3** **REF 985 049**

Type:	tube test 0-49
Measuring range:	0.20–3.00 mg/L Ag^+
Sufficient for:	20 tests
Shelf life:	at least 1.5 years after production
Sea water suitability:	no

Starch

Reaction basis:
Starch reacts with iodine in sulfuric acid solution to form a blue inclusion complex.

Oxidizing and reducing substances interfere.

***NANOCOLOR*® Starch 100** **REF 985 085**

Type:	tube test 0-85
Measuring range:	5–100 mg/L starch
Sufficient for:	19 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes, after dilution (1+1)

Sulfate

SO_4^{2-}

Reaction basis:
turbidity measurement as barium sulfate (Reaction basis according to DIN 38405-D5-2).

Turbidities interfere and have to be filtered prior to the test. Good reproducibility is obtained for drinking, surface and ground water. Polluted waste waters cause low results.

***NANOCOLOR*® Sulfate 200** **REF 985 086**

Type:	tube test 0-86
Measuring range:	10–200 mg/L SO_4^{2-}
Sufficient for:	20 tests
Shelf life:	at least 3 years after production
Sea water suitability:	no

***NANOCOLOR*® Sulfate 1000** **REF 985 087**

Type:	tube test 0-87
Measuring range:	200–1000 mg/L SO_4^{2-}
Sufficient for:	20 tests
Shelf life:	at least 3 years after production
Sea water suitability:	no

Sulfide / Hydrogen sulfide

S^{2-}

Reaction basis:
DIN method: N,N-Dimethyl-1,4-phenylene diamine reacts with hydrogen sulfide to form a compound which changes to leucomethylene blue. This compound is oxidized to methylene blue using iron(III) ions (Reaction basis according to DIN 38405-D26/27).

Sulfide is measured in an acidic medium; vigorous mixing can cause evaporation of gaseous hydrogen sulfide which escapes analysis.

***NANOCOLOR*® Sulfide 3** **REF 985 073**

Type:	tube test 0-73
Measuring range:	0.05–3.00 mg/L S^{2-}
Sufficient for:	20 tests
Shelf life:	at least 3 years after production
Sea water suitability:	yes, after dilution (1+3)



***NANOCOLOR*® Sulfide** **REF 918 88**

Type:	standard test 1-88
Measuring range:	0.01–3.0 mg/L S^{2-}
Sufficient for:	250 tests
Shelf life:	at least 3 years after production
Sea water suitability:	yes

NANOCOLOR®

Sulfite

SO_3^{2-}

Reaction bases:
(a) Thiodibenzoic acid method: Sulfite reacts with a derivative of thiodibenzoic acid to form a yellow color complex, which is evaluated photometrically. Contrary to the reduction method (b), which also covers other reducing agents, this procedure is selective for sulfite.

(b) Reduction method: Sulfite ions bleach iodine solutions. The excess iodine is measured photometrically. Oxidizing and reducing substances interfere.

NANOCOLOR® Sulfite 10 — REF 985 089

Type: tube test 0-89
Reaction basis: (a) Thiodibenzoic acid method
Measuring range: 0.2–10.0 mg/L SO_3^{2-}
when using semi-micro cuvettes 50 mm (REF 919 50):
0.05–2.40 mg/L SO_3^{2-}
Sufficient for: 20 tests
Shelf life: at least 1 year after production
Sea water suitability: yes, after dilution (1+19)



NANOCOLOR® Sulfite 100 — REF 985 090

Type: tube test 0-90
Reaction basis: (b) Reduction method
Measuring range: 5–100 mg/L SO_3^{2-}
Sufficient for: 19 tests
Shelf life: at least 1 year after production
Sea water suitability: yes

Surfactants (detergents)

Detergents are surface-active substances, which are classified into anionic, cationic and nonionic surfactants. They can be found in municipal and industrial waste waters.

Reaction bases:
(a) Methylene blue method: Under suitable conditions anionic detergents react with methylene blue to form a colored complex, which is extracted with an organic phase according to DIN 38 409-H23. Reference substance is methyl dodecylbenzene sulfonate (MBAS: 342 g/mol) (Reaction basis according to DIN 38409-H23-1).

(b) Bromophenol blue method: Cationic detergents react with bromophenol blue to form a colored complex, which is extracted with an organic phase. Reference substance is *N*-cetyl-*N*,N,N-trimethylammonium bromide (CTAB: 364.5 g/mol).

(c) Disulfine blue method: Cationic surfactants react with disulfine blue to form a colored complex, which is extracted with chloroform.

(d) TBPE method: Nonionic surfactants react with an indicator (TBPE = Tetrabromophenolphthaleinethylester) to form a complex, which is extracted with dichloromethane.

If a water contains cationic and anionic detergents, equivalent quantities are combined and escape analysis. Normally detergents are determined as a sum. For the analysis of specific detergents a correction factor has to be determined

NANOCOLOR® Anionic surfactants 4 — REF 985 032

Type: tube test 0-32
Reaction basis: (a) methylene blue method
Measuring range: 0.20–4.00 mg/L MBAS
0.20–3.50 mg/L SDS
Sufficient for: 20 tests
Shelf life: at least 2 years after production
Sea water suitability: yes, after dilution (1+19)

NANOCOLOR® Detergents anionic — REF 918 32

Type: standard test 1-32
Reaction basis: (a) methylene blue method
Measuring range: 0.02–5.0 mg/L MBAS
Sufficient for: 40 tests
Shelf life: at least 3 years after production
Sea water suitability: no
The test kit contains chlorinated hydrocarbons; observe local regulations.

NANOCOLOR® Cationic surfactants 4 — REF 985 034

Type: tube test 0-34
Reaction basis: (c) Disulfine blue method
Measuring range: 0.20–4.00 mg/L CTAB
Sufficient for: 20 tests
Shelf life: at least 2 years after production
Sea water suitability: yes, after dilution (1+19)

NANOCOLOR® Detergents cationic — REF 918 34

Type: standard test 1-34
Reaction basis: (b) bromphenol blue method
Measuring range: 0.05–5.0 mg/L CTAB
Sufficient for: 40 tests
Shelf life: at least 3 years after production
Sea water suitability: no
The test kit contains chlorinated hydrocarbons; observe local regulations.

***NANOCOLOR*® Nonionic surfactants 15** **REF 985 047**
Type: Tube test 0-47
Reaction basis: (d) TBPE method
Measuring range: 0.3–15.0 mg/L Triton® X-100
Sufficient for: 20 tests
Shelf life: at least 2 years after production
Sea water suitability: no

Thiocyanate

SCN⁻

Reaction basis:
Thiocyanate reacts with iron(III) ions to form blood-red iron(III) thiocyanate.
The described method can also be used for detecting a thiocyanate interference during cyanide determination (test 1-30 and test 0-31).

***NANOCOLOR*® Thiocyanate 50** **REF 985 091**
Type: tube test 0-91
Measuring range: 0.5–50.0 mg/L SCN^-
Sufficient for: 20 tests
Shelf life: at least 2 years after production
Sea water suitability: yes, after dilution (1+1)

Tin

Sn

Reaction basis:
Photometric determination of dissolved tin(II) and tin(IV) with 9-phenyl-3-fluorone.

***NANOCOLOR*® Tin 3** **REF 985 097**
Type: tube test 0-97
Measuring range: 0.10–3.00 mg/L Sn
Sufficient for: 18 tests
Shelf life: at least 1 year after production
Sea water suitability: yes, after dilution (1+9)

TOC

TOC

Total organic carbon

Reaction basis:
clear and simple two-step procedure:

1. Removal of inorganic carbon (TIC)
2. Digestion of organic carbon (TOC) and determination of the CO_2 formed as color decrease of an indicator (Reaction basis according to DIN EN 1484)

***NANOCOLOR*® TOC 25** **REF 985 093**
Type: tube test 0-93
Measuring range: 2.0–25.0 mg/L TOC
Sufficient for: 10 tests
Shelf life: at least 1 year after production
Sea water suitability: no

***NANOCOLOR*® TOC 60** **REF 985 094**
Type: tube test 0-94
Measuring range: 2–60 mg/L TOC
Sufficient for: 10 tests
Shelf life: at least 1 year after production
Sea water suitability: no



***NANOCOLOR*® TOC 600** **REF 985 099**
Type: tube test 0-99
Measuring range: 40–600 mg/L TOC
Sufficient for: 10 tests
Shelf life: at least 1 year after production
Sea water suitability: no

***NANOCOLOR*® Thermo caps** **REF 916 116**
for the determination of TOC
Content: 3 pcs

***NANOCOLOR*® Accessory set for TOC (small)**
REF 916 990
for single measurement and small sample throughput
Content: 1 magnetic stirrer (1 position)
2 beakers 100 mL
2 magnetic stir bars 35 mm

***NANOCOLOR*® Accessory set for TOC (big)**
REF 916 991
for multi measurements and big sample throughput
Content: 1 magnetic stirrer (15 positions)
6 beakers 100 mL
6 magnetic stir bars 35 mm

***NANOCOLOR*® Beaker** **REF 916 992**
Beaker glass 100 mL incl. magnetic stir bar 35 mm

TTC / Sludge activity

TPF

Reaction basis:
Determination of the biochemical activity of sludge (activated sludge, digested sludge etc.) by means of the dehydrogenase activity using 2,3,5-triphenyltetrazoliumchloride (TTC). Colorless TTC is converted into red triphenylformazane (TPF) by dehydrogenases. The formed, water-insoluble TPF is dissolved in ethanol and is determined photometrically.

This method allows the determination of the biochemical activity of sludge samples, the characterization of the action of waste waters and waste water constituents towards sludge and a rapid visual evaluation of the degree of stabilization of a sludge.

NANOCOLOR® TTC / Sludge activity 150

REF 985 890

Type: tube test 8-90
Measuring range: 5–150 µg TPF
Sufficient for: 20 tests
Shelf life: at least 2 years after productionat 2–8 °C
Sea water suitability: no

Turbidity

FAU/NTU

Reaction bases:
The turbidity is measured by comparison with formazine-standard suspensions. The result can be given as spectral attenuation coefficient in 1/m according to German and international standard methods (Reaction basis according to DIN EN ISO 7027-C2)

(a) Turbidity measurement with 180° transmitted light

(b) Turbidity measurement with 90° scattered light

NANOCOLOR® Turbidity — Test 1-92

Type: no reagents required test 1-92
Reaction basis: (a) turbidity measurement with 180° transmitted light
Measuring range: 1–100 FAU
0.2–40.0 1/m
Sea water suitability: yes

NANOCOLOR® Turbidity — Test 9-06

Type: no reagents required test 9-06
Reaction basis: (b) turbidity measurement with 90° scattered light
Measuring range: 1–1000 NTU
Sea water suitability: yes

The nephelometric turbidity measurement is only possible with the *NANOCOLOR*® spectrophotometers and PF-12^{Plus}.

Zinc

Zn

Reaction basis:
At pH 8.5–9.5 zinc ions react with zincon to form a blue color complex.

NANOCOLOR® Zinc 4 — REF 985 096

Type:	Tube test 0-96
Measuring range:	0.10–4.00 mg/L Zn^{2+}
Sufficient for:	20 tests
Shelf life:	at least 1 year after production
Sea water suitability:	yes, after dilution (1+1)

NANOCOLOR® Zinc — REF 918 95

Type:	Standard test 1-95
Measuring range:	0.02–3.0 mg/L Zn^{2+}
Sufficient for:	250 tests
Shelf life:	3 years
Sea water suitability:	yes, after dilution (1+9)

Reagents for lime precipitation — REF 918 939

Reagents for elimination of interfering calcium (up to 20 g/L Ca^{2+}) for copper, nickel and zinc determinations.

Sufficient for:	20 tests
Shelf life:	at least 2 years after production



Chemicals for special *NANOCOLOR*® procedures

Ordering information

Description	Pack of	REF
Distilled water for dilutions	1 L	**918 932**
Silica-free water for the preparation of a blank value for the determination of silica	1 L	**918 912**
COD-free water for dilutions of samples prior to COD analysis	50 mL	**918 993**
Isobutyl methyl ketone* (MIBK) for tube test phenolic index 5 (method 1-742)	100 mL	**918 929**
Chloride complexing agent for COD analysis	100 mL	**918 911**
Amidosulfuric acid* for elimination of nitrite interferences	25 g	**918 973**
Reagents for sample preparation by clarification precipitation, for the determination of nitrite in cooling lubricants etc.	2 x 30 mL	**918 937**
Reagents for lime precipitation, for removal of interfering calcium for determinations of copper, nickel and zinc	100 g	**918 939**
Ammonium compensation reagent*	30 mL	**918 045**

* These products contain harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

The system for photometric water analysis

NANOCOLOR® reagent cases

Mobile photometric analysis

NEW!

- **Rugged case ensures highest security during transport**
- **Highest precision due to the *NANOCOLOR*® tube tests**
- **Heating block *VARIO C2* for fast sample digestions**

The *NANOCOLOR*® reagent case is specially designed for fast and save controlling of water purification in sewage plants.

These mini labs in tough cases with premium foam inlays are available with or without photometer and can be equipped with different *NANOCOLOR*® tests for individual needs. Additionally, 1 heating block *NANOCOLOR*® *VARIO C2*, 2 pipettes and accessories can be stowed within the case.

The practical in-field analysis guarantees reliable results within a very short time and enables an immediate inspection of the most important parameters in waste water plants.

NANOCOLOR® reagent case PF-12^{Plus}, empty

REF 919 215

For individual combination with 1 photometer PF-12^{Plus}, 1 heating block *NANOCOLOR*® *VARIO C2*, 2 pipettes, 3 *NANOCOLOR*® tube tests and accessories

NANOCOLOR® reagent case with PF-3 COD, empty

REF 919 213

For individual combination with 1 photometer PF-3 COD, 1 heating block *NANOCOLOR*® *VARIO C2*, 2 pipettes, 3 *NANOCOLOR*® tube tests and accessories





Examples for fully combined *NANOCOLOR*® analysis cases

NANOCOLOR® reagent case with PF-12^{Plus}

REF 919 214

For individual combination with 1 heating block *NANOCOLOR*® *VARIO C2*, 2 pipettes, 3 *NANOCOLOR*® tube tests with accessories

NANOCOLOR® reagent case with PF-3 COD

REF 919 212

For individual combination with 1 heating block *NANOCOLOR*® *VARIO C2*, 2 pipettes, 3 *NANOCOLOR*® tube tests and accessories

Ordering information

Typ	REF
NANOCOLOR® reagent case PF-12^{Plus}, empty	**919 215**
NANOCOLOR® reagent case with PF-12^{Plus}	**919 214**
NANOCOLOR® reagent case PF-3 COD, empty	**919 213**
NANOCOLOR® reagent case with PF-3 COD	**919 212**

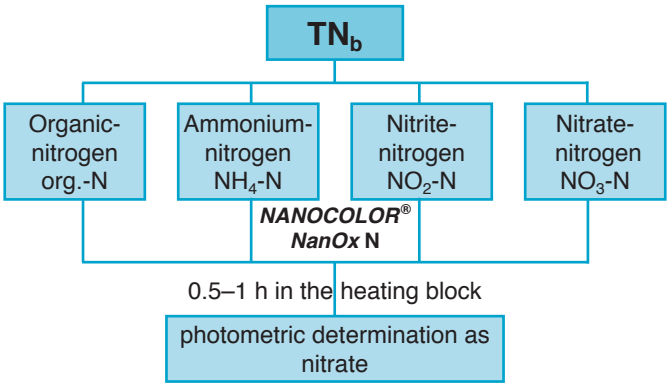
Determination of total nitrogen

In some countries government regulations require a complete nitrogen balance for effluents. Besides ammonium, nitrite and nitrate, organic nitrogen compounds have to be determined – the sum of all these nitrogen compounds is called total nitrogen.

The Standard Method DIN EN ISO 11 905-1 describes the procedure for the determination of total N. After formation of nitrate by oxidative digestion of all inorganic and organic nitrogen-containing substances, a subsequent nitrate determination gives the total nitrogen content in mg N per liter. In samples with low nitrate and nitrite concentrations this method directly gives similar results to the determination of Total Kjeldahl Nitrogen TKN (including only ammonium and organic nitrogen compounds). In the presence of detectable amounts of nitrate/nitrite, the TKN can be determined by subtracting nitrate/nitrite nitrogen from total nitrogen.

NANOCOLOR® *NanOx* N – Oxidative digestion of samples containing nitrogen compounds

NanOx N consists of convenient solid oxidative digestion reagents (potassium peroxodisulfate) and solid compensation reagents for elimination of interfering substances. After digestion with *NanOx* N, the samples can be analyzed with *NANOCOLOR*® Nitrate tube or standard tests.



For this digestion the following reagents and accessories are required:

***NANOCOLOR*® total Nitrogen TN_b 22** **REF 985 083**
Type: tube test 0-83
Measuring range: 0.5–22.0 mg/L N

or

***NANOCOLOR*® total Nitrogen TN_b 60** **REF 985 092**
Type: tube test 0-92
Measuring range: 3–60 mg/L N

or

***NANOCOLOR*® total Nitrogen TN_b 220** **REF 985 088**
Type: tube test 0-88
Measuring range: 5–220 mg/L N

The above mentioned tests are convenient combinations of *NANOCOLOR*® *NanOx* N reagents, predosed tube tests for determination of total N and digestion tubes.

or

***NANOCOLOR*® *NanOx* N** **REF 918 979**

empty reaction tubes 16 mm OD REF 916 80

For decomposition of larger sample volumes (heating block *NANOCOLOR*® *VARIO C2* with big bores, REF 919 350.1):

empty reaction tubes 22 mm OD REF 916 22

***NANOCOLOR*® Nitrate 50** **REF 985 064**
Type: tube test 0-64
Measuring range: 0.3–22.0 mg/L N

or

***NANOCOLOR*® *NanOx* N** **REF 918 979**

empty reaction tubes 16 mm OD REF 916 80

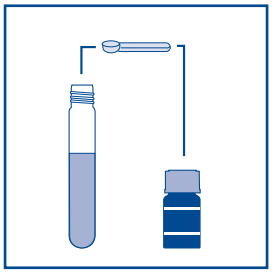
For decomposition of larger sample volumes (heating block *NANOCOLOR*® *VARIO C2* with big bores, REF 919 350.1):

empty reaction tubes 22 mm OD REF 916 22

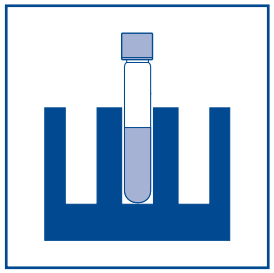
***NANOCOLOR*® Nitrate** **REF 918 65**
Type: standard test 1-65
Measuring range: 0.9–30.0 mg/L N

Digestion in a heating block

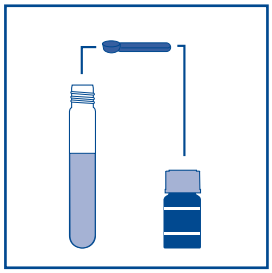
- Easy handling
- Choice for everyday routine analyses



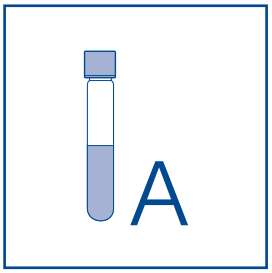
Mix sample with *NANOCOLOR*® *NanOx* N digestion reagent



Boil: 30 min at 120 °C or 1 h at 100 °C



Add compensation reagent



Decomposed sample for the test procedure

The system for photometric water analysis

Special *NANOCOLOR*® procedures

Determination of total phosphorus

The element phosphorus occurs in many different circulations on earth. In waters, phosphorus containing substances are unwanted, whereas in soil phosphorus is an important fertilizer for the growth of plants. Phosphates occur in many different waters, mainly as ortho- and polyphosphates. Most phosphates reach the waters via the municipal and industrial waste water. They derive from detergents, residues of human and animal excrements and from soluble contents of fertilizers. The discharge of phosphates to rivers and lakes leads to eutrophication, an increased growth of algae and water plants.

In many countries governmental regulations require a complete phosphorus balance for effluents. Besides orthophosphates, also phosphonates and organic phosphorus compounds have to be determined – the sum of all these compounds is called total phosphorus. After formation of phosphate by oxidative digestion of all inorganic and organic phosphorus-containing substances, a subsequent determination of phosphate gives the total phosphorus content in mg P per liter.



The *NANOCOLOR*® system offers several rapid and convenient methods for sample preparation and determination of total phosphorus.

a) *NANOCOLOR*® tube tests for digestion in a heating block

- Solid reagent capsules for digestion
- Pre-dosed tube tests for determination of total P
- Digestion and photometric evaluation in one and the same test tube
- The choice for everyday routine analyses

For a correct determination of total P with *NANOCOLOR*® tube tests, the following reagents are available:

NANOCOLOR® ortho and total Phosphate 1 **REF 985 076**

Type: tube test 0-76
Measuring range: 0.05–1.50 mg/L P (PO_4-P)

NANOCOLOR® ortho and total Phosphate 5 **REF 985 081**

Type: tube test 0-81
Measuring range: 0.20–5.00 mg/L P (PO_4-P)

NANOCOLOR® ortho and total Phosphate 15 **REF 985 080**

Type: tube test 0-80
Measuring range: 0.30–15.00 mg/L P (PO_4-P)

NANOCOLOR® ortho and total Phosphate 45 **REF 985 055**

Type: tube test 0-55
Measuring range: 5.0–50.0 mg/L P (PO_4-P)

NANOCOLOR® ortho and total Phosphate 50 **REF 985 079**

Type: tube test 0-79
Measuring range: 10.0–50.0 mg/L P (PO_4-P)

b) *NANOCOLOR*® standard tests and *NanOx* Metal for digestion in a heating block

For frequent analyses of large numbers of samples, *NANOCOLOR*® standard tests are the choice for determination of total P. For a correct determination of total P the following reagents and accessories are required:

NANOCOLOR® _NanOx_ Metal **REF 918 978**

empty reaction tubes 16 mm OD REF 916 80

For decomposition of larger sample volumes (heating block *NANOCOLOR*® *VARIO C2* with big bores, REF 919 350.1):

empty reaction tubes 22 mm OD REF 916 22

NANOCOLOR® ortho Phosphate **REF 918 77**

Type: standard test 1-77
Measuring range: 0.04–6.5 mg/L P (PO_4-P)

or

NANOCOLOR® _NanOx_ Metal **REF 918 978**

empty reaction tubes 16 mm OD REF 916 80

For decomposition of larger sample volumes (heating block *NANOCOLOR*® *VARIO C2* with big bores, REF 919 350.1):

empty reaction tubes 22 mm OD REF 916 22

NANOCOLOR® ortho Phosphate **REF 918 78**

Type: standard test 1-78
Measuring range: 0.2–17 mg/L P (PO_4-P)

Oxidation of samples containing heavy metals



In practice an analysis often recovers only the quantity of metals which is present in the sample as dissolved ions. If the total content of a metal has to be determined (particularly samples of highly contaminated water or industrial waste water), it must be digested to avoid falsely negative or falsely low results. Usually, by applying acid and heat, undissolved metal oxides are dissolved, metal ions are released from complexes and adsorptive compounds or interfering organic substances are eliminated. Thus, maximum recovery rates can be achieved for the analysis of heavy metals.

The *NANOCOLOR*® system offers various rapid and convenient methods for sample preparation with solid reagents for regular digestion and liquid reagents for vigorous digestion.

NANOCOLOR® *NanOx* Metal – Oxidative digestion of samples containing heavy metals

NANOCOLOR® *NanOx* Metal consists of convenient solid oxidative digestion reagents (potassium peroxodisulfate) and solid neutralization reagents for pH adjustment prior to the subsequent determination of metals.

***NANOCOLOR*® *NanOx* Metal** **REF 918 978**

empty reaction tubes 16 mm OD REF 916 80

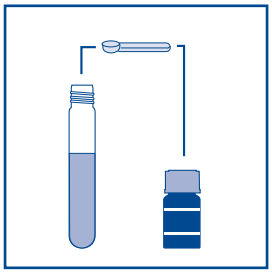
A decomposition of larger sample volumes can be accomplished by using the big composition vessels with a capacity of up to 17 mL (in the heating block *NANOCOLOR*® *VARIO C2* with big bores, REF 919 350.1).

empty reaction tubes 22 mm OD REF 916 22

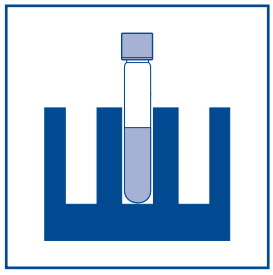
After digestion with *NanOx* Metal, the samples can be analyzed with the following *NANOCOLOR*® tests:	
Test 0-98 Aluminum 07 *	Test 0-61 Nickel 7
Test 1-02 Aluminum *	Test 0-71 Nickel 4
Test 1-13 Cadmium	Test 1-62 Nickel
Test 0-24 Chromate 5 (Chromium)	Test 0-76 Phosphate 1
Test 1-25 Chromate (Chromium)	Test 0-81 Phosphate 5
Test 1-51 Cobalt	Test 0-80 Phosphate 15
Test 1-53 Copper	Test 0-55 Phosphate 45
Test 0-54 Copper 7	Test 0-79 Phosphate 50
Test 0-37 Iron	Test 1-95 Zinc
Test 1-36 Iron	Test 0-96 Zinc 4
*only with microwave digestion	

Digestion in a heating block

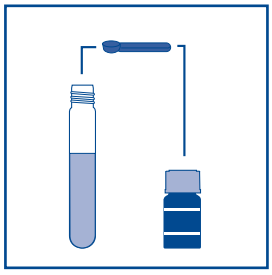
- Easy handling
- Choice for everyday routine analyses



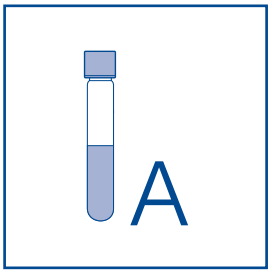
Mix sample with *NANOCOLOR*® *NanOx* Metal digestion reagent



Boil: 30 min at 120 °C or 1 h at 100 °C



Add compensation reagent



Decomposed sample for the test procedure

The system for photometric water analysis

Special *NANOCOLOR*® procedures

NANOCOLOR® Crack set

Liquid reagents for oxidative digestion of samples containing heavy metals

The crack set is used for oxidative sample preparation in acidic medium (sulfuric acid / potassium peroxodisulfate) under normal pressure at 100 °C in a heating block. The crack set is recommended for the complete and vigorous digestion of very resistant samples.

After digestion, the samples can be analyzed in accordance with the instructions for the respective *NANOCOLOR*® tests. For this digestion the following reagents and accessories are required:

***NANOCOLOR*® Crack set** **REF 918 08**

Type: Reagent set for sample preparation
Shelf life: at least 3 years after production

Reaction basis:
Digestion with sulfuric acid/potassium peroxodisulfate at 100–120 °C. Some stable heavy metal cyanide complexes are not completely destructible.

The reagent set *NANOCOLOR*® Crack set contains all reagents required for the oxidative digestion and subsequent neutralization. Additionally, a heating block with 22 mm bores and reagent sets for determination of the individual metals are required



Accessories for crack set · Ordering information

Description	Pack of	REF
Tube for sample digestion 22 mm diameter, NS 19/26, with glass stopper	2	**916 66**
Condenser 200 mm, type KS, NS 19/26 bottom and NS 29/32 top, with 3 m polyethylene tubing	1	**916 67**
Absorption attachment for condenser, NS 29/32	1	**916 68**

After digestion the sample can be analyzed with the following *NANOCOLOR*® tests:	
Test 0-09 Lead	Test 1-36 Iron
Test 0-14 Cadmium 2	Test 1-51 Cobalt
Test 0-37 Iron 3	Test 1-53 Copper
Test 0-54 Copper 7	Test 1-62 Nickel
Test 0-61 Nickel 7	Test 1-95 Zinc
Test 0-96 Zinc 4	

NANOCOLOR® Sludge

Liquid reagents for oxidative digestion of sludge containing heavy metals

In Germany, the use of sludge for soil improvement in farming and forestry and in gardening is regulated by government regulations which define the maximum contents of 7 heavy metals (Cd, Cr, Cu, Hg, Ni, Pb, Zn) allowable in sludge for the above applications. The *NANOCOLOR*® reagent set sludge 50 allows even non-chemists to determine these contents with high accuracy. It is, however, recommended that you arrange for the supplier of the kit to provide instructions to those members of your team likely to be involved in its use.

With the exception of mercury and lead all of the above metals can be determined with the *NANOCOLOR*® analytical system. The photometers *NANOCOLOR*® 250 D and 350 D cannot be used for this sludge analysis. When using the photometers *NANOCOLOR*® $^{UV}/_{VIS}$ II, $^{UV}/_{VIS}$, *VIS*, 500 D, 400 D or 300 D, you can directly read results as mg/kg dried residue of sludge (S). For a digestion of sludge we recommend the following reagents and accessories:

***NANOCOLOR*® Sludge** **REF 918 50**

Type: Reagent sets for digestion with aqua regia
Shelf life: at least 3 years after production

Reaction basis:
Mineralisation of sludge and soil samples with aqua regia at 100 °C and preparation of a solution for metal analysis according to DIN 38-414-S7. Additionally, reagent sets for determination of the individual metals are required.

Accessories for sludge analysis · Ordering information

Description	REF
Combination of all equipment required for sludge analysis (without reagents, photometer and heating block): 1 mortar with pestle, 2 tubes for sample digestion with stoppers, 1 condenser with connecting tubing, 1 absorption attachment, 100 filter circles MN 1670, 11 cm diameter, 100 filter circles MN 640 d, 15 cm diameter, 1 plastic wash bottle 500 mL, 1 holder for round glass tubes and tubes for sample digestion, 2 volumetric flasks 100 mL, 1 Erlenmeyer flask 200 mL, 1 measuring cylinder 50 mL, 1 pipette 50 mL, 1 glass funnel each with 60 mm and 80 mm diameter, 100 test strips pH-Fix 0–14, 1 double spatula 180 mm, safety glasses, bulb for filling 20 mL pipettes, instructions for use	**916 10**

After digestion the sample can be analyzed with the following *NANOCOLOR*® tests:	
Test 1-13$_2$ Cadmium	1–100 *
Test 1-25$_3$ + 1-25 Chromium	20–1800 *
Test 1-53 Copper	20–4000 *
Test 1-62 Nickel	2–400 *
Test 1-95 Zinc	80–6000 *
* ranges in mg/kg for *NANOCOLOR*® $^{UV}/_{VIS}$ II, $^{UV}/_{VIS}$, *VIS*, 500 D, 400 D, Linus and 300 D	

AOX analysis has never been so easy and reliable before!

The AOX content represents the sum of organically bound halogens (chlorine, bromine, iodine) which are adsorbable to a suitable adsorbent; their concentration is expressed as chloride.

The rapid test *NANOCOLOR*® AOX 3 allows the determination of AOX in natural waters, industrial or municipal waste waters and sea water. The test is based on an easy three-step procedure:

1. Solid phase extraction with the *NANOSORB* adsorbent for AOX according to DIN 38 409-22
2. Oxidative digestion of the enriched adsorbent in a heating block at 120 °C or in a microwave oven
3. Photometric determination of AOX as chloride

Advantages of *NANOCOLOR*® AOX 3

- The complete test procedure takes less than 60 minutes.
- No expensive instrumentation is required; the test can be performed and evaluated with the usual equipment for photometric water analysis.
- In contrast to carbon-based adsorbents, the use of *NANOSORB* for AOX, a polymeric adsorbent pad, avoids interferences by inorganic halides, which can be removed entirely from the adsorbent. Even in sea water, with chloride contents of up to 20 g/L (!), reproducible results are obtained.
- For convenient handling, *NANOSORB* for AOX pads come individually prepackaged in plastic cartridges, protecting the adsorbent during adsorption.
- The use of pre-dosed reagents shortens the procedure and reduces the analyst's exposure to chemicals to a minimum.
- Outstanding recovery rates can be achieved, even in undiluted samples with high COD contents.
- Application of the automatic pump set increases the sensitivity of the test kit and facilitates the use of *NANOSORB* for AOX.

For a correct determination of AOX you need the following reagents and accessories:

NANOCOLOR® AOX 3 — REF 985 007

Type:	tube test 0-07
Measuring range:	0.1–3.0 mg/L AOX 0.01–0.3 mg/L AOX
Shelf life:	at least 1 year after production

NANOCOLOR® starter set for AOX 3 — REF 916 111

Includes useful accessories for the determination of AOX with reagent set AOX 3; recommended to be ordered with the first order of reagent set AOX 3



Supplement kit for AOX 3 — REF 918 072

Contains additional oxidizing reagents for the sensitive AOX range (0.01–0.3 mg/L AOX) as well as for COD-contaminated samples between 50 and 1000 mg/L COD

Shelf life: at least 1 year

Pump set for AOX 3 — REF 916 115

Required to increase the sensitivity of reagent set AOX 3 or simply a useful auxiliary for convenient solid phase extraction with *NANOSORB* for AOX



NANOCOLOR®

The system for photometric water analysis

Special *NANOCOLOR*® procedures

BOD_5 – Biochemical oxygen demand

Together with the chemical oxygen demand (COD) the biochemical oxygen demand (BOD) is the most important sum parameter for an estimation of the pollution of waste water.

The BOD is defined as the amount of oxygen per volume, which is used by the microorganisms at 20 °C for oxidative degradation of the organic substances present in the water.

Normally, the BOD is determined over a period of 5 days, and is then called BOD_5. MACHEREY-NAGEL offers two tests for the determination of the BOD_5: a method with sample incubation in Winkler bottles, in accordance with EN 1899-1, and a quick, simplified tube test.

Benefits of *NANOCOLOR*® BOD_5

- Recovery rates within the tolerances stated in EN 1899-1
- Oxygen measurement similar to DIN EN 25813-621, no manometers required
- Use of a nitrification inhibitor avoids oxygen consumption caused by oxidation of ammonium and nitrite (nitrification)
- Sample incubation in Winkler flasks in accordance with EN 1899-1 or
- Simplified incubation and oxygen measurement in one and the same test tube
- Photometric evaluation with all types of *NANOCOLOR*® photometers – no additional instrumentation necessary
- Clear evaluation form for hand-written step-by-step calculation of the BOD_5

For a correct determination of the BOD_5 you need the following reagents and accessories:

a) BOD_5 determination in Winkler bottles according to EN 1899-1

NANOCOLOR® BOD_5 **REF 985 822**

Type: in Winkler bottles, according to EN 1899-1, test 8-22
Measuring range: 0.5–3000 mg/L O_2
Shelf life: at least 2 years after production



BOD_5-accessories set **REF 916 918**

Includes useful accessories for sample preparation prior to the determination of BOD_5, recommended to be ordered with the first order of the tube test BOD_5.
The accessories set consists of an electric air pump, 2 aerating bricks, tubing, a 10 L PE container, a 1 L laboratory bottle and 4 Winkler bottles.

BOD_5 nutrient mixture **REF 918 994**

Without nitrification inhibitor *N*-allylthiourea (ATU).
Ready-to-use supplementary reagents for preparation of the inoculating water for BOD_5 test 8-22.

BOD_5 nutrient mixture Plus **REF 918 995**

With nitrification inhibitor N-allylthiourea (ATU).
Ready-to-use supplementary reagents for preparation of the inoculating water for BOD_5 test 8-22.

b) BOD_5 determination as simplified tube test

Simple determination of the biochemical oxygen demand after 5 days (BOD_5) of undiluted samples without using a control in accordance with EN 1899-2-H52! The oxygen enriched, undiluted sample is incubated in test tubes for 5 days at 20 ± 1°C in the dark. Determination of the dissolved oxygen after 5 days is based on the Winkler procedure, EN 25813-G21.

NANOCOLOR® BOD_5-TT **REF 985 825**

Type: tube test 8-25
Measuring range: 0.5–3000 mg/L O_2
Shelf life: at least 2 years after production

Includes nitrification inhibitor *N*-allylthiourea (ATU) to prevent falsely high BOD_5 results due to high ammonium concentrations.

BOD_5 accessories set **REF 916 925**

Includes useful accessories for sample preparation prior to the determination of BOD_5-TT, recommended to be ordered with the first order of the tube test BOD_5-TT.

The accessories set consists of 1 electric air pump, 2 aerating bricks, tubing, 1 1000 mL PE container and 2 40 mL reaction vessels.

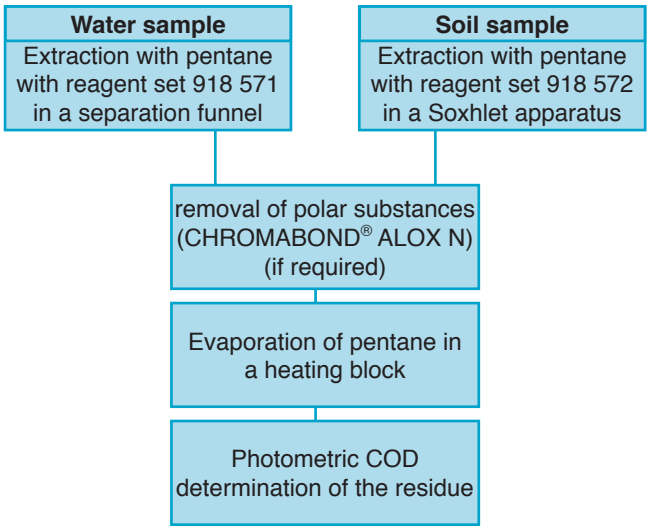
Spare parts · Ordering information

Description	Pack of	REF
Oxygen bottles according to Winkler	4	**916 919**
4 aerating bricks	4	**916 920**
10 reaction vessels for BOD_5-TT	10	**916 926**

Hydrocarbons / lipophilic substances

The rapid test *NANOCOLOR*® HC 300 (Hydrocarbons) is based on a MN-patented method. Hydrocarbons with a boiling temperature above 120 °C can be detected in a clear fivestep procedure:

1. Extraction of hydrocarbons from the sample
2. Removal of polar substances
3. Evaporation of the extraction solvent
4. Oxidative digestion in a heating block
5. Photometric determination of hydrocarbons



Benefits of *NANOCOLOR*® HC 300

- Applicable for water and soil
- Extraction without halogenated solvents
- Mercurey-free reagents
- Outstanding selectivity
- Complete removal of polar substances by solid phase extraction with CHROMABOND® ALOX N columns
- Can be adapted to the determination of lipophilic substances
- Evaluation with all types of *NANOCOLOR*® photometers – no expensive analytical instrumentation required

For a correct determination of hydrocarbons you need the following reagents and accessories:

NANOCOLOR® HC 300 **REF 985 057**
after extraction from water or soil samples
Type: tube test 0-57
Measuring range: 0.5–5.6 mg/L HC
30–300 mg/kg HC
Shelf life: at least 1 year after productionat 15–25 °C

empty reaction tubes 16 mm OD	REF 916 80
Threaded couplings (pack of 2)	REF 916 04
Stop valves for piston pipettes (pack of 100)	REF 916 21

For determination of hydrocarbons in water

Extraction kit HC from water **REF 918 571**
Shelf life: 1.5 years

Separation funnel 500 mL (pack of 2)	REF 916 08
Volumetric flask 25 mL (pack of 2)	REF 916 61

For determination of hydrocarbons in soil

Extraction kit HC from soil **REF 918 572**
Shelf life: 1.5 years

Soxhlet apparatus 30 mL (additionally a heater is required)	REF 916 05
Extraction thimbles (pack of 25)	REF 645 008
Volumetric flask 50 mL (pack of 2)	REF 916 06

For removal of fatty acids, fat or other polar compounds

CHROMABOND® SPE columns ALOX N (pack of 20)	REF 730 250
Plastic syringes 50 mL (pack of 10)	REF 916 09
Syringe adapters (pack of 2)	REF 916 03





The system for photometric water analysis

NANOCOLOR® accessories

A comprehensive analytical system should include all accessories required for the analytical procedure, such as equipment for sampling, sample preparation and conservation, for digestion reactions, extraction and filtration – from analytical preparations to protective accessories for safe operation. All these components improve analytical procedures and thus help to obtain optimum results.



NANOCOLOR® membrane filters

Removal of turbidities (fine filtration) is recommended for two reasons:

- Turbidities interfere with photometric determinations, intense turbidities must be removed prior to the analysis.
- When both soluble and total amounts of a substance (e.g. iron, manganese, COD etc.) have to be determined, part of the sample has to be filtered to remove undissolved particles. The German Standard Methods use a pore size of 0.45 µm as standard for differentiation between dissolved and undissolved particles.

Additionally we offer a pore size of 1.2 µm.

Ordering information

Description	Pack of	REF
Membrane filtration kit 0.45 µm: 2 syringes 20 mL and 25 CHROMAFIL® membrane filters 0.45 µm	1 kit	**916 50**
CHROMAFIL® membrane filters 0.45 µm	50	**916 52**
Membrane filtration kit 1.2 µm: 2 syringes 20 mL and 25 CHROMAFIL® membrane filters 1.2 µm	1 kit	**916 511**
CHROMAFIL® membrane filters 1.2 µm	50	**916 513**
Membrane filtration kit: 2 syringes 20 mL and 25 CHROMAFIL® membrane filters GF/PET	1 kit	**916 01**
CHROMAFIL® membrane filters GF/PET	50	**916 02**

Piston pipettes and pipette stand



Exact dosage of water sample and reagents is prerequisite for analytical accuracy. We offer a complete line of piston pipettes – with fixed or adjustable volume.

- Convenient operation – exact dosage
- Guarantees clean analytical work through use of disposable tips
- High security when working with toxic or corrosive substances, because direct contact is avoided
- Clean and safe storage of the valuable pipettes in a pipette stand
- All pipettes are supplied with tip ejector

Ordering information

Description	Pack of	REF
200 µL piston pipette (without tips)	1	**916 72**
Plastic tips for 50–200 µL piston pipettes	100	**916 915**
500 µL piston pipette (without tips)	1	**916 53**
Plastic tips for 100–1000 µL piston pipettes	100	**916 76**
1.0 mL piston pipette (without tips)	1	**916 71**
Plastic tips for 100–1000 µL piston pipettes	100	**916 76**
2.0 mL piston pipette (without tips)	1	**916 917**
Plastic tips for 1.0–5.0 mL piston pipettes	100	**916 916**
5–50 µL digital piston pipette, adjustable	1	**916 58**
50–200 µL digital piston pipette, adjustable	1	**916 914**
Plastic tips for 5–50 and 50–200 µL piston pipettes	100	**916 915**
100–1000 µL digital piston pipette, adjustable	1	**916 77**
Plastic tips for 100–1000 µL piston pipettes	100	**916 76**
1.0–5.0 mL digital piston pipette, adjustable	1	**916 909**
Plastic tips for 1.0–5.0 mL piston pipettes	100	**916 916**
Pipette stand for 6 piston pipettes	1	**916 79**

General analytical accessories

Ordering information

Description	Pack of	REF
Volumetric flask 10 mL for reduced analytical preparations	2	**916 42**
Volumetric flask 25 mL with NS 10/19 and polyethylene stopper for analytical preparations	2	**916 61**
Volumetric flask 100 mL with NS 12/21 and polyethylene stopper	2	**916 83**
Erlenmeyer flask 50 mL	1	**916 212**
Erlenmeyer flask 100 mL	1	**916 38**
Measuring cylinder 50 mL	1	**916 84**
Bulb for filling pipettes	1	**916 65**
Glass funnel 60 mm diameter	1	**916 81**
Glass funnel 80 mm diameter	1	**916 82**
Filter circles MN 1670, 11 cm diameter	100	**470 011**
Filter circles MN 640 d, 15 cm diameter	100	**205 015**
Plastic wash bottle 500 ml	1	**916 89**
Magnetic stirring unit without heater	1	**970 115**
Mini-magnets for stirring (30 x 6 mm)	1	**916 211**
Timer with digital display and acoustic signal (up to 99:59 min)	1	**916 96**
Electric air pump with delivery tube	1	**916 55**
Double spatula, 18/8 steel, 180 mm long	1	**916 94**
Porcelain mortar 90 mm diameter with pestle	1	**916 88**
Holder for 15 round glass tubes and 2 tubes for sample digestion	1	**916 36**
Safety bottle for shaking COD test tubes	1	**916 37**
Safety kit, consist of safety glasses, gloves and rubber apron	1 kit	**916 90**
Accessory set for TOC (small) for single measurement and small sample throughput	1 kit	**916 990**
Accessory set for TOC (big) for multi measurements and big sample throughput	1 kit	**916 991**
Beaker 100 mL, incl. magnetic stir bar 35 mm	2 kits	**916 992**





Quality control for photometric water analysis

NANOCONTROL

The *NANOCONTROL* system for analytical quality control

Quality control is an essential aspect in any lab and its importance is growing constantly. All components of a measuring system, such as reagents and test kits, the actual measuring equipment and personal handling need to be monitored and checked on a regular basis in most labs. This is important to ensure accurate results and to fulfill validation and auditing requirements

The *NANOCONTROL* system offers a complete range of products for analytical quality control of analyses carried out with the *NANOCOLOR*® system.

- *NANOCONTROL* standards
- *NANOCONTROL* 100+ addition solution
- *NANOCONTROL* NANOCHECK
- *NANOCONTROL* NANOTURB

In line with the overall *NANOCOLOR*® system, no additional equipment of special training is needed to use *NANOCONTROL*. The *NANOCONTROL* system provides users with all necessary components to check the entire *NANOCOLOR*® analysis range:

- *NANOCOLOR*® reagents and test kits
- *NANOCOLOR*® photometers and heating blocks
- Personal handling and work flow

Using *NANOCONTROL* requires just slightly more effort, but gives you all the safety and assurance you need to backup and confirm your results and the work of your lab.

NANOCONTROL NANOCHECK

Test solutions for the determination of photometric accuracy

NANOCONTROL NANOCHECK is a secondary standard to control inspection, measuring and test equipment in accordance to ISO 9001 and ISO 14001. The test solutions have been checked in a reference photometer monitored with primary standards (NIST-Standards) with all results being documented. With just 2 stable color solutions the wavelength accuracy and the linearity of absorbance measurements can be checked. *NANOCONTROL* NANOCHECK fullfils the requirements of analytical quality control according to DWA-advisory leaflet A 704 (Operational Methods for the Self-Monitoring of Wastewater Systems).



***NANOCONTROL* NANOCHECK** **REF 925 701**

Shelf life:	at least 2 years after production
Content:	2 tubes with control solution 1
	2 tubes with control solution 2

NANOCONTROL NANOTURB

Turbidity standard for nephelometric turbidity measurements

NANOCONTROL NANOTURB is a turbidity standard for nephelometric turbidity measurements for our spectrophotometers *NANOCOLOR*® *UV/VIS* and *NANOCOLOR*® *VIS*.

The solutions are suitable as a primary standard for calibration and testing of the nephelometric turbidity unit according to ISO 7027. The *NANOCONTROL* NANOTURB solutions are free of hazardous or carcinogenic substances and don't have to be labeled as hazardous goods. The test solutions come ready to use and just have to be inserted into the photometer. Dilution steps or contact with chemicals is thus effectively avoided.



***NANOCONTROL* NANOTURB** **REF 925 702**

Shelf life:	at least 8 months after production
Content:	1 tube with test solution 1 NTU
	1 tube with test solution 4 NTU
	1 tube with test solution 100 NTU
	1 tube with test solution 400 NTU

NANOCONTROL analysis standards

NANOCONTROL Standards

NANOCONTROL Standard solutions contain a defined concentration of a particular substance. The standard concentration lies roughly within the middle of the respective test's measuring range. The standard has a narrow confidence interval, which is given with each standard solution. Using the standard is very simple. Instead of an actual water sample, you use the *NANOCONTROL* Standard solution and run the test as usual. If the result lies within the confidence interval, you can be sure all individual components of your measurement system are working well and there are no handling errors. If you find deviations, equipment and tests should be checked and monitored again.



NANOCONTROL Multistandards

In addition to single standards, MACHEREY-NAGEL offers standard solution mixtures that are created for specific application areas, such as waste water treatment plants or water works. *NANOCONTROL* Multistandards allow you to check and document multiple significant parameters in one single step.

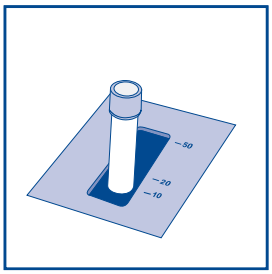
NANOCONTROL 100+ addition solutions

Monitoring interferences due to the sample matrices, which means checking whether additional substances within the sample may interfere with the determination of a specific parameter is especially important if:

- You start a new analytical series with an unknown sample matrix
- You know that your sample contains interfering substances, e. g. proteins, larger amounts of salts etc.
- You find continuous major deviations from other analytical procedures
- You question the accuracy of your own analytical results

The principle of standard additions is to increase the concentration of a sample in defined steps. The recovery rate is then an indication of possible interferences. A constant and proportional deviation allows you to correct and adapt the result. For the multistandard solution, *NANOCONTROL* 100+ addition solution is also available. Due to the complex sample composition, we recommend a simplified procedure with one single addition of 1.0 mL *NANOCONTROL* 100+ addition solution.

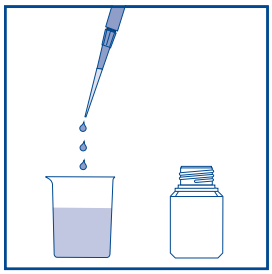
Using *NANOCONTROL* 100+ addition solution



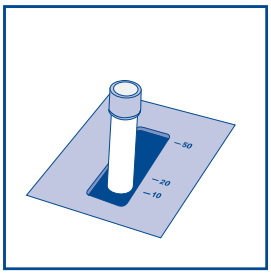
Measure the concentration before adding 100+ solution.



Fill a beaker with 20 mL sample.



Add 200 µL 100+ solution and mix.



Measure the concentration again.

The difference between the measurements should agree with the theroretical value of the 100+ solution.

Quality control for photometric water analysis

NANOCONTROL

Ordering information

Parameter	*NANOCOLOR*® test		Concentration of the standard solution	Confidence interval	Number of tests	REF
***NANOCONTROL* Standards**						
AOX	0-07	AOX 3	1.0 mg/L AOX	0.8–1.2 mg/L	20	**925 07**
BOD_5	8-22 8-25	BOD_5 BOD_5-TT	210 mg/L O_2	170–250 mg/L	10	**925 82**
Chlorine	1-16 0-17	Chlorine Chlorine / Ozone 2	1.00 mg/L Cl_2 0.80 mg/L Cl_2	0.90–1.10 mg/L 0.70–0.90 mg/L	30	**925 17**
Chromate	0-24 1-25	Chromate 5 Chromate	2.0 mg/L CrO_4^{2-} 0.40 mg/L CrO_4^{2-}	1.8–2.2 mg/L 0.36–0.44 mg/L	15	**925 24**
COD 60	0-22 0-27 0-93	COD 60 COD 40 TOC 25	30 mg/L O_2 12 mg/L C	26–34 mg/L 10.0–14.0 mg/L	15	**925 22**
COD 160	0-26 0-33 0-94	COD 160 COD 300 TOC 60	100 mg/L O_2 40 mg/L C	90–110 mg/L 35–45 mg/L	15	**925 26**
COD 1500	0-29 0-30 0-99	COD 1500 COD 600 TOC 600	400 mg/L O_2 160 mg/L C	360–440 mg/L 140–180 mg/L	15	**925 29**
COD 15000	0-23 0-28	COD 10000 COD 15000	4.00 g/L O_2 4.0 g/L O_2	3.60–4.40 g/L 3.6–4.4 g/L	30 150	**925 28**
Nitrite	1-67 0-68 0-69	Nitrite Nitrite 2 Nitrite 4	0.060 mg/L NO_2-N 0.30 mg/L NO_2-N 2.1 mg/L NO_2-N	0.054–0.066 mg/L 0.25–0.35 mg/L 1.9–2.3 mg/L	15	**925 68**
ortho-Phosphate	0-76 1-77	ortho and total Phosphate 1 ortho Phosphate 1	1.00 mg/L PO_4-P 0.20 mg/L PO_4-P	0.90–1.10 mg/L 0.18–0.22 mg/L	15	**925 76**
Sulfite	0-90	Sulfite 100	50 mg/L SO_3^{2-}	45–55 mg/L	15	**925 90**
***NANOCONTROL* Multistandards**						
***NANOCONTROL* Multistandard Sewage outflow 1** incl. *NANOCONTROL* 100+ standard addition					12–120	**925 011**
Ammonium	0-04	Ammonium 10	3.0 mg/L NH_4-N	2.7–3.3 mg/L		
COD	0-26 0-33	COD 160 COD 300	114 mg/L O_2 114 mg/L O_2	103–125 mg/L 103–125 mg/L		
Nitrate	0-64 0-65	Nitrate 50 Nitrate 8	6.0 mg/L NO_3-N 6.00 mg/L NO_3-N	5.2–6.8 mg/L 5.20–6.80 mg/L		
total N	0-92	total Nitrogen TN_b 60	30 mg/L N	27–33 mg/L		
total P	0-81	ortho and total Phosphate 5	2.50 mg/L P	2.25–2.75 mg/L		
***NANOCONTROL* Multistandard Sewage outflow 2** incl. *NANOCONTROL* 100+ standard addition					12–120	**925 010**
Ammonium	0-03	Ammonium 3	1.50 mg/L NH_4-N	1.30–1.70 mg/L		
COD	0-27 0-22	COD 40 COD 60	30 mg/L O_2 30 mg/L O_2	26–34 mg/L 26–34 mg/L		
Nitrate	0-64 0-65 1-65	Nitrate 50 Nitrate 8 Nitrate	3.0 mg/L NO_3-N 3.00 mg/L NO_3-N 3.0 mg/L NO_3-N	2.6–3.4 mg/L 2.60–3.40 mg/L 2.6–3.4 mg/L		
total N	0-83	total Nitrogen TN_b 22	12.0 mg/L N	10.0–14.0 mg/L		
total P	0-76 0-81	ortho and total Phosphate 1 ortho and total Phosphate 5	1.00 mg/L P 1.00 mg/L P	0.90–1.10 mg/L 0.90–1.10 mg/L		
***NANOCONTROL* Multistandard Sewage inflow** incl. *NANOCONTROL* 100+ standard addition					30–300	**925 012**
Ammonium	0-05	Ammonium 50	25 mg/L NH_4-N	22–28 mg/L		
COD	0-12 0-29 0-30	COD 60000 COD 1500 COD 600	10.0 g/L COD 400 mg/L COD 400 mg/L COD	9.0–11.0 g/L 360–440 mg/L 360–440 mg/L		
Nitrate	0-64 0-66	Nitrate 50 Nitrate 250	15.0 mg/L NO_3-N 15 mg/L NO_3-N	13.5–16.5 mg/L 13–17 mg/L		
total N	0-88	total Nitrogen TN_b 220	75 mg/L N	67–83 mg/L		
total P	0-80	ortho and total Phosphate 15	8.00 mg/L P	7.20–8.80 mg/L		

Multistandards can also be used for checking reagents and photometers from other manufacturers.

The contents of one package of each multistandard are sufficient for at least 1 repeated test of each parameter indicated. If you only check one or a few parameters, then the number of individual determinations is increased.
Shelf life: 1 year or 6 weeks after opening

Parameter	NANOCOLOR® test		Concentration of the standard solution	Confidence interval	Number of tests	REF
NANOCONTROL Multistandard Seepage incl. *NANOCONTROL* 100+ standard addition					15–300	**925 013**
Ammonium	0-06 0-08	Ammonium 200 Ammonium 100	80 mg/L NH_4-N 40 mg/L NH_4-N	72–88 mg/L 36–44 mg/L		
COD	0-23 0-28	COD 10000 COD 15000	4.00 g/L COD 4.0 g/L COD	3.60–4.40 g/L 3.6–4.4 g/L		
Nitrate	0-66	Nitrate 250	30 mg/L NO_3-N	27–33 mg/L		
total P ortho P	0-55 0-79	ortho and total Phosphate 45 ortho and total Phosphate 50	25.0 mg/L P 25.0 mg/L PO_4-P	22.0–28.0 mg/L 22.0–28.0 mg/L		
NANOCONTROL Multistandard Metals 1 incl. *NANOCONTROL* 100+ standard addition					15–60	**925 015**
Cadmium	1-13 0-14	Cadmium Cadmium 2	0.10 mg/L Cd^{2+} 1.00 mg/L Cd^{2+}	0.08–0.12 mg/L 0.80–1.20 mg/L		
Chloride	0-19 0-21	Chloride 200 Chloride 50	80 mg/L Cl^- 20 mg/L Cl^-	70–90 mg/L 17–23 mg/L		
Chromium	0-24 0-24 1-25 1-25	Chromate 5 + total Chromium Chromate 5 + *NanOx* Metal Chromate + *NanOx* Metal Chromate + total Chromium	1.0 mg/L Cr 1.0 mg/L Cr 1.0 mg/L Cr 1.0 mg/L Cr	0.8–1.2 mg/L 0.8–1.2 mg/L 0.8–1.2 mg/L 0.8–1.2 mg/L		
Fluoride	0-40 1-42	Fluoride 2 Fluoride	1.0 mg/L F^- 1.00 mg/L F^-	0.8–1.2 mg/L 0.80–1.20 mg/L		
Iron	1-36 0-37	Iron Iron 3	0.10 mg/L Fe^{3+} 1.00 mg/L Fe^{3+}	0.08–0.12 mg/L 0.80–1.20 mg/L		
Sulfate	0-86	Sulfate 200	80 mg/L SO_4^{2-}	70–90 mg/L		
Zinc	1-95 0-96	Zinc Zinc 4	0.10 mg/L Zn^{2+} 1.00 mg/L Zn^{2+}	0.08–0.12 mg/L 0.80–1.20 mg/L		
NANOCONTROL Multistandard Metals 2 incl. *NANOCONTROL* 100+ standard addition					15	**925 016**
Copper	1-53 0-54	Copper Copper 7	0.60 mg/L Cu^{2+} 2.00 mg/L Cu^{2+}	0.50–0.70 mg/L 1.80–2.20 mg/L		
Lead	0-09 1-10	Lead 5 Lead	2.50 mg/L Pb^{2+} 0.25 mg/L Pb^{2+}	2.25–2.75 mg/L 0.22–0.28 mg/L		
Nickel	0-61 1-62	Nickel 7 Nickel	2.00 mg/L Ni^{2+} 0.60 mg/L Ni^{2+}	1.80–2.20 mg/L 0.50–0.70 mg/L		
Potassium	0-45	Potassium 50	20 mg/L K^+	18–22 mg/L		
NANOCONTROL Multistandard Drinking water incl. *NANOCONTROL* 100+ standard addition					15–30	**925 018**
Aluminum	1-02 0-98	Aluminum Aluminum 07	0.50 mg/L Al^{3+} 0.50 mg/L Al^{3+}	0.44–0.56 mg/L 0.44–0.56 mg/L		
Ammonium	1-05	Ammonium	0.20 mg/L NH_4-N	0.17–0.23 mg/L		
Chloride	1-20 0-21	Chloride Chloride 50	20 mg/L Cl^- 20 mg/L Cl^-	17–23 mg/L 17–23 mg/L		
Iron	1-36 0-37	Iron Iron 3	1.50 mg/L Fe^{3+} 1.50 mg/L Fe^{3+}	1.30–1.70 mg/L 1.30–1.70 mg/L		
Manganese	1-60 0-58	Manganese Manganese 10	1.50 mg/L Mn^{2+} 1.5 mg/L Mn^{2+}	1.30–1.70 mg/L 1.3–1.7 mg/L		
Sulfate	0-86	Sulfate 200	120 mg/L SO_4^{2-}	102–138 mg/L		

Multistandards can also be used for checking reagents and photometers from other manufacturers.

The contents of one package of each multistandard are sufficient for at least 1 repeated test of each parameter indicated. If you only check one or a few parameters, then the number of individual determinations is increased.
Shelf life: 1 year or 6 weeks after opening

Contents

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Luminometer BioFix® *Lumi-10* 152
Luminous bacteria BioFix® *Lumi* 153
BioFix® *Lumi* ATP 154

Microbiological tests

Nitrification inhibition tests

Does the biology in your sewage plant work properly?

During aerobic and anaerobic decomposition reactions nitrogen from nitrogen-containing organic substances is first converted to ammonium. The subsequent two-step microbial oxidation of ammonium to nitrate via nitrite is called nitrification. In soil as well as in water it is performed by nitrifying bacteria, a fact which is used for the purification of waste water in sewage plants. Nitrification is an important step during waste water purification in order to keep the concentration of ammonium ions in the effluents of the sewage plant as low as possible. Additionally, nitrification is prerequisite for the denitrification for complete nitrogen elimination, which is required for waste water treatment in many countries.

Proper nitrification and denitrification procedures are important for meeting governmental regulations concerning the nitrogen limits of a sewage plant. Nitrification is a very complex process which depends on many factors. Exceeding allowable limits may have drastic consequences on fees for waste water disposal.

Nitrificants or nitrifying bacteria belong to the group of gram-negative, chemolithotrophic, aerobic bacteria. One differentiates between the groups of ammonia oxidants and the group of nitrite oxidants. In the first step of the nitrification process the ammonia oxidants oxidize ammonium to nitrite in the presence of oxygen. In the second step the nitrite oxidants transform the nitrite to nitrate, again in the presence of oxygen.

Nitrifying bacteria are very sensitive to certain environmental influences. It is long known, that a number of substances can selectively inhibit nitrification. These substances can reach the sewage plant with the waste water from different sources and significantly, sometimes irreversibly, damage the population of nitrifying bacteria in the activated sludge.

Standard procedures for determination of the nitrification inhibition (e.g. DIN EN ISO 9509 – L38) are very time-consuming, and require lots of experience and work. For this reason it is seldom used in sewage plants, although knowledge about possible effects of sewage influx to the nitrifying bacteria of a sewage plant may help to maintain a proper cleaning process.

The solution for nitrification control

With BioFix® nitrification inhibition tests you can now easily determine the nitrification inhibition in waste waters of all kinds as well as nitrification inhibition by individual substances or substance mixtures.

Principle: amperometric measurement of the oxygen consumption

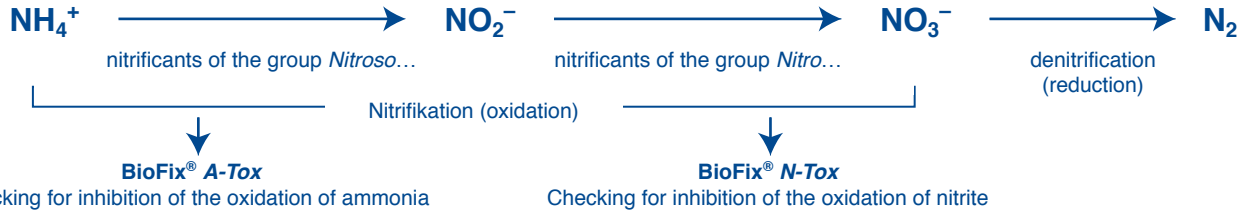
As biomass these tests use nitrifying microorganisms which are typical for sewage plants, preferably Nitrosomonas and Nitrobacter. The bacteral strains are applied as inoculum for the test preparation in defined composition – concerning the precise bacterial strain as well as their concentration – either as pure cultures or as mixed cultures.

Measurement of the metabolic activity of the test organisms is performed with an apparatus for oxygen determination using a commercial oxygen electrode. The result is obtained as % inhibition of the oxygen consumption of the sample solution compared to a non-inhibited control.

BioFix® nitrification inhibition tests allow the following investigations:

- BioFix® *A-Tox*: direct test, whether the first step of the nitrification, the oxidation of ammonium, is inhibited by sample components.
- BioFix® *N-Tox*: direct test, whether the second step of the nitrification, the oxidation of nitrite, is inhibited by sample components.
- Undifferentiated screening test A/*N-Tox* using both BioFix® tests (*A-Tox* and *N-Tox*) to determine, whether nitrification in general is inhibited by sample components.

Application of BioFix® nitrification inhibition tests



Please note: BioFix® *A-Tox* and *N-Tox* test kits require cooling during transport and storage!

BioFix® *A-Tox*/*N-Tox*

Advantages of BioFix® nitrification inhibition tests are:

- High sensitivity
- Very good reproducibility due to defined bacterial strains used in defined concentrations
- Easy procedure (by far less effort than for the DIN procedure)
- Speed (considerable time-saving: test time 10 min; 4 hours for the DIN test)
- Ready-to-use reagents
- Reagents and preserved bacteria have a shelf life of at least 1 year under the temperatures indicated for storage
- Easy disposal
- Ability to differentiate between inhibition of the different steps of nitrification (ammonium and/or nitrite oxidation)
- Preserved nitrificants for application in accordance with DIN EN ISO 9509-L38



Ordering information

Type	Field of application	Evaluation of the biological conversion of	Number of tests / pack of	REF
BioFix® *A-Tox*	1st step of nitrification	ammonium to nitrite	25	**970 001**
BioFix® *N-Tox*	2nd step of nitrification	nitrite to nitrate	25	**970 002**
Starter kit for BioFix® nitrification inhibition tests: 1 electrode adapter which holds the oxygen electrode, 3 x 2 seals for the electrode adapter, 2 mini-magnets for stirring, 1 micro syringe 100 µL, 1 filtration syringe 20 mL			1 Set	**970 101**
Preserved nitrificants for application in accordance with DIN EN ISO 9509 – L38				
Reagent BioFix® *A-Tox* R2, enriched nitrificants for oxidation of ammonia			10 x 2 mL	**970 903**
Reagent BioFix® *N-Tox* R2, enriched nitrificants for oxidation of nitrite			10 x 2 mL	**970 902**
Accessories				
CHROMAFIL® membrane filters, not sterilised, pore size 0.45 µm			50	**916 52**
Electrode adapter			1	**970 111**
Special adapter 12 mm for oxygen electrodes with membrane heads type WP3-ST			1	**970 116**
Seals for the electrode adapter			5 x 2	**970 112**
Reaction vessels			50	**970 113**
Magnetic stirring unit without heater			1	**970 115**
Mini-magnets for stirring			5	**970 114**

Luminous bacteria toxicity test systems

Luminometer BioFix® *Lumi-10*

BioFix® *Lumi-10* is a portable luminometer for the measurement of biological and chemical luminescence reactions with relatively constant light emission. As a mobile test system with a high sensitive detector the BioFix® *Lumi-10* is suitable for a wide range of applications:

- Environmental analysis/ecological toxicology: acute luminous bacteria tests
- Hygiene monitoring: ATP and biomass analysis
- Molecular biological and biochemical diagnostics: Reporter gene assays, NADP(H)-measurements, DNA probe assays, luminescence immunoassays



Modern and flexible

- Battery and mains operable
- High-resolution graphic display
- User language German or English
- Serial RS 232 interface for data transfer to a PC
- Variable measurement times in order to obtain optimum results even in case of weak luminescence

User-friendly

- Data memory for up to 2000 test results
- Selective data administration by means of the location identification digit, sample number, date, time parameters
- 6 individual programme places for user-defined measuring programmes
- Classification of test results by means of previously defined thresholds

Test methods and measurement protocol:

A maximum of 6 different measurement protocols can be issued with an own name and stored with the protocol types and measurement parameters (incubation time, measuring time, limit values, test method, etc.).

The user can distinguish between the following 3 procedures:

- BioTox-S Implementation of luminous bacteria toxicity tests only with the analysis of the final light intensity of the tests.
- BioTox-B Implementation of luminous bacteria toxicity tests with the analysis of initial and final light intensity.
- RLU Evaluation of luminescence tests (e.g. ATP tests, Reporter gene assays) with respect to relative light units (RLU).

Technical data

Detector:	Ultra Fast Single Photon Counter, Spectral wave range 380 – 630 nm
Display:	Illuminated graphic display (128 x 64 pixel)
Data storage:	max. 2000 measurements
Humidity:	10 % to 90 %, no condensation
Temperature range:	+15 °C to +30 °C
Software:	Microprocessor software, 6 userspecific measurement protocols can be stored
Interface:	RS 232 interface for data transfer to the PC or printer
Power supply:	3 rechargeable batteries: NiCd R14/C/Baby/UM2 batteries; 2500 mAh or with mains power supply: 230 V / 50 Hz, 115 V / 60 Hz
Dimensions:	170 x 150 x 280 mm (H x W x D)
Weight:	2 kg (incl. batteries)
Warranty:	2 years
CE	This device complies with the following directives: - 2006/95/EC - Low-Voltage Directive - 2004/108/EC - EMC Directive

Ordering information

Description	REF
BioFix® *Lumi-10*, for measuring BioFix® *Lumi* luminous bacteria toxicity tests, for ATP and biomass determinations, reportergen assays, DNA probe assays and other bioluminescence tests, with integrated software for variable evaluation	**940 008**
Accessories	
Absorbance color correction cuvettes (pack of 4) with 100 aspirators	**940 006**
Glass cuvettes, 50 x 12 mm, pack of 690	**916 912**
Rack for glass cuvettes 12 mm diameter, 5 x 10 positions	**945 013**
Manual BioFix® *Lumi-10*, German	**940 014**
Manual BioFix® *Lumi-10*, English	**940 014.en**
Mains adaptor	**940 009**

Luminous bacteria BioFix® *Lumi*

In contrast to chemical single parameter analysis, luminous bacteria tests are able to evaluate the toxicity of a sample. As an internationally standardised method (EN ISO 11348) it is one of the most important biological tests for toxicity analysis beside the also standardised fish-, daphnia- and algae-tests. For the performance of luminous bacteria tests a wide range of liquid- and freeze-dried products is available.

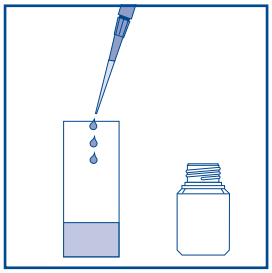
Luminous bacteria are used as test organisms because of their natural luminescence. In luminous bacteria tests, the marine bacterium Vibrio fischeri NRRL B-11177 is used, a halophile, facultative anaerobic, gram-negative rod with polar flagellum. Bioluminescence is a part of the metabolism of these bacteria. Toxic substances influence this sensitive metabolism and inhibit the bioluminescence.

The inhibition of the bacteria's bioluminescence is determined in a static test by mixing a defined amount of a sample with a luminous bacteria suspension in a cuvette. Subsequently, the inhibition of the luminescence in the sample is determined in comparison to an uninhibited control solution.

The evaluation of the toxicity analysis is performed with the BioFix® *Lumi-10*, a universal luminometer, which is suitable for portable use.

The BioFix® *Lumi* allows an easy and rapid toxicity control of environmental samples and offers significant advantages

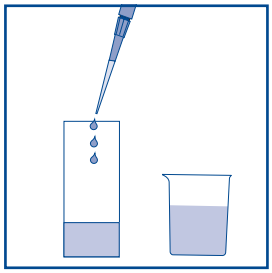
- Liquid and freeze dried luminous bacteria are available
- Reliable and safe measurement results without high efforts
- Trouble-free disposal
- Suitable for ground-, surface-, seepage- and waste water
- Determination of gene toxic substances



Sample preparation and reactivation of the bacteria



Measure initial light intensity



Add your sample and wait the indicated time



Measure final light intensity

The pictograms are just an example for a general procedure for Bio Tox-B tests.

Ordering information

Description	REF
BioFix® *Lumi* luminous bacteria, freeze-dried, in accordance with DIN EN ISO 11348-3*	
All freeze-dried products are ready-to-use with a shelf life of at least 24 months after production when stored at –20 ± 2 °C. They are shipped in special cooling packages. All freeze-dried BioFix® *Lumi* luminous bacteria are supplied with a certificate of quality in accordance with DIN EN ISO 11348-3.	
20 tubes (1 mL), sufficient for up to 2000 toxicity tests, with reconstitution solution	**945 002**
10 tubes (1 mL), sufficient for up to 1000 toxicity tests, with reconstitution solution	**945 003**
20 tubes, sufficient for up to 400 toxicity tests, with medium for freeze-dried luminescent bacteria	**945 006**
10 tubes, sufficient for up to 200 toxicity tests, with medium for freeze-dried luminescent bacteria	**945 007**
BioFix® *Lumi* „Multi-Shot" luminous bacteria, 10 tubes for up to 100 toxicity tests, with reactivation and control solution	**945 022**
BioFix® *Lumi* „Single-Shot" luminous bacteria, 20 tubes for 40 toxicity tests, including the corresponding "Single-Shot" reactivation and control solution and 20 glass tubes (50 x 12 mm)	**945 021**
BioFix® *Lumi* luminous bacteria, liquid-dried, in accordance with DIN EN ISO 11348-2*	
All liquid-dried products are ready-to-use with a shelf life of at least 24 months after production when stored at –20 ± 2 °C. They are shipped in special cooling packages. All liquid-dried BioFix® *Lumi* luminous bacteria are supplied with corresponding reactivation solution, sodium chloride standard solution and a certificate of quality in accordance with DIN EN ISO 11348-2.	
10 tubes, sufficient for up to 200 toxicity tests	**945 023**
20 tubes, sufficient for up to 400 toxicity tests	**945 024**
10 tubes, sufficient for up to 100 toxicity tests	**945 025**
BioFix® *Lumi* auxiliary reagents	
BioFix® *Lumi* diluent, 1 L	**945 601**
BioFix® *Lumi* osmotic pressure adjusting solution, 1 x 50 mL	**945 602**
BioFix® *Lumi* reconstitution solution for REF 945 002 and 945 003, 1 L	**945 603**
BioFix® *Lumi* diluent for solid phase test, 1L	**945 604**
BioFix® *Lumi* medium for freeze-dried luminous bacteria in accordance to DIN EN ISO 11348-3, 1 L	**945 608**
*All freeze/liquid-dried BioFix® *Lumi-10* luminous bacteria are also suited for luminometers of other manufacturers (e.g. LUMIStox, LUMISmini of Dr. Lange, Germany)	

Microbiological tests

Luminous bacteria toxicity test systems

BioFix® *Lumi* ATP

With the BioFix® *Lumi* ATP tests and the luminometer BioFix® *Lumi-10* MACHEREY-NAGEL offers a complete system for professional hygienic control of surfaces and liquid samples.

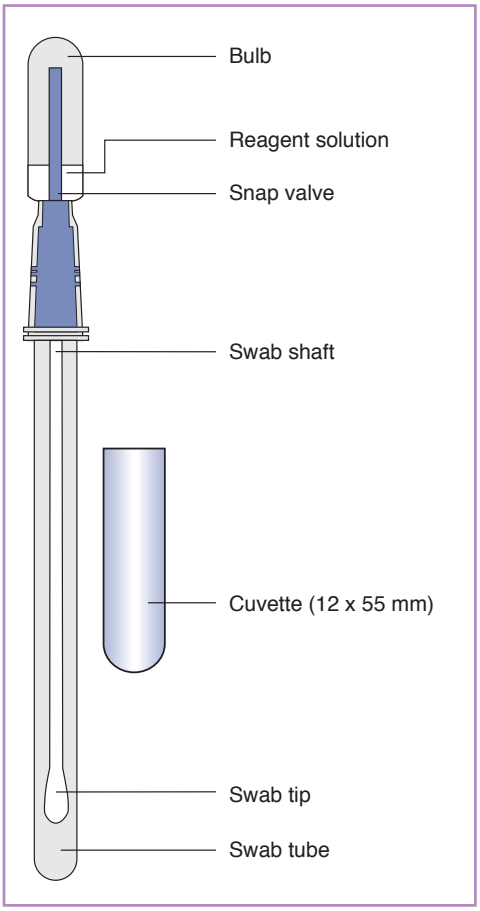
Because of their high sensitivity and extreme easy handling, they are particularly suitable for hygiene monitoring within the scope of HACCP (Hazard Analysis and Critical Control Point) and IFS (International Food Standard) concepts.

Furthermore cleaning processes can be controlled and optimized via the determination of adenosine triphosphate.

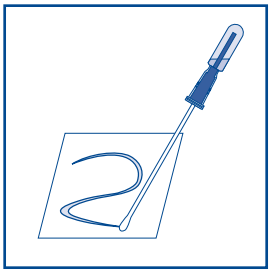
Milk, meat, fish, sausage, preserves, frozen foods, beverages etc: the production of food makes high demands on hygienic conditions. Each contamination leads to a loss of quality of the product or to a loss of time within the production. With the rapid determination of ATP, hygienic impurities on surfaces can easily be detected.

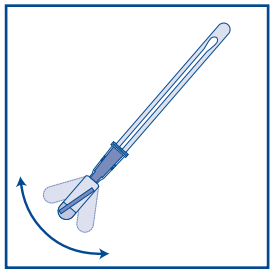
Impurities in boiler and cooling water circulations and other liquid samples can be monitored with BioFix® *Lumi* ATP for liquid samples.

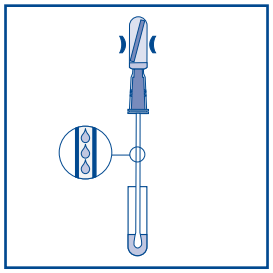
In addition, with the luminometer BioFix® *Lumi-10* the user can create individual measurement reports and define cut-offvalues for an optimal adaption to the requirements of the respective companies.



Procedure for hygiene monitoring of surfaces

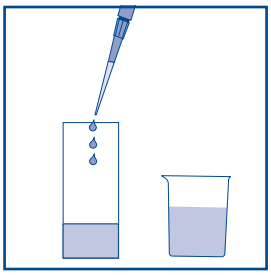

Sampling

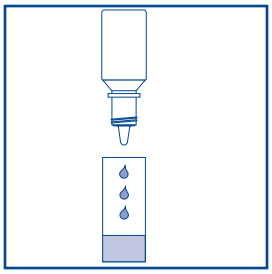

Test activation

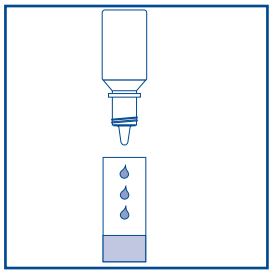

Reaction


Measurement

Procedure for hygiene monitoring in liquid samples


Sampling


Extraction


Reaction


Measurement

Ordering information

Type	Description	REF
Test kits for hygiene monitoring of surfaces with the luminometer BioFix® *Lumi-10* Content of these test kits: BioFix®ATP pens, disposable cuvettes 12 x 55 mm, instruction leaflet		
BioFix® *Lumi* ATP	Rapid test for 25 determinations	**946 001**
BioFix® *Lumi* ATP	Rapid test for 50 determinations	**946 002**
Test kits for hygiene monitoring of surfaces with the luminometer HY-LiTE® of Merck Content of these test kits: BioFix®ATP pens, disposable cuvettes 12 x 55 mm, instruction leaflet		
BioFix® *Lumi* ATP	Rapid test for 25 determinations	**946 011**
BioFix® *Lumi* ATP	Rapid test for 50 determinations	**946 012**
Test kits for monitoring of hygienic impurities and biological contaminations in liquid samples Content of this test kit: BioFix® *Lumi* ATP extraction reagent and bioluminescent reagent, disposable cuvettes 12 x 55 mm, instruction leaflet		
BioFix® *Lumi* ATP	Rapid test for 100 determinations	**946 006**

Special instructions

For special analytical tasks, often with special sample matrices which require a specific sample preparation, our R & D department continually develops special instructions. A selection of frequently requested procedures is listed in the following table.

Parameter	Contents of the special instruction
Alcohol	Analysis of alcohol in canned whipped cream with the tube test *NANOCOLOR*® Ethanol
Cadmium	Supplementary purification for test 1-13 Cadmium – removal of interfering colors for cadmium determination
Calcium	Determination of calcium and magnesium in soil with *VISOCOLOR*®
Calcium	Precipitation of high calcium concentrations prior to the determination of metals
Carbonic acid	Determination of lime dissolving carbonic acid with *VISOCOLOR*®
Chloride	Determination of chloride in concrete with *VISOCOLOR*®
Chlorophyll	Determination of chlorophyll in natural waters with the *NANOCOLOR*® photometers
Chromate	Determination of water-soluble chromium(VI) in cement with *NANOCOLOR*® or *VISOCOLOR*®
Color of electroplating baths	Checking the color of electroplating baths with MACHEREY-NAGEL photometers; determination of the contents of chromium(VI), copper and nickel
Construction materials	Analysis of construction materials with *NANOCOLOR*®
Cooling lubricants	Determination of cooling lubricants with *VISOCOLOR*® Alkalinität AL 7
Cyanide	Determination of cyanides in stone fruit spirits with *VISOCOLOR*®
Cyanide	Determination of total cyanide and easily released cyanide
Dithionite	Determination of dithionite (hydrosulphite) with *VISOCOLOR*®
Electroplating baths, color	Checking the color of electroplating baths with MACHEREY-NAGEL photometers; determination of the contents of chromium(VI), copper and nickel
Hardness	Determination of total hardness in the presence of copper
Hydrosulfite	Determination of dithionite (hydrosulphite) with *VISOCOLOR*®
Iron	Determination of iron in hydrochloric acid
Lipophilic substances, non volatile	Determination of non volatile lipophilic substances with test 0-57 *NANOCOLOR*® HC 300
Magnesium	Determination of calcium and magnesium in soil with *VISOCOLOR*®
Phosphate	Determination of phosphate in the presence of larger concentrations of silica acid with the tube test *NANOCOLOR*® Phosphate 15
Phosphonate	Determination of phosphonates with *NANOCOLOR*® *NanOx* Metal and *VISOCOLOR*® *ECO* Phosphate
Sodium	Determination of sodium with *VISOCOLOR*®
Standard tests	Simplification of *NANOCOLOR*® standard test procedures for tests 1-36, 1-48, 1-53, 1-60, 1-62, 1-67 and 1-78
TNT	Photometric determination of TNT in water
Toxicity	Color correction within the luminous bacteria test with the luminometer BioFix® Lumi-10 – 4 cuvette method using adsorption-correction-cuvettes (in addition we supply an EXCEL program for value computation)
Zinc	Determination of zinc in the presence of manganese, iron and calcium with *NANOCOLOR*® tests 1-95 and 0-96

Alphabetical list of parameters and subject index

Parameter / Subject	Recommended MN product*	Range	REF	Page
A				
Acetic acid	*NANOCOLOR*® Organic acids 3000	30–3000 mg/L CH_3COOH / 0.5–50.0 mmol/L CH_3COOH	985 050	109, 125
Acid binding capacity	*VISOCOLOR*® *ECO* Alkalinity TA	0.10–5.00 mmol/L H^+	931 204	56, 58
	VISOCOLOR® *HE* Alkalinity AL 7	0.2–7.2 mmol/L OH^-	915 007	56, 58
Acid consumption	*VISOCOLOR*® *ECO* Alkalinity TA	0.10–5.00 mmol/L H^+	931 204	56, 58
	VISOCOLOR® *HE* Alkalinity AL 7	0.2–7.2 mmol/L OH^-	915 007	56, 58
Acidity of water	*VISOCOLOR*® *HE* Acidity AC 7	0.2–7.0 mmol/L H^+	915 006	56, 58
Active oxygen	QUANTOFIX® Active oxygen	4-25 mg/L KMPS	913 49	22, 23
Adsorbable organically bounded halogens	*NANOCOLOR*® AOX 3	0.01–3.0 mg/L AOX	985 007	108, 113, 139
Alcohol	*NANOCOLOR*® Ethanol 1000	0.10–1.00 g/L EtOH / 0.013–0.130 Vol. % EtOH	985 838	108, 119
	NANOCOLOR® Methanol 15	0.2–15.0 mg/L MeOH	985 859	109, 123
Alkaline phosphatase in milk	Phosphatesmo MI	qualitative	906 12	39, 44
Alkalinity of cooling lubricants	QUANTOFIX® LubriCheck	15–200 mmol/L KOH	913 36	22, 27
Alkalinity of water (p/m)	QUANTOFIX® Carbonate hardness	3.75–25.00 °e	913 23	22, 24
	VISOCOLOR® *alpha* Carbonate hardness	1.3–12.5 °e and higher 1 drop = 1.3 °e	935 016	56, 60
	VISOCOLOR® *ECO* Carbonate hardness	1.3–12.5 °e and higher 1 drop = 1.3 °e	931 014	56, 60
	VISOCOLOR® *HE* Carbonate hardness C 20	0.63–25.00 °e / 0.2–7.2 mmol/L H^+	915 003	56, 60
	NANOCOLOR® Carbonate hardness 15	1.25–18.75 °e / 0.4–5.4 mmol/L H^+	985 015	108, 114
Alkalinity of water (total)	*VISOCOLOR*® *ECO* Alkalinity TA	0.10–5.00 mmol/L H^+	931 204	56, 58
	VISOCOLOR® *HE* Alkalinity AL 7	0.2–7.2 mmol/L OH^-	915 007	56, 58
Aluminum	Aluminum test paper	qualitative, > 10 mg/L Al^{3+}	907 21	39, 40
	QUANTOFIX® Aluminum	5–500 mg/L Al^{3+}	913 07	22, 23
	VISOCOLOR® *ECO* Aluminum	0.10–0.50 mg/L Al^{3+}	931 006	56, 59
	NANOCOLOR® Aluminum 07	0.02–0.70 mg/L Al^{3+}	985 098	108, 112
	NANOCOLOR® Aluminum	0.01–1.00 mg/L Al^{3+}	918 02	110, 112
Amidosulphuric acid	elimination of nitrite interferences		918 973	123, 124
Ammonia, Ammonium	Ammonium test paper	qualitative, > 10 mg/L NH_4^+	907 22	39, 40
	Ammonia test	0.5–6 mg/L NH_4^+	907 14	34
	QUANTOFIX® Ammonium	10–400 mg/L NH_4^+	913 15	22, 23, 33
	VISOCOLOR® *ECO* Ammonium 15	0.5–15 mg/L NH_4^+	931 010	56, 59
	VISOCOLOR® *alpha* Ammonium	0.2–3 mg/L NH_4^+	935 012	56, 59
	VISOCOLOR® *ECO* Ammonium 3	0.2–3 mg/L NH_4^+	931 008	56, 59
	VISOCOLOR® *HE* Ammonium	0.02–0.50 mg/L NH_4^+	920 006	56, 59
	NANOCOLOR® Ammonium 200	30–160 mg/L NH_4-N	985 006	108, 112
	NANOCOLOR® Ammonium 100	4–80 mg/L NH_4-N	985 008	108, 112
	NANOCOLOR® Ammonium 50	1–40 mg/L NH_4-N	985 005	108, 112
	NANOCOLOR® Ammonium 10	0.2–8.0 mg/L NH_4-N	985 004	108, 112
	NANOCOLOR® Ammonium 3	0.04–2.30 mg/L NH_4-N	985 003	108, 112
	NANOCOLOR® Ammonium	0.01–2.0 mg/L NH_4-N	918 05	110, 112
Ammonia oxidation, inhibition	BioFix® nitrification inhibition *A-Tox*	0–100 % inhibition	970 001	150, 151
Analytical accessories	for the *NANOCOLOR*® system			142–143
Analytical quality control	*NANOCONTROL* NANOCHECK, NANOTURB, Standards			144–147
*Recommended MN Products are arranged by increasing sensitivity.				

Parameter / Subject	Recommended MN product*	Range	REF	Page
Anionic surfactants	*NANOCOLOR*® Anionic surfactants 4	0.20–4.00 mg/L MBAS	985 032	109, 130
	NANOCOLOR® Detergents anionic	0.02–5.0 mg/L MBAS	918 32	111, 130
Antimony	Antimony test paper	qualitative, > 5 mg/L Sb^{3+}	907 23	39, 40
AOX	*NANOCOLOR*® AOX 3	0.01–3.0 mg/L AOX	985 007	108, 113, 139
Aquarium water	QUANTOFIX® Multistick for aquarium owners	Total hardness 6.3–31.3 °e; Carbonate hardness 3.8–25.0 °e; pH 6.4–8.4	913 26, 913 27	23, 31
	VISOCOLOR® *alpha*		935 …	
Arsenic, arsine	Arsenic test paper	qualitative, > 0.5 µg As	907 62	39, 40
	QUANTOFIX® Arsenic 50	0.05–3.0 mg/L $As^{3+/5+}$	913 32	22, 24
	QUANTOFIX® Arsenic 10	0.01–0.5 mg/L $As^{3+/5+}$	913 34	22, 23
	QUANTOFIX® Arsenic Sensitive	0.005–0.5 mg/L $As^{3+/5+}$	913 45	22, 24
Ascorbic acid	QUANTOFIX® Ascorbic acid	50–2000 mg/L vitamin C	913 14	22, 24, 33
ATP test	BioFix® Lumi ATP	154–155		
B				
Biochemical oxygen demand	*NANOCOLOR*® BOD_5	2–3000 mg/L O_2	985 822	108, 113, 140
	NANOCOLOR® BOD_5-TT (simplified tube test)	0.5–3000 mg/L O_2	985 825	108, 113, 140
BioFix®	Rapid tests for hygienic monitoring			150–155
BioFix® Lumi	Luminous bacteria toxicity test systems BioFix® Lumi			152–155
Bioluminescence	Luminous bacteria toxicity test systems BioFix® Lumi			152–155
Biotoxicity	Luminous bacteria toxicity test systems BioFix® Lumi			152–155
Bismuth	Bismuth test paper	qualitative, > 60 mg/L Bi^{3+}	907 33	39, 40
Blood traces	Peroxtesmo KM	qualitative	906 05	39, 43
BOD_5	*NANOCOLOR*® BOD_5	2–3000 mg/L O_2	985 822	108, 113, 140
	NANOCOLOR® BOD_5-TT (tube test)	0.5–3000 mg/L O_2	985 825	108, 113, 140
Borates, boric acid	Tumeric paper	qualitative, > 20 mg/L B	907 47	39, 46
Bromide, Chloride	Saltesmo	0.45–8.8 g/L NaBr	906 08	34, 37
Bromine	*VISOCOLOR*® *ECO* Bromine	0.10–13.00 mg/L Br_2	931 211	56, 59
	with *NANOCOLOR*® Chlorine tests			113
C				
Cadmium	*NANOCOLOR*® Cadmium 2	0.05–2.00 mg/L Cd^{2+}	985 014	108, 114
	NANOCOLOR® Cadmium	0.002–0.50 mg/L Cd^{2+}	918 13, 918 131	111, 114
Calcium	QUANTOFIX® Calcium	10–100 mg/L Ca^{2+}	913 24	22, 24
	VISOCOLOR® *ECO* Calcium	5–50 mg/L Ca^{2+} and higher 1 drop = 5 mg/L Ca^{2+}	931 012	56, 60
	VISOCOLOR® *HE* Calcium CA 20	0.6–25.0 °e / 0.1–3.6 mmol/L Ca^{2+}	915 010	56, 60
	NANOCOLOR® Hardness Ca / Mg	10–100 mg/L Ca^{2+}	985 044	108, 120
	NANOCOLOR® Hardness 20	10–100 mg/L Ca^{2+}	985 043	108, 120

*Recommended MN Products are arranged by increasing sensitivity.

Alphabetical list of parameters and subject index

Parameter / Subject	Recommended MN product*	Range	REF	Page
Carbonate hardness of water	QUANTOFIX® Carbonate hardness	3.75–25.00 °e	913 23	22, 24
	VISOCOLOR® alpha Carbonate hardness	1.3–12.5 °e and higher 1 drop = 1.3 °e	935 016	56, 60
	VISOCOLOR® ECO Carbonate hardness	1.3–12.5 °e and higher 1 drop = 1 °e	931 014	56, 60
	VISOCOLOR® HE Carbonate hardness C 20	0.63–25.00 °e / 0.2–7.2 mmol/L H^+	915 003	56, 60
	NANOCOLOR® Carbonate hardness 15	1.25–18.75 °e / 0.4–5.4 mmol/L H^+	985 015	108, 114
Carbonic acid	*VISOCOLOR® HE* Acidity AC 7	0.2–7.0 mmol/L H^+	915 006	56, 58
Cationic surfactants	*NANOCOLOR®* Cationic surfactants 4	0.20–4.00 mg/L CTAB	985 034	109, 130
	NANOCOLOR® Detergents, cationic	0.05–5.0 mg/L CTAB	918 34	111, 130
Certificate				6
Chemical oxygen demand	*NANOCOLOR®* COD 60000	5.0–60.0 g/L O_2	985 012	108, 117
	NANOCOLOR® COD 15000	1.0–15.0 g/L O_2	985 028	108, 117
	NANOCOLOR® COD 10000	1.00–10.00 g/L O_2	985 023	108, 117
	NANOCOLOR® COD 4000	400–4000 mg/L O_2	985 011	108, 117
	NANOCOLOR® COD 1500	100–1500 mg/L O_2	985 029	108, 117
	NANOCOLOR® COD 600	50–600 mg/L O_2	985 030	108, 117
	NANOCOLOR® COD 300	50–300 mg/L O_2	985 033	108, 117
	NANOCOLOR® COD 160	15–160 mg/L O_2	985 026	108, 116
	NANOCOLOR® COD 160 Hg-free	15–160 mg/L O_2	963 026	108, 116
	NANOCOLOR® COD 60	5–60 mg/L O_2	985 022	108, 116
	NANOCOLOR® COD 40	2–40 mg/L O_2	985 027	108, 116
Chloride	Saltesmo	0.25–5 g/L NaCl	906 08	34, 37
	QUANTOFIX® Chloride	500–≥3000 mg/L Cl^-	913 21	22, 25
	VISOCOLOR® HE Chloride CL 500	5–500 mg/L Cl^-	915 004	56, 61
	VISOCOLOR® ECO Chloride	1–60 mg/L Cl^-	931 018	56, 60
	NANOCOLOR® Chloride 200	5–200 mg/L Cl^-	985 019	108, 114
	NANOCOLOR® Chloride 50	0.5–50.0 mg/L Cl^-	985 021	108, 114
	NANOCOLOR® Chloride	0.2–125 mg/L Cl^-	918 20	110, 114
Chloride complexing agents	elimination of interfering chloride during COD measurement		918 911	117, 133
Chloride elimination, cartridges	elimination of interfering chloride during COD and nitrate measurements		918 911	117, 133

*Recommended MN Products are arranged by increasing sensitivity.

Alphabetical list of parameters and subject index

Parameter / Subject	Recommended MN product*	Range	REF	Page
Chlorine	Chlortesmo	qualitative, > 1 mg/L chlorine	906 03	39, 40
	Chlorine test	10–200 mg/L Cl_2	907 09	34, 36
	QUANTOFIX® Chlorine	1–100 mg/L Cl_2	913 17	22, 25
	QUANTOFIX® Chlorine Sensitive	0.1–10 mg/L Cl_2	913 39	22, 25, 33
	VISOCOLOR® alpha Chlorine	0.25–2.0 mg/L Cl_2	935 019	56, 61
	VISOCOLOR® ECO Chlorine 1, free and total	0.1–2.0 mg/L Cl_2	931 035	56, 61
	VISOCOLOR® ECO Chlorine 2, free and total	0.1–2.0 mg/L Cl_2	931 015	56, 61
	VISOCOLOR® ECO free Chlorine 2	0.1–2.0 mg/L Cl_2	931 016	56, 61
	VISOCOLOR® ECO Chlorine 6, free and total	0.05–6.00 mg/L Cl_2	931 217	56, 62
	VISOCOLOR® ECO free Chlorine 6	0.05–6.00 mg/L Cl_2	931 219	56, 62
	VISOCOLOR® HE Chlorine	0.02–0.60 mg/L Cl_2	920 015	56, 62
	NANOCOLOR® Chlorine / Ozone 2	0.05–2.50 mg/L Cl_2 / 0.05–2.00 mg/L O_3	985 017	108, 114
	NANOCOLOR® Chlorine	0.02–10.0 mg/L Cl_2	918 16	110, 114
	also see swimming pool parameters			
Chlorine dioxide	*VISOCOLOR®* Chlorine dioxide	< 0.2–3.8 mg/L ClO_2	931 021	56, 62
	NANOCOLOR® Chlorine dioxide 5	0.15–5.00 mg/L ClO_2	985 018	108, 115
	NANOCOLOR® Chlorine dioxide	0.04–4.00 mg/L ClO_2	918 163	110, 115
Chlorite	*NANOCOLOR®* Chlorine dioxide	0.04–4.00 mg/L ClO_2	918 163	110, 115
Chromate / Chromium(VI)	Chromium test paper	qualitative, > 5 mg/L CrO_4^{2-}	907 24	39, 41
	QUANTOFIX® Chromate	3–100 mg/L CrO_4^{2-}	913 01	22, 25
	VISOCOLOR® ECO Chromium(VI)	0.02–0.50 mg/L Cr(VI)	931 020	56, 62
	NANOCOLOR® Chromate 5	0.01–4.0 mg/L CrO_4^{2-}	985 024	108, 115
	NANOCOLOR® Chromate	0.01–6.0 mg/L CrO_4^{2-}	918 25	110, 115
	NANOCOLOR Chromium total 2	0.005–2,00 mg/L CrO_4^{2-}	985 059	108, 115
Chromium, total	*NANOCOLOR* Chromium total 2	0.005–2,00 mg/L CrO_4^{2-}	985 059	108, 115
	With *NANOCOLOR®* Chromate tests and *NanOx* Metal		–	115, 137
Clarification precipitation	*NANOCOLOR®* Reagents for sample preparation		918 937	125, 133
Cobalt	Cobalt test paper (qualitative)	> 25 mg/L Co^{2+} / 0.5 % Co	907 28	39, 41
	QUANTOFIX® Cobalt	10–1000 mg/L Co^{2+}	913 03	22, 25
	NANOCOLOR® Cobalt	0.002–0.70 mg/L Co^{2+}	918 51	110, 115
COD	*NANOCOLOR®* COD 60000	5.0–60.0 g/L O_2	985 012	108, 117
	NANOCOLOR® COD 15000	1.0–15.0 g/L O_2	985 028	108, 117
	NANOCOLOR® COD 10000	1.00–10.00 g/L O_2	985 023	108, 117
	NANOCOLOR® COD 4000	400–4000 mg/L O_2	985 011	108, 117
	NANOCOLOR® COD 1500	100–1500 mg/L O_2	985 029	108, 117
	NANOCOLOR® COD 600	50–600 mg/L O_2	985 030	108, 117
	NANOCOLOR® COD 300	50–300 mg/L O_2	985 033	108, 117
	NANOCOLOR® COD 160	15–160 mg/L O_2	985 026	108, 116
	NANOCOLOR® COD 160 Hg-free	15–160 mg/L O_2	963 026	108, 116
	NANOCOLOR® COD 60	5–60 mg/L O_2	985 022	108, 116
	NANOCOLOR® COD 40	2–40 mg/L O_2	985 027	108, 116
COD-free water	for control measurements and dilution		918 993	117, 133
Color of water	*NANOCOLOR®* Color	5 –500 mg/L Pt / 0.2–20.0 $^1/_m$		110, 118

*Recommended MN Products are arranged by increasing sensitivity.

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Complexing agents	QUANTOFIX® EDTA	100–400 mg/L EDTA	913 35	22, 26
	NANOCOLOR® Complexing agents 10	0.5–10.0 mg/L IBic	985 052	108, 118
Cooling lubricants, concentration	QUANTOFIX® LubriCheck	15-200 mmol/L KOH	913 36	22, 27
Cooling lubricants, nitrite content	QUANTOFIX® Nitrate/Nitrite	10–500 mg/L NO_3^-, 1–80 mg/L NO_2^-	913 13	22, 28, 33
	QUANTOFIX® Nitrite	1–80 mg/L NO_2^-	913 11	22, 28, 33
	QUANTOFIX® Nitrite/pH	1–80 mg/L NO_2^- ; pH 6.0–9.6	913 38	22, 28
	NANOCOLOR® Nitrite 2	0.02–1.50 mg/L NO_2^-	985 068	109, 124
	NANOCOLOR® Nitrite	0.005–1.0 mg/L NO_2^-	918 67	110, 124
Copper	Copper test paper	qualitative, > 20 mg/L Cu^{2+}	907 29	39, 41
	Cuprotesmo	qualitative, > 0.05 µg Cu	906 01	39, 41
	QUANTOFIX® Copper	10–300 mg/L $Cu^{+/2+}$	913 04	22, 25
	VISOCOLOR® *ECO* Copper	0.1–1.5 mg/L Cu^{2+}	931 037	56, 63
	VISOCOLOR® *HE* Copper	0.04–0.50 mg/L Cu^{2+}	920 050	56, 63
	NANOCOLOR® Copper 7	0.10–7.00 mg/L Cu^{2+}	985 054	108, 118
	NANOCOLOR® Copper	0.01–10.0 mg/L Cu^{2+}	918 53	110, 118
CSB	Kompaktphotometer PF-3 COD	im Analysenkoffer	919 212	75
Cyanide	Cyantesmo	qualitative, > 0.2 mg/L HCN	906 04	39, 41
	QUANTOFIX® Cyanide	1–30 mg/L CN^-	913 18	22, 26
	VISOCOLOR® *ECO* Cyanide	0.01–0.20 mg/L CN^-	931 022	56, 63
	VISOCOLOR® *HE* Cyanide	0.002–0.04 mg/L CN^-	920 028	56, 63
	NANOCOLOR® Cyanide 08	0.005–0.80 mg/L CN^-	985 031	108, 119
	NANOCOLOR® Cyanide	0.001–0.50 mg/L CN^-	918 30	110, 119
Cyanuric acid	Cyanuric acid test	50–300 mg/L Cya	907 10	34, 38
	VISOCOLOR® *ECO* Cyanuric acid	10–100 mg/L Cya	931 023	56, 64
D				
DEHA (Diethylhydroxylamine)	*VISOCOLOR*® *ECO* DEHA	0.01–0.30 mg/L DEHA	931 024	56, 64
	NANOCOLOR® DEHA 1	0.05–1.00 mg/L DEHA	985 035	108, 119
Dehydrogenase activity	*NANOCOLOR*® TTC 150	5–150 µg TPF	985 890	109, 132
Detergents, anionic	*NANOCOLOR*® Anionic surfactants 4	0.20–4.00 mg/L MBAS	985 032	109, 130
	NANOCOLOR® Detergents anionic	0.02–5.0 mg/L MBAS	918 32	111, 130
Detergents, cationic	*NANOCOLOR*® Cationic surfactatnts 4	0.20–4.00 mg/L CTAB	985 034	109, 130
	NANOCOLOR® Detergents, cationic	0.05–5.0 mg/L CTAB	918 34	111, 130
Detergents, nonionic	*NANOCOLOR*® Nonionic surfactants 15	0.3–15.0 mg/L Triton® X-100	985 047	109, 131
Diethylhydroxylamine (DEHA)	*VISOCOLOR*® *ECO* DEHA	0.01–0.30 mg/L DEHA	931 024	56, 64
	NANOCOLOR® DEHA 1	0.05–1.00 mg/L DEHA	985 035	108, 119
Digestion				135
Disinfectants (QUATS)	INDIQUAT indicator papers	semi-quantitative	909 000–909 002	34, 36
	QUANTOFIX® QUAT	10–1000 mg/L benzalkonium chloride	913 37	22, 30
Distilled water	for dilution		918 932	133
Dithionite	special instruction with *VISOCOLOR*® *HE* Sulfite SU 100		71	
E				
EDTA	QUANTOFIX® EDTA	100–400 mg/L EDTA	913 35	22, 26
*Recommended MN Products are arranged by increasing sensitivity.				

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Ethanol	*NANOCOLOR*® Ethanol 1000	0.10–1.00 g/L EtOH / 0.013–0.130 Vol. % EtOH	985 838	108, 119
Extraction methods	for *NANOCOLOR*® standard tests			111
F				
Fatty acids	*NANOCOLOR*® Organic acids 3000	30–3000 mg/L CH_3COOH 0.5–50.0 mmol/L CH_3COOH	985 050	108, 125
Filters	for removal of turbidities and undissolved substances		916 …	142
Fluoride, hydrogen fluoride	Fluoride test paper	qualitative, >20 mg/L F^-	907 50	39, 42
	Fluoride test	2–100 mg/L F^-	907 34	34, 36
	VISOCOLOR® *ECO* Fluoride	0.1–2.0 mg/L F^-	931 227	56, 64
	NANOCOLOR® Fluoride 2	0.1–2.0 mg/L F^-	985 040	108, 119
	NANOCOLOR® Fluoride	0.05–2.00 mg/L F^-	918 142	110, 119
Formaldehyde	QUANTOFIX® Formaldehyde	10–200 mg/L HCHO	913 28	22, 26, 33
	NANOCOLOR® Formaldehyde 10	0.02–10.00 mg/L HCHO	985 046	108, 120
	NANOCOLOR® Formaldehyde 8	0.1–8.0 mg/L HCHO	985 041	108, 120
G				
Glucose	QUANTOFIX® Glucose	50–2000 mg/L glucose	913 48	22, 26, 33
Glutaraldehyde	QUANTOFIX® Glutaraldehyde	0.5–2.5 % glutaraldehyde	913 43	22, 26
H				
H_2O_2	QUANTOFIX® Peroxide 1000	50–1000 mg/L H_2O_2	913 33	22, 29, 33
	QUANTOFIX® Peroxide 100	1–100 mg/L H_2O_2	913 12	22, 29, 33
	QUANTOFIX® Peroxide 25	0.5–25 mg/L H_2O_2	913 19	22, 29, 33
	NANOCOLOR® Peroxide 2	0.03–2.00 mg/L H_2O_2	985 871	109, 126
HACCP	BioFix® Lumi ATP		946 …	154–155
Hardness of water	AQUADUR® test strips	3.75–31.25 °e / 3.75–26.25 °e / 3.75–17.50 °e	912 01 / 912 20 / 912 39	34, 35
	AQUADUR® Sensitive	0–1.38 °e	912 10	35
	VISOCOLOR® *alpha* total Hardness	1 drop ≙ 1.25 °e ≙ 17.8 mg/L $CaCO_3$	935 042	56, 65
	VISOCOLOR® *ECO* total Hardness	1 drop ≙ 1.25 °e ≙ 17.8 mg/L $CaCO_3$	931 029	56, 65
	VISOCOLOR® *HE* total Hardness H 20 F	0.6–25.0 °e / 0.1–3.6 mmol/L Ca^{2+}	915 005	56, 65
	VISOCOLOR® *HE* total Hardness H 2	0.06–2.50 °e / 0.01–0.36 mmol/L Ca^{2+}	915 002	56, 65
	VISOCOLOR® *alpha* residual Hardness	0.05–0.38 °e	935 080	56, 65
	NANOCOLOR® Hardness Ca / Mg	1.25–25.0 °e	985 044	108, 120
	NANOCOLOR® Hardness 20	1.25–25.0 °e	985 043	108, 120
	NANOCOLOR® residual Hardness 1	0.03–1.25 °e	985 084	109, 120
Heating blocks	*NANOCOLOR*® *VARIO 4*, *VARIO C2*, *VARIO HC*		919 300, 919 350, 919350.1, 919 330	104–106
Heavy metals in sludge	*NANOCOLOR*® Sludge	decomposition with aqua regia	918 50	138
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Humidity, relative	Moisture indicator	20–80 % rel. humidity	908 01	34, 36
		8 % rel. humidity	908 901	34, 36
	Moisture indicator without cobalt chloride	8 % rel. humidity	908 903	34, 37
Hydrazine	*VISOCOLOR® ECO* Hydrazine	0.05–0.40 mg/L N_2H_4	931 030	56, 65
	NANOCOLOR® Hydrazine	0.002–1.50 mg/L N_2H_4	918 44	110, 121
Hydrocarbons	Oil test paper	qualitative	907 60	39, 43
	NANOCOLOR® HC 300	0.5–5.6 mg/L HC in water 30–300 mg/kg HC in soil	985 057	108, 121, 141
Hydrocyanic acid, cyanide	Cyantesmo	qualitative, >0.2 mg/L HCN	906 04	39, 41
	QUANTOFIX® Cyanide	1–30 mg/L CN^-	913 18	22, 26
	VISOCOLOR® ECO Cyanide	0.01–0.20 mg/L CN^-	931 022	56, 63
	VISOCOLOR® HE Cyanide	0.002–0.04 mg/L CN^-	920 028	56, 63
	NANOCOLOR® Cyanide 08	0.005–0.80 mg/L CN^-	985 031	108, 119
	NANOCOLOR® Cyanide	0.001–0.50 mg/L CN^-	918 30	110, 119
Hydrogen peroxide	QUANTOFIX® Peroxide 1000	50–1000 mg/L H_2O_2	913 33	22, 29, 33
	QUANTOFIX® Peroxide 100	1–100 mg/L H_2O_2	913 12	22, 29, 33
	QUANTOFIX® Peroxide 25	0.5–25 mg/L H_2O_2	913 19	22, 29, 33
	NANOCOLOR® Peroxide 2	0.03–2.00 mg/L H_2O_2	985 871	126
Hydrosulfite	special instructions with *VISOCOLOR® HE* Sulfite SU 100			71
Hygiene control	BioFix® Lumi ATP		946 …	154–155
I				
Internal quality control	*NANOCOLOR®* T-Set		919 917	107
	NANOCONTROL system		925 …	144–147
Iodide	Saltesmo	0.7–14.2 g/L KI	906 08	34, 37
IQC	*NANOCOLOR®* T-Set		919 917	107
	NANOCONTROL system		925 …	144–147
Iron, divalent	Dipyridyl paper	qualitative, >2 mg/L Fe^{2+}	907 25	39, 41
Iron, di- and trivalent	Iron test paper	qualitative, >10 mg/L $Fe^{2+/3+}$	907 26	39, 42
	QUANTOFIX® Total iron 1000	5–1000 mg/L $Fe^{2+/3+}$	913 30	22, 27
	QUANTOFIX® Total iron 100	2–100 mg/L $Fe^{2+/3+}$	913 44	22, 27
	VISOCOLOR® ECO Iron 2	0.04–1.0 mg/L Fe	931 026	57, 66
	VISOCOLOR® ECO Iron 1	0.04–1.0 mg/L Fe	931 025	56, 66
	VISOCOLOR® HE Iron	0.01–0.20 mg/L Fe	920 040	57, 66
	NANOCOLOR® Iron 3	0.02–3.00 mg/L Fe	985 037	109, 121
	NANOCOLOR® Iron	0.01–15.00 mg/L Fe	918 36	110, 121
Isobutyl methyl ketone	for color extraction of *NANOCOLOR®* Phenolic index 5		918 929	126, 133
L				
Lactoperoxidase	Peroxtesmo MI	qualitative	906 27	39, 44
Lead	Plumbtesmo	qualitative <5 mg/L Pb^{2+} 0.05 µg Pb	906 02	39, 44
	NANOCOLOR® Lead 5	0.10–5.00 mg/L Pb^{2+}	985 009	109, 122
	NANOCOLOR® Lead	0.005–1.00 mg/L Pb^{2+}	918 10	122
Lime precipitation	*NANOCOLOR®* reagents for lime precipitation		918 939	118, 123, 133
Lipophilic substances	*NANOCOLOR®* HC 300	0.5–5.6 mg/L HC in water; 30–300 mg/kg HC in soil	985 057	108, 121, 141

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Luminometer	BioFix® Lumi-10		940 008	152, 153
Luminous bacteria	BioFix® Luminous bacteria toxicity test systems		940 …, 945 …	153–155
M				
m value (alkalinity)	*VISOCOLOR® HE* Alkalinity AL 7	0.2–7.2 mmol/L OH^-	915 007	56, 58
	VISOCOLOR® ECO Alkalinity TA	0.10–5.00 mmol/L H^+	931 204	56, 58
	VISOCOLOR® HE Carbonate hardness C 20	0.63–25.00 °e / 0.2–7.0 mmol/L H^+	915 003	56, 60
Magnesium	indirect determination with *VISOCOLOR®*			66
	NANOCOLOR® Ca / Mg	5–50 mg/L Mg^{2+}	985 044	108, 120
	NANOCOLOR® Hardness 20	5–50 mg/L Mg^{2+}	985 043	108, 120
Manganese	*VISOCOLOR® ECO* Manganese	0.1–1.5 mg/L Mn	931 038	57, 66
	VISOCOLOR® HE Manganese	0.03–0.50 mg/L Mn	920 055	57, 66
	NANOCOLOR® Manganese 10	0.02–10.0 mg/L Mn	985 058	109, 122
	NANOCOLOR® Manganese	0.01–10.0 mg/L Mn	918 60	110, 122
Mastitis with milk-giving animals	Udder test paper	qualitative	907 48	39, 46
Material safety data sheets				6
Membrane filters	For removal of turbidities and undissolved substances		916 …	142
Methanol	*NANOCOLOR®* Methanol 15	0.2–15.0 mg/L MeOH	985 859	109, 123
Molybdenum	QUANTOFIX® Molybdenum	5–250 mg/L Mo(VI)	913 25	22, 27
	NANOCOLOR® Molybdenum 40	1.0–40.0 mg/L Mo(VI)	985 056	109, 123
Multiteststicks	QUANTOFIX® Multisticks for aquarium owners	Total hardness 6.25–31.25 °e; carbonate hardness 3.75–25.00 °e; pH 6.4–8.4	913 26 / 913 27	23, 31
	Swimming Pool Test 3 in 1	0.5–10 mg/L Cl_2; pH 6.4–8.4; 80–240 mg/L $CaCO_3$	907 52	34, 38
	Swimming Pool Test 5 in 1	0–100 mg/L $CaCO_3$; 0.5–10 mg/L Cl_2; 0–10 mg/L Cl_2; 80–240 mg/L $CaCO_3$; pH 6.4–8.4	907 59	34, 38
N				
NanOx Metal	reagents for oxidative decomposition of heavy metal samples and determination of total phosphorus with microwave oven or heating block		918 978	136, 137
NanOx N	reagents for determination of total nitrogen with microwave oven or heating block		918 979	135
Nickel	Nickel test paper	qualitative, > 10 mg/L Ni^{2+}	907 30	39, 42
	QUANTOFIX® Nickel	10–1000 mg/L Ni^{2+}	913 05	22, 27
	VISOCOLOR® ECO Nickel	0.1–1.5 mg/L Ni^{2+}	931 040	57, 67
	NANOCOLOR® Nickel 4	0.02–7.00 mg/L Ni^{2+}	985 071	109, 123
	NANOCOLOR® Nickel 7	0.02–7.00 mg/L Ni^{2+}	985 061	109, 123
	NANOCOLOR® Nickel	0.01–10.0 mg/L Ni^{2+}	918 62	110, 123

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Nitrate	Nitratesmo	10 mg/L NO_3^-; 5 mg/L NO_2^-	906 11	39, 43
	QUANTOFIX® Nitrate 100	5–100 mg/L NO_3^-	913 51	28
	QUANTOFIX® Nitrate/Nitrite	10–500 mg/L NO_3^-; 1–80 mg/L NO_2^-	913 13	22, 28, 33
	VISOCOLOR® alpha Nitrate	2–50 mg/L NO_3^-	935 065	57, 67
	VISOCOLOR® ECO Nitrate	1–120 mg/L NO_3^-	931 041	57, 67
	NANOCOLOR® Nitrate 250	4–60 mg/L NO_3-N	985 066	124
	NANOCOLOR® Nitrate	0.9–30.0 mg/L NO_3-N	918 65	110, 124, 135
	NANOCOLOR® Nitrate 8	0.30–8.00 mg/L NO_3-N	985 065	109, 124
	NANOCOLOR® Nitrate 50	0.3–22.0 mg/L NO_3-N	985 064	109, 124, 135
	NANOCOLOR® Nitrate Z	0.1–5.0 mg/L NO_3^-	918 63	110, 124
Nitrate and Nitrite	Nitratesmo	10 mg/L NO_3^-; 5 mg/L NO_2^-	906 11	39, 43
	QUANTOFIX® Nitrate/Nitrite	10–500 mg/L NO_3^-; 1–80 mg/L NO_2^-	913 13	22, 28, 33
Nitrificants, preserved	for application in accordance with DIN EN ISO 9509-L38		970 902, 970 903	151
Nitrification inhibition tests	BioFix® *A-Tox* and *N-Tox*	0 – 100% inhibition	970 001, 970 002	150–151
Nitrite	Potassium iodide starch paper	qualitative	907 53	39, 45
	Nitratesmo	10 mg/L NO_3^-; 5 mg/L NO_2^-	906 11	39, 43
	QUANTOFIX® Nitrite 3000	0.1–3 g/L NO_2^-	913 22	22, 28
	QUANTOFIX® Nitrite	1–80 mg/L NO_2^-	913 11	22, 28, 33
	QUANTOFIX® Nitrate/Nitrite	10–500 mg/L NO_3^-: 1–80 mg/L NO_2^-	913 13	22, 28, 33
	VISOCOLOR® alpha Nitrite	0.05–1.0 mg/L NO_2^-	935 066	57, 67
	VISOCOLOR® ECO Nitrite	0.02–0.5 mg/L NO_2^-	931 044	57, 67
	VISOCOLOR® HE Nitrite	0.005–0.10 mg/L NO_2^-	920 063	57, 67
	NANOCOLOR® Nitrite 4	0.1–4.0 mg/L NO_2-N	985 069	109, 124
	NANOCOLOR® Nitrite 2	0.003–0.460 mg/L NO_2-N	985 068	109, 124
	NANOCOLOR® Nitrite	0.005–1.00 mg/L NO_2^-	918 67	110, 124
Nitrite oxidation, inhibition	BioFix® *N-Tox*	0–100 % inhibition	970 002	150–151
Nitrogen (total)	*NANOCOLOR®* total Nitrogen TN_b 22	0.5–22.0 mg/L N	985 083	109, 125, 135
	NANOCOLOR® total Nitrogen TN_b 60	3–60 mg/L N	985 092	109, 125, 135
	NANOCOLOR® total Nitrogen TN_b 220	5–220 mg/L N	985 088	109, 125, 135
Nitrous acid, nitrite	Potassium iodide starch paper	qualitative	907 53	39, 45
	Nitratesmo	10 mg/L NO_3^-; 5 mg/L NO_2^-	906 11	39, 43
	QUANTOFIX® Nitrite 3000	0.1–3 g/L NO_2^-	913 22	22, 28
	QUANTOFIX® Nitrite	1–80 g/L NO_2^-	913 11	22, 28, 33
	VISOCOLOR® alpha Nitrite	0.05–1.0 mg/L NO_2^-	935 066	57, 67
	VISOCOLOR® ECO Nitrite	0.02–0.5 mg/L NO_2^-	931 044	57, 67
	VISOCOLOR® HE Nitrite	0.005–0.10 mg/L NO_2^-	920 063	57, 67
	NANOCOLOR® Nitrite 4	0.1–4.0 mg/L NO_2-N	985 069	109, 124
	NANOCOLOR® Nitrite 2	0.003–0.460 mg/L NO_2-N	985 068	109, 124
	NANOCOLOR® Nitrite	0.005–1.0 mg/L NO_2^-	918 67	110, 124

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Nonionic surfactants	*NANOCOLOR*® Nonionic surfactants 15	0.3–15.0 mg/L Triton® X-100	985 047	109, 131
Nutrient mixture	for BOD_5 determination			140
O				
Oil in water or in soil	Oil test paper	qualitative	907 60	39, 43
	NANOCOLOR® HC 300	0.5–5.6 mg/L HC in water, 30–300 mg/kg HC in soil	985 057	108, 141
Organic acids	*NANOCOLOR*® Organic acids 3000	30–3000 mg/L CH_3COOH	985 050	109, 125
Oxidative decompositions	Crack set (acid oxidation of aqueous systems in a heating block)		918 08	138
	NANOCOLOR® *NanOx*		918 979, 918 978	135–137
	NANOCOLOR® Sludge (decomposition with aqueous systems in a heating block for determination of metals in sludge or soil)		918 50	138
Oxygen in water	*VISOCOLOR*® *ECO* Oxygen	1–10 mg/L O_2	931 088	57, 68
	VISOCOLOR® *HE* Oxygen SA 10	0.2–10.0 mg/L O_2	915 009	57, 68
	NANOCOLOR® Oxygen 12	0.5–12.0 mg/L O_2	985 082	109, 125
Ozone	Ozone test strips	orienting measurement in air	907 36	34, 37
	Potassium iodide starch paper	qualitative	907 53	39, 45
	NANOCOLOR® Chlorine / Ozone 2	0.05–2.00 mg/L O_3	985 017	108, 114
P				
p value	*VISOCOLOR*® *HE* Carbonate hardness C 20	0.63–25.00 °e	915 003	56, 60
Peracetic acid	QUANTOFIX® Peracetic acid 50	5–50 mg/L PAA	913 40	22, 29, 33
	QUANTOFIX® Peracetic acid 500	50–500 mg/L PAA	913 41	22, 29, 33
	QUANTOFIX® Peracetic acid 2000	500–2000 mg/L PAA	913 42	22, 29, 33
Peroxidase in blood traces	Peroxtesmo KM	qualitative	906 05	39, 43
Peroxidase in food	Peroxtesmo KO	qualitative	906 06	39, 43
Peroxidase in milk	Peroxtesmo MI	qualitative	906 27	39, 43
Peroxides	QUANTOFIX® Peroxide 1000	50–1000 mg/L H_2O_2	913 33	22, 29, 33
	QUANTOFIX® Peroxide 100	1–100 mg/L H_2O_2	913 12	22, 29, 33
	QUANTOFIX® Peroxide 25	0.5–25 mg/L H_2O_2	913 19	22, 29, 33
	NANOCOLOR® Peroxide 2	0.03–2.00 mg/L H_2O_2	985 871	109, 126

*Recommended MN Products are arranged by increasing sensitivity.

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pH	Indicator papers without color scale	Brillant yellow paper	907 01	21
		Congo paper	907 02 – 907 05	21
		Litmus paper	911 …	21
		Nitrazine yellow paper	907 11	21
		Phenolphtalein paper	907 12 / 907 13	21
	Indicator papers with color scale	Duotest	903 …	20
		Special indicator papers	902 …	19
		Tritest	905 …	20
		Universal indicator papers	902 …	19
	especially for colored solutions	PEHANON®	904 …	18
		VISOCOLOR® ECO pH 4.0–9.0	931 066	57, 68
	especially for weakly buffered solutions	pH-Fix test strips	921 …	17
		UNISOL® liquid indicators	910 02, 910 31	21
		VISOCOLOR® alpha pH 5–9	935 075	57, 68
		VISOCOLOR® ECO pH 4.0–9.0	931 066	57, 68
	especially for unbuffered solutions	*VISOCOLOR® HE* pH 4.0–10.0	920 074	57, 68
	photometric	pH-Fix	921 …	33
		VISOCOLOR® ECO pH 6.0–8.2	931 270	57, 68
		NANOCOLOR® pH 6.5–8.2	918 72	109, 126
pH value in cooling lubricants	QUANTOFIX® Nitrite / pH	1–80 mg/L NO_2^- ; pH 6.0–9.6	913 38	22, 28
pH value in photographic solutions	Ag-Fix test strips	0.5–10 g/L Ag^+, pH 4–8	907 41	34
Phenols	*NANOCOLOR®* Phenolic index 5	0.2–5.0 mg/L Phenol	985 074	109, 126
	NANOCOLOR® Phenol	0.01–7.0 mg/L Phenol	918 75	110, 126
Phosphatase, acid	Phosphatesmo KM	qualitative	906 07	39, 44
Phosphatase, alkaline	Phosphatesmo MI	qualitative	906 12	39, 44
Phosphate, ortho	QUANTOFIX® Phosphate	3–100 mg/L PO_4^{3-}	913 20	22, 30
	VISOCOLOR® alpha Phosphate	2–20 mg/L PO_4^{3-}	935 079	57, 69
	VISOCOLOR® ECO Phosphate	0.2–5 mg/L P	931 084	57, 69
	VISOCOLOR® HE Phosphate	0.05–1.0 mg/L P	920 082	57, 69
	VISOCOLOR® HE Phosphate (DEV)	0.01 – 0.25 mg/l P	920 080	57, 69
	NANOCOLOR® ortho Phosphate	0.5–50 mg/L PO_4^{3-}	918 78	110, 127, 136
	NANOCOLOR® ortho Phosphate	0.1–20 mg/L PO_4^{3-}	918 77	110, 127, 136
Phosphate, ortho and total	*NANOCOLOR®* Phosphate 50	10.0–50.0 mg/L P	985 079	109, 127, 136
	NANOCOLOR® Phosphate 45	5.0–50.0 mg/L P	985 055	109, 127, 136
	NANOCOLOR® Phosphate 15	0.30–15.00 mg/L P	985 080	109, 127, 136
	NANOCOLOR® Phosphate 5	0.20–5.00 mg/L P	985 081	109, 127, 136
	NANOCOLOR® Phosphate 1	0.01–1.50 mg/L P	985 076	109, 127
Phosphonate	with *NanOx* Metal and *VISOCOLOR® ECO* Phosphate			69

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Photometers	Spectrophotometers *NANOCOLOR*® $^{UV}/_{VIS}$ II and *NANOCOLOR*® *VIS*		919 600, 919 150	94–99
	NANOCOLOR® 500 D		919 500	101–102
	Compact photometer PF-12^{Plus}		919 250	80–85
	Compact photometer PF-3	PF-3 Pool		86–89
		PF-3 Drinking Water		86–89
		PF-3 Soil		86–89
		PF-3 COD		86–89
Piston pipettes			916 …	142
POC (Polyoxycarboxylic acids)	*NANOCOLOR*® POC 200	20–200 mg/L POC	985 070	109, 128
Potassium	Potassium test paper	qualitative, >250 mg/L K^+	907 27	39, 45
	QUANTOFIX® Potassium	200–1500 mg/L K^+	913 16	22, 30
	VISOCOLOR® *ECO* Potassium	2–15 mg/L K^+	931 032	57, 69
	NANOCOLOR® Potassium 50	2–50 mg/L K^+	985 045	109, 128
Protein residues on surfaces	INDIPRO	qualitative	907 65	39, 42
Q				
Quality control	*NANOCOLOR*® T-Set		919 917	107
	NANOCONTROL system		925 …	144–147
Quaternary ammonium compounds	INDIQUAT® indicator paper	semi-quantitative	909 000–909 002	34, 36
	QUANTOFIX® QUAT	10–1000 mg/L benzalkonium chloride	913 37	22, 30
R				
Residual hardness of water	*VISOCOLOR*® *HE* total Hardness H 2	0.06–2.50 °e / 0.01–0.36 mmol/L Ca^{2+}	915 002	56, 65
	VISOCOLOR® *alpha* residual Hardness	0.05–0.38 °e	935 080	56, 65
	NANOCOLOR® residual Hardness 1	0.03–1.25 °e	985 084	109, 120
S				
Silica, silicon	*VISOCOLOR*® *ECO* Silica HR 200	10–200 mg/L SiO_2	931 234	57, 70
	VISOCOLOR® *ECO* Silica	0.2–3.0 mg/L SiO_2	931 033	57, 70
	VISOCOLOR® *HE* Silicon	0.01–0.30 mg/L Si	920 087	57, 70
	NANOCOLOR® Silica	0.005–10.0 mg/L SiO_2	918 48	110, 128
Silica-free water	for silicate determination		918 912	128, 133
Silver	Silver test paper	qualitative, >20 mg/L Ag^+	907 32	39, 45
	NANOCOLOR® Silver 3	0.20–3.00 mg/L Ag^+	985 049	109, 128
Silver in photographic solutions	Ag-Fix test strips	0.5–10 g/L Ag^+	907 41	34
	QUANTOFIX® Silver	1–10 g/L Ag^+	913 50	22, 30
Sludge activity	*NANOCOLOR*® TTC	5–150 µg TPF	985 890	109, 132
Sludge (heavy metals)	*NANOCOLOR*® Sludge	decomposition with aqua regia	918 50	138
Sodium	possible with *VISOCOLOR*® special instruction			70
Soil analysis	Compact photometer PF-3 Soil		919 341, 934 202	88
	Reagent case with PF-3 Soil		934 210	79
	VISOCOLOR® reagent case for soil analysis		931 601	78–79
	VISOCOLOR® reagent case for soil analysis with PF-3 Soil		934 220	78–79
Sperm (acid phosphatase)	Phosphatesmo KM	qualitative	906 07	39, 44
Standard solutions	*NANOCONTROL* Standards		925 …	145–147
Starch	*NANOCOLOR*® Starch 100	5–100 mg/L starch	985 085	109, 129
*Recommended MN Products are arranged by increasing sensitivity.				

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Sulfate	QUANTOFIX® Sulfate	<200–>1600 mg/L SO_4^{2-}	913 29	22, 31, 33
	VISOCOLOR® ECO Sulfate	25–200 mg/L SO_4^{2-}	931 092	57, 70
	NANOCOLOR® Sulfate 1000	200–1000 mg/L SO_4^{2-}	985 087	109, 129
	NANOCOLOR® Sulfate 200	10–200 mg/L SO_4^{2-}	985 086	109, 129
Sulfide, hydrogen sulfide	Lead acetate paper	qualitative, >5 mg/L S^{2-}	907 44	39, 42
	Sulfide test paper	qualitative, > 5 mg/L S^{2-}	907 61	39, 45
	VISOCOLOR® ECO Sulfide	0.1–0.8 mg/L S^{2-}	931 094	57, 71
	NANOCOLOR® Sulfide 3	0.05–3.00 mg/L S^{2-}	985 073	109, 129
	NANOCOLOR® Sulfide	0.01–3.0 mg/L S^{2-}	918 88	110, 129
Sulfite, sulfurous acid	Potassium iodate starch paper	qualitative	907 53	39, 45
	Sulfite test paper	qualitative, >10 mg/L $Na_2SO_3^{2-}$	907 63	39, 46
	QUANTOFIX® Sulfite	10–1000 mg/L SO_3^{2-}	913 06	23, 31, 33
	VISOCOLOR® ECO Sulfite	1 drop = 1 mg/L SO_3^{2-}	931 095	57, 71
	VISOCOLOR® HE Sulfite SU 100	2–100 mg/L SO_3^{2-}	915 008	57, 71
	NANOCOLOR® Sulfite 100	5–100 mg/L SO_3^{2-}	985 090	109, 130
	NANOCOLOR® Sulfite 10	0.05–10.0 mg/L SO_3^{2-}	985 089	109, 130
Sulfurous acid, sulfite	Potassium iodate starch paper	qualitative	907 53	39, 45
	Sulfite test paper	qualitative, >10 mg/L $Na_2SO_3^{2-}$	907 63	39, 46
	QUANTOFIX® Sulfite	10–1000 mg/L SO_3^{2-}	913 06	23, 31
	VISOCOLOR® ECO Sufite	1 drop = 1 mg/L SO_3^{2-}	931 095	57, 71
	VISOCOLOR® HE Sulfite SU 100	2–100 mg/L SO_3^{2-}	915 008	57, 71
	NANOCOLOR® Sulfite 100	5–100 mg/L SO_3^{2-}	985 090	109, 130
	NANOCOLOR® Sulfite 10	0.05–10.0 mg/L SO_3^{2-}	985 089	109, 130
Surfaces, hygiene control	BioFix® Lumi ATP		946 …	154–155
Surfaces, protein contamination	INDIPRO	qualitative	907 65	39, 42
Surfactants	*NANOCOLOR®* Anionic surfactants 4	0.20–4.00 mg/L MBAS	985 032	109, 130
	NANOCOLOR® Detergents anionic	0.02–5.0 mg/L MBAS	918 32	111, 130
	NANOCOLOR® Cationic surfactants 4	0.20–4.00 mg/L CTAB	985 034	109, 130
	NANOCOLOR® Detergents cationic	0.05–5.0 mg/L CTAB	918 34	111, 130
	NANOCOLOR® nonionic surfactants 15	0.3–15.0 mg/L Triton® X-100	985 047	109, 131
Swimming pool parameters	Swimming Pool Test 3 in 1	0.5–10 mg/L Cl_2; pH 6.4–8.4; 80–240 mg/L $CaCO_3$	907 52	34, 38
	Swimming Pool Test 5 in 1	100–1000 mg/L $CaCO_3$; 0.5–10 mg/L Cl_2; 1–10 mg/L Cl_2; pH 6.4–8.4; 80–240 mg/L $CaCO_3$	907 59	34, 38
	Cyanuric Acid Test	50–300 mg/L Cya	907 10	34, 38
	Compact photometer PF-3 Pool	–	919 340, 934 102	88
		in reagent case	934 …	74
	VISOCOLOR® ECO Alkalinity TA	0.10–5.00 mmol/L H^+	931 204	56, 58
	VISOCOLOR® ECO Cyanuric acid	10–100 mg/L Cya	931 023	56, 64
	VISOCOLOR® ECO pH 6.0 – 8.2	pH 6.0–8.2	931 270	57, 68
	VISOCOLOR® ECO Swimming pool	0.1–2.0 mg/L Cl_2; pH 6.9–8.2	931 090	57, 71
	NANOCOLOR® pH 6.5–8.2	pH 6.5–8.2	918 72	109, 126

*Recommended MN Products are arranged by increasing sensitivity.

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T				
Tab equipment for beverages	BioFix® Lumi ATP		946 ...	154–155
Thiocyanate	*NANOCOLOR*® Thiocyanate 50	0.5–50.0 mg/L SCN^-	985 091	109, 131
Tin	QUANTOFIX® Tin	10–500 mg/L Sn^{2+}	913 09	23, 31
	NANOCOLOR® Tin 3	0.10–3.00 mg/L Sn	985 097	109, 131
TN_b	*NANOCOLOR*® total Nitrogen TN_b 22	0.5–22.0 mg/L N	985 083	109, 125, 135
	NANOCOLOR® total Nitrogen TN_b 60	3–60 mg/L N	985 092	109, 125, 135
	NANOCOLOR® total Nitrogen TN_b 220	5–220 mg/L N	985 088	109, 125, 135
TOC	*NANOCOLOR*® TOC 25	2.0–25.0 mg/L TOC	985 093	109, 131
	NANOCOLOR® TOC 60	10–60 mg/L TOC	985 094	109, 131
	NANOCOLOR® TOC 600	40–600 mg/L TOC	985 099	109, 131
Total alkalinity	*VISOCOLOR*® *HE* Alkalinity AL 7	0.2–7.2 mmol/L OH^-	915 007	56, 58
	VISOCOLOR® *ECO* Alkalinity TA	0.10–5.00 mmol/L H^+	931 204	56, 58
Total hardness of water	AQUADUR® test strips	3.75–31.25 °e / 3.75–26.25 °e / 3.75–17.50 °e	912 01 / 20 / 39	34, 35
	AQUADUR® Sensitive	0–1.38 °e	912 10	35
	VISOCOLOR® *alpha* Hardness	1 drop ≙ 1.25 °e ≙ 17.8 mg/L $CaCO_3$	935 042	56, 65
	VISOCOLOR® *ECO* Hardness	1 drop ≙ 1.25 °e ≙ 17.8 mg/L $CaCO_3$	931 029	56, 65
	VISOCOLOR® *HE* Hardness H 20 F	0.6–25.0 °e / 0.1–3.6 mmol/L Ca^{2+}	915 005	56, 65
	VISOCOLOR® *HE* Hardness H 2	0.06–2.5 °e / 0.01–0.36 mmol/L Ca^{2+}	915 002	56, 65
	VISOCOLOR® *alpha* residual Hardness	0.05–0.38 °e	935 080	56, 65
	NANOCOLOR® Hardness 20	1.25–25.0 °e	985 043	108, 120
	NANOCOLOR® residual Hardness 1	0.03–1.25 °e	985 084	109, 120
Total nitrogen	*NANOCOLOR*® total Nitrogen TN_b 22	0.5–22.0 mg/L N	985 083	109, 125, 135
	NANOCOLOR® total Nitrogen TN_b 60	3–60 mg/L N	985 092	109, 125, 135
	NANOCOLOR® total Nitrogen TN_b 220	5–220 mg/L N	985 088	109, 125, 135
Total phosphorus	*NANOCOLOR*® Phosphate tests and decomposition with *NanOx* Metal			136
Toxicity control	Luminous bacteria toxicity test system BioFix® Lumi		940 …, 945 …	153–155
	BioFix® *A-Tox* and *N-Tox* nitrification inhibition tests	0–100 % inhibition	970 001 / 970 002	150–151
TTC / Sludge activity	*NANOCOLOR*® TTC 150	5–150 µg TPF	985 890	109, 132
Turbidity of water	*NANOCOLOR*® Turbidity	1–100 TE/F/ 0.5–40.0 1/m		110, 132
		1–1000 NTU	110, 132	
U				
Udder diseases	Udder test paper	qualitative	907 48	39, 46
V				
Vat dye conversion, endpoint	Indanthrene yellow paper	qualitative	907 51	39, 42
*Recommended MN Products are arranged by increasing sensitivity.				

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W				
Water hardness	AQUADUR® test strips	3.75–31.25 °e / 3.75–26.25 °e / 3.75–17.50 °e	912 01 / 20 / 39	34, 35
	AQUADUR® Sensitive	0–1.38 °e	912 10	35
	VISOCOLOR® alpha Hardness	1 drop ≙ 1.25 °e ≙ 17.8 mg/L $CaCO_3$	935 042	56, 65
	VISOCOLOR® ECO Hardness	1 drop ≙ 1.25 °e ≙ 17.8 mg/L $CaCO_3$	931 029	56, 65
	VISOCOLOR® HE Hardness H 20 F	0.6–25.0 °e / 0.1–3.6 mmol/L Ca^{2+}	915 005	56, 65
	VISOCOLOR® Hardness H 2	0.06–2.5 °e / 0.01–0.36 mmol/L Ca^{2+}	915 002	56, 65
	VISOCOLOR® alpha residual Hardness	0.05–0.38 °e	935 080	56, 65
	NANOCOLOR® Hardness 20	1.25–25.0 °e	985 043	108, 120
	NANOCOLOR® Hardness Ca/Mg	1.25–25.0 °e	985 044	108, 120
	NANOCOLOR® residual Hardness 1	0.03–1.25 °e	985 084	109, 120
Water in butter	Wator indicator paper	qualitative	906 10	39, 47
Water in organic solvents	Watesmo indicator paper	qualitative	906 09	39, 46
Water in petrol and fuel oil tanks	AQUATEC test strips	qualitative	907 42	39, 40
Z				
Zinc	QUANTOFIX® Zinc	2–100 mg/L Zn^{2+}	913 10	23, 31
	VISOCOLOR® ECO Zinc	0.5–3 mg/L Zn^{2+}	931 098	57, 71
	NANOCOLOR® Zinc 4	0.10–4.00 mg/L Zn^{2+}	985 096	109, 133
	NANOCOLOR® Zinc	0.02–3.0 mg/L Zn^{2+}	918 95	110, 133
Zirconium	Zirconium test paper	qualitative, > 20 mg/L Zr^{4+}	907 21	39, 47

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MACHEREY-NAGEL

MACHEREY-NAGEL GmbH & Co. KG · Neumann-Neander-Str. 6–8 · 52355 Düren · Germany

Germany and international:
Tel.: +49 24 21 969-0
Fax: +49 24 21 969-199
E-mail: info@mn-net.com

Switzerland:
MACHEREY-NAGEL AG
Tel.: +41 62 388 55 00
Fax: +41 62 388 55 05
E-mail: sales-ch@mn-net.com

France:
MACHEREY-NAGEL EURL
Tel.: +33 388 68 22 68
Fax: +33 388 51 76 88
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