

MACHEREY-NAGEL

NANOCOLOR[®]

Compact photometer PF-12^{Plus}



Increased flexibility

- Reliable – Easy handling for precise results
- Mobile – Robust and waterproof
- Versatile – NTU check for detection of interfering turbidities

Water analysis

MACHEREY-NAGEL

www.mn-net.com



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Compact photometer PF-12^{Plus}

Increased flexibility

The PF-12^{Plus} compact photometer is a tailor-made instrument for mobile water analysis, which is used to evaluate *VISOCOLOR[®] ECO*, *VISOCOLOR[®] Powder Pillows*, *NANOCOLOR[®] ECO* and *NANOCOLOR[®]* tube tests.

The icon-based user guidance and the clear task bar turn the PF-12^{Plus} into a user friendly, easy and intuitively operated photometer for all scope of applications in water and waste water analysis without the need for extensive training. The delivery is carried out in a robust case, equipped with helpful accessories, allowing for an analysis directly at the point of interest.

Save time – make work easier

- Ready to use immediately
- All tests and menu items can be activated fast and easily
- Perfect handling without extensive training

Highest flexibility

- More than 100 preprogrammed methods
- Compatible *NANOCOLOR[®]* tube tests, *NANOCOLOR[®] ECO* tests, *VISOCOLOR[®] ECO* tests and *VISOCOLOR[®] Powder Pillows*

Be mobile – enjoy versatility

Due to its compact size and the robust and waterproof housing, the PF-12^{Plus} fits perfectly for measurements directly at the sampling site.

Using the USB interface, the device can be updated with new tests and methods very quickly.

Works under any condition

- Flexible power supply via batteries or accu pack
- Robust and waterproof according to IP 68

Free programming of user-defined methods

- Programmable for 20 user-defined methods
- Equations up to 4th degree and logarithmic functions can be programmed

Fast photometer update – free of charge

- Always up-to-date through simple program updates via Internet and PC
- For current software updates please visit www.mn-net.com

Versatilely applicable

- Applicable in all fields of water and waste water analysis
- Nephelometric turbidity measurement and NTU-Check



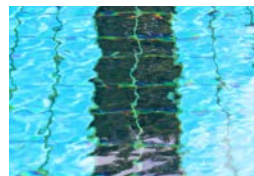
Drinking water



Sewage plant



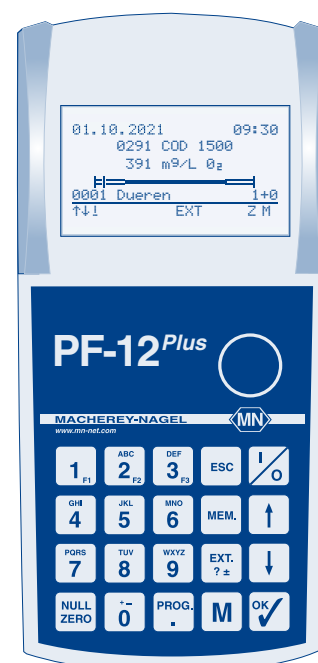
Metal processing industry



Pool & spa care



Brewery



Good to know



The PF-12^{Plus} can be used even under the toughest conditions.

As the only photometer in its class, the PF-12^{Plus} meets the strict requirement of Regulation MIL-STD 8100 (Test regulation 514.2).

Minimize errors – experience precision

An 860 nm LED enables the nephelometric turbidity measurement in the range of 1–1000 NTU. This feature allows for the well established NTU-Check of our MACHEREY-NAGEL spectrophotometers now also on the PF-12^{Plus}; a big PLUS in terms of safe measurement results. In addition turbidity in transmitted light, between 4 – 350 FAU, can be determined.

High measurement safety

- Automatic detection of interfering turbidity in 90° angle (NTU-Check)
- Display of the 20 – 80 % measurement range bar

Measurement without cuvette slot cover

- The state-of-art optical system is insensitive to external light and allows straightforward measurement without cuvette slot cover.

Fulfill requirements – assure results

The GLP-conform data, stored after each measurement, can be transferred conveniently to the PC via the *NANOCOLOR*[®] data export software and evaluated with the PC-standard software.

Clear memory management

- GLP-conform storage of results incl. 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

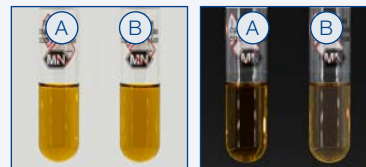
Internal quality control of photometric accuracy

- Fulfill supervisor and authority requirements
- *NANOCONTROL NANOCHECK 2.0* to fulfill the photometric accuracy: testing of all wavelengths in the range of 340–800 nm
- Documentation of photometric accuracy for safeguarding against authorities



Turbidity – An error source:

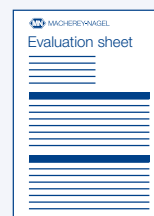
Turbidity within a cuvette is often underestimated because it is not always visible. With the integrated turbidity control (NTU-Check), turbidity within the sample is determined for every measurement and in case of an interference the operator is warned.



2 cuvettes (A|B) with similar COD-concentrations. The turbidity in cuvette B influences the result up to 30 %.



Good to know



Electronically fillable evaluation sheets are available online. The *NANOCONTROL NANOCHECK 2.0* evaluation sheets meet all quality assurance requirements.

www.mn-net.com/NANOCHECK



Compact photometer PF-12^{Plus}

VISOCOLOR® ECO

Colorimetric VISOCOLOR® ECO tests consist of single reagents which offer the possibility to compensate turbidity and color of water samples. This allows high sensitivity and accuracy to be achieved.

A evaluation with the photometer PF-12^{Plus} enables a quantitative evaluation of the test kit.

- Chemical analysis without further accessories
- Color-coded reagents with clear dosing instructions
- Pictogram test instructions
- Manifold case solutions more information here:
www.mn-net.com/wateranalysis/reagent-cases/



Test	Measuring range		No. of tests	Shelf life (years)	REF
VISOCOLOR® ECO					
Alkalinity TA	5–250 mg/L CaCO ₃	0.3–14 °d	100	1	931204
Ammonium 3*	0.1–2.5 mg/L NH ₄ ⁺	0.1–2 mg/L NH ₄ -N	50	1.5	931208
Ammonium 15*	0.5–8.0 mg/L NH ₄ ⁺	0.4–6.2 mg/L NH ₄ -N	50	1.5	931210
Bromine	0.10–13.00 mg/L Br ₂		200	2	931211
Chlorine 1, free + total	0.05–2.00 mg/L Cl ₂		150	2	931235
Chlorine 2, free + total*	0.05–2.00 mg/L Cl ₂		150	1.5	931215
Free Chlorine 2	0.05–2.00 mg/L Cl ₂		150	1.5	931216
Chlorine 6, free + total	0.05–6.00 mg/L Cl ₂		200	2	931217
Free Chlorine 6	0.05–6.00 mg/L Cl ₂		400	2	931219
Chlorine dioxide*	0.20–3.80 mg/L ClO ₂		150	1.5	931221
Chlorine*	1–50 mg/L Cl ⁻		90	1	931218
Chromium (VI)*	0.04–1.00 mg/L CrO ₄ ²⁻	0.02–0.5 mg/L Cr	140	1.5	931220
Cyanide*	0.01–0.20 mg/L CN ⁻		100	1	931222
Cyanuric acid*	10–100 mg/L Cya		100	1.5	931223
DEHA	0.010–0.500 DEHA		125	1	931224
Iron 1*	0.04–2.00 mg/L Fe		200	2	931225
Iron 2	0.04–2.00 mg/L Fe		100	2	931226
Fluoride	0.1–2.0 mg/L F ⁻		150	2	931227
Hydrazine*	0.05–0.40 mg/L N ₂ H ₄		130	1	931230
Potassium*	2–25 mg/L K ⁺		60	3	931232
Silica	0.2–3.0 mg/L SiO ₂	0.1–1.4 mg/L Si	80	3	931233
Silica HR 200 ¹⁾	10–200 mg/L SiO ₂	5–100 mg/L Si	100	3	931234
Copper	0.1–5.0 mg/L Cu ²⁺		100	2	931237
Manganese*	0.1–5.0 mg/L Mn ²⁺		70	1.5	931238
Nickel*	0.04–5.00 mg/L Ni ²⁺		150	1.5	931240
Nitrate*	4–60 mg/L NO ₃ ⁻	1–14 mg/L NO ₃ -N	110	1.5	931241
Nitrite	0.02–0.50 mg/L NO ₂ ⁻	0.01–0.15 NO ₂ -N	120	1.5	931244
Ozone ²⁾	0.05–1.50 mg/L O ₃		200	1 (2–8 °C)	91885
pH 6.0–8.2	pH 6.1–8.4		150	1.5	931270
Phosphate*	0.2–5.0 mg/L PO ₄ -P	0.6–15.0 mg/L PO ₄ ³⁻	80	3	931284
Oxygen*	1–8 mg/L O ₂		50	1.5	931288
Sulfate*	20–200 mg/L SO ₄ ²⁻		100	3	931292
Sulfide*	0.05–0.80 mg/L S ²⁻		90	3	931294
Zinc	0.1–3.0 mg/L Zn ²⁺		120	1	931298

* GHS: Globally harmonized system: This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see the SDS.

¹⁾ For evaluation with the PF-12^{Plus}, a special filter (450 nm) is required.

²⁾ Please see separate test instruction.



Compact photometer PF-12^{Plus}

VISOCOLOR® Powder Pillows

VISOCOLOR® Powder Pillows are photometric tests that combine easiest dosing of reagents with photometric precision. Each VISOCOLOR® Powder Pillows contains the exact amount of reagents needed for a determination. The individually packaged portions not only stand out due to their very long shelf life, but also avoid the use of hazardous substances wherever possible.

- Dosing without spoon or pipette
- No zero measurement required
- Photometric precision for best results



Test	Measuring range to PF-12 ^{Plus}		No. of tests	Shelf life (years)	REF
VISOCOLOR® Powder Pillows					
Ammonium	0.03–1.00 mg/L NH ₄ ⁺	0.02–0.8 mg/L NH ₄ -N	100	3	936229
Chlorine, free	0.03–6.00 mg/L Cl ₂		100	5	936220
			1000		936220.1
Chlorine, total; Ozone	0.03–6.00 mg/L Cl ₂	0.03–4.00 mg/L O ₃	100	5	936221
			1000		936221.1
Iron	0.05–3.00 mg/L Fe		100	3	936227
Silica LR	0.04–2.10 mg/L SiO ₂	0.02–1.00 mg/L Si	100	3	936224
Silica HR ¹⁾	2–210 mg/L SiO ₂	1–100 mg/L Si	100	3	936225
Nitrate	1.0–50.0 mg/L NO ₃ -N	5–220 mg/L NO ₃	100	3	936226
Nitrite	0.01–0.30 mg/L NO ₂ -N	0.03–1.00 mg/L NO ₂	100	5	936230
pH	pH 6.2–8.2		100	5	936222
Phosphate	0.03–4.50 mg/L PO ₄ ³⁻	0.01–1.5 mg/L PO ₄ -P	100	3	936228
Sulfate	15–200 mg/L SO ₄ ²⁻		100	5	936223

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¹⁾ For evaluation with the PF-12^{Plus}, a special filter (450 nm) is required.

NANOCOLOR® ECO

NANOCOLOR® ECO reagent kits are convenient and flexible tests sets for photometric analysis. The tests are performed and measured in 16 mm cuvettes.

- Tests are performed directly in 16 mm test tubes
- Reaction chemistry based on internationally standardized methods
- No complex sample preparation in volumetric flask or beaker



Test	Measurement range to PF-12 ^{Plus}		No. of tests	Shelf life (years)	REF
NANOCOLOR® ECO					
Ammonium LR	0.05–2.30 mg/L NH ₄ ⁺	0.04–1.8 mg/L NH ₄ -N	100	1.5	976003

NANOCOLOR[®] tube tests -

Precise rapid tests for photometric water analysis

NANOCOLOR[®] tube tests for photometric analysis convince by their easy handling. A maximum in accuracy and precision is granted for the measurement results due to exactly pre-dosed reagents in 16 mm cuvettes and additional reagents.

The tests are preprogrammed in the PF-12^{Plus} photometer. All NANOCOLOR[®] tube tests are delivered in stable boxes, which provide a perfect protection from sunlight and convenient withdrawal of test tubes and reagents.

- Colored pictograms as step-by-step instruction
- Big cuvettes for easy pipetting
- No contact with chemicals due to precisely pre-dosed reagents



Test	Measurement range	No. of tests	Shelf life (years)	REF	
NANOCOLOR[®] tube tests					
Aluminum 07	0.02–0.70 mg/L Al ³⁺	19	1	985098	
Ammonium 3*	0.04–2.30 mg/L NH ₄ -N	0.05–3.00 mg/L NH ₄ ⁺	20	1	985003
Ammonium 10*	0.2–8.0 mg/L NH ₄ -N	0.2–10.0 mg/L NH ₄ ⁺	20	1	985004
Ammonium 50*	1.0–40.0 mg/L NH ₄ -N	1.0–50.0 mg/L NH ₄ ⁺	20	1	985005
Ammonium 100*	4–80 mg/L NH ₄ -N	5–100 mg/L NH ₄ ⁺	20	1	985008
Ammonium 200*	30–160 mg/L NH ₄ -N	40–200 mg/L NH ₄ ⁺	20	1	985006
AOX 3*	0.1–3.0 mg/L AOX	0.01–0.30 mg/L AOX	20	1	985007
Lead 5*	0.10–5.00 mg/L Pb ²⁺		20	1	985009
BOD ₅ * ¹⁾	0.5–12.0 mg/L O ₂		25–50	2	985822
BOD ₅ -RKT*	0.5–7.5 mg/L O ₂		11–21	2	985825
Cadmium 2	0.05–2.00 mg/L Cd ²⁺		10–19	1	985014
Carbonate hardness 15	1.0–15.0 °d	0.4–5.4 mmol/L H ⁺	20	1	985015
Chlorine/Ozone 2*	0.05–2.50 mg/L Cl ₂	0.05–2.00 mg/L O ₃	20	1	985017
Chlorine dioxide 5	0.15–5.00 mg/L ClO ₂		20	1	985018
Chloride 50*	0.5–50.0 mg/L Cl ⁻		20	1	985021
Chloride 200*	5–200 mg/L Cl ⁻	0.10–1.00 g/L Cl ⁻	20	1	985019
Total-chrome 2*	0.05–2.00 mg/L Cr		20	2	985059
Chromate 5	0.05–2.00 mg/L Cr(VI)	0.1–4.0 mg/L CrO ₄ ²⁻	20	2	985024
COD 40*	2–40 mg/L O ₂		20	1 at 2–8 °C	985027
COD 60*	5–60 mg/L O ₂		20	1 at 2–8 °C	985022
COD 160*	15–160 mg/L O ₂		20	1	985026
COD 160 Hg-free*	15–160 mg/L O ₂		20	1 at 2–8 °C	963026
COD 300*	50–300 mg/L O ₂		20	1	985033
COD 600*	50–600 mg/L O ₂		20	1 at 15–25 °C	985030
COD 1500*	100–1500 mg/L O ₂		20	1	985029
COD 1500 Hg-free*	100–1500 mg/L O ₂		20	1	963029
COD 4000*	400–4000 mg/L O ₂		20	1 at 15–25 °C	985011
COD 10000*	1.00–10.00 g/L O ₂		20	1	985023
COD 15000*	1.0–15.0 g/L O ₂		20	1	985028
COD 60000*	5.0–60.0 g/L O ₂		20	1	985012
COD LR 150*	3–150 mg/L O ₂		20	1	985036
COD HR 1500*	20–1500 mg/L O ₂		20	1	985038
easily liberated cyanide 04	0.02–0.40 mg/L CN ⁻		19	1	985025
Cyanide 08*	0.02–0.80 mg/L CN ⁻		20	1	985031
DEHA 1 (Diethylhydroxylamin)	0.05–1.00 mg/L DEHA		20	1	985035
Iron 3*	0.10–3.00 mg/L Fe		20	1.5	985037
Ethanol 1000	0.10–1.00 g/L EtOH	0.013–0.130 Vol. % EtOH	23	2 at < 0 °C	985838
Fluoride 2	0.1–2.0 mg/L F ⁻		20	1.5	985040
Formaldehyde 8*	0.1–8.0 mg/L HCHO		20	2	985041
Formaldehyde 10	0.20–10.00 mg/L HCHO		10–19	2	985046
Hardness Ca/Mg	1.0–20.0 °d	0.2–3.6 mmol/L; 10–100 mg/L Ca ²⁺	20	1.5	985044
	5–50 mg/L Mg ²⁺				
Hardness 20	1.0–20.0 °d; 5–50 mg/L Mg ²⁺	0.2–3.6 mmol/L; 10–100 mg/L Ca ²⁺	20	1.5	985043
Potassium 50*	2–50 mg/L K ⁺		20	2	985045
Org. Complexing agent 10	0.5–15.0 mg/L I _{BK}		10–19	1	985052
Copper 5	0.10–7.00 mg/L Cu ²⁺		20	2	985053

* GHS: Globally harmonized system: This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see the SDS.

¹⁾ For evaluation with the PF-12^{Plus}, a special filter (520 nm) is required.

Compact photometer PF-12^{Plus}

Test	Measurement range	No. of tests	Shelf life (years)	REF	
KW 300* (Hydrocarbons)	0.5–5.6 mg/L KW	20	1	985057	
Manganese 10*	0.1–10.0 mg/L Mn	20	1.5	985058	
Methanol 15	0.2–15.0 mg/L MeOH	23	2 at < 0 °C	985859	
Molybdenum 40*	1.0–40.0 mg/L Mo (VI)	1,6–65,0 mg/L MoO ₄ ²⁻	20	2	985056
Nickel 4*	0.10–7.00 mg/L Ni ²⁺	20	2	985071	
Nitrate 8*	0.30–8.00 mg/L NO ₃ -N	1,3–35,0 mg/L NO ₃ ⁻	20	2	985065
Nitrate 50*	0.3–22.0 mg/L NO ₃ -N	2–100 mg/L NO ₃ ⁻	20	2	985064
Nitrate 250*	4–60 mg/L NO ₃ -N	20–250 mg/L NO ₃ ⁻	20	2	985066
Nitrite 2*	0.003–0.460 mg/L NO ₂ -N	0,02–1,50 mg/L NO ₂ ⁻	20	1	985068
Nitrite 4	0.1–4.0 mg/L NO ₂ -N	0,3–13,0 mg/L NO ₂ ⁻	20	1	985069
Org. Acid 3000*	30–3000 mg/L CH ₃ COOH	0,5–50,0 mmol/L CH ₃ COOH	20	1.5	985050
Peroxide 2	0.03–2.00 mg/L H ₂ O ₂		10–19	1 at 2–8 °C	985871
pH 6.5–8.2	pH 6.10–8.40		100	1.5	91872
Phenol-Index 5*	0.2–5.0 mg/L Phenol		10–19	1.5	985074
ortho- and total-Phosphate 1*	0.05–1.50 mg/L P	0,2–5,0 mg/L PO ₄ ³⁻	20	1	985076
ortho- and total-Phosphate 5*	0.20–5.00 mg/L P	0,5–15,0 mg/L PO ₄ ³⁻	20	1	985081
ortho- and total-Phosphate 15*	0.30–15.00 mg/L P	1,0–45,0 mg/L PO ₄ ³⁻	20	1	985080
ortho- and total-Phosphate 45*	5.0–50.0 mg/L P	15–150 mg/L PO ₄ ³⁻	20	1.5	985055
ortho- and gesamt-Phosphat 50*	10.0–50.0 mg/L P	30–150 mg/L PO ₄ ³⁻	19	3	985079
ortho- and gesamt-Phosphat LR 1	0.05–0.50 mg/L P	0,2–1,5 mg/L PO ₄ ³⁻	20	1	985095
POC 200 (Polyoxycarboxylic acids)	20–200 mg/L		20	1.5	985070
Residual hardness 1	0.02–1.00 °d	0,004–0,180 mmol/L	20	1	985084
Oxygen 12*	0.5–12.0 mg/L O ₂		22	2	985082
Silver 3	0.20–3.00 mg/L Ag ⁺		20	1.5	985049
Hardness 100*	5–100 mg/L Starch		19	1	985085
Total kjeldahl nitrogen TKN 16	1.0–16.0 mg/L NO ₃ -N		20	1.5	985067
Total-nitrogen TN _o 22*	0.5–22.0 mg/L N		20	1	985083
Total-nitrogen TN _o 60*	3–60 mg/L N		20	1	985092
Total-nitrogen TN _o 220*	5–220 mg/L N		20	1	985088
Sulfate LR 200	20–200 mg/L SO ₄ ²⁻		20	3	985062
Sulfate MR 400	40–400 mg/L SO ₄ ²⁻		20	3	985060
Sulfate HR 1000	200–1000 mg/L SO ₄ ²⁻		20	2	985063
Sulfate 1000*	200–1000 mg/L SO ₄ ²⁻		20	3	985087
Sulfide 3*	0.05–3.00 mg/L S ²⁻		20	3	985073
Sulfite 10*	0.2–10.0 mg/L SO ₃ ²⁻		20	1	985089
Sulfite 100*	5–100 mg/L SO ₃ ²⁻		19	1	985090
Anionic surfactants 4*	0.20–4.00 mg/L MBAS		20	2	985032
Cationic surfactants 4*	0.20–4.00 mg/L CTAB		20	2	985034
Nonionic surfactants 15*	0.3–15.0 mg/L Triton® X-100		20	2	985047
Thiocyanate 50*	0.5–50.0 mg/L SCN ⁻		20	2	985091
TOC 30*	2.0–30.0 mg/L C		20	1 at 2–8 °C	985075
TOC 300*	20–300 mg/L C		20	1 at 2–8 °C	985078
TTC /Mud activity 150*	5–150 µg TPF; 0.050–2.300 E		20	2 at 2–8 °C	985890
Zinc 4*	0.10–4.00 mg/L Zn ²⁺		20	1	985096
Tin 3* ¹⁾	0.10–3.00 mg/L Sn		18	1	985097
Zinc 6	0.20–6.00 mg/L Zn ²⁺		20	1	985042

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¹⁾ For evaluation with the PF-12^{Plus}, a special filter (520 nm) is required.

Compact photometer PF-12^{Plus}

Technical data

Type	Filter photometer with microprocessor control, self-test and auto calibration
Optics	Automatic filter wheel with 7 interference filters, Insensitive to external light for fast measurements without cuvette slot cover
Wavelengths	345 nm / 436 nm / 470 nm / 540 nm / 585 nm / 620 nm / 690 nm plus 1 compartment for an additional filter, 860 nm LED for NTU-measurement
Wavelength accuracy	± 2 nm, bandwidth at half transmission 10 nm–12 nm
Light source	Xenon-high pressure lamp
Detector	Silicon photodiode
Blank value	Automatic
Measuring mode	More than 100 preprogrammed tests and special methods, absorbance, transmittance, factor, standard, nephelometric turbidity measurement; 20 freely programmable methods
Photometric range	± 3 Abs
Evaluable tests	VISOCOLOR [®] ECO Tests VISOCOLOR [®] Powder Pillows NANOCOLOR [®] tube tests NANOCOLOR [®] ECO Tests
Photometric accuracy	± 1 %
Stability	< 0.002 Abs/h
Cuvette holder	Round tubes 16 mm AD
Data memory	1000 results, GLP-conform
Display	Backlit graphic display, 128 x 64 Pixel. All important data at a glance: Result in respective unit, date, time, sample number, dilution, measuring, control bar
Auto-Off function	Inactive or automatic deactivation after 5 min, 10 min, 15 min, 20 min, 60 min
Quality control	With NANOCHECK 2.0
Interface	USB 2.0
Languages	DE / EN / FR / ES / IT / NL / HU / PL / PT-BR / CZ / SI / TR / MY
Update	For free via internet / PC
Operation range	10 °C–40 °C, up to 80 % relative humidity (non-condensing), up to max. 3000 m
Power supply	Via USB cable, USB power supply, batteries / rechargeable batteries or battery pack
Housing	Shock-resistant; waterproof and dustproof, according to IP 68
Dimensions	215 mm x 100 mm x 65 mm
Weight	0.7 kg
Warranty	2 years
CE	CE certified

Ordering information:

Description	REF
Compact photometer PF-12 ^{Plus}	919250
Incl. software DVD, manual, 4 batteries, 4 empty test tubes, funnel, breaker, syringe, USB cable, calibration cuvette and certificate in rugged case	
Accu pack	919201
USB-power supply	919220
Accu-Charger	919221
NANOCHECK 2.0	925703
VISOCOLOR [®] Color standards	914820



www.mn-net.com

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