Water Analysis

MACHEREY-NAGEL

NANOCOLOR®

Compact photometer PF-12*Plus*

Increased flexibility

- Reliable – Easy handling for precise results
- Mobile – Robust and waterproof
- Versatile – Nephelometric turbidity measurement and NTU-Check

Compact photometer PF-12*Plus*

Increased flexibility

The compact photometer PF-12*Plus* is tailor-made for the mobile water analysis, to evaluate our proven MACHEREY-NAGEL *VISOCOLOR® ECO* tests and our *NANOCOLOR®* tube tests.

The icon-based user guidance and the new 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. The delivery is carried out in a robust case, equipped with helpful accessories, allowing for an analysis directly at the point of interest.

For an overview of the *VISOCOLOR® ECO* and *NANOCOLOR®* tube tests, evaluable on the PF-12*Plus*, look at page 6, 7 and 8.

Save time – make work easier

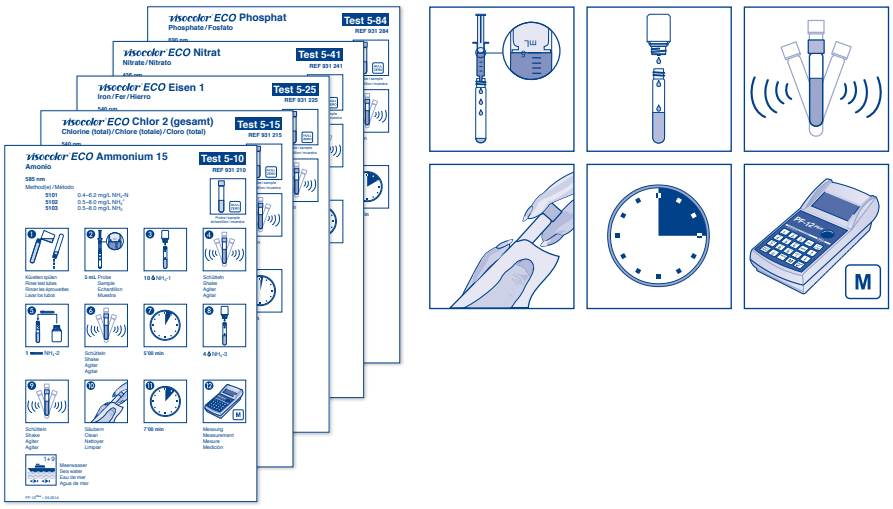
The PF-12*Plus* is already equipped with more than 100 preprogrammed methods and additional functions. Because of the easy handling, measurement results can be produced within seconds.

Backlit graphic display with intuitive user guidance

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

Preprogrammed tests and basic functions

- More than 100 preprogrammed methods
- Manual with test instructions displayed as pictograms



Compact photometer PF-12^{Plus}

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.

Highest accuracy

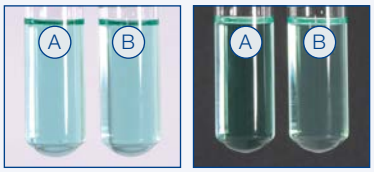
- Warning of potential interferences by fully automatic turbidity control measurement with 90° (NTU-Check)
- Display of the 20–80 % measurement range bar

Measurement without cuvette slot cover

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

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 %.

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 according to ISO 9001

- Fulfill supervisor and authority requirements
- Fast and easy self-monitoring of photometric accuracy with *NANOCONTROL* NANOCHECK (REF 925701)

Compact photometer PF-12^{Plus}

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.

Aside the preprogrammed methods the PF-12^{Plus} offers the possibility to install up to 50 special methods for customer specific applications. Step by step functions up to fourth-degree and logarithmic functions can be programmed this way.

Via the USB-port the device can be updated with new tests and methods in a minimum of time.

Works under any condition

- Variable power supply for mobile use
- Waterproof housing (IP68)
- Battery info and status

Free programming of user-defined methods

- Programmable for 50 user-defined methods
- 4th degree polynomial with ln-function

Fast photometer update – free of charge

- At any time, stay up-to-date with our easy online software update
- For current software updates please visit www.mn-net.com

The PF-12^{Plus} can be used even under hardest conditions. This was officially confirmed by the military science department of the German armed forces, where the instrument underwent shaking inquiries at different frequencies.

Even under such stress the device stayed fully functional. The PF-12^{Plus} therefore is the only photometer of its class, which fulfills the strict requirements of the regulation MIL-STD 8100.

A wide range of applications

Adjusted to today's and future customer needs, the PF-12^{Plus} is suitable for universal use in all fields of water and waste water analysis. Including municipal and industrial waste water, drinking water, surface water, ground water and boiler feed water.

- Public authorities
- Metalworking industries and galvanics
- Industrial laboratories
- Fish farmers
- Maintenance companies for mobile water analysis
- Schools and universities

Compact photometer PF-12^{Plus}

Individual mini-labs

For the PF-12^{Plus} several variants of reagent cases are available, allowing the individual assembly of a mini-lab.

VISOCOLOR® Reagent case for environmental analysis with PF-12^{Plus}

- Reagent case with PF-12^{Plus} and *VISOCOLOR*® *ECO* test kits for the following parameters
  - Ammonium
  - Carbonate hardness
  - Iron
  - Nitrate
  - Nitrite
  - pH
  - Phosphate
  - Total hardness
  - and accessories
- The allrounder for all applications
- Cost-efficient refill packs

REF 914353

VISOCOLOR® Reagent case with PF-12^{Plus}

- Reagent case with PF-12^{Plus} and room for individual equipping with
  - QUANTOFIX® test strips
  - pH-Fix test strips
  - pH indicator papers
  - Qualitative test papers
  - *VISOCOLOR*® test kits
- Infinite options
- Room for accessories and integrated cuvette stand

REF 914351

Example: Fully assembled *VISOCOLOR*® Reagent case

NANOCOLOR® Reagent case with PF-12^{Plus}

- Reagent case with PF-12^{Plus} and room for individual equipping with
  - Heating block *NANOCOLOR*® *VARIO C2* or *NANOCOLOR*® *VARIO Mini*
  - Two piston pipettes
  - Three packages of *NANOCOLOR*® tube tests
  - Accessories
- Especially for the fast and secure maintenance of small sewage treatment plants
- Highest transport safety by exceptionally robust cases

REF 919214

Example: Fully assembled *NANOCOLOR*® Reagent case

Compact photometer PF-12^{Plus}

Test	Measuring range		Wave-length	No. of tests	Shelf life (years)	Sea water	REF
VISOCOLOR® ECO							
Alkalinity TA	5–250 mg/L $CaCO_3$		436 / 585	100	1	yes	931204
Ammonium 3*	0.1–2.5 mg/L NH_4^+		690	50	1.5	1+9	931208
Ammonium 15*	0.5–8.0 mg/L NH_4^+		585	50	1.5	1+9	931210
Bromine	0.10–13.00 mg/L Br_2		540	200	2	yes	931211
Chloride*	1–50 mg/L Cl^-		470	90	1	no	931218
Chlorine 1, free + total	0.05–2.00 mg/L Cl_2		540	150	2	yes	931235
Chlorine 2, free + total*	0.05–2.00 mg/L Cl_2		540	150	1.5	no	931215
free Chlorine 2	0.05–2.00 mg/L Cl_2		540	150	1.5	no	931216
Chlorine 6, free + total	0.05–6.00 mg/L Cl_2		540	200	2	yes	931217
free Chlorine 6	0.05–6.00 mg/L Cl_2		540	400	2	yes	931219
Chlorine dioxide*	0.20–3.80 mg/L ClO_2		540	150	1.5	no	931221
Chromium (VI)*	0.04–1.00 mg/L CrO_4^{2-}		540	140	1.5	yes	931220
Copper	0.1–5.0 mg/L Cu^{2+}		585	100	2	yes	931237
Cyanide*	0.01–0.20 mg/L CN^-		585	100	1	1+3	931222
Cyanuric acid*	10–100 mg/L Cya		540	100	1.5	yes	931223
Fluoride	0.1–2.0 mg/L F^-		585	150	1.5	after destillation	931227
Hydrazine*	0.05–0.40 mg/L N_2H_4		436	130	1	yes	931230
Iron 1*	0.04–2.00 mg/L Fe		540	200	2	yes	931225
Iron 2	0.04–2.00 mg/L Fe		540	100	2	yes	931226
Manganese*	0.1–5.0 mg/L Mn^{2+}		436	70	1.5	yes	931238
Nickel*	0.04–5.00 mg/L Ni^{2+}		470	150	1.5	1+9	931240
Nitrate*	4–60 mg/L NO_3^-		436	110	1.5	yes	931241
Nitrite	0.02–0.50 mg/L NO_2^-		540	120	1.5	yes	931244
Oxygen*	1–8 mg/L O_2		540	50	1.5	yes	931288
pH 6.0–8.2	pH 6.1–8.4		436 / 540	150	1.5	yes	931270
Phosphate*	0.2–5.0 mg/L PO_4-P	0.6–15.0 mg/L PO_4^{3-}	690	80	3	yes	931284
Potassium*	2–25 mg/L K^+		690	60	3	1+1	931232
Silica	0.2–3.0 mg/L SiO_2		690	80	3	yes	931233
Silica HR 200 [1)]	10–200 mg/L SiO_2		450	100	3	yes	931234
Sulfate*	20–200 mg/L SO_4^{2-}		436	100	3	1+49	931292
Sulfide*	0.05–0.80 mg/L S^{2-}		620	90	3	yes	931294
Zinc	0.1–3.0 mg/L Zn^{2+}		620	120	1	1+9	931298
NANOCOLOR® tube tests							
Aluminium 07	0.02–0.70 mg/L Al^{3+}		540	19	1	yes	985098
Ammonium 3*	0.04–2.30 mg/L NH_4-N	0.05–3.00 mg/L NH_4^+	690	20	1	1+1	985003
Ammonium 10*	0.2–8.0 mg/L NH_4-N	0.2–10.0 mg/L NH_4^+	690	20	1	yes	985004
Ammonium 50*	1.0–40.0 mg/L NH_4-N	1.0–50.0 mg/L NH_4^+	690	20	1	yes	985005
Ammonium 100*	4–80 mg/L NH_4-N	5–100 mg/L NH_4^+	585	20	1	yes	985008
Ammonium 200*	30–160 mg/L NH_4-N	40–200 mg/L NH_4^+	585	20	1	yes	985006
Ammonium 2000*	300–1600 mg/L NH_4-N	400–2000 mg/L NH_4^+	585	20	1	yes	985002
AOX 3*	0.1–3.0 mg/L AOX	0.01–0.30 mg/L AOX	470	20	1	yes	985007
BOD_5*	0.5–12.0 mg/L O_2		470	25–50	2	yes	985822
BOD_5-TT*	0.5–7.5 mg/L O_2		436	11–21	2	yes	985825
Cadmium 2	0.05–2.00 mg/L Cd^{2+}		540	10–19	1	yes	985014
Carbonate hardness 15	1.0–18.0 °e	0.4–5.4 mmol/L H^+	436 / 585	20	1	yes	985015
Chloride 50*	0.5–50.0 mg/L Cl^-		470	20	1	no	985021
Chloride 200*	5–200 mg/L Cl^-	0.10–1.00 g/L Cl^-	470	20	1	1+199	985019
Chlorine / Ozon 2*	0.05–2.50 mg/L Cl_2	0.05–2.00 mg/L O_3	540	20	1	yes	985017
Chlorine dioxide 5	0.15–5.00 mg/L ClO_2		540	20	1	yes	985018
Chromate 5	0.05–2.00 mg/L Cr(VI)	0.1–4.0 mg/L CrO_4^{2-}	540	20	2	yes	985024
total Chromium 2*	0.05–2.00 mg/L Cr		540	20	2	no	985059
COD 40*	2–40 mg/L O_2		345	20	1 at 2–8 °C	no	985027
COD 60*	5–60 mg/L O_2		345	20	1 at 2–8 °C	no	985022
COD 160*	15–160 mg/L O_2		436	20	1	no	985026
COD 160 Hg-free*	15–160 mg/L O_2		436	20	1 at 2–8 °C	no	963026
COD 300*	50–300 mg/L O_2		436	20	1	no	985033
COD 600*	50–600 mg/L O_2		620	20	1 at 15–25 °C	no	985030
COD 1500*	100–1500 mg/L O_2		620	20	1	no	985029
COD 1500 Hg-free*	100–1500 mg/L O_2		620	20	1	no	963029
COD 4000*	400–4000 mg/L O_2		620	20	1 at 15–25 °C	no	985011
COD 10000*	1.00–10.00 g/L O_2		620	20	1	no	985023
COD 15000*	1.0–15.0 g/L O_2		620	20	1	no	985028
COD 60000*	5.0–60.0 g/L O_2		620	20	1	no	985012

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see SDS.
[1)] For evaluation with PF-12/PF-12^{Plus} a special filter is necessary

Compact photometer PF-12^{Plus}

Test	Measuring range		Wave-length	No. of tests	Shelf life (years)	Sea water	REF
COD LR 150*	3–150 mg/L O_2		436	20	1	no	985036
COD HR 1500*	20–1500 mg/L O_2		620	20	1	no	985038
org. Complexing agents 10 (Screeningtest)	0.5–10.0 mg/L I_{BiC}		540	10–19	1	1+19	985052
Copper 5	0.10–7.00 mg/L Cu^{2+}		585	20	2	yes	985053
Cyanide 08*	0.02–0.80 mg/L CN^-		585	20	1	1+3	985031
DEHA 1 (Diethylhydroxylamin)	0.05–1.00 mg/L DEHA		540	20	1	yes	985035
Ethanol 1000	0.10–1.00 g/L EtOH	0.013–0.130 Vol. % EtOH	620	23	2 at < 0 °C	no	985838
Fluoride 2	0.1–2.0 mg/L F^-		620	20	1.5	1+9	985040
Formaldehyde 8*	0.1–8.0 mg/L HCHO		585	20	2	no	985041
Formaldehyde 10	0.20–10.00 mg/L HCHO		436	20	2	yes	985046
Hardness Ca / Mg	1.25–25.00 °e; 5–50 mg/L Mg^{2+}	0.2–3.6 mmol/L; 10–100 mg/L Ca^{2+}	540	20	1.5	1+29	985044
Hardness 20	1.25–25.00 °e; 5–50 mg/L Mg^{2+}	0.2–3.6 mmol/L; 10–100 mg/L Ca^{2+}	540	20	1.5	1+29	985043
HC 300* (hydrocarbons)	0.5–5.6 mg/L KW	30–300 mg/kg KW	436	20	1	yes	985057
Iron 3*	0.10–3.00 mg/L Fe		540	20	1	yes	985037
Lead 5*	0.10–5.00 mg/L Pb^{2+}		540	20	1	no	985009
Manganese 10*	0.1–10.0 mg/L Mn		470	20	1.5	yes	985058
Methanol 15	0.2–15.0 mg/L MeOH		620	23	1 at < 0 °C	no	985859
Molybdenum 40*	1.0–40.0 mg/L Mo (VI)	1.6–65.0 mg/L MoO_4^{2-}	345	20	2	no	985056
Nickel 4*	0.10–7.00 mg/L Ni^{2+}		470	20	2	1+9	985071
Nitrate 8*	0.30–8.00 mg/L NO_3-N	1.3–35.0 mg/L NO_3^-	345	20	2	no	985065
Nitrate 50*	0.3–22.0 mg/L NO_3-N	2–100 mg/L NO_3^-	345	20	2	no	985064
Nitrate 250*	4–60 mg/L NO_3-N	20–250 mg/L NO_3^-	345	20	2	no	985066
Nitrite 2*	0.003–0.460 mg/L NO_2-N	0.02–1.50 mg/L NO_2^-	540	20	1	yes	985068
Nitrite 4	0.1–4.0 mg/L NO_2-N	0.3–13.0 mg/L NO_2^-	540	20	1	yes	985069
total Kjeldahl nitrogen TKN 16	1.00-16.00 mg/L TKN		345	20	1	no	985067
total Nitrogen TNb 22*	0.5–22.0 mg/L N		345	20	1	no	985083
total Nitrogen TNb 60*	3–60 mg/L N		345	20	1	no	985092
total Nitrogen TNb 220*	5–220 mg/L N		345	20	1	no	985088
Organic acids 3000*	30–3000 mg/L CH_3COOH	0.5–50.0 mmol/L CH_3COOH	470	20	1.5	yes	985050
Oxygen 12*	0.5–12.0 mg/L O_2		436	22	2	yes	985082
Peroxide 2	0.03–2.00 mg/L H_2O_2		620	10–19	1 at 2–8 °C	yes	985871
pH 6,5–8,2	pH 6.1–8.4		436 / 540	100	1.5	yes	91872
Phenolic index 5*	0.2–5.0 mg/L Phenol		470	10–19	1.5	after extraction	985074
ortho and total Phosphate LR 1*	0.05-0.50 mg/L P	0.2-1.5 mg/L PO_4^{3-}	885	20	1	yes (ortho-P)	985095
ortho and total Phosphate 1*	0.05–1.50 mg/L P	0.2–5.0 mg/L PO_4^{3-}	690	20	1	yes (ortho-P)	985076
ortho and total Phosphate 5*	0.20–5.00 mg/L P	0.5–15.0 mg/L PO_4^{3-}	690	20	1	yes (ortho-P)	985081
ortho and total Phosphate 15*	0.30–15.00 mg/L P	1.0–45.0 mg/L PO_4^{3-}	690	20	1	yes (ortho-P)	985080
ortho and total Phosphate 45*	5.0–50.0 mg/L P	15–150 mg/L PO_4^{3-}	690	20	1	yes (ortho-P)	985055
ortho and total Phosphate 50*	10.0–50.0 mg/L P	30–150 mg/L PO_4^{3-}	436	19	3	yes (ortho-P)	985079
POC 200	20–200 mg/L		436	20	1.5	1+3	985070
Potassium 50*	2–50 mg/L K^+		690	20	2	1+9	985045
Residual Hardness 1	0.03–1.25 °e	0.004–0.180 mmol/L	540	20	1	no	985084
Silver 3	0.20–3.00 mg/L Ag^+		620	20	1.5	no	985049
Starch 100*	5–100 mg/L Starch		540	19	1	1+1	985085
Sulfate 200*	10–200 mg/L SO_4^{2-}		436	20	3	no	985086
Sulfate 1000*	200–1000 mg/L SO_4^{2-}		436	20	3	no	985087
Sulfate LR 200*	20–200 mg/L SO_4^{2-}		436	20	3	no	985062
Sulfide 3*	0.05–3.00 mg/L S^{2-}		620	20	3	1+3	985073
Sulfite 10*	0.2–10.0 mg/L SO_3^{2-}		436	20	1	1+19	985089
Sulfite 100*	5–100 mg/L SO_3^{2-}		470	19	1	yes	985090
Anionic surfactants 4*	0.20–4.00 mg/L MBAS		620	20	2	1+19	985032
Cationic surfactants 4*	0.20–4.00 mg/L CTAB		620	20	2	1+19	985034
Nonionic surfactants 15*	0.3–15.0 mg/L Triton® X-100		620	20	2	no	985047
Thiocyanate 50*	0.5–50.0 mg/L SCN^-		470	20	2	1+1	985091

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[1] For evaluation with PF-12/PF-12^{Plus} a special filter is necessary

Compact photometer PF-12^{Plus}

Test	Measuring range	Wave-length	No. of tests	Shelf life (years)	Sea water	REF
Tin 3* (special filter required)	0.10–3.00 mg/L Sn	520	18	1	1+9	985097
TOC 30*	2.0-30.0 mg/L C	436	20	1	no	985075
TOC 300*	20-300 mg/L C	436	20	1	no	985078
TTC / Sludge activity150*	5–150 µg TPF; 0.050–2.300 E	470	20	2 at 2–8 °C	no	985890
Zinc 4*	0.10–4.00 mg/L Zn^{2+}	620	20	1	1+1	985096
Zirconium 100	5-100 mg/L Zr	540	20	3	yes	985001

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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 for fast measurements without cuvette slot cover
Wave-lengths	345 / 436 / 470 / 540 / 585 / 620 / 690 nm plus 1 compartment for an additional filter, 860 nm LED for NTU-measurement
Wavelength accuracy	± 2 nm, bandwidth at half transmission 10–12 nm
Light source	Xenon high pressure 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 A
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, dilution, measuring range control bar
Auto-Off function	Inactive or automatic deactivation after 5 min, 10 min, 15 min, 20 min, 60 min
Quality Control	With *NANOCONTROL* NANOCHECK
Operation	Self-explanatory menu guidance, foil keypad, test selection via parameter lists
Interface	USB 2.0
Languages	DE / EN / FR / ES / IT / NL / HU / PL / PT / CZ / ID / SL / TR / MY
Update	For free via internet / PC
Operating range	10 °C–40 °C, up to 80 % relative humidity (non-condensing)
Power supply	4 AA batteries, rechargeable batteries, USB interface; optional internal accu-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} Incl. software DVD, manual, 4 batteries, 4 empty test tubes, funnel, beaker, syringe, USB cabel, calibration cuvette and certificate in rugged case	919250
Accu pack	919201
USB power supply	919220
Charger	919221

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MACHEREY-NAGEL

MACHEREY-NAGEL GmbH & Co. KG · Neumann-Neander-Str. 6–8 · 52355 Düren · Germany

DE / International:
Tel.: +49 24 21 969-0
Fax: +49 24 21 969-199
E-mail: info@mn-net.com

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

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

US:
Tel.: +1 484 821 0984
Fax: +1 484 821 1272
E-mail: sales-us@mn-net.com

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