

MACHEREY-NAGEL

Spectrophotometer
NANOCOLOR[®] Advance



Operating instruction

Distributed By:



MACHEREY-NAGEL

www.mn-net.com



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1. Introduction

The *NANOCOLOR* Advance is a spectrophotometer from MACHEREY-NAGEL for mobile use and for use in laboratories. It is used for the evaluation of colorimetric test kits from MACHEREY-NAGEL. Besides the measurement of the absorbed light it offers the possibility to determine the nephelometric turbidity units by measuring the light scattering in a 90° angle. The touch screen and the intuitive menu navigation allow for fast, comfortable and pleasant working with the instrument and make it the ideal laboratory photometer in the whole spectrum of water analysis.

2. CE marking



The CE marking declares that the product complies with the following European Community harmonisation legislation:

European Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS 2)

European Directive 2012/19/EU on waste electrical and electronic equipment (WEEE)

European Directive 2014/30/EU on the harmonization of the laws of the member states relating to electromagnetic compatibility (EMC)

European Directive 2014/35/EU of electrical equipment designed for use with certain voltage limits (LVD)

3. Type label

   Made in Germany MACHEREY-NAGEL MACHEREY-NAGEL GmbH & Co. KG Neumann-Neander-Str. 6-8 · 52355 Düren · Germany Tel.: +49 24 21 969-0 · Fax: +49 24 21 969-199 info@mn-net.com · www.mn-net.com	 NANOCOLOR® Advance 12 V $\overline{\text{DC}}$ / 2.5 A SN
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4. Explanation of symbols

The type label of the device contains the symbols and terms listed below with the following meanings:

Term/Symbol	Meaning
NANOCOLOR® Advance	Device type designation
SN:	Serial number of the device
12 V DC / 2,5 A	Power supply NANOCOLOR® Advance
	Direct voltage
	Attention (observe documentation)! Observe the safety instructions in this operating instruction of the device
	Identification USB interface
	According to 2012/19/EU, it is prohibited to dispose of the device through public waste disposal systems. Note also the information in the “Disposal” section.
	The CE symbol indicates fulfillment of the applicable harmonization legislation of the European Community.
MACHEREY-NAGEL	Identification of the manufacturer
	This symbol indicates that there is a risk of electric shock.
	This symbol indicates that the chemicals used have a corrosive effect. Observe the safety measures in the laboratory and wear the prescribed protective equipment. Follow the instructions in the current safety data sheets (SDS) of the products used.
	This symbol indicates that there may be a danger by using flammable substances.
	Explanations to the text. Tips and tricks for better handling.

5. Safety instructions

BE SURE TO READ THE FOLLOWING SAFETY INSTRUCTIONS CAREFULLY BEFORE USING THE DEVICE.

Failure to follow these instructions may result in serious injury to the operator, malfunction or damage to the equipment.

Keep this manual in a safe place for future reference.

Follow the safety notes and instructions in the operating manual and observe the stickers and notices on the device.

Do not work on internal parts of the unit. Non-compliance will invalidate any warranty claim.

Use of the hazard warning:

DANGER

Indicates an imminent or potentially hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates an imminent or potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

Indicates a situation which, if not avoided, may result in malfunction or damage to the device. Information that clarifies facts in the text and that requires special attention.

6. Chemical and biological safety

WARNING

Possible dangers of contact with chemical and biological substances.

Working with samples, reagents and corresponding accessories is associated with dangers.

Wear suitable protective equipment when working with the cuvettes. Observe the safety data sheet (SDS) of the test kit used.

During normal operation of this device, it may be necessary to use chemicals that are hazardous to your health or biologically harmful samples.

Before handling these substances, read all hazard statements and safety information printed on the containers with the original solutions and in the safety data sheets. All used solutions must be disposed of in accordance with the national laws and regulations. The type of protective equipment must be selected according to the concentration and amount of the hazardous substance present at the corresponding workplace.

7. Technical description

The *NANOCOLOR*[®] Advance enables measurements in the wavelength range of 340 nm to 800 nm. The light generated by a halogen lamp is diffracted by a concave grating and directed into the cuvette shaft of the instrument by means of imaging optics. After passing through the sample, the proportion of absorbed light is calculated by detecting the attenuated light. The proportion of absorbed light is converted to the concentration of the analyte according to a calibration.

7.1 Technical data

Specification	Description
Type:	Spectrophotometer with reference-detector-technology (RDT)
Light source:	Halogen lamp
Optical system:	Single beam photometer with grating monochromator
Wavelength range:	340 nm–800 nm
Wavelength accuracy:	± 2 nm
Wavelength resolution:	1 nm
Wavelength calibration:	Automatic
Wavelength selection:	Automatic, barcode, manually
Wavelength reproducibility:	± 0.1 nm
Scan speed:	1 complete scan < 3 min
Spectral bandwidth:	< 4 nm
Photometric range:	± 3.0 Abs
Photometric accuracy:	0.003 Abs at 0.0–0.5 Abs; 1 % at 0.5–2.0 Abs
Photometric linearity:	< 0.5 % at 0.5–2.0 Abs; ≤ 1 % at > 2 Abs with neutral glass filters at 546 nm
Stray light:	< 0.5 %
Measurement modes:	More than 200 preprogrammed tests and special methods; 99 free programmable methods; Absorbance; Transmission; Factor; Kinetics; 2 Point calibration; Scan; Nephelometric turbidity measurement
Turbidity measurement:	Nephelometric turbidity measurement (16 mm and 24 mm): 1–1000 NTU
Cuvette slot:	Test tubes 16 mm and 24 mm OD; Rectangular cuvettes 10 mm, 20 mm, 40 mm and 50 mm
Battery:	Lithium iron phosphate battery; approx. 1000 measurements or 8 h runtime (depending on energy settings)
Data memory:	1000 measured data sets / spectra; GLP-compliant
Display:	Backlit colored 5" display
Operation:	Barcode technology; icon-based menu navigation; capacitive touch screen
Dimensions:	325 × 280 × 130 mm (L × W × H)
Languages:	DE/EN/FR/ES/PT/PL /NL
External light:	Insensitive; open cuvette slot
Interfaces:	LAN (CAT6; only use shielded cable of max. 20 m length) 2 × USB (Host), 1 × USB (Function)
Operating conditions:	10–40 °C, up to 80 % rel. humidity (non-condensing)
Protections class:	IP6X: dust proof IPx7: water proof for 30 minutes at 1 m depth
Update:	Via USB-Stick

8. Setting up and connecting the device

8.1 Scope of delivery

Check the delivery for completeness. If parts of the delivery should be missing, contact MACHEREY-NAGEL or your local distributor directly.

- Spectrophotometer *NANOCOLOR*[®] Advance
- Cuvette adapter 10 mm, 16 mm, 20 mm, 50 mm (Adapter A)
- Cuvette adapter 24 mm (Adapter B)
- Power supply: 12 V / 2.5 A; incl. 4 adapters
- Calibration cuvette 16 mm and 24 mm
- Microfiber cloth for cleaning of display and cuvettes
- Cuvette slot cover
- Dust cover
- Certificate
- 4 × 24 mm cuvettes
- Quick start guide (different languages)

8.2 Connecting the device

CAUTION

Multiple hazards: Only qualified personnel should perform the instructions described in this step.

WARNING



Risk of electric shock: Make sure that the power cord is not damaged. Check the suitability of the power source for the equipment.

CAUTION

Risk of injury: Place the device on a flat surface. Do not stack the unit.

NOTICE

The unit is designed for indoor and outdoor use. Do not expose the device to direct sunlight. Protect the interfaces from moisture and dampness at all time.

WARNING



Fire hazard: Take care not to overload the main socket. There is a risk of overload and fire.

Make sure that the power cord is not damaged. Check the suitability of the power source for the equipment.

WARNING

Risk of injury: Familiarize yourself with the device before working with it and read this document carefully. Do not use the device unless you have received instruction on its use.

NOTICE

Defects in the device can lead to malfunction of the device. If the device shows an apparent breakage of the housing or a damaged power supply, it must be taken out of operation.

The spectrophotometer is equipped with an internal battery. When the instrument is put into operation, it must be connected to a power source to unlock the transport mechanism of the lithium-ion battery. Before the first operation, the battery of the instrument should be fully charged.

1. Remove the interface cover on the left side of the unit e.g. by using a coin (Fig. 1).
2. Connect the power cord to the power connector of the unit (Fig. 2).
3. Attach the adapter corresponding to your power outlet to the supplied AC adapter.
4. Connect it to a power source.



Fig. 1: Removing the interface cover



Fig. 2: Connecting the power supply

8.3 Transport

NOTICE



If the battery is damaged, the device must not be shipped. Contact MACHEREY-NAGEL or your local distributor.

NOTICE



When the equipment is shipped, the outer box must be marked to indicate a lithium-ion battery is included (UN 3481).

Only ship the device in a box that is suitable for shipment of devices containing lithium-ion batteries. If the original box is no longer available contact MACHEREY-NAGEL.

9. Device views

9.1 Front and side view

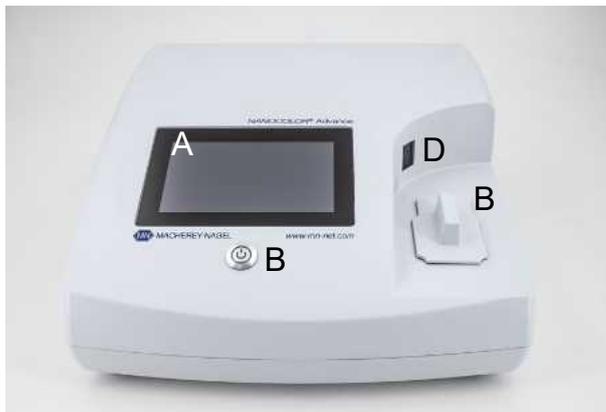


Fig. 3: Front view



Fig. 4: Side view

A Touch screen (capacitive)

B Universal cuvette slot for rectangular cuvettes 16 mm OD, 24 mm OD and rectangular cuvettes 10 mm, 20 mm, 40 mm and 50 mm

C On/Off button

D 2D-barcode scanner

E 2 × USB A interface

F USB B interface

G Ethernet (LAN) interface

H Power socket 12 V DC 2.5 A

9.2 Device from below



Fig. 5: View from below

- A Speaker
- B Lamp shaft
- C Cuvette slot drain

10. Initial operation

WARNING

Exposure of the eye to light. Do not look directly into the light beam of the halogen lamp and the turbidity LED.

10.1 Turning on the device

After charging the battery, switch on the device using the button on the front panel below the display (Fig. 3 B).

When the device is switched on for the first time, it automatically asks for the language and region settings. Select the desired language and region from the displayed lists.

The language can also be changed after switching on the device via the menu *Settings > Device Settings > Language* (see 12.2 *Device Settings, page 31*).

10.2 Operation and user guidance

The *NANOCOLOR*[®] Advance is operated via a 5" display with capacitive touch screen. All entries are made via the touch screen. Only switching on/off is done via the button on the front of the device.

10.2.1 Operating the touch screen

The spectrophotometer is operated via a capacitive touch screen. This reacts to touch by one or more fingers. In this way, the device can be operated by pressing and wiping on the touch screen. The operation can be done by touching with a finger or with the help of a touch-pen (special pen for projective, capacitive touch screens). Wearing rubber gloves is no problem. Numbers or texts are entered in the corresponding number or text fields, which react to touch and automatically open a pop-up with a number pad or an input keyboard.

By clicking on the &123 character, you can switch to the numeric keyboard with special characters. Clicking the character ↑ allows you to enter upper case letters. The language-specific keyboard options QWERTZ, QWERTY and AZERTY can be set via the keyboard settings menu *Settings > Device Settings > Keyboard*.

10.2.2 Application and status information bar

The operating menu of the spectrophotometer consists of a status information bar at the top of the screen and an application bar directly below. The status information bar is always displayed. The application bar is temporarily hidden depending on the menu for a better overview.

The status information bar provides information about the status of the device, activated settings and users who are logged in.

If special properties (e.g. memory, reaction time) are activated, a corresponding status icon is displayed to indicate that the function is active. The status of operational readiness is indicated by a status icon in the upper left corner of the display. If the green tick is visible, the device is ready for operation. If the white X is displayed against a red background, the device is occupied with a measurement or there is an error.

The unit is controlled via the application bar.

During an ongoing measuring process, the device cannot be operated via the application bar. The symbols are then displayed in grey.

The meaning of the icons in the task bar is as follows:



Return to the start screen of the device by pressing this icon. From this menu it is possible to call up the *NANOCOLOR*[®] tests via barcode.



Return to the previously selected menu or application. Some menus cannot be called up again with this icon after exiting (e.g. measuring menu) because the process was completed by exiting the menu.



This icon can be used to call up additional options, provided they are available in the selected menu.



This icon can be used to add information in an application (e.g. to a measurement result).



This icon leads to the settings in a specific menu.



This icon adds a selected entry to the favorites.



Use this icon to delete one or more selected entries.

10.2.3 Start screen

The start page of the device is empty when delivered. However, up to eight different icons can be linked on the start page. These are then available directly after the device is started. The icons can be attached to the start screen by holding the icon for a longer time and confirming the command “Attach to start screen”. The icons are automatically arranged in the order in which they were linked. To delete the favorite icons from the start screen, you can remove them again by pressing the respective icon for a longer time and confirming the command “Detach from start screen”.

10.2.4 Radio buttons, check boxes and sliders

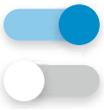


Radio buttons contain black bordered selection points. Selection points are shown as circles. Active selection points are filled in. Only one selection point is active in a radio button.

Touch a selection point to activate it. When you exit the menu, the selected options are saved.



Checkboxes are square boxes that are active as soon as a check mark is set. If you touch an empty checkbox, it is marked with a check mark and is activated. If you touch a checkbox with a tick, the tick is removed and the checkbox is deactivated. It is possible to select several checkboxes in parallel.



Sliders are used to activate and deactivate various functions. If the slider is highlighted in blue, the function is active and if it is displayed in grey, it is inactive.

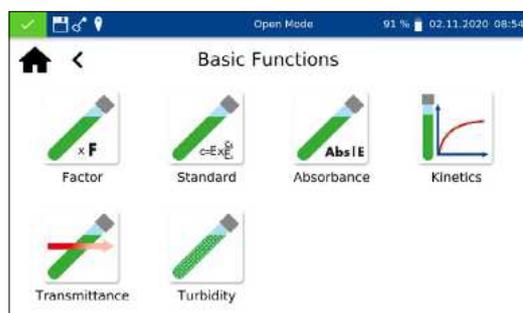
In some menus, an option is selected via a popup menu in form of a list from which the required option can be selected by clicking (see 10.2.5 List functions, page 14).

10.2.5 List functions

When confirming text or number fields, it is possible that a selection list appears instead of an input keyboard. The contents of the list can be moved by vertical wiping. The selection is made by pressing the corresponding entry. The currently active entry in the list is displayed with a colored background. A distinction is made between two types of lists: With predefined lists (e.g. submethod) there is no possibility to add an entry, whereas the dynamic lists (e.g. sample locations) can be edited by the user. The possibility of executing actions in a list is controlled via the application bar of a list.

11. Measurements

11.1 Basic Functions



Pressing the  icon will open the basic functions menu with six different measurement options to choose from. With the exception of the turbidity measurement, the tests in the *Basic Functions* menu are independent of the cuvette size used.

After a measurement, various sample information can be entered via the icons below the results window.

Using the icon , further sample information can be added below the measurement result. For this purpose the desired sample information can be activated using the slider in front of the option.

Further options are available via the  icon.

With the command *Do not save* the measurement result is not saved in the instrument memory when the cuvette is pulled out or when leaving the menu.

NOTICE

This function is only available in *Open Mode*.

11.1.1 Factor



The basic function *Factor* enables the determination of measurement results through the multiplication of an absorbance with a user defined factor.

After having selected this method, a window will appear asking for the factor (max. 7 digits) and the wavelength for the measurement and calculation.

Confirming with  opens the measurement window. Inserting the zero solution and pressing  will initiate the zero measurement. After the successful measurement of the zero solution, the sample solution needs to be inserted. Pressing  will start the measurement process. After the measurement has been completed, the measurement result will be displayed in the result window.

11.1.2 Standard

The basic function *Standard* enables the definition of a sample's concentration on basis of the concentration of a standard solution and a zero solution. After having selected this method, a window will appear asking for the standard concentration (max. 7 digits) and the wavelength for the measurement.

Confirming the entries by pressing  will open the measurement window. Inserting the zero solution and pressing  will initiate the zero measurement. Then, the standard solution needs to be inserted. Pressing  will start the sample measurement.

After the measurement has been completed, the measurement result will be displayed in the result window (see 11.3 Result view, page 19). In case more samples need to be investigated the next sample can be inserted. Pressing  will start the measurement of the next sample.

11.1.3 Absorbance

The basic function *Absorbance* enables the measurement of a sample's absorbance against a zero solution.



After having selected this method, a window to enter the wavelength for the measurement will appear. The wavelengths are entered in a list by pressing . By selecting  the options, the marked entry is removed.

Confirming with  will open the measurement window. The instrument asks for a zero measurement. Inserting the zero solution and pressing  will initiate the zero measurement. After the successful measurement of the zero solution, the sample solution needs to be inserted. Pressing  will start the measurement process. After the measurement has been completed, the measurement result is displayed in the result window.

The absorbance values of the individual wavelengths can be displayed by selecting the corresponding wavelength below the result.

11.1.4 Kinetics

The basic function *Kinetics* enables the measurement of a sample's kinetic against a zero solution. After having selected this method, a window will appear asking for the measurement time, a time interval and the measurement wavelength.

Confirming the entries with  opens the measurement window. Inserting the zero solution and pressing  will initiate the zero measurement. After the successful measurement of the zero solution, the sample solution needs to be inserted. Pressing  starts the measurement process. A diagram will be displayed showing the live-recording of the measurement results. When the measurement is finished, the result of the measurement is displayed as a graphic. A table of the value pairs can be displayed via the *Measured values* entry in the options.

11.1.5 Transmittance

The basic function *Transmittance* enables the measurement of a sample's transmission against a zero solution. After having selected this method, a window will appear asking for the wavelength of measurement.



After calling the menu, a window appears for entering the wavelengths. The wavelengths are entered in a list by pressing λ^+ . By selecting , the marked entry is removed from the list.

Confirming with  will open the measurement window. A request for a zero solution will appear. Inserting the zero solution and pressing  initiates the zero measurement. After the successful measurement of the zero solution, the sample solution needs to be inserted. Pressing  starts the measurement process. After the measurement has been completed, the measurement result will be displayed in the measurement window.

11.1.6 Turbidity

The basic function *Turbidity* enables the measurement of a sample's nephelometric turbidity.



You will be prompted to insert the sample solution. Insertion of the test tube and pressing  initiates the measurement. After the measurement has been completed, the measurement result will be displayed in the result window. When measuring against a zero value, the cuvette with the zero solution must be measured before measuring the sample solution. The measurement of the zero solution is started by pressing .

NOTICE

The nephelometric turbidity measurement can only be performed in the 16 mm and 24 mm OD test tubes.

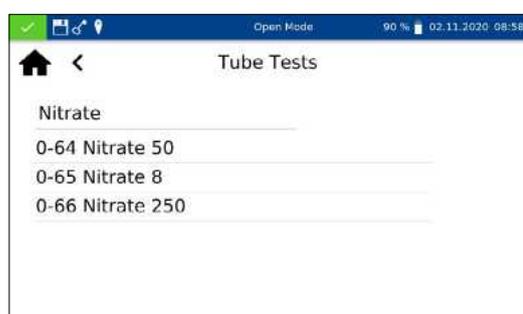
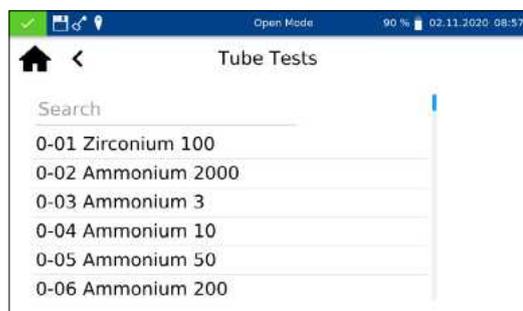
11.2 MN Tests



The MN Tests menu is opened by pressing . The available options are shown on the left. Press the appropriate icon to open the desired menu.

11.2.1 Tube Tests

NANOCOLOR[®] tube tests can be called up in the device in various ways. All test tubes are labelled with a barcode (Except test 0-72 pH). When the start screen is active or the device is in measuring mode, the barcode of the inserted test tube will be scanned automatically. The instrument detects the tube test and the measuring process is initiated



NOTICE

For tube tests that must be measured against a zero solution, no automatic measurement is performed. The measurement must be started manually by pressing  or .

Press the icon  to access the selection list of tube tests. By selecting an entry, the corresponding test is highlighted. After confirming with , the measuring window is opened. Besides the scroll function in the selection list, a search function is also available. By clicking *Search* and entering any search term (filtering by test name or test number is possible), a global search is performed in the list of predefined methods

NOTICE

If a test is called up via the selection list, there is no automatic measurement when the cuvette is inserted. The measurement must be started manually by pressing  or .

11.2.2 Standard tests

NANOCOLOR[®] standard tests can be selected in different ways. It is, however, not possible to select a standard test by barcode identification. The measuring menu of the rectangular cell tests can be opened by selecting the corresponding test from the list with rectangular cell tests or by entering the test number (see *11.7 Test number, page 29*). The insertion of the cuvette with the zero solution is required. After pressing , the zero solution is measured and the cuvette with the sample solution is inserted. Pressing  initiates the measurement. The result is displayed in the result window. Various sample information can be entered via the  icon and the icons below the result field (see *11.3 Result view, page 19*). After removal of the cuvette or leaving the measuring menu the result is stored in the measurement memory of the device.

11.2.3 Bio tests

NANOCOLOR[®] bio tests can be selected in different ways. All bio tests are labelled with a barcode. When the start screen is active or the device is in measuring mode, the barcode of the inserted test tube will be scanned automatically. The instrument detects the tube test and the measuring process is initiated.

The desired test can also be called up by entering the test number (see 11.7 Test number, page 29). When the test is complete, the result is displayed in the measurement window. Various sample information can be entered using the  icon and the icons below the result field (see 11.3 Result view, page 19). Removing the tube or leaving the measuring menu ends the measuring procedure and saves the result in the memory of the device.

NOTICE

For bio tests that must be measured against a zero solution, no automatic measurement is performed. The measurement must be started manually by pressing  or .

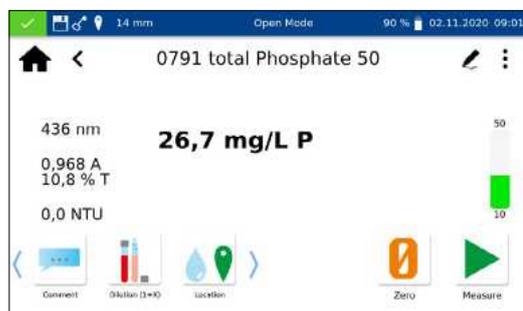
11.2.4 VISOCOLOR® Powder Pillows and VISOCOLOR® ECO

VISOCOLOR® Powder Pillows and ECO Test kits can be selected in different ways. Calling up the method via barcode is not possible. The measuring menu of the VISOCOLOR® test kits can be opened by selecting the corresponding test from the list with VISOCOLOR® PP or VISOCOLOR® ECO tests or by entering the test number (see 11.7 Test number, page 29). Depending on the test, either the insertion of the cuvette with the zero solution is required or a direct measurement is possible. After pressing , the zero solution is measured and the cuvette with the sample solution is inserted. Pressing  initiates the measurement. The result is displayed in the result window. Various sample information can be entered via the  icon and the icons below the result field (see 11.3 Result view, page 19). After removal of the cuvette or leaving the measuring menu the result is stored in the measurement memory of the device.

11.2.5 Favorites

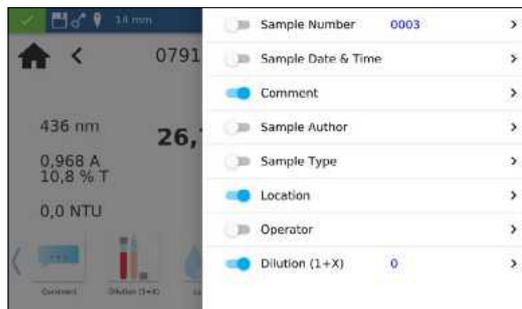
An entry from the list of favorites can be made by selecting from the list or by entering the test number. After marking the desired entry and confirming with , the corresponding window for measuring the test is opened. To add an entry to the favorites from the respective list of test kits, mark the desired entry and press the  icon. To delete a test from the favorites list, mark the entry to be deleted and press the  icon.

11.3 Result view



When the measurement is complete, the result of the respective measurement is displayed in the results window.

Various sample information can be entered via the icons below the results window. Various sample information can be entered via the icons below the results window. Via the  icon further sample information are available, which can be arranged as favorites below the measurement result. For this purpose, the slider in

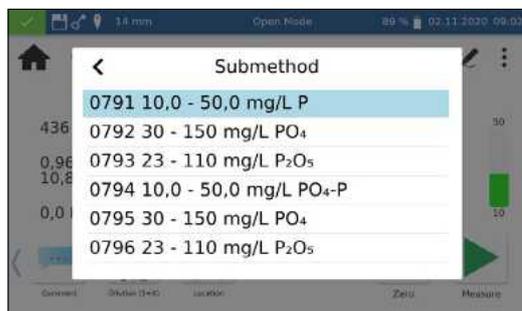


front of the corresponding sample information must be activated. To remove the icon from the sample information bar, proceed in the same way and set the slider to inactive. The following sample information can be added to the sample:

- **Sample Number:** Sample numbers are assigned automatically and consecutively by the instrument. By pressing the sample number icon, you can assign a sample number manually. Thereafter, the instrument will count forward based on the manually assigned sample number.
- **Sample Date & Time:** Date and time of the sampling.
- **Comment:** Additional information about the sample (e.g. appearance of the sample, turbidity)
- **Sample Author:** Name of the person, who has collected the sample
- **Sample type:** Information on the nature of the sample (e.g. 24 h Composite sample).
- **Location:** Information on the place of origin of the sample.
- **Operator:** Name of the user who performs the measurement. In user mode, a name can be entered here, if the user is different from the user who is logged in.
- **Dilution:** The dilution of the sample can be entered here. Depending on the setting in the settings menu for dilution, the dilution is displayed either as “1+X” or „1:X“. The result of the measurement is converted automatically.

Further options are available via the  icon.

The *Submethod* entry allows you to change the reference unit and the reference quantity (e.g. PO₄-P). The active submethod is highlighted.



When changing the submethod, the result is automatically converted. Removing the cuvette or exiting the measuring menu via the other icons in the taskbar quits the measurement, and the result will be stored in the measured value memory of the instrument. The last selected submethod is used the next time the corresponding method is called up.

The *Settings* entry is a quick way to change settings for the display of the measurement result. Activating the slider for *Show absorbance* activates the display of the absorbance and transmission value of the measurement to the left of the measurement result. By activating the entry *20–80 % measuring range* a colored bar is displayed to the right of the measurement result, which shows the position of the measurement result in the measuring range. If the bar is colored green, the result is within the 20–80 % measuring range. If the bar is yellow, the result is within the measuring range but outside the 20–80 % measuring range. If the bar is colored red, the measured value is outside the measuring range. The measuring range limits are displayed above and below the bar.



The “Correction measurement” option can be used, if a correction value (see 11.4 *Determination of corrections values*, page 21) is applied to compensate for a measurement error with colored or turbid samples.

With the command *Do not save*, the measurement result is not stored in the instrument memory when the cuvette is removed or when the menu is exited.

NOTICE

The *Do not save* function is only available in *Open Mode*.

11.4 Determination of corrections values

These instructions are only to be used in connection with the original instructions of the *NANOCOLOR*[®] cuvette tests. The photometric analysis of water samples with inherent color or turbidity requires the determination of a correction value. Colors and turbidity influence the measurement and therefore lead to deviating measured values. The correction values require a special procedure for each test. For example, it is not always sufficient to measure the intrinsic color of the sample without reagents and subtract it from the measured value. In many cases the reagents change the intrinsic color or turbidity of the sample. All changes to the sample, such as dilution, addition of chemicals that influence pH or redox potential, must be reproduced as in the original analysis. Only the coloring reagent is not added.

In the *NANOCOLOR*[®] Advance spectrophotometer, the correction value program is activated after the normal evaluation (value A) by selecting the “correction value” entry via the  icon in the result window (see 11.3 *Result view*, page 19). For this purpose, the cuvette with the correction value (value B) is requested and measured. The corrected measurement result is displayed and stored. Depending on the test, the photometer requires a zero measurement for the correction value in addition to the correction value cuvette.

Underlying procedure:

measured value according to original instruction = A

correction value according to special specification = B
Analysis value = A – B

Exceptions: Methods in which decreasing absorbance is measured against a reagent blank value. Then the following applies: Analysis value = A + B. This is pointed out in the corresponding tests.

It is very important that only values of the same dimension are subtracted from each other (e.g. mg/L N; mg/L NH₄; mmol/m³; Abs).

If the correction factor is so low in the same matrix with several samples that it is negligible for the measurement problem at hand, the determination can be omitted. However, this only results from practical testing and is not evident beforehand!

When measuring the correction value, a clean, empty tube filled with distilled water is used as the zero value (exception: tests 0-59/0-64 /0-65 /0-66).

11.4.1 Correction values for NANOCOLOR® tube tests

Test	Tube for correction (value B)
0-01 Zirconium 100	Proceed as described in the instructions for test 0-01, but do not add NANOFIXR2. Seal, mix.
0-02, 0-03, 0-04, 0-05, 0-06, 0-08 Ammonium 3–2000	Proceed as described in the instructions for test 0-02 / 0-03 / 0-04 / 0-05 / 0-06 / 0-08 but do not add NANOFIXR2, close, mix.
0-07 AOX3	Almost all colors and turbidities are destroyed under test conditions and do not interfere. Resistant colors and turbidities cause deviating results which cannot be circumvented.
0-09 Lead 5	The original test already contains a correction.
0-14 Cadmium 2	Fill empty test tube with 4.0 mL sample, add 0.2 mL R2, close and mix.
0-15 Carbonate hardness 15	Open carbonate hardness test tube, add 4.0 mL sample solution, close, mix and adjust to zero (value B). Open test tube again, add NANOFIXR2, close and shake well. Measure after 2 min (analytical result = A – B).
0-17 Chlorine/Ozone 2	Fill empty test tube with 4.0 mL sample for each test.
0-18 Chlorine dioxide 5	Fill empty test tube with 4.0 mL sample for each test.
0-19 Chloride 200	Open chloride test tube, add 1.0 mL sample solution and 1.0 mL distilled water, close, mix.
0-21 Chloride 50	Open chloride test tube, add 4.0 mL sample solution and 1.0 mL distilled water, close, mix.
0-24 Chromate 5	Fill empty test tube with 4.0 mL sample, add 0.2 mL R2, close, mix.
0-11, 0-12, 0-22, 0-23, 0-26, 0-27, 0-28, 0-29, 0-30, 0-33, 0-36, 0-38 COD 40–60000	Almost all colors and turbidities are destroyed under test conditions and do not interfere. Resistant colors and turbidities cause deviating results which cannot be circumvented.
0-31 Cyanide 08	Proceed as described in the instructions for test 0-31, but add 0.5 mL distilled water instead of 0.5 mL R3.
0-32 Anionic surfactants 4	Proceed as described in the instructions for test 0-32, but instead of 0.5 mL R2 add 0.5 mL distilled water.
0-34 Cationic surfactants 4	Proceed as described in the instructions for test 0-34, but instead of 0.5 mL R2 add 0.5 mL distilled water.
0-35 DEHA 1	Open DEHA test tube, add 4.0 mL sample, close and mix.
0-37 Iron 3	No correction possible.
0-40 Fluoride 2	No correction possible.
0-41 Formaldehyde 8	Open formaldehyde test tube, add 2.0 mL sample solution, close and mix.
0-42 Zinc 6	Proceed as described in the instructions for test 0-42, but instead of 0.2 mL R3 add 0.2 mL distilled water.
0-43 Hardness 20	Open hardness test tube, add 0.2 mL sample solution, close and mix.
0-44 Hardness Ca / Mg	No correction possible.
0-45 Potassium 50	Open potassium test tube, add 2.0 mL sample solution, close and mix.
0-46 Formaldehyde 10	Fill empty test tube with 2.0 mL distilled water, 2.0 mL sample solution and 1.0 mL R2, close and mix.
0-47 Nonionic surfactants 15	No correction possible.
0-49 Silver 3	Proceed as described in the instructions for test 0-49, but instead of 0.5 mL R3 add 0.5 mL DMSO.
0-50 Organic acids 3000	Proceed as described in the instructions for test 0-50, but instead of 2.0 mL R5 add 2 mL distilled water.
0-52 Complexing agents 10	Fill empty test tube with 4.0 mL sample and 1.0 mL distilled water, close and mix (analytical result = A + B).
0-53 Copper 5	Proceed as described in the instructions for test 0-53, instead of 0.1 mL R2 add 0.1 mL DMSO.
0-54 Copper 7	Fill empty test tube with 4.0 mL sample and 0.4 mL distilled water, add 0.2 mL R2, close and mix.
0-56 Molybdenum 40	No correction possible.
0-57 KW 300	The original test already contains a correction.
0-58 Manganese 10	Fill empty test tube with 4.0 mL sample solution, 0.5 mL distilled water and 0.5 mL R2, close and mix. Add 1 measuring spoon R3, close and shake vigorously.
0-59 total-Chromium 2	Almost all colors and turbidities are destroyed under test conditions and do not interfere. For samples which are still colored or turbid after decomposition: Fill empty test tube with 4.0 mL of the digested solution.
0-60 Sulfate MR 400	Fill empty test tube with 4.0 mL sample solution and 1.0 mL distilled water, close, mix.
0-61 Nickel 7	Proceed as described in the instructions for test 0-61, but instead of 1.0 mL R2 add 1.0 mL NaOH 14 %.
0-62 Sulfate LR 200	Fill empty test tube with 4.0 mL sample solution and 1.0 mL distilled water, close, mix.
0-63 Sulfat HR 1000	Fill empty test tube with 3.7 mL sample solution and 1.0 mL distilled water, close, mix.

Test	Tube for correction (value B)
0-64, 0-65 Nitrate 8–50	Open nitrate test tube, add 0.5 mL sample and 0.5 mL 2-propanol, close, mix. Blank value for correction: Open nitrate test tube, add 0.5 mL distilled water and 0.5 mL 2-propanol, close, mix.
0-66 Nitrate 250	Open nitrate test tube, add 0.2 mL sample and 0.5 mL 2-propanol, close, mix. Blank value for correction: Open nitrate test tube, add 0.2 mL distilled water and 0.5 mL 2-propanol, close, mix.
0-67 total Kjeldahl nitrogen TKN 16	No correction possible.
0-68 Nitrite 2	Fill empty test tube with 4.0 mL sample, add 0.2 mL R2, close, mix.
0-69 Nitrite 4	Open nitrite test tube, add 4.0 mL sample, close, mix.
0-70 POC 200	Proceed as described in the instructions for test 0-70, but instead of 1.0 mL R2 add 1.0 mL distilled water.
0-71 Nickel 4	Proceed as described in the instructions for test 0-71, but instead of 1.0 mL R2 add 1.0 mL NaOH 14 %.
0-72 pH 6.5–8.2	The original test already contains a correction.
0-73 Sulfide 3	Fill empty test tube with 0.5 mL sulfuric acid 50 %, add 1 measuring spoon R2 and 4.0 mL sample solution, close and shake gently. Add 0.2 mL R3, close, mix.
0-74 Phenolic index 5	Fill empty test tube with 0.5 mL R2, add 1.0 mL sample solution, close and mix. Add 1 NANOFIXR3, close and mix. Using the extraction procedure does not require a correction value.
0-55, 0-76, 0-80, 0-81, 0-95 ortho- and total-Phosphate LR 1-45	Proceed as described in the instructions for test 0-55 / 0-76 / 0-80 / 0-81 , but instead of R4 add 0.2 mL distilled water, close, mix.
0-75, 0-78 TOC 30–300	No correction possible.
0-79 ortho- and total-Phosphate 50	Proceed as described in the instructions for test 0-79, but instead of R3 add 1.0 mL sulfuric acid 20 %, close, mix.
0-82 Oxygen 12 8-22, 8-25 BSBs	The original tests already contain a correction.
0-83, 0-88, 0-92 total-Nitrogen TN _t 22–220	Almost all colors and turbidities are destroyed under test conditions and do not interfere. For samples which are still colored or turbid after decomposition, correction values are determined as described above for test 0-64.
0-84 Residual hardness 1	Open Residual hardness test tube, add 5.0 mL sample solution, close and mix.
0-85 Starch 100	No correction possible.
0-89 Sulfite 10	Open Sulfite test tube, add 4.0 mL sample solution and 0.2 mL distilled water, close and mix.
0-90 Sulfite 100	Fill empty test tube with 0.2 mL R2, 4.0 mL sample solution and 1.0 mL distilled water, close, mix. Analytical result = A + B
0-91 Thiocyanat 50	Fill empty test tube with 4.0 mL sample.
0-96 Zinc 4	Fill empty test tube with 4.0 mL sample, add 0.2 mL R2, close and mix.
0-97 Tin 3	Proceed as described in the instructions for test 0-97, but instead of 1.0 mL R4 add 1.0 mL ethanol.
0-98 Aluminium 07	Proceed as described in the instructions for test 0-98, but instead of 0.5 mL R3 add 0.5 mL distilled water.
8-38 Ethanol 1000	Open ethanol test tube, add 4.0 mL R1 and 0.5 mL sample solution (consider dilution), mix, add 2 drops R3, close and mix.
8-59 Methanol 15	Open methanol test tube, add 3.0 mL R1 and 1.5 mL sample solution (consider dilution), mix, add 2 drops R3, close and mix.
8-71 Peroxide 2	Fill empty test tube with 4.0 mL sample.
8-90 Sludge activity TTC 150	No correction possible.

Table 1: Determination of the correction values for NANOCOLOR® tube tests

11.4.2 Correction values for NANOCOLOR® standard tests with reagent blank value

For tests of this category, the instructions require distilled water plus reagents as a reagent blank value. Another volumetric flask 25 mL is necessary for the correction value. Distilled water is used as a blank value for the correction value. For some tests, a special reagent has to be prepared for correction. If reduced sample volumes are used for a test (dilution due to concentrations which are too high), the sample volume for determination of the correction value must be reduced by the same amount.

Test	Preparation for correction (value B)
1-02 Aluminum	20 mL sample; 0.2 mL R1, mix; 1 measuring spoon R2, mix; 2 mL R4, mix; fill to 25 mL with distilled water, mix.
1-05 Ammonium	20 mL sample; 1 mL R1, mix; fill to 25 mL with distilled water, mix.
1-10 Lead	The original tests already contain a correction.
1-13 Cadmium	The original tests already contain a correction.

Test	Preparation for correction (value B)
1-163 Chlorine dioxide	20 mL sample; 1.0 mL R4, 1.0 mL R1, mix; fill to 25 mL with distilled water, mix.
1-20 Chloride	20 mL sample; 2 mL R1, mix; fill to 25 mL with distilled water, mix.
1-26 Manganese LR	No correction possible.
1-28 Iron LR	No correction possible.
1-42 Fluoride	No correction possible.
1-44 Hydrazine	20 mL sample; 2 mL R1, mix; fill to 25 mL with distilled water, mix.
1-483 Silica HE	20 mL sample; 1 mL acid 10 %, mix; 1 mL R2, mix; 1mL R3, mix; fill to 25 mL with silica-free water, mix.
1-51 Cobalt	20 mL sample; 1 mL R1, mix; 1 mL R3, mix; fill to 25 mL with distilled water, mix.
1-63 Nitrate Z	20 mL sample; 1 mL R1, mix; fill to 25 mL with distilled water, mix.
1-65 Nitrate	4.0 mL Nitrate R1, 0.5 mL sample, 0.5 mL 2-propanol, mix. Blank value for correction: 4.0 mL Nitrate R1, 0.5 mL distilled water, 0.5 mL 2-propanol, mix.
1-67 Nitrite	20 mL sample; 2 mL R1, mix; fill to 25 mL with distilled water, mix.
1-75 Phenol	20 mL sample; 1 mL R3, mix; fill to 25 mL with distilled water, mix.
1-77 Phosphate	20 mL sample; 1 mL sulfuric acid 30 %, mix; 1 mL R2, mix; fill to 25 mL with distilled water, mix.
1-78 Phosphate	20 mL sample, 1.5 mL R1, mix; fill to 25 mL with distilled water, mix.
1-85 Ozone	No correction possible.
1-95 Zinc	20 mL sample; 1 mL R1, mix; 1 mL R3, do not mix! Fill to 25 mL with distilled water, mix.

Table 2: Determination of the correction values for *NANOCOLOR*[®] standard tests with reagent blank value

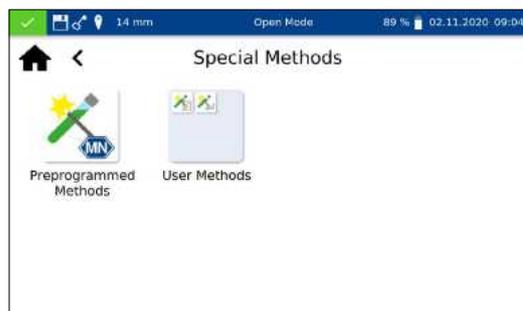
11.4.3 Correction values for *NANOCOLOR*[®] standard tests with sample blank value

For the tests in this category, the correction can already be performed during the measurement. In these cases the following solutions are used as blank values instead of the blank values given in the instructions. For some tests, a special reagent has to be prepared for correction. If reduced sample volumes are used for a test (dilution due to concentrations which are too high), the sample volume for determination of the correction blank value must be reduced as well.

Test	Preparation of correction blank values (value B)
1-161 free Chlorine	20 mL sample; 1 mL R1, mix; fill to 25 mL with distilled water, mix.
1-162 total Chlorine	20 mL sample; 1 mL R1, mix; 5 drops of R3, mix; fill to 25 mL with distilled water, mix.
1-25 Chromate	20 mL sample; 2,0 mL R2, mix; fill to 25 mL with distilled water, mix.
1-30 Cyanide	20 mL sample; 1 spoon R1, dissolve; 2 mL R3, mix; fill to 25 mL with distilled water, mix.
1-36 Iron	20 mL sample; 1 mL R1, mix; 1 spoon R2, mix; 1 mL R3, mix; fill to 25 mL with distilled water, mix.
1-48 Silica	20 mL sample; 1 mL sulfuric acid 10 %, mix; 1 mL R2, mix; 1 mL R3, mix; fill to 25 mL with distilled water, mix.
1-53 Copper	20 mL sample; 2 mL R1, mix; fill to 25 mL with distilled water, mix.
1-60 Manganese	20 mL sample; 1 mL R2, mix; 1 mL R3, mix; fill to 25 mL with distilled water, mix.
1-62 Nickel	20 mL sample; 1 mL R1; 1 mL R2, mix; 1 mL R3, mix; fill to 25 mL with distilled water, mix. Note: The yellow color produced by the addition of R2 must disappear when R3 is added!
1-88 Sulfide	20 mL sample, 1 mL sulfuric acid 50%, mix; fill to 25 mL with distilled water, mix.

Table 3: Determination of the correction values for *NANOCOLOR*[®] standard tests with sample blank value

11.5 Special Methods



The *Special Methods* menu is opened by pressing the icon sequence  → . This menu allows you to retrieve the special methods preprogrammed by MACHEREY-NAGEL, as well as the special methods created by the user.

11.5.1 Preprogrammed Methods

Pressing  will open the list box containing the MACHEREY-NAGEL preprogrammed special methods. The preprogrammed special methods involve important standard analytical methods from the fields of drinking water analysis and turbidity measurements.

By selecting an entry, the corresponding test is highlighted. After confirming with , the measuring window is opened. Besides the scroll function in the selection list, a search function is also available. By clicking *Search* and entering any search term (filtering by test name or test number is possible), a global search is performed in the list of predefined methods.

If a test is called up via the selection list, there is no automatic measurement when the cuvette is inserted. The measurement must be started manually by pressing  or . The result is displayed in the same way as for the tube tests and rectangular tests (see 11.3 *Result view*, page 19).

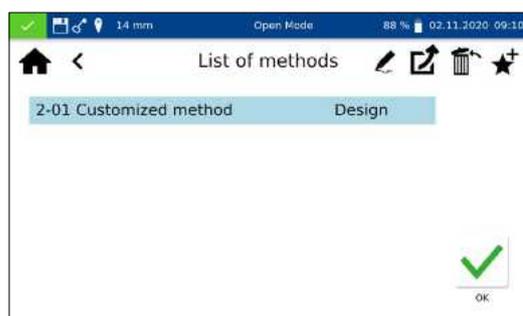
11.5.2 User Methods



  opens the submenu for creating and displaying user-defined special methods.

11.5.2.1 List of methods

Pressing  opens the list containing all of the special methods that have already been created by the user. Besides the scroll function in the selection list, a search function is also available. By clicking *Search* and entering any search term (filtering by test name or test number is possible), a global search is performed in the list of special methods. If the list is empty, no special methods have yet been created by the user.



The selected special method can be edited by selecting the  icon. A window opens with the properties of the special method. These properties can be viewed or changed. Confirming with  saves the changes.

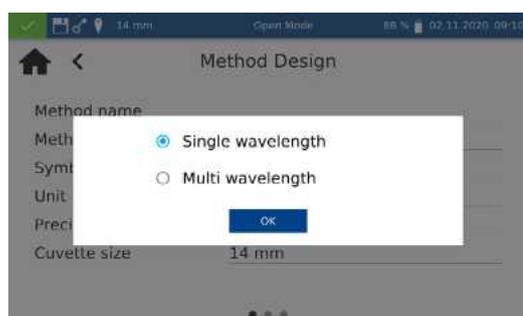
Selecting the  icon removes the marked method from the list. A prompt to confirm the deletion opens. After confirming with Yes, the method is irrevocably removed from the list of special methods.

By pressing the icon  the selected user method can be exported to an external storage device and later imported on a photometer of the same type.

By pressing the icon  the selected user method can be added to the list of favorites.

To execute a method, select the corresponding entry from the list and confirm with .

11.5.2.2 Method Design

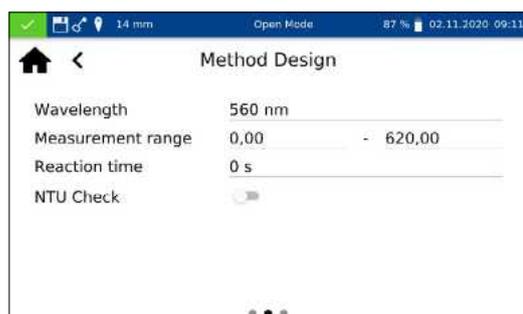


The method design menu allows you to create special methods based on previously established method information, such as factors and wavelengths of the measurement. In the single wavelength mode, the measurements are carried out at a defined wavelength. The multiwavelength mode allows measurements to be made while taking into account (sum, difference and ratio) of several absorbance values that were measured at up to four different wavelengths. A calibration function to the fourth degree can be shown. Pressing  opens a pop-up window for selecting a single wavelength method or a multiwavelength method.

Depending on which selection is made, a window will open in which the data of the special method can be entered. In the case of the multiwavelength method, not only the wavelengths of the measurement are required, but also the factors for the multiplication and corresponding calculation formula.

Method name: Enter a method name via the text keypad. The name should not exceed 25 characters in length. Confirm your entry with Enter.

Method number: The method number is a specific number with which the method can be retrieved later from the list in the *User Methods* menu (see 11.5.2.1 *List of methods*, page 25). Enter a method number between 1 and 99 using the numeric keypad. The lowest available number will appear automatically. Confirm the entry with . If the selected number has already been assigned, the message “This method number is already in use” will appear. Either select another method number or delete the method using that number.



Symbol: Enter a symbol via the text keypad which will be shown after the unit when the result is displayed. Confirm the entry with Enter. No more than 10 characters are allowed.

Unit: Enter a unit via the text keypad which will be shown when the result is displayed. Confirm the entry with Enter. No more than 10 characters are allowed.

Measuring range: Enter the desired measuring range of the method using the numeric keypad.

Reaction time: Enter the reaction time using the numeric keypad and confirm your entry with . The reaction time is given in seconds. If the reaction time has been activated in the settings, the entered time will count down before each measurement (see 12.1.2 Reaction time, page 29).

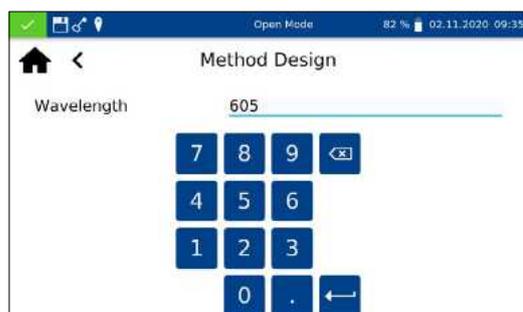
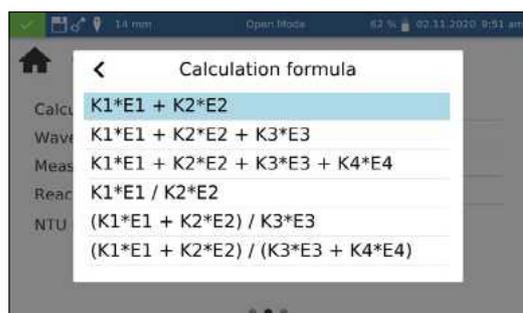
Turbidity control: When activated, the nephelometric turbidity of the sample will also be measured with each measurement and evaluated on the basis of the limit stored in the settings (see 12.1.1 NTU-Check, page 29). This function is available only with the 16 mm and 24 mm (OD) test tubes

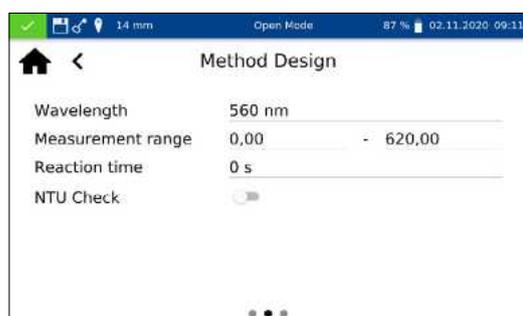
Precision: Choose the number of decimals from the list in the opening selection list. The result will be displayed with the selected number of decimals. A maximum of three decimals is possible.

Calculation formula (Multi wavelength measurement): In this section, the wavelengths and coefficients given in the selected calculation formula are defined. The number of wavelengths is determined by the choice of the calculation formula. To enter, tap on the calculation formula entry and select the desired formula from the list. Tap on the respective wavelength and coefficient entry and enter the values using the numeric keypad. The list of calculation formulas includes the options shown on the left, with A1 as absorbance value of the wavelength 1, A2 as absorbance value of the wavelength 2, K1 as multiplication factor of the wavelength 1, K2 as multiplication factor of the wavelength 2, etc. To include a subtraction step in one of the formula, a minus sign should be assigned to the respective K factor.

Wavelength (Single wavelength measurement): Enter the wavelength of the measurement using the numeric keypad and confirm your entry with . A wavelength in the range between 340 nm–800 nm can be entered.

Cuvette size: Select the cuvette size from the displayed list box. When methods are carried out, the photometer detects automatically whether the correct cuvette is being used.





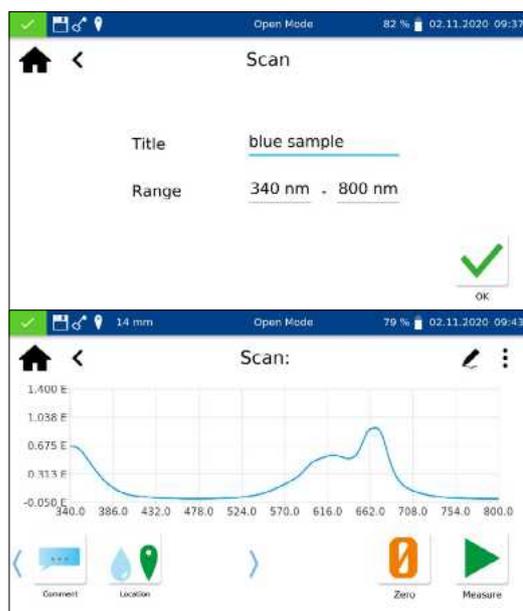
Factors: On the last page of the method design, factors for the final calculation of the measurement result are entered. Formulas up to the 4th degree can be used. Tapping on the individual fields of the factors will open a numeric keypad for entering numerical values. Negative factors can be depicted by entering a negative numeric value.

NOTICE

The formula has the format $y = F0 + F1 \cdot A + F2 \cdot A^2 + F3 \cdot A^3 + F4 \cdot A^4$ with A as absorbance value and F_n as factors of the equation. The factors must be entered based on an equation, that was determined based on a plot of concentration values (x-axis) against the absorbance values (y-axis).

After successfully entering all parameters, confirm the entries with . The method will be saved and included in the list of user methods (see 11.5.2.1 List of methods, page 25). The properties that were entered can be edited there via the icon.

11.6 Scan



The spectrophotometer enables to record a sample's absorbance in the range of 340 nm–800 nm.

A scan is performed with the halogen lamp in the selected wavelength range. The measurement is performed against a zero solution. After selecting the menu via a sample name can be entered. The lower and upper limit of the measurement range must be selected. The scan is performed with a precision of 1 nm. After confirming with the measuring window appears and the insertion of the zero solution is requested.

Afterwards the insertion of the sample solution is required. A spectrum opens to show the absorbance over the wavelength. The scan over the entire wavelength range can be followed live. When the measurement is complete, the entire scan is displayed in the result window.

Various types of sample information can be entered using the icons located below the result window. Press the icon to view other available options. Via the *Properties* command, new sample information can be added below the measurement menu (see 11.3 Result view, page 19).

Pressing the *Do not save* command prevents the measurement result from being stored in the instrument's memory when the cuvette is removed or when the menu is exited.

NOTICE

The *Do not save* function is only available in *Open Mode*.

Removing the cuvette or leaving the measuring menu via the remaining icons in the application bar quits the measuring procedure and saves the result in the memory of the instrument.

11.7 Test number



All tests can also be accessed by entering the test number.

When entering the three-digit test number, the information of the last selected sub-method appears. By entering the three-digit test number plus the corresponding sub-method number, the information for this sub-method can be viewed. Pressing *Delete* deletes the entry. Confirming with executes the selected method.

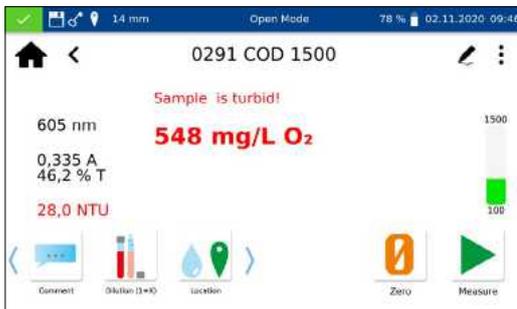
After entering the method number, details of the method are displayed.

12. Settings

Press the to enter the instrument settings. In addition to the settings for measurement and the device settings, the logging can be exported. A dialog box opens to set the respective settings. The dialog box is closed by clicking on the display next to the box or via . The settings are saved.

12.1 Measurement

12.1.1 NTU-Check



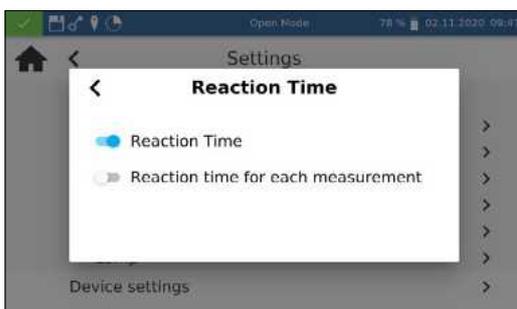
The *NANOCOLOR*[®] Advance provides a warning of interfering turbidity when measuring a test in 16 mm or 24 mm test tubes.

The NTU check is activated by default. Parallel to the measurement, the nephelometric turbidity is determined by measuring at 860 nm at a 90° angle. The NTU value is reported together with the result. If the set warning limit is exceeded, a warning is issued and the result is displayed in red. The measured turbidity value is stored together with the result.

Clicking the NTU-Check entry opens a window for setting this function. Use the slider to activate the NTU-Check. Define a warning limit with the help of the numeric keypad. The default warning limit of 10 NTU is recommended.

Activating the *Warning message for turbidity* option will display an additional warning message in the results window if the turbidity value exceeds the warning limit.

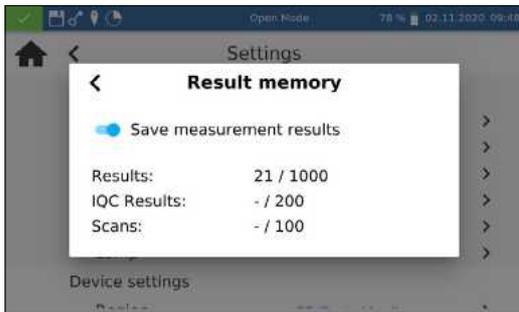
12.1.2 Reaction time



Clicking the *Reaction Time* entry opens a window for setting this function. When activated, the reaction time stored for a test is automatically counted down before the measurement. After the reaction time has elapsed, the test is performed automatically. After activating the slider, a appears in the status bar.

If you set the *Reaction time for each measurement* slider, the reaction time within each method is also counted down for each additional inserted cell.

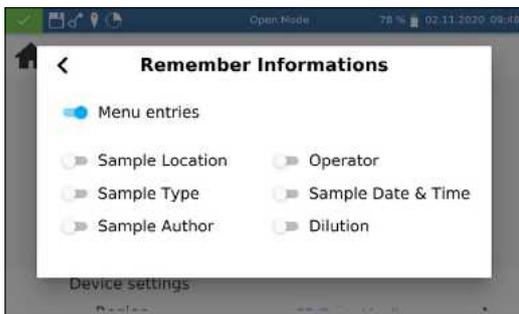
12.1.3 Result Memory



If the *Reaction Time* is activated, it can be skipped within a measurement by pressing .

By clicking on the Memory entry you can view the memory settings. In addition to an overview of the memory usage, the measurement result memory can be switched on or off here. By setting the slider, the memory is activated or deactivated accordingly.

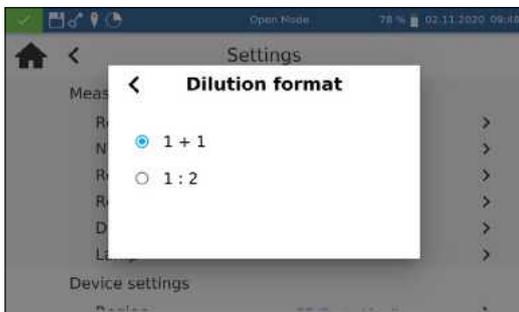
12.1.4 Remember information



Clicking on the *Remember Informations* entry opens a window for setting this function. If the respective option is activated, a value entered once (e.g. for sample location) is taken over for each further measurement until it is deselected or changed again. The activity of this function can be recognized by the  icon in the status bar.

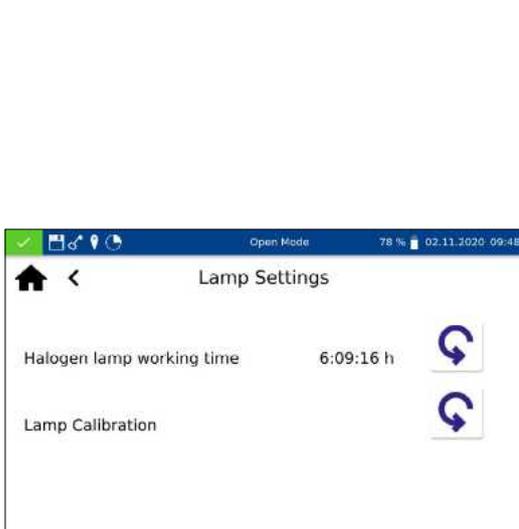
By setting the *Menu entries* setting, information such as the last used scan area or LOT number is automatically called up the next time it is used.

12.1.5 Dilution Format



Clicking the *Dilution format* entry opens a window for setting the dilution format. The formats "1 + X" and "1 : X" can be selected. When activated, the selected dilution is displayed in this format and taken into account in all menus with input of a dilution.

12.1.6 Lamp Settings



NOTICE

Incorrect measurement values due to not performed lamp calibration. The halogen lamp must be recalibrated after a lamp change.

Clicking the *Lamp Settings* opens a window for the lamp settings. In this menu the working time of the halogen lamp is displayed. In case of a lamp change the working time can be reset by clicking the icon .

When changing the halogen lamp it is mandatory to calibrate the new lamp. After changing the lamp, press the icon  and confirm the security question. The lamp calibration is performed automatically.

12.2 Device Settings

12.2.1 Language



NOTICE

The device will restart automatically after changing the language.

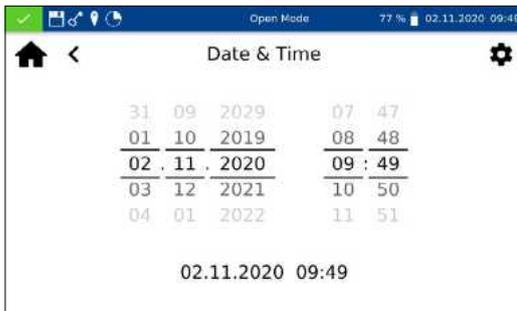
Click on *Language* to select the language of the instrument from the list that pops up. After you have selected the desired language, the list will close and the chosen language will be applied as the general display language for the entire device. The currently selected language is displayed next to the setting and is highlighted in blue in the list.

12.2.2 Region

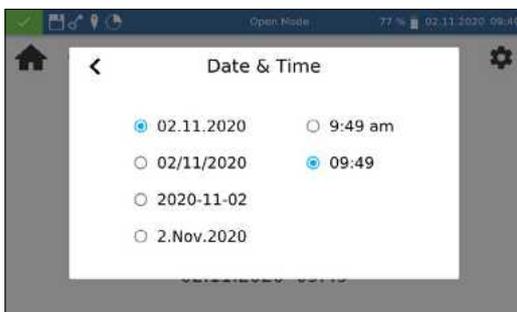


Click on *Region* to select the region of the device from the list that pops up. After you have selected the desired region, the list will close and the chosen region will be applied. The currently selected region is displayed next to the setting and is highlighted in blue in the list. Changing the regional settings will affect the display of the measurement result. This can change the way the thousands separator and the decimal place are depicted (Example: DE (Deutschland) 1.567,222; UK (United Kingdom) 1,567.222).

12.2.3 Date & Time

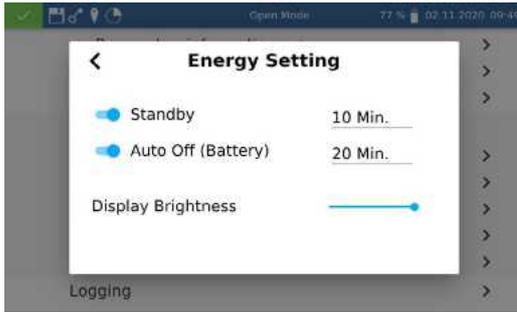


Click on *Date & Time* to change the date and time and the display format. Use the  icon to change the format for date and time.



Four different options are available for the date format. After changing the display format, the date will be shown in the chosen format in the status bar. Two options are available for the clock display – 12 hrs and 24 hrs.

12.3 Energy Settings



Clicking the Energy Settings entry opens a dialog box for setting the energy settings. Here you can set the time after which the device switches to standby mode. Users logged in at this time are automatically logged out. By tapping on the device display, the standby mode is ended. The default setting is 10 minutes.

The *Auto Off (Battery)* setting can be used to define the automatic switch-off time in battery mode. This can be set in the range of 5–60 minutes. The default setting is 20 minutes.

The brightness of the display can be adjusted with the *Display Brightness* slider.

12.3.1 Logging

In case of problems, the logging of the device can be exported via this menu and sent to the manufacturer. To do this, connect a USB stick to the side interface and execute the export via the  icon. The execution of the action will be acknowledged accordingly in the display.

13. System



The *System* menu is opened by clicking on the icon .

13.1 Information



Clicking on the *Information* icon opens a window with information about the device. Here you will find information about the manufacturer, device model, serial number, firmware versions and system ID. Have this information available when contacting MACHEREY-NAGEL Technical Support.

13.2 Update & Backup

Clicking  opens a window with the options Firmware update, Method update and Backup.

NOTICE

We recommend to make a data backup before each update. To save customer-specific special methods, we recommend exporting them to an external storage medium, e.g. a USB stick.

Download the folder with the update files from the MACHEREY-NAGEL website. Unzip the folder and follow the instructions in the update manual.

13.3 System reset

A system reset sets the device back to the default setting. All data, special methods and custom settings will be deleted. We suggest that you backup all saved data, special methods, and the user-defined settings beforehand (see 13.2 Update & Backup, page 33).

After pressing , a dialogue with a confirmation prompt will open. Confirming with Yes will reset the instrument to the default settings.

13.4 Battery

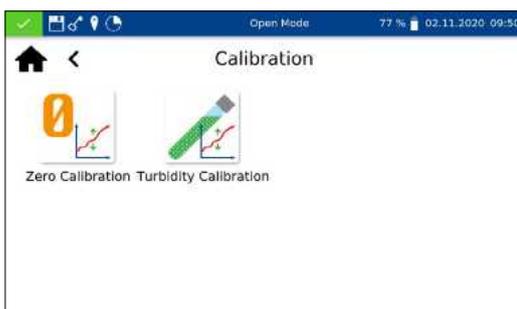


Clicking the *Battery* icon opens a window with information about the internal lithium-ion battery of the device. Here information about capacity, status and voltage are displayed, among other information. Have this information available when contacting MACHEREY-NAGEL Technical Support.

13.5 Service

Use of the service menu is protected by a password. This menu is reserved exclusively for authorized technicians for servicing purposes.

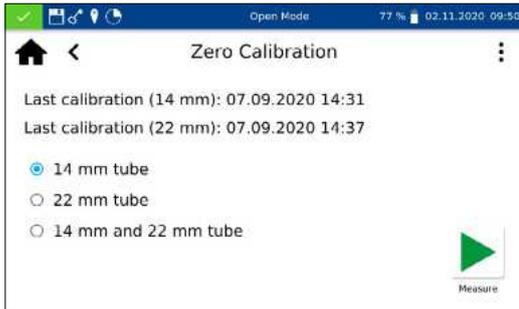
13.6 Calibration



The spectrophotometer performs a self-test each time it starts to check the basic calibration. The *Zero Calibration* as well as the *Turbidity calibration* can be performed manually, if required, via the calibration menu

In each case, the result of the calibration can be saved to an external storage device in the form of a CSV file by clicking the  icon.

13.6.1 Zero Calibration



Clicking  opens the window for the zero calibration

Select the desired cuvette size and start the calibration procedure by confirming with . The instrument performs an air measurement first and then asks you to insert the calibration cuvette.

NOTICE

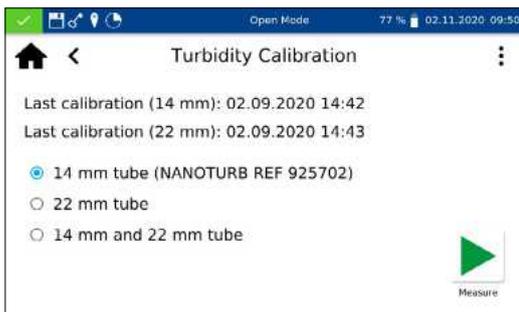
Make sure that the calibration cuvette used is free of scratches and turbidity. If necessary, carry out a turbidity measurement before calibration (target value < 2 NTU). Clean the outside of the cuvette with the enclosed cuvette cleaning cloth.

Insert the supplied calibration cuvette into the cuvette shaft; the calibration is continued automatically.

The calibration can be interrupted by clicking the  icon.

When the calibration is finished, the date of the calibration is stored in the instrument and displayed the next time the calibration procedure is started.

13.6.2 Turbidity Calibration



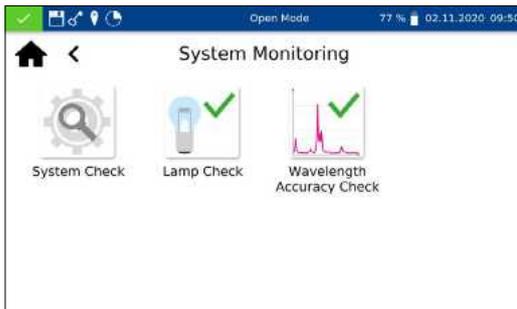
Clicking the icon  opens the window for turbidity calibration of the instrument. Select the desired cuvette size. Start the calibration procedure by confirming with . The instrument sequentially asks for the corresponding standards and starts the respective measurement automatically. When the calibration is complete, the date of the calibration is stored in the instrument and displayed the next time the calibration procedure is called up.

13.7 IQC



The Internal Quality Control (IQC) menu is accessed via the  icon. Through the various options, quality control parameter can be checked and documented..

13.7.1 System Monitoring



Clicking the icon  opens the menu *System Monitoring*. The menu contains the programs for checking the optical properties of the device. All tests can be carried out directly with the instrument without additional material.

13.7.1.1 System Check

Clicking the icon  opens the dialog for the *System Check* menu. The system check can be triggered manually by pressing . A lamp test, wavelength accuracy test, filter test and detector test are performed. This can take a few minutes. No measurements are possible during this time. The result of the system check is then displayed in the overview window.

If one or more tests fail, restart the device and repeat the measurements. If the problems persist, contact the manufacturer or your local distributor.

13.7.1.2 Lamp Check

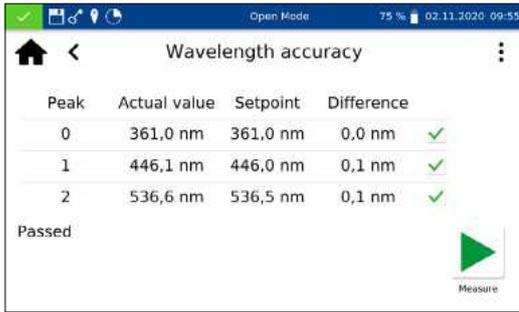
Wavelength	Result	Setpoint	Rating
369,8 nm	1257168.8	1228583.9	2% ✓
371,0 nm	1912794.6	1866629.0	2% ✓
451,2 nm	5343678.0	5421018.0	0% ✓
600,8 nm	13105072.0	12933275.0	1% ✓

Passed

The *Lamp Check* serves to ensure that the installed halogen lamp is working properly. To start the lamp check press .

The device records a lamp curve and compares it with the stored setpoints. The test is then evaluated. The result of the test can then be saved to an external storage device in the form of a CSV file by clicking on the .

13.7.1.3 Wavelength Accuracy Check

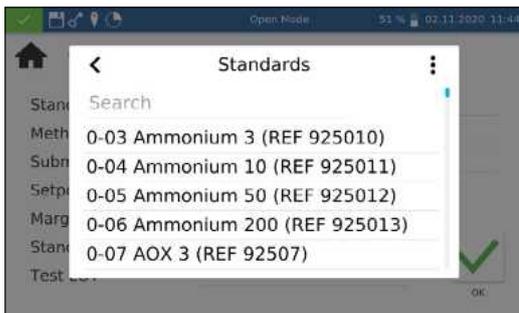


The *Wavelength Accuracy Check* tests the accuracy of the wavelengths at 361 nm, 446 nm and 536 nm against an internal holmium oxide filter. Press the icon to open the program for the *Wavelength Accuracy Check*. Confirm with to start the automatic measuring process. After testing, the result of the measurement will be displayed and compared against the reference values stored for the built-in holmium oxide filter. The maximum allowed deviation is ± 2 nm. If all of the values are within the specified confidence intervals, the test will be rated *Passed*.

The result of the test can then be printed out as a certificate or saved to an external storage device in the form of a CSV file or PDF file by clicking on the icon.

If the results of the check exceed or fall below the tolerances specified in the certificate, contact the manufacturer or your local distributor.

13.7.2 Standard Measurement

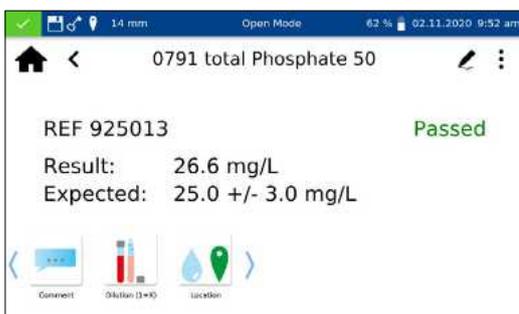


Standard measurements are used to check your own work and that of the photometer and analytical accessories. Standards are available for purchase in the form of standard and spiking solutions (see also www.mn-net.com).

Press the icon to open the window for specifying the desired standard opens. Now either the desired standard can be selected from the dynamic list or a new standard can be defined via selecting the entry *Add*.



After selecting a predefined standard, the remainder of the fields will be filled in with the values for method, submethod, cuvette, setpoint and margin. Entering the LOT for the test kit and standard via the text keypad and confirm with to open the measurement window. After inserting the appropriate sample solution and confirming with the measurement will be carried out and the result will be displayed. The result will be given a *Passed* (green) or *Failed* (red) rating in the upper right corner. The measured value is compared against the reference value of the standard solution.



Various sample information can be entered via the icons below the results window. Further options are available via the icon. New sample information can be added via the -icon below the measuring menu (see 11.3 Result view, page 19). By selecting *Do not save* the measurement result is not saved in the instrument memory when the cuvette is removed or when leaving the menu.

NOTICE

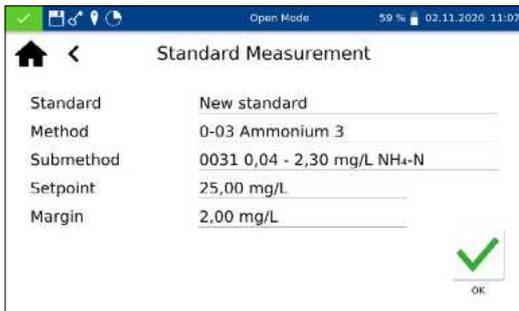
This function is only available in *Open Mode*.

Removing the cuvette or leaving the measuring menu via the remaining icons in the application bar quits the measuring procedure and saves the result in the IQC memory of the instrument (see 13.7 IQC, page 35).



Alternatively, a standard measurement can also be subsequently defined within the scope of a measurement. After the measurement via the normal measurement menu of the spectrophotometer, a measurement can be defined as a standard measurement by selecting *IQC Standard* via the icon. A window for selecting the desired IQC standard opens.

After entering the LOT for the test kit and standard via the keyboard and confirming with , the result is evaluated.



To create a user-defined standard, select *Add* in the menu within the dynamic list *Select standard*.

The input keyboard opens to enter the name for the user-defined standard. The name entered here will be transferred to the list of standards after the first measurement and displayed there together with the test number and the test name.

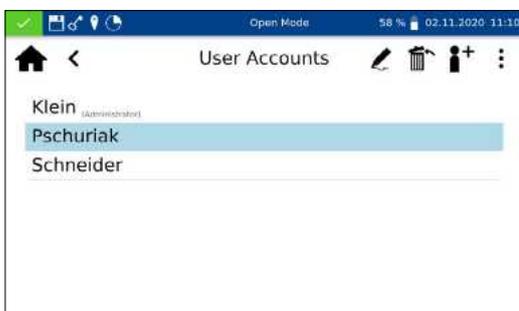
Via the *Method* entry, the method for which the standard is to be defined is then selected from the displayed *Select method*. The submethod can be selected via the *Submethod* field if there are several submethods for one method. Via the fields *Setpoint* and *Margin* the target value and confidence range for the standard must be entered using the numeric keyboard. Entering the LOT for the test kit and standard using the numeric keypad and confirming with leads to the measurement view. After inserting the appropriate sample solution and confirming with , the measurement is performed and the result is displayed. The results of the standard measurements can be viewed in the IQC memory of the instrument (see 13.7 IQC, page 35).

13.8 User Accounts



The spectrophotometer allows user management by creating different users with different rights. The *Open Mode* is set by default when the instrument is delivered. There are no rights restrictions in this mode. An administrator must first be created to change to the *User Mode*. Afterwards, the *Open Mode* can be activated or deactivated via .

For adding a user profile, the *User Accounts* menu can be reached via the icon. Existing users are listed on the left side. If no user is defined yet, the list is empty.



By clicking on the icon, a new user can be created. A *Username* and *Password* are entered via the input keyboard. The password must be confirmed once. By setting the *Administrator* slider, the user is granted unrestricted access on the device. When

deactivated, the user is no longer allowed to change settings in the device, delete measurements or edit users. The assignment of a password is mandatory for administrator accounts. Confirm with  saves the created account and adds it to the user list.

By clicking on the  icon, the settings for a user can be edited. In *User Mode* the modification of a user account is only possible with administrator rights.

A marked user can be deleted by clicking on the  icon. After confirmation, the user is removed from the list. In *User Mode*, deletion of a user account is only possible with administrator rights.

NOTICE

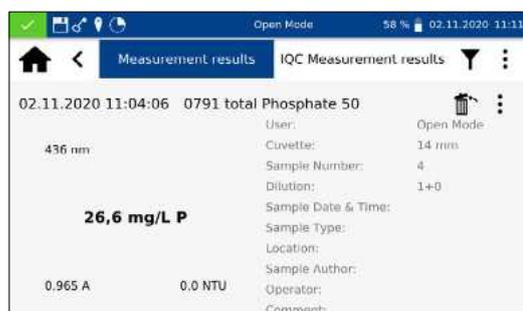
Deletion of the last user is only possible in *Open mode*.

To change the user mode, press  and select *Turn on User Mode* or *Turn on Open Mode* depending on the activated user mode. After confirmation, the device changes the user mode and expects the login of a registered user if changing to *User Mode*.

By clicking on a user and entering the password, the device is unlocked and the logged-in user is displayed in the status bar. To change the user, click on the user name in the status bar of the device. A dialog appears asking you to log off the user. By confirming, the device is locked again. The user is automatically logged off when the device enters the power saving mode or turns off automatically.

In *User Mode*, the login information is requested at each startup. The device is already booting in the background during the login. The  icon in the status bar shows that the user has administrator rights.

14. Results



NOTICE

If the maximum memory usage is exceeded, the oldest measurement results are overwritten. Before the memory is full, a warning appears in the start screen with the reminder to save the results.

The measurement data memory can store up to 1000 measurement data, 1000 IQC results and 100 scans. All entered sample information is stored in addition to the measurement result. The sample information is linked to the measurement result during the storage process in a way that is tamper-proof (GLP-compliant). The results are recalled by selecting .

The IQC memory saves all measurement results that are generated via the IQC menu or the IQC selection in the results window. These are results of the internal quality control, which are stored separately from the general *Measurement Results*.

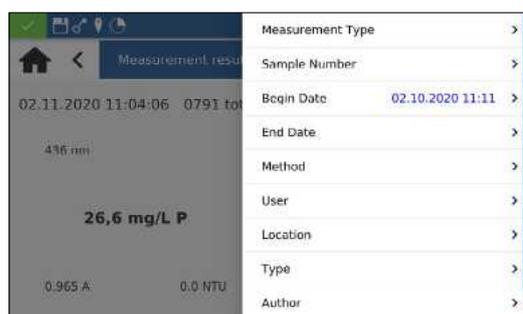
The IQC memory can be called up via the  icon in the IQC menu (see 13.7 IQC, page 35) or by selecting the *IQC Measurement Results* tab in the measurement data memory.

Besides the type of IQC measurement, the associated method is displayed. Each measurement is evaluated as *Passed* (green) or *Failed* (red).

You can scroll through the individual entries of the measurement data or IQC-memory by scrolling the display. Detailed information on a measurement can be obtained by selecting an individual entry in the memory. In addition to the result, all entered sample information is displayed here. Up to two results with detailed information can be opened simultaneously. In the case of a scan or kinetics measurement, the recorded spectrum or the evaluation graph of the kinetics is displayed in the detailed view.

Pressing  will display the options to export, delete or print the results. In each case, a dialog box appears asking whether the selected option should be applied to the selection or to the entire data set.

14.1 Filter Results



In the *Results* menu, the measurement and IQC results can be filtered according to different sample information by pressing .

The selection list for selecting according to a specific method is called up by clicking on the *Method* entry in the filter menu.

After selecting the method, the memory contents are selected accordingly. Different selection criteria can be applied simultaneously. In addition to the method, you can also select by date, for example.

After selecting the data, this selection can also be exported.

Closing the memory deletes the filter settings.

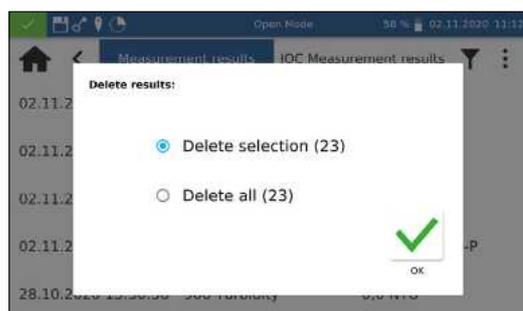
14.2 Export from data memory

14.2.1 Export to CSV file

Via  it is possible to export the filtered data as a CSV file to an external mass storage device. A name can be specified for the export folder using the input keyboard. The file contained within can be further processed in a spreadsheet program. The file name has the format:

```
mn-nc-advance_results_NADXXXX_YYYY.MM.TT_HHMMSS.csv
mn-nc-advance_results_NADXXXX_YYYY.MM.TT_HHMMSS_X.csv (Contains data of the scan with entry X)
mn-nc-advance_IQC_results_NADXXXX_YYYY.MM.TT_HHMMSS.csv
```

14.3 Delete Data Memory



Individual measured values, a selection of measured results or the entire measured data memory can be deleted. Deletion of information from the instrument memory is only authorized in *Open Mode* or by the administrators in *User Mode*. Pressing  in the memory menu followed by confirmation of the entry *Delete Results* calls up a request to delete the measurement results. If the option *Delete selection* is chosen, the selected values are deleted. Selecting the *Delete all* option will delete the entire measurement result memory. The number in brackets indicates the number of results that will be deleted. The IQC memory remains unaffected by this action. To delete a single result, select  in the single entry view. After confirmation of the dialogue box with *Yes*, the measurement result is deleted irreversibly.

NOTICE

The delete function is only available in *Open Mode* or to the administrator in *User Mode*.

15. Maintenance and Cleaning

NOTICE



The unit must be switched off and disconnected from the power supply for all cleaning work.

WARNING



Fire hazard: Do not use flammable detergents or solvents to clean the unit.

NOTICE

Do not clean the device with acetone or similar products.

WARNING

Incorrect measurements: A dirty cuvette slot can lead to contamination of the inserted cuvettes and to incorrect results. Check the cleanliness of the cuvette slot and the adapters at regular intervals and during maintenance. Clean the cuvette slot and the adapters in case of contamination (see section cleaning).

NOTICE

Make sure that there is no cuvette and no cuvette adapter in the cuvette shaft.

NOTICE

Malfunction or damage of the device due to incorrect maintenance. Maintenance of the device may only be carried out by qualified personnel

NOTICE

Only use accessories and spare parts approved by the manufacturer. If parts not approved by the manufacturer are used, the operator is responsible for the conformity of the device and the warranty will be voided.

15.1 Cleaning of Display

If necessary, clean or dry the touchscreen with a soft, lint-free cotton cloth. The enclosed cuvette cleaning cloth can be used for this purpose. Do not use liquid glass cleaners. Wipe off excess water immediately. Avoid scratching the display. Do not use ball-point pens or other pointed objects to operate the touch screen. Any stylus suitable for PCAP displays can be used to operate the touch screen.

15.2 Cleaning of Cuvette Slot and Adaptors

If necessary, clean or dry the cuvette slot and the adaptors with a soft, lint-free cotton cloth. Do not use sharp objects or brushes for cleaning to prevent damage to mechanical components. Liquid that has leaked into the cuvette slot is drained off through a hole in the bottom of the instrument. In general, the cuvettes used and the photometer must always be kept clean. Contaminants in the cuvette slot can influence the measurement and lead to incorrect measurement results. The cuvettes used can be cleaned with the enclosed special cleaning cloth.

15.3 Cleaning of Housing

Wipe the outside of the device with a damp cloth. Use water or a mild detergent. Then dry the device with a soft cloth.

15.4 Replacement of Halogen Lamp

1. Disconnect the device from the power supply and place it upside down on a soft surface.
2. Remove the lamp cover screws on the bottom of the unit (see *Fig. 5: View from below, page 11*) and remove the cover.
3. Remove the connector plug from the lamp board and loosen the retaining screw of the retaining bracket of the lamp socket.
4. Remove the old lamp socket and insert the new lamp socket using the guide pin and fix it with the retaining screw.
5. Connect the connector plug with the contacts and close the lamp cover carefully with the appropriate screw.

NOTICE

Incorrect measurement results due to not performed lamp calibration. The halogen lamp must be recalibrated after a lamp change.

16. Errors, Sources and Solutions

Depending on the operating status, different messages can be displayed. The source of the error can be either an operating error or a malfunction of the device.

In case of recurring errors contact MACHEREY-NAGEL.

Error	Source	Solution
The device does not start	The battery is empty and the device is not connected to a power source.	Connect the device to a power source. Charge the battery of the device.
Wavelength is outside the permitted range (340–800 nm)	The wavelength range of the device extends from 340–800 nm.	Enter a wavelength within the range of 340–800 nm.
Data cannot be exported	The connected data storage is damaged.	Reconnect the data storage and repeat the data export.
Initialization error	The device was not successfully initialized.	Restart the device. Contact the technical customer service.
Absorbance > 3.5 Abs	The measured absorbance is higher than 3.5 Abs.	Dilute the sample and repeat the measurement. Check the use of a cuvette with a shorter path length.

17. Service

17.1 Spare parts, Accessories and Consumables

NOTICE

Use only accessories and spare parts approved by the manufacturer. If parts not approved by the manufacturer are used, the operator is responsible for the conformity of the device and the warranty will be voided.

WARNING

Risk of injury: The use of parts not approved by the manufacturer can lead to personal injury and damage or malfunction of the meter or equipment. The replacement parts in this section are approved by the manufacturer.

Description	REF
Halogen lamp	919759
Manual (quick start guide), printed	919754
Cuvette slot cover for <i>NANOCOLOR</i> [®] Advance	919753
Empty reaction tubes 24 mm (6 pcs.)	936101
Dust protection cover for <i>NANOCOLOR</i> [®] Advance	919751
Calibration cuvette 16 mm	916908
Calibration cuvette 24 mm	916930
Mains adaptor for <i>NANOCOLOR</i> [®] VISII, <i>VARIOMini</i> and Advance	919156
Case for <i>NANOCOLOR</i> [®] Advance	919757
Cuvette adaptor A and B for 16 mm and 24 mm for <i>NANOCOLOR</i> [®] Advance	919752
LAN-Cable (1.5 m)	919682
<i>NANOCONTROL</i> NANOCHECK 2.0	925703
<i>NANOCONTROL</i> NANOTURB	925702
<i>VISOCOLOR</i> [®] standards Chlorine	914820

17.2 Disposal

NOTICE



Disposal via public disposal systems is not permitted. Contact your local MACHEREY-NAGEL representative.



Disposal according to EU Directive 2012/19/EU. In accordance with the EU Directive 2012/19/EU MACHEREY-NAGEL takes back the old device and disposes it free of charge.

17.3 Warranty, liability and complaints

The warranty for this device is 24 months from date of purchase. The original invoice serves as proof and must be presented when making a claim. In case of improper handling and / or maintenance of the device, the warranty expires. It does not cover defects that are due to a power supply other than the external power supply included in the delivery.

The warranty is limited to the repair of defective parts or – at MACHEREY-NAGEL's discretion – the delivery of a faultless replacement unit. The warranty period of 24 months shall not be affected by any warranty claim. There is no right of withdrawal. Further claims are excluded. These include in particular all claims for damages resulting from consequential or indirect damages. In addition, our general terms and conditions of sale and delivery apply in the currently valid version as printed on all price lists.

17.4 Contact



MACHEREY-NAGEL GmbH & Co. KG

If you still have questions or need technical assistance after reading the manual, contact:

MACHEREY NAGEL GmbH & Co. KG

Neumann-Neander-Str. 6–8 · 52355 Dueren · Germany

Phone: +49 2421 969 0

e-mail: info@mnnet.com

www.mn-net.com

Spectrophotometer *NANOCOLOR*[®] Advance

Distributed By: Camlab Ltd

Unit 24, Norman Way Industrial Estate

Over, Cambridge, CB24 5WE, United Kingdom

T: +44 (0) 1954 233 110 E: sales@camlab.co.uk

