

Exaqua

Instrument manual

portable multiwavelength
photometer with unique **rayject** technology



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1 Safety information

- Prior to unpacking or using the photometer, please read the entire manual and pay special attention to all warnings and notes. Failure to do so may cause damage to the instrument or its improper operation.
- Ensure the mains power supply conforms to the rating shown on the name plate of the power adaptor.
- Any adjustments, maintenance and repair carried out in a way other than outlined in this manual may compromise the basic safety protection provided by the equipment and may invalidate the warranty. The warranty does not cover damage caused by misuse of the equipment.
- Always use genuine accessories. Alternative accessories, even if very similar, may differ slightly in structure and negatively influence the performance of the device.
- The photometer has compact and durable construction and is resistant to moisture and spills and thus is suitable for use both in home and in the field. However, to ensure a long lifetime of the device keep it clean and free of contamination, operate with care and avoid any drips or spills of reagent solutions on the instrument, especially into the vial holder.
- Ensure the photometer vials and the round vial holder are clean, have no droplets or sediments on the surfaces and are not scratched. If it is necessary, wipe the outside surface of the vial or the interior of the vial holder with a soft cloth. Do not use abrasive chemicals or agents. Otherwise, measurement accuracy may be impaired.
- When not in use, store the photometer in clean and dry conditions.
- Handling chemicals contained in the reagents sets can be dangerous. Read the necessary Material Safety Data Sheets, follow instructions carefully and take all required safety precautions.
- Keep the reagents out of reach of children and store locked up. Avoid eye or skin contact or breathing. In case a reagent spills, clean up immediately.
- Always use genuine Exaqua reagents when performing the photometer test methods. Alternative reagents may differ considerably in formulation and can give inaccurate results.
- Disposal of waste electrical and electronic instruments or equipment in municipal waste containers is not allowed. Dispose them in accordance with the regulations in your local area or country .

Use of safety information



CAUTION :

Indicates a potential situation which, if not avoided, may result in minor or moderate injury, damage or improper operation of the device.

NOTE:

Information requiring special emphasis

2 Unpacking the instrument

Remove the instrument and accessories from the packaging and examine them carefully. Ensure all items specified in the below list are included. If any items are missing or damaged, please report it immediately to the manufacturer or local distributor.

NOTE:

In case of any complaint, the device and accessories can only be returned in their original packaging. Keep all packing materials until you are sure the device is operating correctly.

Each version of the photometer is supplied in a case and includes:

- Photometer
- 5 ml syringe
- USB cable with power adaptor
- sample vials with caps (4 pcs.)
- Instruction manual
- EU Declaration of Conformity
- Warranty Card
- Cleaning cloth



3 Power supply

The Photometer can be powered either from batteries or via the USB port.

- To power the photometer via the USB port, the USB cable included in the case should be connected either to the power adaptor or a PC. After connection, the **battery charging icon**  will be displayed on the main screen indicating that the battery is being charged.
- When the photometer is battery powered, the **battery icon**  displayed on the main screen indicates the charge level. If the charge level is low, connect the device immediately via the delivered USB cable and AC adaptor. Too low power will automatically turn off the instrument but all settings and data are saved.

4 General description

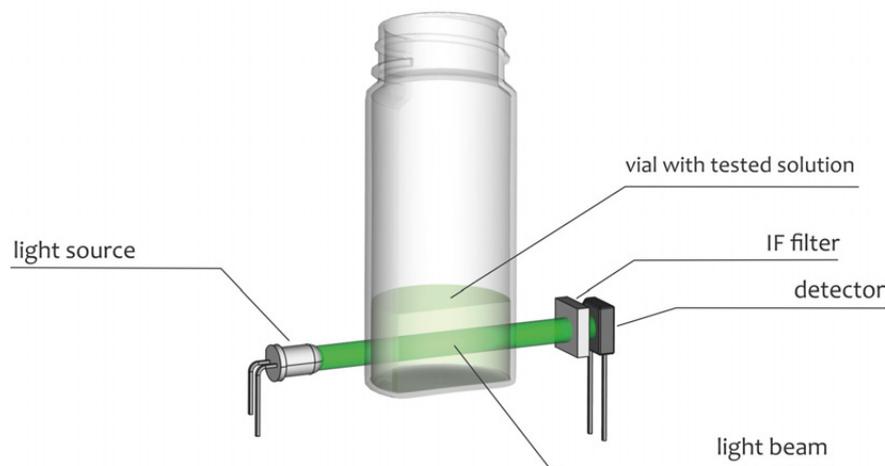
Exaqua is an advanced handheld multiwavelength photometer with unique **rayject** technology that allows to perform measurements with no separation of the test vial from the ambient light. Depending on version Exaqua can be equipped with up to 6 measurement wavelengths (channels) and can perform a broad range of tests (methods). The instrument is dust and splash proof and has a robust construction for convenient operation in the field. Exaqua is equipped with a Li-ion rechargeable battery for approx. 10 hours of operation.



The sample vial holding a tested sample is placed in the **vial holder**. There is no need to cover the sample vial under any lighting conditions. The interior of the vial holder should be kept clean and free from any liquid residues as it can affect the accuracy of the measurements. During measurement the vial should be fully inserted in the holder and not removed before the measurement is concluded. The instrument should be positioned horizontally. Exaqua is equipped with instability detection that will indicate an error if the vial is moved or the photometer is shaken during measurement.

5 Theory of operation

Exaqua is a photometer that measures absorbance with monochromatic light of one of the available wavelengths. Absorbance is the measure of how much the monochromatic light is attenuated by the sample and in simple words it is the measure of sample colour intensity. In an ideal model of photometry, absorbance is proportional to the concentration of the light absorbing substance (a dye) in the sample. In order to test a certain water parameter, the water sample needs to be treated with a series of chemical reagents to develop colour which intensity (absorbance) increases with the concentration. The absorbance is measured and the value we look for can be calculated. To measure the absorbance it is essential to measure zero for which a blank sample (sample without reagents) is used. It serves as a reference for absorbance calculation.

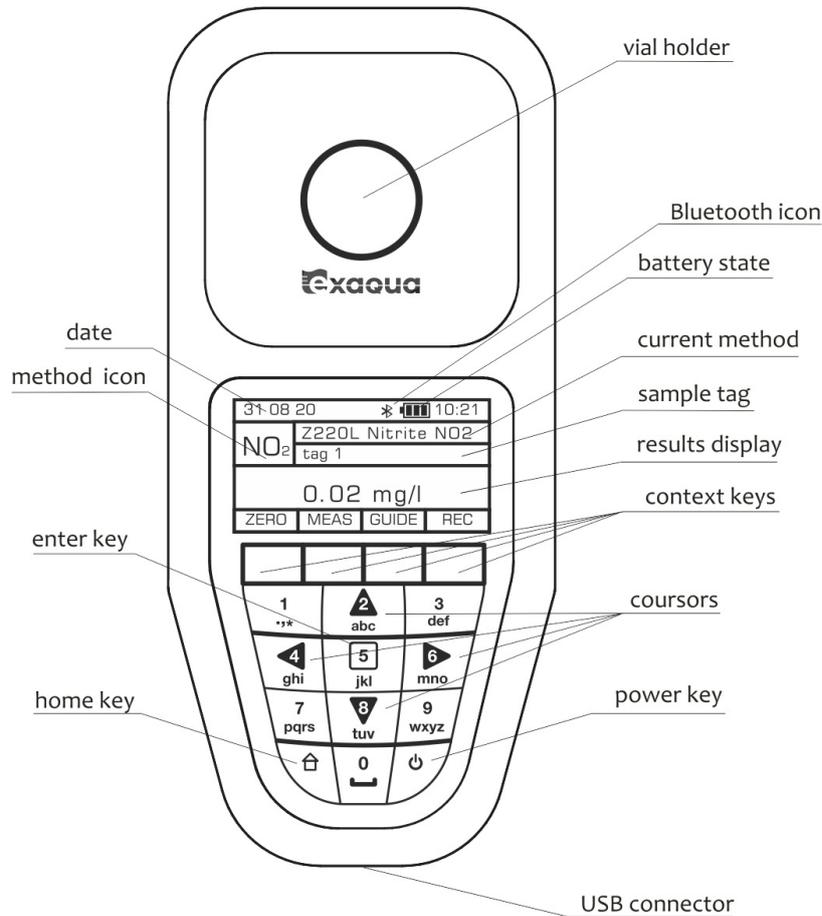


One of the six optical path ways of Exaqua

Innovative mechanism - **rayject** for absolute resistance to ambient light

For most of the available photometers it is very important to separate the sample vial and optical path from influence of the ambient light. The innovative **rayject** mechanism links light source with the light detector in such a way that the detector is only sensitive to the photometer's light source, and is able to ignore all other light. **rayject** records the light level with high time resolution and can detect abnormal changes that can indicate unstable measurement conditions (shaking the instrument, moving test vial).

6 GUI navigation



6.1 Keyboard sections

Exaqua keyboard combines numeric keys with cursor and enter keys.

	<p>Power key main function is to switch the instrument on and off.</p>
	<p>Up/down cursor keys allow for changing the current section in the main screen or browsing lists.</p>
	<p>Left/right cursors change the selection in the section of the main screen (e.g. they change a tag when used in the tag section or change displayed units in the results section).</p>
	<p>Enter key is generally for confirming operations and when used in the results section automatically changes its function in sequence ZERO → MEAS → REC.</p>
	<p>Pressing Home key takes us to the higher level in the menu structure and when the highest level is reached switches to main screen, then it toggles between the main menu and the main screen.</p>

6.2 Switching on and off

To switch on the instrument press the **power key** for approximately 2 seconds and press for the same amount of time to switch off.

6.3 Main menu - main screen

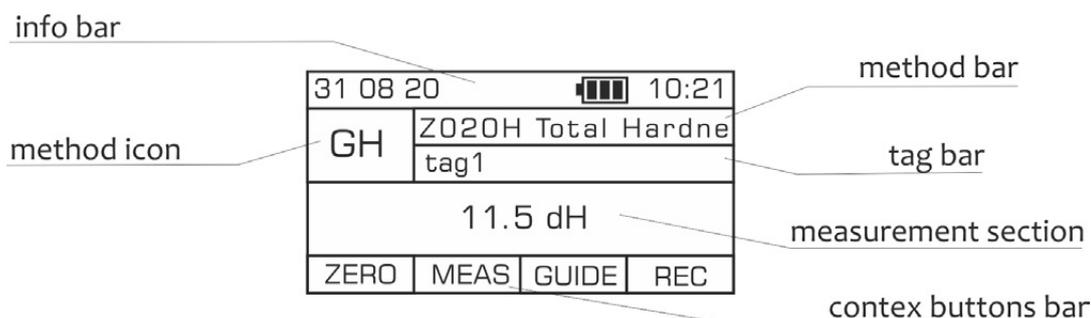
The **Home key** toggles between the **main menu** and the **main screen**.

MAIN MENU		10:21	
Settings			
Methods			
Log			
User			
		EXIT	SEL

The **main screen** is the place where measurements are performed and all basic information that will be recorded with the result are displayed.

31 08 20		10:21	
NO ₂	Z220H Nitrite NO2	tag 1	
1.24 mg/l			
ZERO	MEAS	GUIDE	REC

6.4 Main screen sections



On the top of the main screen there is an **info bar** with current date/time, battery charging level icon and bluetooth icon when on.

The **method icon** and **method bar** informs us about selected method. With the **left/right cursors** you can quickly access the last 5 methods that were used. Method icon is a symbolic representation of the measured parameter and in the method bar you can find method number and the name of the parameter.

The **tag bar** displays the currently selected tag. With the **left/right cursors** the tag can be changed to any other from the tag list.

Measurement section displays the result of the measurement together with its unit. After taking the final measurement, with the **left/right cursors** you can change between available alternative representations of the result (e.g. alternative units).

Context buttons bar indicates current functions of the corresponding context buttons.

7 Before starting measurements

Switching on the photometer for the first time or after its restoring to factory settings, the user will be automatically guided through the four-step commissioning procedure including setting of language version, current date, time, then running calibration and self-check, see sections 7.1 to 7.4 below. It is possible to skip any of the initial steps by using the **EXIT** context button but if all steps are skipped the commissioning procedure is activated each time the photometer is turned on. Additionally, after completing the commissioning procedure the user should set device and user's names, see sections 7.5 and 7.6 below. Complete list of settings and edit instructions, see 12 Settings.

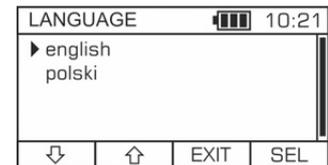
NOTE:

It is highly recommended to set current date/time, device name and operator name before use, as these data are recorded together with the measurement results. With this, in the log, we can quickly find a result of interest using one of the available criteria.

7.1 Setting language version

During the first step of commissioning procedure, the instrument will ask you to set the language version. Scroll through the displayed list to choose the desired language, press the **SEL** button to accept. The system will automatically take you to the next step of configuration i.e. setting the Date.

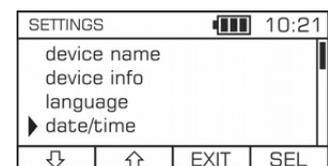
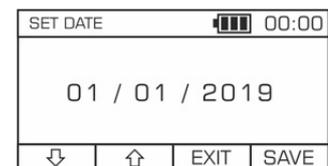
After completing the commissioning procedure you can change the language at any time by entering **MAIN MENU** → **Settings** → **language**.



7.2 Setting date

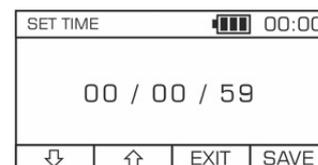
During the second step of the commissioning procedure, the instrument will ask you to set the date. To select the number from 0 to 9 use the **up/down**  **buttons**. To move through the day, month, year numbers use the **left / right**  **cursor**s on the keyboard. After setting the current date accept by pressing the **SAVE** button. The system will automatically switch you to the next step of configuration. In case of inserting the wrong format of date, the system will not allow to save the date and the message 'wrong date!' is displayed.

After completing of the commissioning procedure you can change date any time you want by entering **MAIN MENU** → **Settings** → **date/time**.

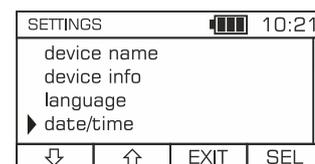


7.3 Setting time

During the third step of the commissioning procedure, the instrument will ask you to set the time. To select the number from 0 to 9 use the up/down  buttons. To move through the hour, minute, second numbers use the left / right  cursors on the keyboard. After setting the current time accept by pressing the SAVE button.

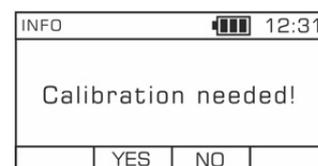


After completing of the commissioning procedure you can change time any time you want by entering **MAIN MENU** → **settings** → **data/time**.



7.4 Running calibration and self-check

During the fourth step of the commissioning procedure, the instrument will ask you to run the calibration. To proceed press the **YES** button. The message 'remove vial' is displayed. Press the **OK** button to confirm the vial is removed from the instrument holder. When the message 'calibration finished' is displayed press the **OK** button. In the next step the Exaqua logo appears on the photometer display what means the self-check is running. After completing calibration and self-check the instrument automatically switches to the main screen and is ready for operation.

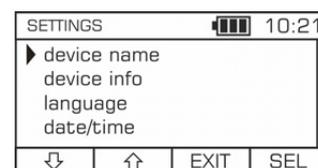


To assure accurate operation, it is advised to perform regular diagnostics of the photometer, see [12.11 Diagnostics](#).



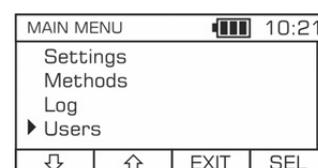
7.5 Entering device name

To set the name on your photometer enter **MAIN MENU** → **settings** → **device name**, and press the **EDIT** context button. While in the section **PARAM EDIT** enter your name of a device using keyboard keys (1-9). Using the context button , you can switch between lowercase and uppercase letters, or switch to numbers. The **CLR** button is used to clear the whole name, the **DEL** button to clear the last character typed. The device name can be 21 characters long.



7.6 Entering user's name

To select or edit an user (operator) name enter **MAIN MENU** → **Users**. By selecting chosen user on the displayed list you can enter an operator's name by pressing the **SEL** button. To edit operator's name press the **EDIT** context button. While in the section **PARAM EDIT** enter an operator's name using



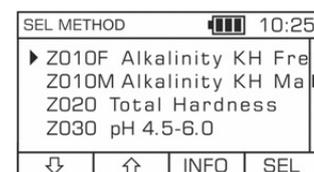
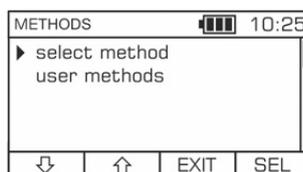
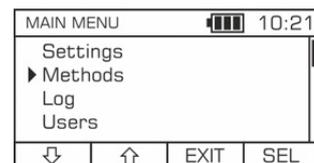
keyboard keys (1–9). Using the context button , you can switch between lowercase and uppercase letters or numbers. The **CLR** button is used to clear the whole name, the **DEL** button to clear the last typed character.

8 Performing measurements

8.1 Choosing method

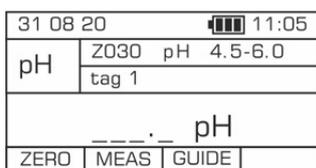
Methods can be accessed in two below specified ways.

- from **MAIN MENU** → **Methods** → **Select method**
- in the **MAIN SCREEN** by selecting method bar with the  up/down cursors, pressing the context button **MENU** and then **Select method**.

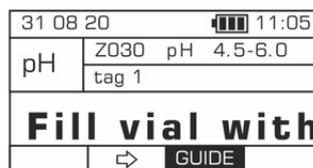


8.2 Using method guide

The measurement procedure can be assisted by a guidance system that provides us with step-by-step basic instructions about necessary actions we need to perform. It includes taking the sample, adding reagents, shaking, zeroing etc. For operations that require time measuring a timer appears which counts down the time and signals the end of an operation with a series of beeps (with beeper on). With the  left/right cursors every step in the guide can be overridden or brought back.



guide button



NOTE:

When *GUIDE* system is on, the auto shutoff function is not active.

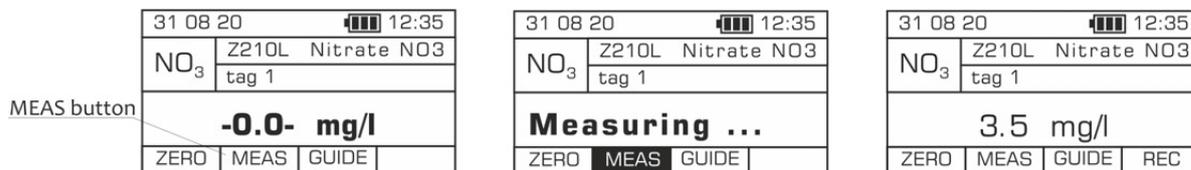
If you want to use the function of the beeper in a guidance system remember to enable the acoustic signal for messages, see [12.7 Beeper](#).

8.3 Zeroing and measurement

For all methods a sample 'zero' need to be acquired and in most of the methods it is performed with a sample before adding reagents. For instructions on how to prepare samples for each method, see [19 Method procedures](#) including the detailed procedures for each method. Zeroing function (the button **ZERO**) is available in the **MAIN SCREEN** when the result section is selected.



Once we have performed zeroing we can add all the required reagents according to the method instruction and take a measurement by pressing **MEAS** button. The result then appears on the screen. In case of some methods, you can also change between available alternative units, by the means of the **◀▶** left/right cursors. For more information, see [8.5 Displaying alternative quantities](#).

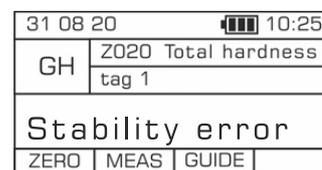


NOTE:
 To obtain best accuracy, it is very important to clean the surface of the vial prior to measurements.

8.4 Instability detection function

The photometer is equipped with a built-in function for detection of measurement instability. The mechanism prevents displaying erroneous readings that can result from the following factors:

- the presence of air bubbles in a sample
- particles present in a tested sample
- the change of colour in a tested solution during measurement (the colour reaction is not finished)
- shaking the photometer during measurement
- inserting or removing the test vial in/from the photometer vial holder during measurement



If the photometer detects one of the above described conditions that can adversely affect the reliability of measurement results, the warning acoustic signal is activated and the message 'Stability error' is displayed on the main screen. In such a situation, it is required to check whether any of the mentioned circumstances appeared and resume the measurement by pressing the button **MEAS**.

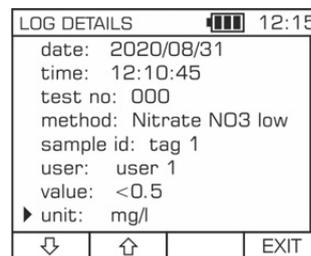
8.5 Recording the result

When the measurement is finished the displayed result can be recorded in the log by pressing the **REC** or the **ENTER** context button on the keyboard. A given result can be saved only once and then the **REC** button disappears until the next measurement is finished.



The result is recorded with additional information such as:

- method name and symbol
- date/time
- sample tag
- user name
- device name
- device serial number

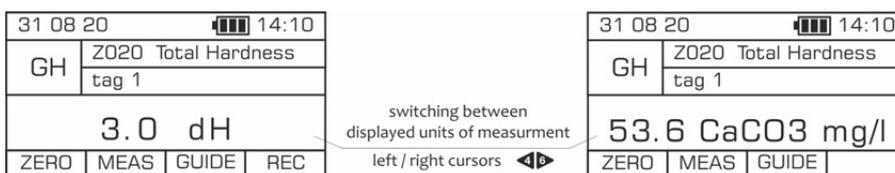


8.6 Displaying alternative quantities

For some of the methods there are alternative representations of the result available. For instance, water general hardness can be expressed in german degrees (°d) in mval/l or as the equivalent concentration of calcium carbonate in mg/l. The available units of measurement can be accessed by pressing the of **left/right cursors** in the result section of the main screen.

NOTE:

*To switch between displayed units of measurement, the **GUIDE** system must be off.*



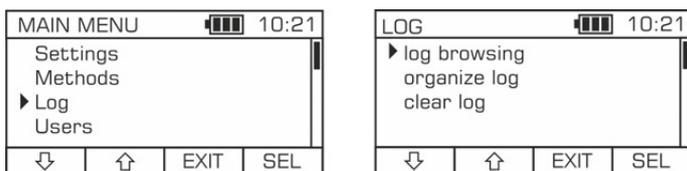
9 Logging results

Exaqua can memorize the measurements results in the log. There are stored such data as measurement value, unit, method name, date and hour, user, tag and some other information. You can access in the instrument by transferring the log file to the personal computer or mobile device for further processing.

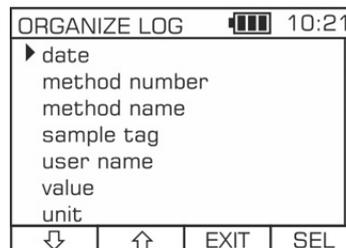
9.1 Browsing the log entries

The photometer offers basic functions for log browsing. In the log browsing section, to enter press **MAIN MENU** → **Log** → **Log browsing**, the last 100 entries can be viewed as a list. Older entries can be accessed

in the *log.csv* file that is available when the photometer is connected to PC by USB or Bluetooth, see [13.1 USB mode and 13.2 BT mode](#).

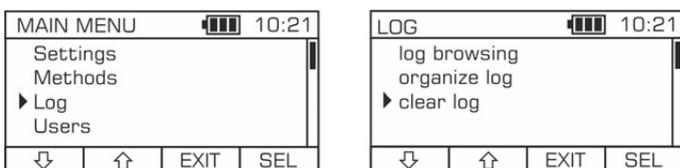


When in the organize log, to enter press **MAIN MENU** → **Log** → **organize log**, one of several criteria can be chosen to sort the log entries.



9.2 Clearing the log

In some cases you may need to clear the log file. With the clearing log function you can clear the content of the log entirely including the last 100 entries, which are displayed, together with older ones. To clear the log enter **MAIN MENU** → **Log** → **clear log**, after pressing the **SEL** button the message 'Are you sure' as an additional step to avoid erasing all data erroneously will appear. Press the **YES** button on the display to confirm this selection or if it is not desired action, press the **NO** button.



NOTE:

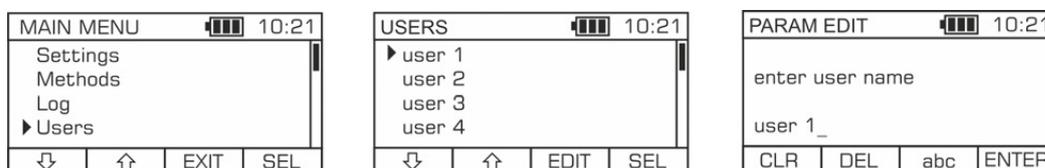
Clearing operation is irreversible. Back up the log.csv file before this operation, if any data stored is valuable for you. It can always be written back to the Exaquua disk, if required.

10 Users

Exaquua can store up to five users' names. Selected (current) user name is recorded in the log file together with other measurement data, and thus the operator of the device is indicated.

10.1 Editing users' list

In the users section there is a list of users that can be selected and edited. To enter users section press **MAIN MENU** → **Users**. To select one of the users press the **SEL** key. To edit the chosen user name press the **EDIT** context button. While in the section **PARAM EDIT** enter an user's name using the keyboard keys (1-9) . Using the context button you can switch between lowercase and uppercase letters, or switch to numbers. The **CLR** button is used to clear the whole name, the **DEL** button to clear the last typed character. The user name can be up to 20 characters long.



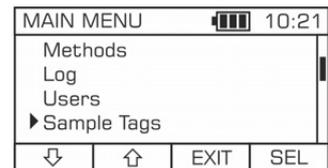
11 Tags

The tag is a kind of a label you can attach to the measurement in order to indicate a place or any other information that will help in isolating data of interest in the log. For example, these can be names of the tanks from which samples are taken or a short remark. The maximum length of the tag is 20 characters.

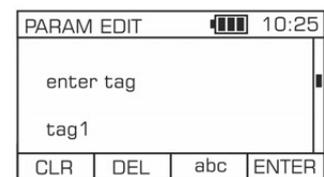
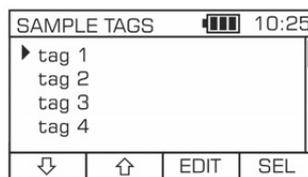
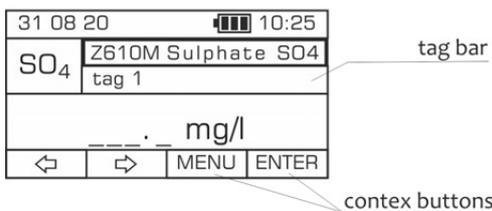
11.1 Editing tags list

Tag list can be edited in two below specified ways:

- from **MAIN MENU** → **Sample Tags**, then by choosing a tag from the displayed list and pressing the **EDIT** context button.



- in the **MAIN SCREEN** by selecting the tag bar (with the **▲/▼** up/down cursors) and pressing one of the context buttons **MENU** or **ENTER**.

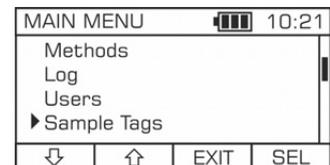


While in the section **PARAM EDIT**, enter the name of a tag using the keyboard keys (1-9). Using the context button **abc** you can switch between lowercase and uppercase letters or numbers. The **CLR** button is used to clear the whole name, the **DEL** button to clear the last typed character.

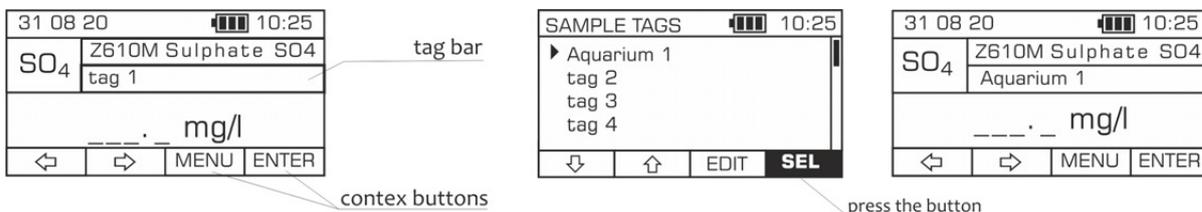
11.2 Selecting tag

You can choose one of the defined tags in two below specified ways:

- from **MAIN MENU** → **Sample Tags**, then by pressing the **SEL** context button. After pressing the SEL button you are automatically switch to the main screen and in the tag bar a new name for a tag is displayed.

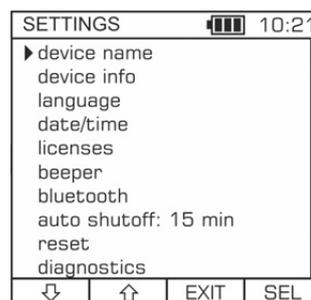


- in the **MAIN SCREEN** by selecting the tag bar with up/down cursors, and pressing one of the context button **MENU** or **ENTER** (after selecting the tag bar you can also choose desired tag directly by using the left / right cursors). The device will automatically switch to the main screen and in the tag bar a new name for a tag is displayed.



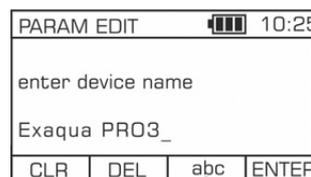
12 Settings

By using the Settings section, to enter press **MAIN MENU** → **Settings**, it is possible to set general data and functions, thus meeting specific preferences such as device name, language version or auto shutoff time.



12.1 Device name

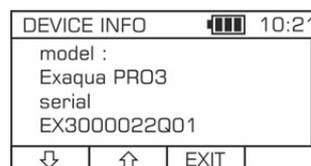
Exaqua owner can give his specific name to the instrument. The device name is recorded in the log and can be used to identify the instrument unit. To enter the device name, go to **MAIN MENU** → **Settings** → **device name**, then press the **EDIT** context button. While in the section **PARAM EDIT** enter your name of a device using the keyboard keys (1-9). By the means of the context button you can switch between lowercase and uppercase letters or switch to numbers. The **CLR** button is used to clear the whole name, the **DEL** button to clear the last typed character.



context button

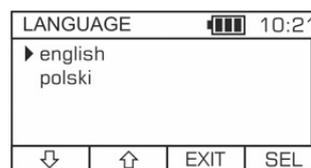
12.2 Device info

By entering **MENU** → **Settings** → **device info**, you can get access to the Device info section where such information like: type of model, software and hardware version can be found.



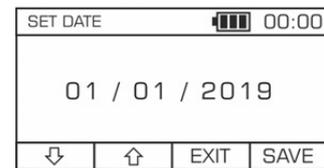
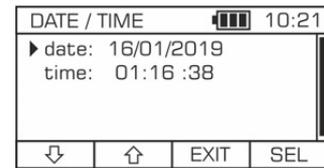
12.3 Language

In the language section, to enter go to **MAIN MENU** → **Settings** → **language**, there is the selection of languages you can choose from. Information like method description will be recorded in the log in the chosen language version.



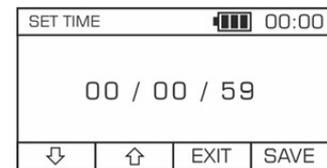
12.4 Date

Exaqua is equipped with the real time clock (RTC) and it is strongly recommended to set it before performing any measurements. To set the current **date** enter **MAIN MENU** → **Settings** → **Date/time** and choose from the list date by pressing the **SEL** context button on the display. To select the number from 0 to 9 use the **up/down**  buttons. To move through the day, month, year numbers use the **left / right**  cursors on the keyboard. After setting the current date accept by pressing the **SAVE** button. In case of inserting the wrong format of date, the system will not allow to save the date and the message 'wrong date!' is displayed.



12.5 Time

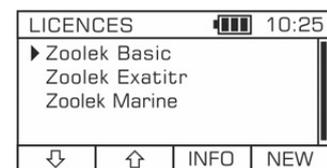
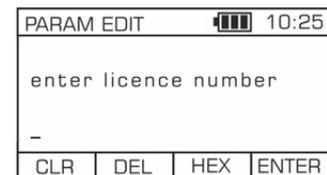
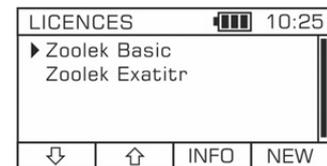
Exaqua is equipped with the real time clock (RTC) and it is strongly recommended to set it before performing any measurements. To set the current **time** enter **MAIN MENU** → **Settings** → **Date/time** and choose from the list **time** by pressing the **SEL** context button on the display. To select the number from 0 to 9 use the **up/down**  buttons. To move through the hour, minute, second numbers use the **left / right**  cursors on the keyboard. After setting the current time accept by pressing the **SAVE** button.



12.6 Licenses

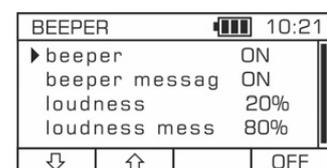
Some method packets or additional functionalities require purchasing and entering a license key. To enter the license key, go to **MAIN MENU** → **Settings** → **licenses**, then press the **NEW** context button. When in **PARAM EDIT** section, enter your licence code using the keyboard keys (1-9 and A-F). The **CLR** button is used to clear the whole code, the **DEL** button to clear the last typed character. Press **ENTER** context button to confirm. The messages 'Unlocking' and then 'Licence added' are displayed on the screen. Now, the new licence is activated and visible on the list in the **LICENCE** section. After choosing the license name from the list and pressing the context button **INFO** information about the content of a license pack is displayed.

NOTE:
The entered key remains valid after software resets or updates.



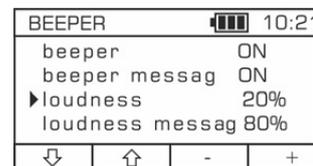
12.7 Beeper

There are separate settings for keyboard beeper and the volume of sound that will be generated in case of any message like the end of timer or an error message.



- To set the keyboard beeper enter **MAIN MENU** → **Settings** → **Beeper**, then choose from the displayed list **beeper** and/or **loudness**.
- To set the message sound (trigger for timers and error messages) enter **MAIN MENU** → **Settings** → **Beeper**, then choose from the displayed list **beeper message** and/or **loudness message**.

To change settings for beepers use the **ENTER** button or the **ON/OFF** context button on the keyboard. Loudness adjustment is made by means of the **plus/minus** context buttons on the screen.



NOTE:

Remember not to switch off the beeper message when you want to use titration methods. It will disable the acoustic signal which indicates the end of the titration.

12.8 Bluetooth

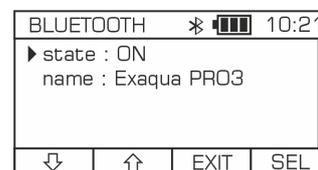
Exaqua photometer has Bluetooth functionality that allows wireless connectivity with mobile devices and the use of the Exaqua application which provides a number of additional features that facilitate and enhance the operation of the photometer:

- convenient viewing, collecting and storing recorded measurement results from one or several photometers,
- creating reports and overviews of measurement data,
- generating PDF reports with possibility to send them by e-mail,
- creating curves and graphs for visual presentation of recorded measurements.

The BT unit can be switch on or off as desired, and the name of the BT device can be set using below procedures.

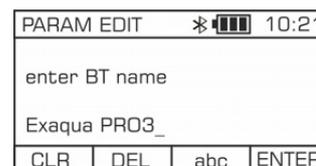
- **Switching off/on**

Switching off the BT unit will reduce the power consumption, and thus extends the working time. To use Bluetooth on your device, go to **MAIN MENU** → **Settings** → **Bluetooth**. If the state is **OFF**, the Bluetooth function is disabled. To switch on the BT unit press the **ENTER** key or the **SEL** button, then the state is changed to **ON** and the **BT icon** appears on the info bar of the main screen. To save the setting press the **EXIT** context button on the display.



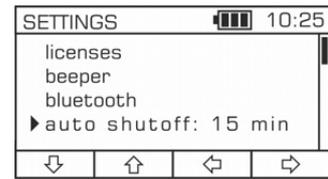
- **Setting the BT device name**

To set the BT device name, go to **MAIN MENU** → **Settings** → **Bluetooth**. Scroll on the list to **name** and enter the **SEL** context button. When in **PARAM EDIT** section, enter your name of a device using the keyboard keys (1-9). Using the context button you can switch between lowercase and uppercase letters, or switch to numbers. The **CLR** button is used to clear the whole name, the **DEL** button to clear the last typed character. The maximum length of the name is 12 characters. Press **ENTER** context button to confirm.



12.9 Auto shutoff

The auto shutoff time can be set and with no key pressed during a set period of time the instrument go to the sleep mode. To wake up the instrument within 1 hour from auto shutoff press the **power key**  with short press. After a time longer than 1 hour a long press is required. To set the auto shutoff time, enter **MAIN MENU** → **Settings** → **auto shutoff** and using left / right cursors   on the keyboard or the   left /right buttons on the display choose the desired time.

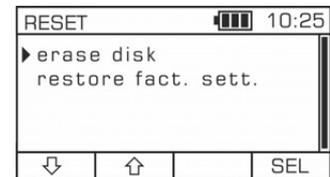


12.10 Reset

Stored data can be erased and factory settings restored using two procedures that follows.

- **Erasing Data**

'Erase disk' setting clears all log files and restore user and tag lists to the factory defaults. All other settings remain unchanged. To erase stored data go to **MAIN MENU** → **Settings** → **reset** → **erase disk** and press the **SEL** context button on the display. The message 'Are you sure' appears on the display as an additional step to avoid erasing all data erroneously. Press the **YES** button on the display to confirm this selection or if it is not desired action, press the **NO** button.



- **Restoring factory settings**

'Restore factory settings' clears log files and removes user methods. It also resets to factory defaults sample and users lists, clock, date and all other user available settings including language version (default is English). To restore factory settings go to **MAIN MENU** → **Settings** → **reset** → **restore fact.sett.** and press the **SEL** context button on the display. The message 'Are you sure' appears on the display as an additional step to avoid erasing all data erroneously. Press the **YES** button on the display to confirm this selection or if it is not desired action, press the **NO** button.

NOTE: After restoring the photometer to its factory defaults, the user will be automatically guided through the four-step commissioning procedure including setting of language version, current date, time, then running calibration and self-check, see [7 Before starting measurement](#), from [7.1](#) to [7.4](#).

The table below contain the overview of reset procedures.

Reset procedures		
	Erasing Data	Restoring factory settings
Clears:		
log files	✓	✓
user methods		✓

Table. The overview of reset procedures

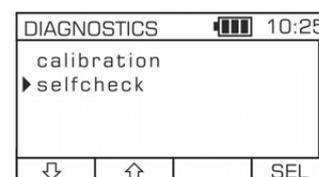
	Reset procedures	
	Erasing Data	Restoring factory settings
Restores to the factory settings:		
sample tag lists	✓	✓
user lists	✓	✓
beeper		✓
Bluetooth mode		✓
Language		✓
Sorting of log entries		✓
Auto shutoff		✓
Resets:		
Clock		✓

12.11 Diagnostics

12.11.1 Selfcheck

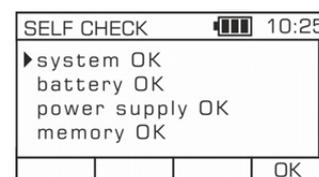
The Selfcheck feature tests basic functions and resources of the instrument. Before performing the diagnostic test remove the test vial from the holder of the photometer. The self-check is run for the following five sections of the instrument:

- **system** - the integrity of the microcomputer is checked
- **battery** - the condition of the battery is checked
- **power supply** - voltages supplying electronic circuits of the photometer are checked
- **memory** - errors in memory of the instrument are found
- **photometry** - diagnostics of the photometric engine is performed



If any problem area is diagnosed during the test, an error identification is displayed. In this case refer to error list in [16 Troubleshooting](#) to check possible corrective actions.

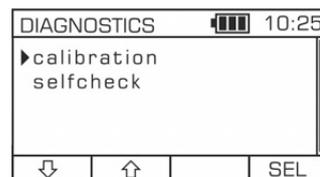
To run the self-check of the instrument enter **MAIN MENU** → **Settings** → **diagnostics** → **selfcheck**. The information to remove vial appears on the display and after pressing the **OK** context button the diagnostic check is performed. If any problem area or error is identified for each section 'OK' is displayed.



12.11.2 Calibration

To achieve highest accuracy of the photometric engine it is required to run its calibration on a regular basis. It is performed internally without the use of any tools. Calibration takes less than one minute and should be carried out once a month or when an operating temperature changes by more than 5 °C. If these conditions are met the message about calibration requirement is displayed by the instrument. The calibration can be started by the user at any time.

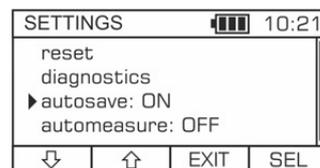
To run the calibration of the instrument enter **MAIN MENU** → **Settings** → **diagnostics** → **calibration**, and press the **SEL** context button on the display. The message 'Are you sure' appears on the display as an additional step to avoid erasing all data erroneously. Press the **YES** button on the display to confirm this selection or if it is not desired action, press the **NO** button.



12.12 Autosave

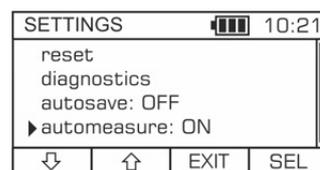
The Autosave function enables automatic recording of each measured result. With this function on, after pressing the **MEAS** key at the end of the measurement procedure, the **REC** context key will be lighted up for a moment to indicate that the reading has been recorded in the photometer log.

To switch on Autosave function, enter **MAIN MENU** → **Settings** → **autosave** and choose **ON** using **left / right cursors** on the keyboard. To switch off, choose **OFF**.



12.13 Automeasure

For all methods with timer, the Automeasure function makes it possible to perform an automatic measurement at the last step of the procedure after the timer has elapsed. It is especially useful for methods which require waiting for a reaction to develop. This functionality releases the user from the need to remember to press the **MEAS** key after the reaction time has elapsed in order to end the measurement.



NOTE:

Automeasure function is enabled only when the guide system is on, see [8.2 Using method guide](#).

13 Communication

13.1 USB mode

USB mode is used to access the files stored in the internal memory of the instrument. The files can be read, written or deleted. To access the stored files switch on the photometer, enter **MAIN MENU** → **USB** and connect the device with your PC by means of micro-USB cable.

Files are organized in the following folders:

- **FW update** - this folder is for uploading the instrument firmware. Entering **Main Menu** → **FW update** enables to execute firmware update process with the file stored here, see [13.3 Firmware update](#).
- **Log** - contains *log.csv* file with measurements records. The file can easily be imported to popular spread sheet applications. For proper data organization set 'tab' as separator.
- **User methods** - it contains files *umn_cfg.txt* with user methods. They can be edited in a text editor or overwritten with the files created on other Exaqua units.
- **User sample info** - here two files are stored: *sample_tags.txt* - containing list of sample tags, *users.txt* - containing list of users.

-  FW Update
-  Log
-  User Methods
-  User Sample Info

 log.csv

-  um1_cfg.txt
-  um2_cfg.txt
-  um3_cfg.txt
-  um4_cfg.txt

-  sample_tags.txt
-  users.txt



CAUTION :

USB mode is intended only to copy the files from the photometer memory to a PC. Do not make any other operations on files, e.g. uploading of changed or partially deleted files back to the instrument, as it can result in its improper operation or software damage.

13.2 BT mode

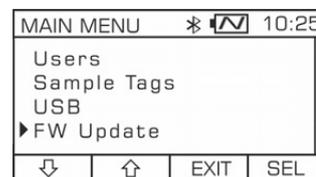
Exaqua is equipped with Bluetooth 5.1 for communication with mobile devices which allows using Exaqua application. This software provides features including easy viewing and collecting recorder measurement results from several photometers, creating reports, generating and e-mailing PDF documents as well as creating curves and graphs for visual presentation of gathered data.

In the Bluetooth menu the BT communication can be switched on or off and the name of the BT device can be set. The maximum length of the name is 12 characters. For detailed information, see [12. Settings, 12.8 Bluetooth](#).

13.3 Firmware update

Once the new release of the firmware is published it is strongly recommended to install it on the device according to the below procedure.

To update firmware version switch on the photometer, enter **MAIN MENU** → **FW Update** and connect the device with your PC by means of micro-USB cable. Copy the folders from your photometer with the stored files to your PC. Download the update file from authorized website and write it down in the '**FW update**' folder. Go to **MAIN MENU** → **FW Update** and press the **SEL** context button to enter **INFO** section. The message 'Upload FW package to MSD' is displayed. The update process starts with pressing the **OK** button and it takes several minutes to complete. The end of the update process is confirmed by an '*FW update finished*' message.



CAUTION :

During Firmware update some files can be lost! Before running Firmware update save all files that can be lost or require resetting on your PC. Read the description of the FW Update package to find out which parameters will require resetting after the update is finished.

14 User methods

14.1 When to use user methods

In some cases there is a need to create user's own methods that will allow to work with a specific set of reagents. Exaqua photometers have a very convenient mechanisms for creating methods that are transferable and can be shared with other Exaqua users. User methods feature is optional.

14.2 Creating user method

14.2.1 Step 0. Prerequisites

To create your own method you need to prepare a series of solutions with a known concentration of the analyte (tested substance) with the reagents added and a zero sample (in most cases it is the pure water). You also need to know which of the available wavelengths is most suitable. In order to choose proper wavelength use the absorbance methods. The one that gives the widest range of values for the prepared solutions is the best choice. On the created reference curve that defines the relation between absorbance and concentration, up to 10 points can be used.

14.2.2 Step 1. Choosing user method

There are four user methods available for editing. All user methods parameters are stored in separated files *user methods/umn.txt*. To enter the user method section, go to **MAIN MENU** → **Methods** → **user methods** and press **SEL** button.

USER METHOD		11:24	
▶	um1: user method 1		
	um2: user method 2		
	um3: user method 3		
	um4: user method 4		
↓	↑	SEL	EDIT

14.2.3 Step 2. Editing user method parameters

To edit a chosen user method parameters go to **MAIN MENU** → **Methods** → **user methods**, scroll through the list to select a desired user method and press the **EDIT** button. In this section there is a set of parameters that the user can modified:

- **name** - user can edit the name of the method which can be up to 21 characters long,
- **unit** – this is the concentration unit that will be displayed and recorded together with the result,
- **wavelength** – for this parameter one of the measurement wavelengths available in the instrument can be selected,
- **abs0, abs1, abs2....** - a series of absorbance value for the concentrations **conc0, conc1, conc2**

USER MET EDIT		11:24	
▶	name: user method 1		
	unit: mg/l		
	wavelength: 520 nm		
	abs0: 0.000		
	conc0: 0: 0.000		
	abs1: 1.000		
	conc1: 1.000		
	abs2: ---		
	conc2: ---		
↓	↑	EXIT	EDIT

By pressing the **EDIT** context button for a chosen parameter you go to the **PARAM EDIT** section. While in this section you can change parameters' names by means of the keyboard keys (1-9). Using the context button you can switch between lowercase and uppercase letters or switch to numbers. The **CLR** button is used to clear the whole name, the **DEL** button to clear the last typed character.

The data entered as **abs0, abs1, abs2....** and **conc0, conc1, conc2** are the points on the reference curve that defines the relation between absorbance and concentration. Up to 10 points can be used. The order of entering the values is arbitrary and they are sorted increasingly on exiting user method edit window and then saved. The absorbance values can be entered manually or acquired from measurement by means of the **MEAS** button pressed in **PARAM EDIT** section when on any **absX** position. In such a case a simplified measurement window appears. Accepted format of entered numbers is **XXX,XXX** (the maximum value of number is 999,999).

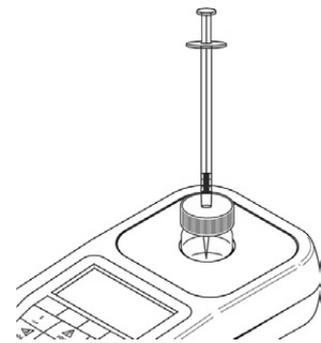
First zero measurement needs to be performed and then the measurement of the sample. When finished press the **EXIT** button and return to user method edit window. Now the measured value is on the list of method parameters. Absorbance measurements should be performed for all prepared solutions including zero which in this case is measured as it was a sample. For most measurements pure water is used for zero and in such a case the same sample is measured twice. However, in some cases, zero can be pure water with reagents added. This should be used when high absorbance bias is expected for zero.

The newly created user method can be checked by measuring the series of reference solutions again, but now as it was any other method, see [8 Performing measurements](#).

31 08 20		10:21	
UM1	user method 1		
		0.000	
ZERO		EXIT	

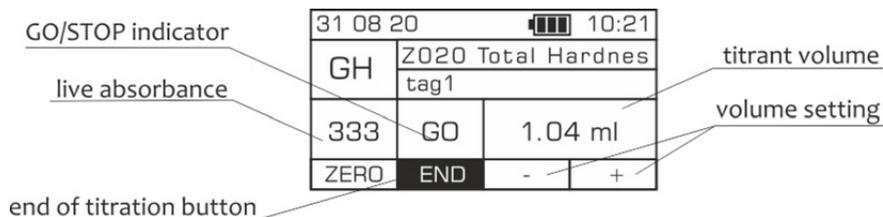
15 Titration methods

Photometric titration is an analysis method in which a solution called a 'titrant' is added to the sample until a rapid change of colour is observed. The titrant is added using a 1 ml syringe which shows amount of titrant used. The measurement result is then calculated using the reading on the syringe.



Exaqua features an innovative photometer aided method **exat:Jr** system for easy and convenient titration measurement. One of the most significant function of this system is to recognise and indicate acoustically the end of the titration. In this way, the user does not need to observe the change of sample colour while adding the titrant to the solution of the analyte.

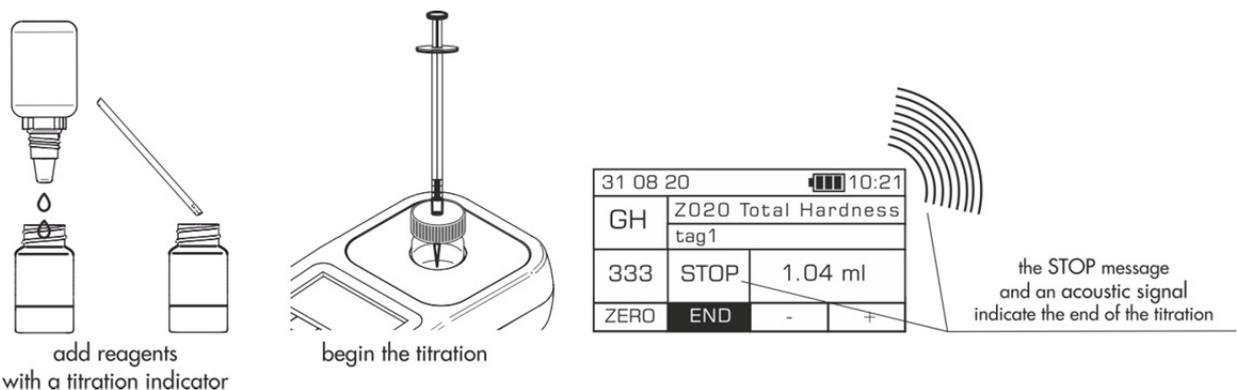
For **exat:Jr** titration method special, taller type of the vial should be used that is equipped with a cap with a hole for adding the titrant. This type of the vial prevents spills when the tested sample is mixed with titrant.



To perform measurement based on titration, first adding reagents containing, among others, a titration indicator is required. Then the zero measurement needs to be performed and the titration can be started by pressing the **MEAS** button. Now the titrant is to be added by slow dispensing from the syringe. To obtain accurate results of titration, it is essential to shake the sample after each unit dose from the syringe. There is no need to remove the sample out of the instrument for mixing - it can be performed by shaking the whole photometer. In the measurement window the absorbance readings can be observed together with the **GO/STOP** indicator. The volume of added reagent given in ml can be entered by pressing any key except for the **minus** key and the **Power** key. When absorbance overpass the defined threshold it is manifested by the **STOP** indicator and the acoustic signal (if beeper is set on, see [12.7 Beeper](#)).

NOTE:

Remember not to switch off the beeper message when you want to use titration methods. It will disable the acoustic signal which indicates the end of the titration.



Provided the absorbance readings are stable and the **GO/STOP** indicator does not return to **GO** we can assume the titration is finished. With the **END** button pressed, the value of the titrant volume (in millilitres) that is entered on the display is recalculated to the measured parameter. Now, it can be recorded exactly the same manner as for any other method by pressing **REC** key. For some titration methods alternative units are also available.

31 08 20		10:25	
GH	Z020 Total hardness tag1		
333	STOP	1.04 ml	
ZERO	END	-	+

31 08 20		10:25	
GH	Z020 Total hardness tag 1		
26.0 dH			
ZERO	MEAS	GUIDE	REC

NOTE:

For basic instructions the **GUIDE** function can be used (before each step of a measurement press the **GUIDE** context button on the display while in the main screen).

16 Troubleshooting

The Exaqua photometers have no user-serviceable parts. Correcting of any problems in operation is limited to responding to error messages displayed on the instrument screen, see [16.2 Error list](#) or the situations described in below table in [16.1 Problem solver](#). In case of any other problem contact Exaqua Customer Service (tel/fax (+48 42) 653 44 57, email: biuro@exaqua.com, www.exaqua.pl) or your Local Distributor.



CAUTION :

Do not attempt to open the photometer. Improper handling not in accordance with the written manufacturer instructions, unauthorized opening or individual repair of the instrument will void the warranty.

16.1 Problem solver

The table below contains the list of possible problems that may appear during photometer operation and the action user can take to correct them.

Type of problem	Action
Photometer doesn't wake up	If the photometer doesn't react to the power button it is most likely due to the battery being deeply discharged. Connect the instrument to a USB charger and wait approximately for an one hour. After this time the device should start up.
Inaccurate readings	To avoid photometric errors keep the interior of the vial holder clean and dry. Also keep the test vials clean and wipe it with clean piece of cloth before measurement. The lower the measured absorbance the more important is cleanliness of the vial

16.2 Error list

In certain cases error information may appear on the screen.

The table below contains error numbers with possible cause and the action user can take.

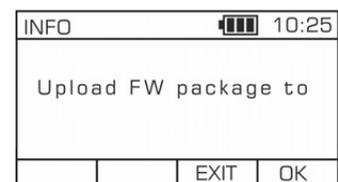
Error number	Type	Action
33 - 49	memory error	If error persists update the instrument firmware.
50 - 57, 97 - 100, 121	system errors	Hold the buttons (3, 5, 7) on the keyboard for 8 seconds to restart the system or try to update the instrument firmware.
65 - 67	battery fault	The battery is probably broken and needs to be replaced – contact Exaquua Customer Service or your Local Distributor.
68 - 71	internal memory error	If error persists update the instrument firmware.
81 – 83, 85	disk fault	A reset to factory settings or firmware update may be helpful.
84	disk full	Check content of the instrument disk. Remove files of excessive size. In case of excessive log file, make back-up of it, if required, and reset (MAIN MENU → Log → clear log)
113 - 120	methods and licenses errors	If error persists update the instrument firmware.
122 - 257	factory settings restore errors or firmware update errors	Hold the buttons (3, 5, 7) on the keyboard for 8 seconds to restart the system or try to update the instrument firmware.
513 - 516	Self-check and calibration errors	Check if detectors were not obscured during self-check. If error persists contact Exaquua Customer Service

16.3 Forced reset

If required, the photometer may be forced to reset by an user. This feature is used generally in case of the software crash (system does not respond and the device stops functioning properly) or if it is recommended in a specific instruction given in [16 Troubleshooting](#).

To force reset of the photometer hold the buttons (3, 5 and 7) firmly on the keyboard for 10 seconds. There will be a black-out of the display for several seconds, then the device will return to the main screen.

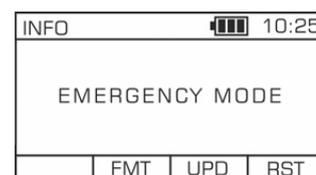
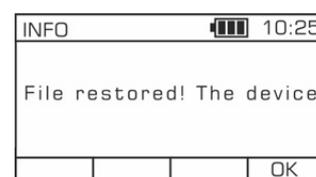
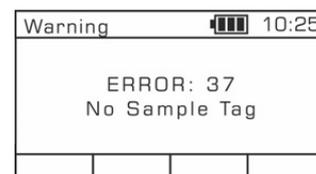
After the forced reset, the device will ask for firmware update and the message 'Upload FW package to MSD..' may be displayed. You can accept this step by pressing the **OK** button or skip by pressing the **EXIT** button.



16.4 Emergency mode

While operating the photometer, in some cases, errors reading configuration files can occur. It may happen during uploading the files in the USB mode from the photometer to a PC, see [13.3 Firmware update](#), when some files required for proper system operation are unintentionally deleted by a user, i.e. user method files, users files, sample tags files or log file. In such situation, two procedures are implemented:

- If a damaged or deleted file can be restored by the controller, first, the message with the number and the description of the error is displayed and then the message *'File restored! The device will restart....'* appears. After pressing the **OK** button to confirm and several seconds of the display black-out, the device will return to the main screen.
- If a damaged or deleted file cannot be restored by the controller, the photometer will automatically switch to the Emergency mode. In this mode, the user gets access to the device's disk by means of the USB connection, and can follow one of the procedures to restore files by pressing one of the three context buttons on the display:



RST Resetting

Pressing this button causes the reset of the device and restores its stable operation.

UPD Updating / Repair of software

Use the UPD function if the RST procedure has failed. Connect the device with your PC by means of micro-USB cable. Download the update file from authorized website and write it down in the 'FW update' folder. Press the **UPD** button.

FMT Formatting of disk

Use this function in case of the USB communication problem. Run formatting of the disk by pressing the **FMT** button, then follow the above **UPD** procedure.

17 Technical specification

Photometry	Photometric channels	up to 6 optical channels <ul style="list-style-type: none"> ○ model Pro3: 470 nm, 520 nm, 610 nm ○ model Pro6: 430 nm, 470 nm, 520 nm, 560 nm, 610 nm, 650 nm
	Bandpass filters	hard coated interference filters, accuracy ± 1 nm, FWHM - 8 nm
	Detectors	large area PIN photodiodes
	Light sources	selected LEDs with controlled spectral profile, temperature compensated
	Absorbance max. displayed values range	- 4.000 to 4.000 ABS
	Absorbance resolution	0.001 ABS
	Photometric accuracy@1 ABS	± 2 mABS
	 rayject photometric engine	full protection for interfering ambient light, max. constant illuminance 30000 LUX, overload indication
	Cuvette	round, diameter 24 mm
	Minimum sample volume	4 ml
Power supply	Charging source	USB, type micro connector
	Battery capacity	1050 mAh Li-ion cell
	Working time	typically 8 h of continues operation, adjustable shut-off function for extending working time <i>NOTE:</i> <i>For optimum life of the battery, discharges of more than 80 % of the rated capacity should be avoided (deep discharge). Recommended storage is around 40 % state-of-charge. Storing in a full-discharge state can shorten battery life.</i>
User interface	Display	OLED type, high brightness, infinite contrast, resolution 128x64
	Keyboard	16-button keyboard with reinforced display window
Communication	USB 2.0 access to:	results log; tags and users list, user's methods configuration files
	Bluetooth 5.1 - access to:	results log; tags and users list, user's methods configuration files and remote control of the instrument (under development)
Software features	Measurement methods	selection of the built-in methods with guide
	exat:tr	photometer aided titration methods
	User methods	up to 4 user methods with up to 10 reference points, user methods are transferable to other Exaqua units
	User names	selection of 5 user names
	Editable tags	selection of 10 user editable tags
	Data logger	max. 2000 entries available in the log file, last 100 entries can be viewed and sorted in the instrument
Environmental	Operating temperature range	10 to 40 °C
	Enclosure rating	IP65 - dust and splash proof
	USB interface	USB type micro IP67
Mechanical	Dimensions	86 x 200 x 37 mm
	Weight	approx. 290 g

18 Methods

This chapter includes general information about measurement conditions, proper handling of reagents and collecting of samples and reagents. Detailed instructions how to perform measurements for each parameter contains chapter [19 Method procedures](#). The illustrated procedures for each method include also information about the type of measured parameter, range and resolution of the method, type of water (fresh or marine), required set of reagents and accessories, possible interferences and helpful guidelines that should be followed to obtain accurate results of tests. The methods are programmed into the instrument and it is not required to make any further adjustments to carry out measurements.

18.1 Measurement conditions

While performing measurement using the photometer, the following should be noted:

- Before measurement, make sure the vial holder is clean and dry. If necessary, gently wipe the photometer body and inside of the vial holder with a soft and dry cleaning cloth. Do not use cleaning or abrasive agents as they may damage the measuring system of the device irreparably.
- Correct measurement readings can be obtained only within the measuring range specified for each individual parameter.
- Always observe specified reaction time. In case of some reagents it is required to wait specified time to obtain proper colour of solution for a measurement. Taking a reading before the reaction time has elapsed may result in falsely low or high readings.
 

- **Optimal temperature range : 20 – 25 °C**
Optimal temperature of solutions and reagents for each method is 20 – 25 °C. Take care to ensure proper temperature conditions, otherwise erroneous readings could be obtained.
- **Optimal pH range : 4,0 ÷ 9,0**
Optimal pH range for each method is 4 – 9. Performing tests for pH exceeding specified range may lead to falsely low or high readings.
- The colour of tested water should not influence readings as a sample blank is performed before a final measurement.
- Too high turbidity of sample may give erroneous high values. In case of natural, slight turbidity of tested water a sample blank determination performed before a final measurement should eliminate the risk of getting false readings.

18.2 Reagent storage and handling

The reagents for each method / parameter are available for purchase as sets, see [18.5 Reagent set selection](#) to find a product code of the required reagent kit.

To obtain reliable results of measurements the following guidelines should be followed while handling the reagents:

- Always use genuine Exaqua reagents when performing the photometer test methods. Alternative reagents may differ considerably in formulation and colour and can give inaccurate results.
- Always replace caps on reagents bottles after measurement to prevent their evaporation and change in their properties.
- Do not interchange, mix or combine reagents from kits with different product numbers except for deionized water (product no 8903 /100 ml).
- Reagents should be stored in original packaging in a dry place at room temperature, away from heat and direct sunlight. Freezing must be avoided.



CAUTION :

Handling chemicals contained in the reagents sets can be dangerous. Read the necessary Material Safety Data Sheets, follow instructions carefully and take all required safety precautions.

Keep the reagents out of reach of children and store locked up. Avoid eye or skin contact or breathing. In case of reagent spill, remove immediately and rinse cautiously with water for several minutes.

18.3 Collecting of samples and reagents

Samples and reagents according to the given instructions are collected or dosed by means of:

- 5 ml syringe (provided in a small case with photometer)
- 1 ml syringe with or without tip (included in some reagents sets, if required)
- bottle dropper with a liquid reagent (included in reagents sets)
- spatula for dosing powder reagents (included in reagents sets)

18.3.1 Proper use of syringe

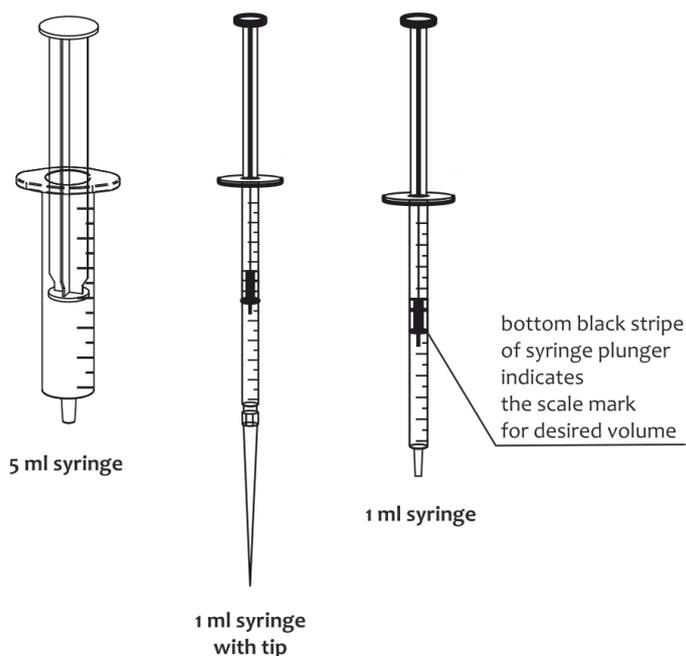
1. Push the plunger entirely into syringe and insert the syringe tip into the reagent or sample solution.
2. **5 ml syringe :**
Pull the plunger backward until the plunger seal is on the scale mark for the volume you desire.

1 ml syringe :

Pull the plunger backward until the bottom black stripe of the syringe plunger is on the scale mark for the desired volume.

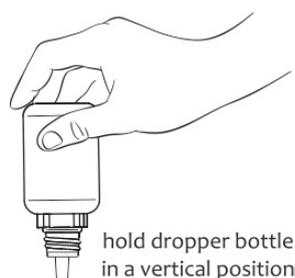
For some methods, additional tips should be applied to facilitate titration according to the given method procedures. In this case, the entire volume below the plunger is not completely filled since some amount of liquid is present in the tip.

3. Make sure no air bubbles are present in a liquid as it can affect accuracy of measurement.
4. Place the syringe above the vial with a sample and push the plunger down into the syringe.
5. Rinse the syringe with clean water and dry after use. Liquid residues or sediments inside the syringe may adversely affect next measurement results.



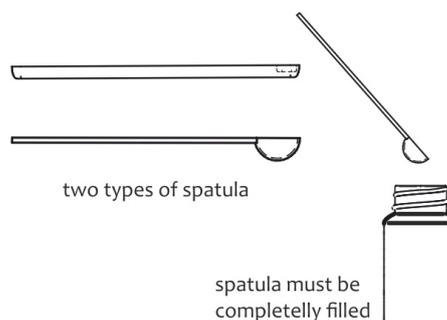
18.3.2 Proper use of bottle dropper

1. Shake the dropper bottle and remove the cap.
2. For proper dosing, place the dropper bottle above the vial with a sample in a vertical position.
3. While dosing, squeeze the bottle gently to obtain equal volumes of reagent.
4. After use, replace the cap on the dropper bottle.



18.3.3 Proper use of spatula:

1. Make sure spatula is clean and dry.
2. While taking the powder reagent make sure that the spatula is completely filled.



18.4 Reagent set selection

The reagent sets are to be purchased separately. To place an order for needed reagents, please check a product number in the below table.

The table with an overview of the measured parameters

Parameter	Water	Range	Resolution	Method name	Product Code	Chapter
Alkalinity KH	fresh (F) marine (M)	0,5 – 30 °d 0,5 – 20 °d	0,5 °d	Z010F/Z010M	8010	19.1
Total hardness GH	fresh	1 – 50 °d	0,5 °d	Z021	8021	19.2
pH 4.5-6.0	fresh	4,5 – 6,0 pH	0,05 pH	Z030	8030	19.3
pH 6.0-8.5	fresh	6,0 – 8,5	0,05 pH	Z040	8040	19.4
pH 4.5-9.0	fresh (F) marine (M)	4,5 – 9,0 pH	0,05 pH	Z050F/Z050M	8050	19.5
Nitrate NO ₃ high range	fresh and marine	5 - 150 mg/l	1,0 mg/l	Z210H	8210	19.6
Nitrate NO ₃ low range	fresh and marine	0,5 - 30 mg/l	0,5 mg/l	Z210L	8210	19.7
Nitrite NO ₂ high range	fresh and marine	1-6 mg/l	0,05 mg/l	Z220H	8220	19.8
Nitrite NO ₂ low range	fresh and marine	0,02-1,5 mg/l	0,01 mg/l	Z220L	8220	19.9
Total ammonia NH ₄ fresh water	fresh	0,1 -5 mg/l	0,05 mg/l	Z230	8230	19.10
Total ammonia NH ₄ marine water	marine	0,1 -3 mg/l	0,05 mg/l	Z231	8231	19.11
Phosphate PO ₄	fresh (F) marine (M)	0,05-10 mg/l	0,01 mg/l	Z240F/Z240M	8240	19.12
Iron Fe	fresh and marine	0,05-10 mg/l	0,01 mg/l	Z410	8410	19.13
Manganese Mn	fresh	0,05-5 mg/l	0,01 mg/l	Z420	8420	19.14
Copper Cu	fresh (F) marine (M)	0,02-5 mg/l 0,08-3 mg/l	0,02 mg/l	Z430F/Z430M	8430	19.15
Silicon Si	fresh and marine	0,05 - 7 mg/l	0,01 mg/l	Z440	8440	19.16
Potassium K high range	fresh	10 – 150 mg/l	0,5 mg/l	Z450H	8450	19.17
Potassium K low range	fresh	2 - 20 mg/l	0,1 mg/l	Z450L	8450	19.18
Calcium Ca marine water	marine	200-600 mg/l	8 mg/l	Z462	8462	19.19
Magnesium Mg marine water*	marine	500-1600 mg/l	18 mg/l	Z463	8463*	19.20
Calcium Ca fresh water	fresh	5-300 mg/l	3,2 mg/l	Z472	8472	19.21
Magnesium Mg fresh water**	fresh	3-150 mg/l	1 mg/l	Z473	8473**	19.22
Sulphate SO ₄ fresh water	fresh	8 - 200 mg/l	2 mg/l	Z610F	8610	19.23
Sulphate SO ₄ marine water	marine	200-3000 mg/l	20 mg/l	Z610M	8610	19.24
Carbon dioxide CO ₂	fresh	1 – 50 mg/l	0,25 mg/l	Z630	8630	19.25

* Purchase this set along with the set for Method Z462, Calcium Ca marine water (product no 8462)

** Purchase this set along with the set for Method Z472, Calcium Ca fresh water (product no 8472)

19 Method procedures

19.1 Method Z010F / Z010M – Alkalinity KH

Specification

Description:	Test for determining the carbonate hardness in fresh and marine water
Range:	0,5 - 30 °d – fresh water 0,5 - 20 °d – marine water
Resolution:	0,5 °d
Wavelength:	610 nm

Reagent set

Product Code	Description	List of components
8010	Set of reagents for method Z010F / Z010M, Alkalinity KH (reagents for approx. 40 tests)	<ul style="list-style-type: none"> ✓ Reagent KH ✓ syringe 1 ml

Performing the measurement

- To measure carbonate hardness in fresh water select the **Z010F Alkalinity KH Fresh** method, in marine water the **Z010M Alkalinity KH Marine** method (**Methods** → **Select method** → Z010F or Z010M Alkalinity KH). How to select the method, see [8.1 Choosing method](#).

NOTE:

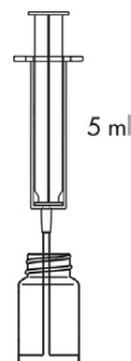
*It is recommended to use the GUIDE system. It will provide you with step-by step basic instruction how to perform measurement. To enable this function press the button **GUIDE**.*

- Rinse the vial and the syringe three times with the tested water.

Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.

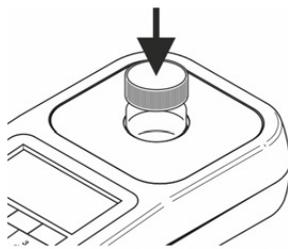


- Insert the vial into the round vial holder and press the **ZERO** key.

NOTE:

Before starting the measurement, it is highly recommended to make sure the test vial is clean and dry. Liquid residues remaining on the vial walls may adversely affect reliability of results.

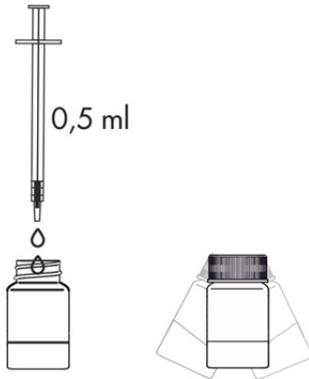
The display will show "-0.0-", which means the device is ready for measurement.



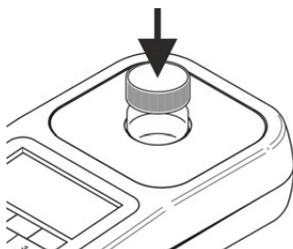
26 08 20		[Battery Icon] 12:35	
KH	Z010F Alkalinity KH	tag 1	
Measuring ...			
ZERO		GUIDE	

26 08 20		[Battery Icon] 12:35	
KH	Z010F Alkalinity KH	tag 1	
-0.0- dH			
ZERO	MEAS	GUIDE	

4. Add 0,5 ml of **Reagent KH**, and shake gently to mix.



5. Insert the vial into the round vial holder and press the **MEAS** key to take a measurement. The result – **carbonate hardness** - is displayed in **German degrees (°d)**.



26 08 20		[Battery Icon] 12:36	
KH	Z010F Alkalinity KH	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		[Battery Icon] 12:36	
KH	Z010F Alkalinity KH	tag 1	
8.5 dH			
ZERO	MEAS	GUIDE	REC

There are also available alternative units to display: CaCO₃ mg/l, mmol/l and mval/l. They can be accessed by pressing the **left / right**  cursors on the keyboard.

19.2 Method Z021 – Total hardness GH

Specification

Description:	Test for determining the total hardness in fresh water
Range:	1 – 50 °d
Resolution:	0,5 °d
Wavelength:	610 nm
Extra feature:	exat:ir method guided by the innovative photometric system for easy and convenient titration, see 15 Titration method .

Reagent set

Product Code	Description	List of components
8021	Set of reagents for method Z021, Total hardness GH (reagents for approx. 40 tests)* * for the average value of total hardness 12,5 °d	<ul style="list-style-type: none"> ✓ Reagent GH-1 ✓ Reagent GH-2 ✓ 1 ml syringe with tip ✓ vial

Performing the measurement

1. Select the **Z021 Total hardness GH** method (**Methods** → **Select method** → **Z021 Total hardness GH**).
How to select the method, see [8.1 Choosing method](#).

NOTE:

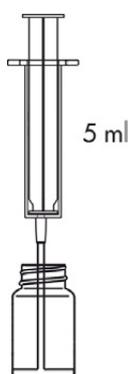
*It is recommended to use the GUIDE system. It will provide you with step-by step basic instruction how to perform measurement and an acoustic signal indicating the end of the titration. To enable this function press the button **GUIDE**.*

2. Rinse the vial and the syringe three times with the tested water.
3. Add 10 drops of **Reagent GH-1** and mix.

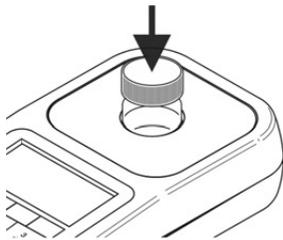
Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



- Insert the vial into the round vial holder and press the **ZERO** key. The display will show "-0.0-", which means the device is ready for measurement.



31 08 20		10:19	
GH	Z021 Total Hardnes		
	tag 1		
Measuring ...			
ZERO	MEAS	GUIDE	

31 08 20		10:19	
GH	Z021 Total Hardnes		
	tag 1		
-0.0- dH			
ZERO	MEAS	GUIDE	

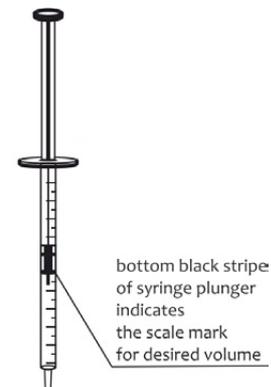
NOTE:

Before starting the measurement, it is highly recommended to make sure the test vial is clean and dry. Liquid residues remaining on the vial walls may adversely affect reliability of results.

- Replace the cap with a hole on the vial. Attach the tip on the end of the 1 ml syringe and take 1 ml of the **Reagent GH-2**. The bottom black stripe of the syringe plunger should be on the scale mark for the desired volume, see [18.3.1 Proper use of syringe](#).

NOTE:

Make sure no air bubbles are present in the syringe or in the tip. Trapped air bubbles can affect accuracy of the measurement.

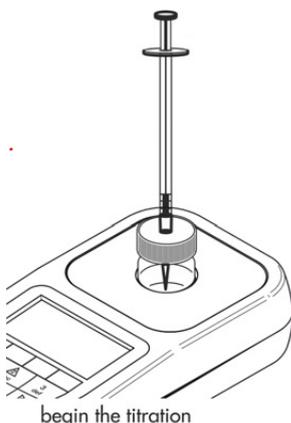


1 ml syringe

- Place the syringe with the Reagent GH-2 in the hole cap. Press the **MEAS** key and begin the titration by carefully adding **Reagent GH-2** in small portions. If the entire volume of the syringe is emptied and there is no end of titration, take another portion (1 ml) of Reagent GH-2 and continue titration.

NOTE:

To obtain accurate results of titration, remember to shake carefully the instrument with the vial after each drop of Reagent GH-2 is added to mix well.



The end of the titration is indicated by an acoustic signal and the message **STOP** appears on the instrument.

31 08 20		10:25	
GH	Z021 Total hardness		
	tag1		
150	STOP	1.04 ml	
ZERO	END	-	+



the STOP message and an acoustic signal indicate the end of the titration

NOTE:

Remember not to switch off the beeper message before taking a measurement, see 12.7 *Beeper*. It will disable the acoustic signal which indicates the end of the titration.

7. Read the volume of added **Reagent GH-2** in ml on the syringe scale and enter the value using the „+“ button or any other key on the keyboard apart from the  **Power key** and the  **minus key**. Press the **END** key. The result – **general hardness** – is displayed in **German degrees (° d)**.

31 08 20		 10:25	
GH	Z021 Total hardness tag1		
150	STOP	1.04 ml	
ZERO	END	-	+

31 08 20		 10:25	
GH	Z021 Total hardness tag 1		
26.0 dH			
ZERO	MEAS	GUIDE	REC

There are also available alternative units to display: CaCO₃ mg/l, mmol/l and mval/l. They can be accessed by pressing the **left / right**   cursors on the keyboard.

19.3 Method Z030 – pH 4.5-6.0

Specification

Description:	Test for determining the pH-value in fresh water
Range:	4.5 - 6.0 pH
Resolution:	0,05 pH
Wavelength:	520 nm

Reagent set

Product Code	Description	List of components
8030	Set of reagents for method Z030, pH 4.5-6.0 (reagents for approx. 40 tests)	<ul style="list-style-type: none"> ✓ Reagent pH 4.5-6.0 ✓ syringe 1 ml

Performing the measurement

1. Select the **Z030 pH 4.5-6.0 method** (Methods → Select method → Z030 pH 4.5-6.0).
How to select the method, see [8.1 Choosing method](#).

NOTE:

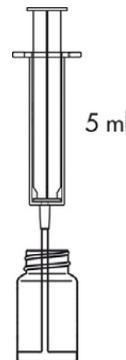
It is recommended to use the **GUIDE** system. It will provide you with step-by step basic instruction how to perform measurement. To enable this function press the button **GUIDE**.

2. Rinse the vial and the syringe three times with the tested water.

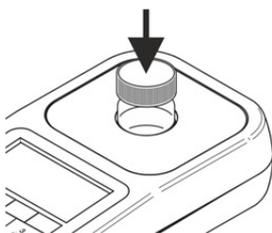
Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

Make sure no air bubbles are present in the syringe.
Trapped air bubbles can affect accuracy of the measurement.



3. Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-"**, which means the device is ready for measurement.



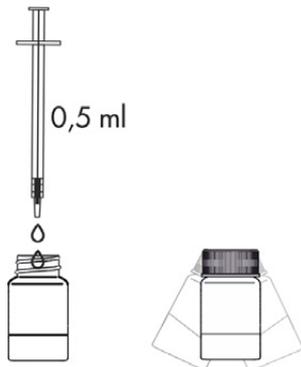
26 08 20 12:45			
pH	Z030 pH 4.5-6.0 tag 1		
Measuring ...			
ZERO	MEAS	GUIDE	REC

26 08 20 12:45			
pH	Z030 pH 4.5-6.0 tag 1		
-0.0- pH			
ZERO	MEAS	GUIDE	

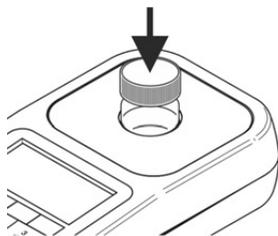
NOTE:

Before starting the measurement, it is highly recommended to make sure the test vial is clean and dry. Liquid residues remaining on the vial walls may adversely affect reliability of results.

4. Add 0.5 ml of **Reagent pH 4.5-6.0** and shake well to obtain uniform colour.



5. Insert the vial into the round vial holder and press the **MEAS** key to take a measurement. The result is displayed in **pH**.



26 08 20		12:45	
pH	Z030	pH 4.5-6.0	
	tag 1		
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:45	
pH	Z030	pH 4.5-6.0	
	tag 1		
5.45 pH			
ZERO	MEAS	GUIDE	REC

19.4 Method Z040 – pH 6.0-8.5

Specification

Description:	Test for determining the pH-value in fresh water
Range:	6.0 – 8,5 pH
Resolution:	0,05 pH
Wavelength:	520 nm

Reagent set

Product Code	Description	List of components
8040	Set of reagents for method Z040, pH 6.0-8.5 (reagents for approx. 40 tests)	<ul style="list-style-type: none"> ✓ Reagent pH 6.0-8.5 ✓ syringe 1 ml

Performing the measurement

- Select the **Z040 pH 6-8.5** method (**Methods** → **Select method** → **Z040 pH 6.0-8.5**).
How to select the method, see [8.1 Choosing method](#).

NOTE:

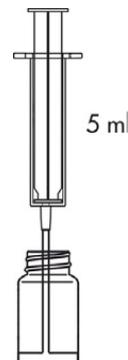
*It is recommended to use the GUIDE system. It will provide you with step-by step basic instruction how to perform measurement. To enable this function press the button **GUIDE**.*

- Rinse the vial and the syringe three times with the tested water.

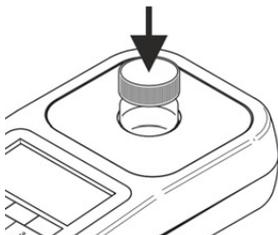
Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



- Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-**", which means the device is ready for measurement.



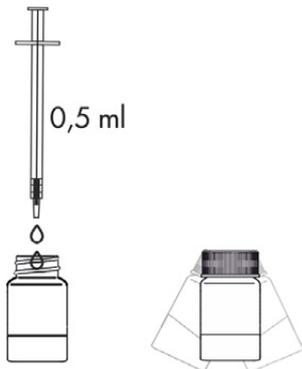
26 08 20		12:45	
pH	Z040 pH 6.0-8.5	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:45	
pH	Z040 pH 6.0-8.5	tag 1	
-0.0- pH			
ZERO	MEAS	GUIDE	

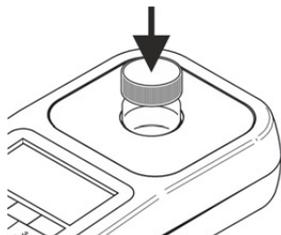
NOTE:

Before starting the measurement, it is highly recommended to make sure the test vial is clean and dry. Liquid residues remaining on the vial walls may adversely affect reliability of results.

4. Add 0.5 ml of **Reagent pH 6.0-8.5** and shake well to obtain uniform colour.



5. Insert the vial into round vial holder and press the **MEAS** key to take a measurement, the result is displayed in **pH**.



26 08 20		12:45	
pH	Z040 pH 6.0-8.5		
	tag 1		
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:45	
pH	Z040 pH 6.0-8.5		
	tag 1		
6.60 pH			
ZERO	MEAS	GUIDE	REC

19.5 Method Z050F / Z050M – pH 4.5-9.0

Specification

Description:	Test for determining the pH-value in fresh and marine water
Range:	4,5 – 9,0 pH
Resolution:	0,05 pH
Wavelength:	470 nm 520 nm 610 nm

Reagent set

Product Code	Description	List of components
8050	Set of reagents for method Z050F and Z050M, pH 4.5-9.0 (reagents for approx. 100 tests)	✓ Reagent pH 4.5-9.0

Performing the measurement

- To measure the pH value in fresh water select the **Z050F pH 4.5-9.0 Fresh method**, in marine water the **Z050M pH 4.5-9.0 method** (Methods → Select method → Z050F or Z050M pH 4.5-9.0). How to select the method, see [8.1 Choosing method](#).

NOTE:

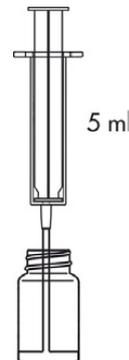
It is recommended to use the **GUIDE** system. It will provide you with step-by step basic instruction how to perform measurement. To enable this function press the button **GUIDE**.

- Rinse the vial and the syringe three times with the tested water.

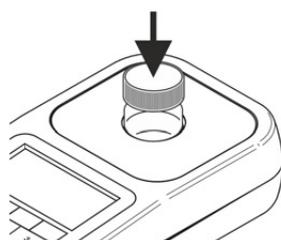
Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



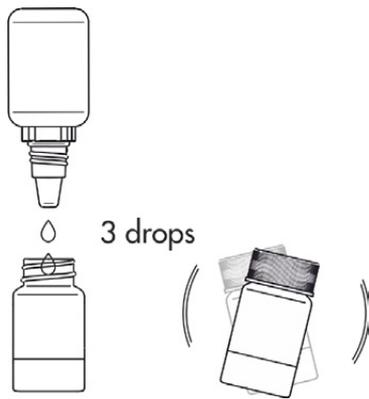
- Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-"**, which means the device is ready for measurement.



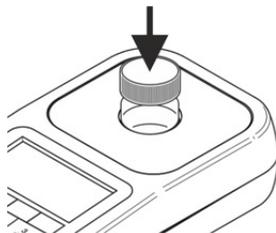
26 08 20		12:45	
pH	Z050F pH 4.5-9.0 F	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:45	
pH	Z050F pH 4.5-9.0 F	tag 1	
-0.0- pH			
ZERO	MEAS	GUIDE	

4. Add 3 drops of **Reagent pH 4.5-9.0** and shake well to obtain uniform colour.



5. Insert the vial into the round vial holder and press the **MEAS** key to take a measurement. The result is displayed in **pH**.



26 08 20		[Battery Icon] 12:45	
pH	Z050F	pH 4.5-9.0 F	
tag 1			
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		[Battery Icon] 12:45	
pH	Z050F	pH 4.5-9.0 F	
tag 1			
6.50 pH			
ZERO	MEAS	GUIDE	REC

19.6 Method Z210H – Nitrate NO₃ High range

Specification

Description:	Test for determining the content of nitrate in marine and fresh water
Range:	5 - 150 mg/l
Resolution:	1,0 mg/l
Wavelength:	520 nm

Reagent set

Product Code	Description	List of components
8210	Set of reagents for method Z210H, Nitrate NO ₃ High range (reagents for approx. 85 tests)	<ul style="list-style-type: none"> ✓ Reagent NO₃-1 ✓ Reagent NO₃-3 ✓ powder Reagent NO₃-2 ✓ spatula ✓ 1 ml syringe

NOTE:

To perform this method measurement, it is required to have also deionized water available as a separate product (no 8903 / 100 ml bottle).

Performing the measurement

1. Select the **Z210H Nitrate NO₃ High range** method (Methods → Select method → Z210H Nitrate NO₃ High range). How to select the method, see [8.1 Choosing method](#).

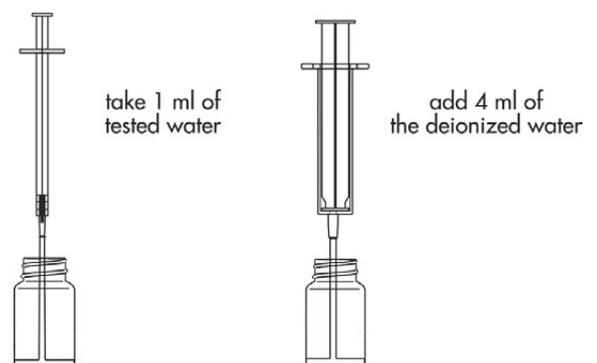
NOTE:

If you do not know what the concentration of nitrate can be expected in the sample, it is recommended to choose Z210L method and perform the measurement for low range first.

It is recommended to use the **GUIDE** system. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.

2. Rinse the vial and the syringe three times with the tested water.

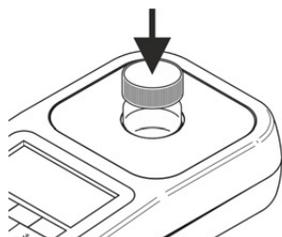
Take exactly 1 ml of the tested water with 1 ml syringe, pour into the vial, then add 4 ml of the deionized water.



NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.

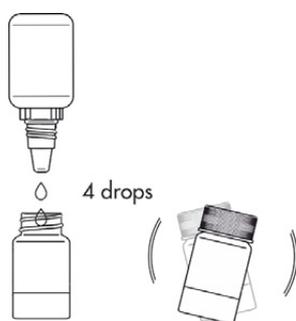
- Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-"**, which means the device is ready for measurement.



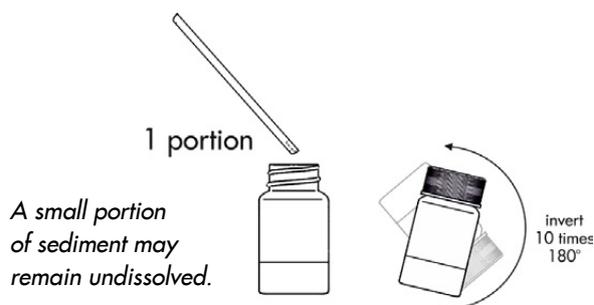
26 08 20		12:45	
NO ₃	Z210H Nitrate NO3	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:45	
NO ₃	Z210H Nitrate NO3	tag 1	
-0.0- mg/l			
ZERO	MEAS	GUIDE	

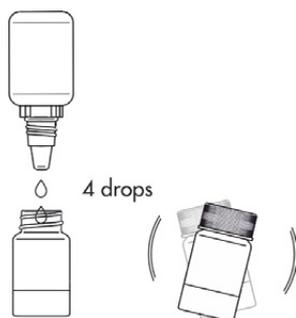
- Add 4 drops of **Reagent NO₃-1**, replace the cap and shake gently to mix.
- Wait 30 seconds before adding **Reagent NO₃-2**



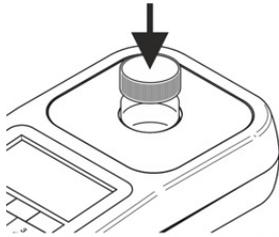
- Add 1 portion of **powder Reagent NO₃-2** with the spatula. Replace the cap and invert 10 times to mix.
- Wait 30 seconds before adding **Reagent NO₃-3**.



- Add 4 drops of **Reagent NO₃-3** and mix.
- Wait **5 minutes** before taking the measurement. Do not stir or shake the sample. In case of air bubbles, gently tap the vial to remove them from the sample. Some sediment may be visible in the solution.



10. After **5 minutes** insert the vial into round vial holder and press the **MEAS** key to take a measurement. The result - **the concentration of nitrate** - is displayed in **mg/l (ppm)**.



26 08 20		12:50	
NO ₃	Z210H Nitrate NO3	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:50	
NO ₃	Z210H Nitrate NO3	tag 1	
45.0 mg/l			
ZERO	MEAS	GUIDE	REC

There are also available alternative units to display: **ppm** and **N mg/l**. They can be accessed by pressing the **left / right** cursors on the keyboard.

Potential interferences

too high or too low temperature

may cause false readings
maintain the optimal temperature of solutions and reagents – 25°C

nitrite content – above 0,5 ppm

may cause falsely high readings

the presence of metal ions:

iron (Fe), antimony (Sb), bismuth (Bi), caesium (Ce), chromium (Cr), gold (Au), silver (Ag) and mercury (Hg)

may cause falsely low readings

strongly oxidizing or reducing agents,
organic ammonium compounds such as urea or amines

may interfere with a NO₃ measurement

19.7 Method Z210L – Nitrate NO₃ Low range

Specification

Description:	Test for determining the content of nitrate in marine and fresh water
Range:	0,5 - 30 mg/l
Resolution:	0,5 mg/l
Wavelength:	520 nm

Reagent set

Product Code	Description	List of components
8210	Set of reagents for method Z210L, Nitrate NO ₃ Low range (reagents for approx. 85 tests)	<ul style="list-style-type: none"> ✓ Reagent NO₃-1 ✓ Reagent NO₃-3 ✓ powder Reagent NO₃-2 ✓ spatula

Performing the measurement

- Select the **Z210L Nitrate NO₃ Low range** method (Methods → Select method → Z210L Nitrate NO₃ Low range).
How to select the method, see [8.1 Choosing method](#).

NOTE:

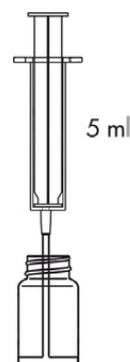
*It is recommended to use the GUIDE system. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.*

- Rinse the vial and the syringe three times with the tested water.

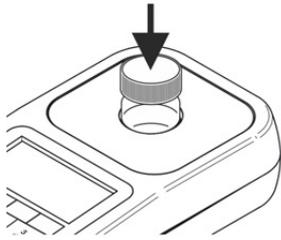
Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



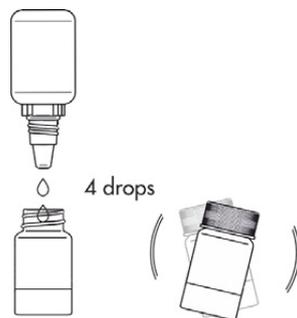
- Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-"**, which means the device is ready for measurement.



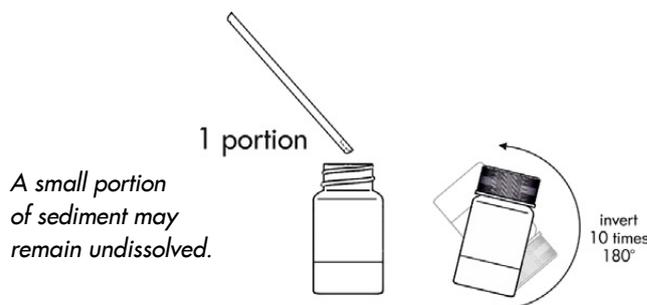
26 08 20		12:45	
NO ₃	Z210L Nitrate NO3 H	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:45	
NO ₃	Z210L Nitrate NO3	tag 1	
-0.0- mg/l			
ZERO	MEAS	GUIDE	

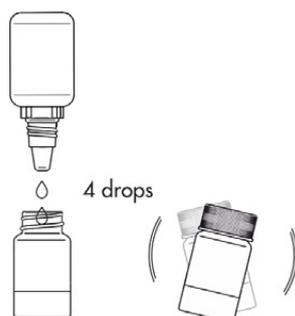
- Add 4 drops of **Reagent NO₃-1**, replace the cap and shake gently to mix.
- Wait 30 seconds before adding Reagent NO₃-2



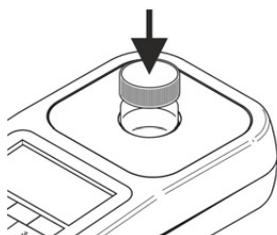
- Add 1 portion of **powder Reagent NO₃-2** with the spatula. Replace the cap and invert 10 times to mix.
- Wait 30 seconds before adding Reagent NO₃-3.



- Add 4 drops of **Reagent NO₃-3** and mix.
- Wait **5 minutes** before taking the measurement. Do not stir or shake the sample. If case of air bubbles present, gently tap the vial to remove them from the sample. Some sediment may be visible in the solution.



10. After **5 minutes** insert the vial into round vial holder and press the **MEAS** key to take a measurement. The result - **the concentration of nitrate** - is displayed in **mg/l (ppm)**.



26 08 20		12:50	
NO ₃	Z210L Nitrate NO3	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:50	
NO ₃	Z210L Nitrate NO3	tag 1	
3.5 mg/l			
ZERO	MEAS	GUIDE	REC

There are also available alternative units to display: **ppm** and **N mg/l**. They can be accessed by pressing the **left / right** cursors on the keyboard.

Potential interferences

too high or too low temperature

maintain the optimal temperature 25°C

nitrite content – above 0,5 ppm

may cause falsely high readings

the presence of metal ions:

iron (Fe), antimony (Sb), bismuth (Bi), caesium (Ce),
chromium (Cr), gold (Au), silver (Ag) and mercury (Hg)

may cause falsely low readings

strongly oxidizing or reducing agents,
organic ammonium compounds such as urea or amines

may interfere with a NO₃ measurement

19.8 Method Z220H – Nitrite NO₂ High range

Specification

Description:	Test for determining the content of nitrite in marine and fresh water
Range:	1-6 mg/l
Resolution:	0,05 mg/l
Wavelength:	470 nm

Reagent set

Product Code	Description	List of components
8220	Set of reagents for method Z220H, Nitrite NO ₂ High range (reagents for approx. 50 tests)	<ul style="list-style-type: none"> ✓ Reagent NO₂-1 ✓ Reagent NO₂-2

Performing the measurement

1. Select the **Z220H Nitrite high range** method (Methods → Select method → Z220H Nitrite NO₂ High range). How to select the method, see [8.1 Choosing method](#).

NOTE:

If you do not know what the concentration of nitrite can be expected in the sample, it is recommended to choose Z220L method and perform the measurement for low range first.

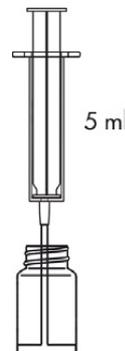
It is recommended to use the GUIDE system by pressing the context button GUIDE on the photometer. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button GUIDE.

2. Rinse the vial and the syringe three times with the tested water.

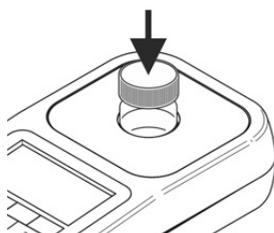
Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



3. Insert the vial into the round vial holder and press the **ZERO** key. The display will show "-0.0-", which means the device is ready for measurement.



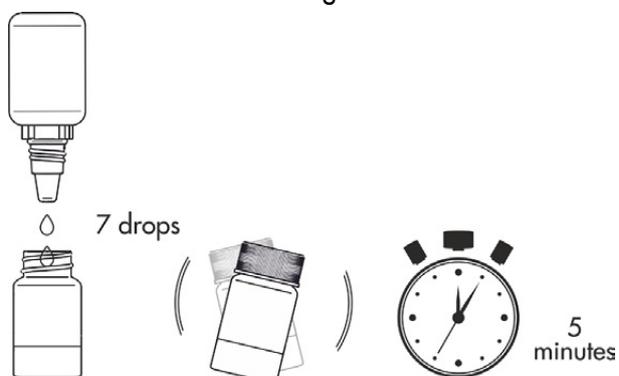
26 08 20		12:45	
NO ₂	Z220H Nitrite NO ₂	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:45	
NO ₂	Z220H Nitrite NO ₂	tag 1	
-0.0- mg/l			
ZERO	MEAS	GUIDE	

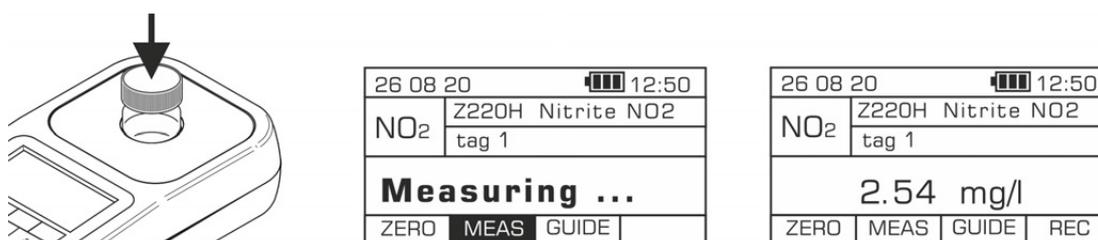
4. Add 7 drops of **Reagent NO₂-1** and shake gently to mix.
5. Wait 15 seconds before adding Reagent NO₂-2.



6. Add 7 drops of **Reagent NO₂-2** and shake to mix.
7. Wait 5 minutes before taking a measurement.



8. Insert the vial into the round vial holder and press the **MEAS** key to take a measurement. The result - **the concentration of nitrite** - is displayed in **mg/l (ppm)**.



There are also available alternative units to display: ppm and N mg/l. They can be accessed by pressing the **left / right** cursors on the keyboard.

Potential interferences

the presence of metal ions

- Fe, Sb, Bi, Ce, Cr, Au, Ag and Hg

may cause falsely low readings

strongly oxidizing or reducing agents,

organic ammonium compounds such as urea or amines

may interfere with the measurement

high content of nitrate (V)

- above 100 ppm

may cause slightly falsely high readings

19.9 Method Z220L – Nitrite NO₂ Low range

Specification

Description:	Test for determining the content of nitrite in marine and fresh water
Range:	0,02-1,5 mg/l
Resolution:	0,01 mg/l
Wavelength:	520 nm

Reagent set

Product Code	Description	List of components
8220	Set of reagents for method Z220L, Nitrite NO ₂ Low range (reagents for approx. 50 tests)	<ul style="list-style-type: none"> ✓ Reagent NO₂-1 ✓ Reagent NO₂-2

Performing the measurement

1. Select the **Z220L Nitrite Low range** method (Methods → Select method → Z220L Nitrite NO₂ Low range). How to select the method, see [8.1 Choosing method](#).

NOTE:

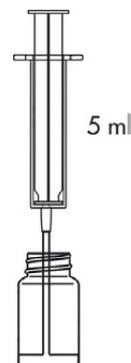
It is recommended to use the **GUIDE** system by pressing the context button **GUIDE** on the photometer. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.

2. Rinse the vial and the syringe three times with the tested water.

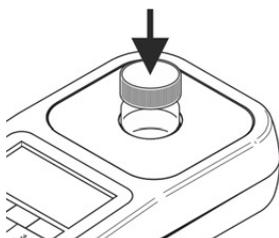
Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



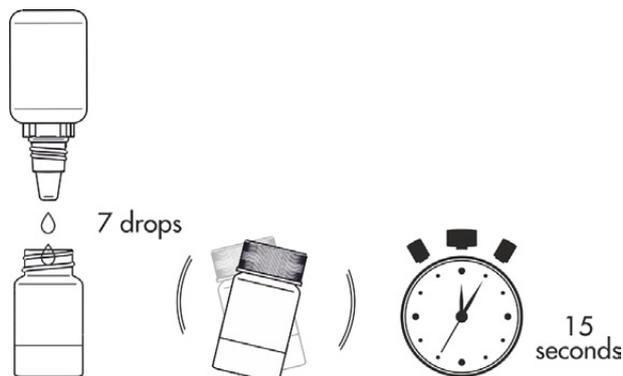
3. Insert the vial into the round vial holder and press the **ZERO** key. The display will show "-0.0-", which means the device is ready for measurement.



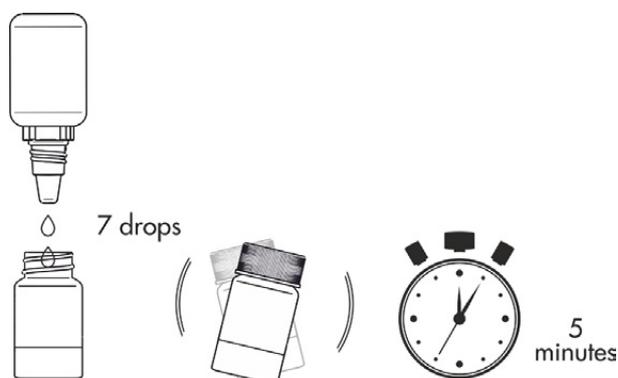
26 08 20		12:45	
NO ₂	Z220L Nitrite NO ₂		
	tag 1		
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:45	
NO ₂	Z220L Nitrite NO ₂		
	tag 1		
-0.0- mg/l			
ZERO	MEAS	GUIDE	

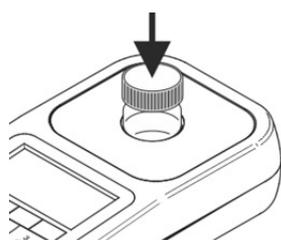
4. Add 7 drops of **Reagent NO₂-1** and shake gently to mix.
5. Wait 15 seconds before adding Reagent NO₂-2.



6. Add 7 drops of **Reagent NO₂-2** and shake gently to mix.
7. Wait 5 minutes before taking a measurement.



8. Insert the vial into the round vial holder and press the **MEAS** key to take a measurement.
The result - **the concentration of nitrite** - is displayed in **mg/l (ppm)**.



26 08 20		12:50	
NO ₂	Z220L Nitrite NO2		
	tag 1		
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:50	
NO ₂	Z220L Nitrite NO2		
	tag 1		
0.14 mg/l			
ZERO	MEAS	GUIDE	REC

There are also available alternative units to display: **ppm** and **N mg/l**. They can be accessed by pressing the **left / right** cursors on the keyboard.

Potential interferences

the presence of metal ions:

iron (Fe), antimony (Sb), bismuth (Bi), caesium (Ce),
chromium (Cr), gold (Au), silver (Ag) and mercury (Hg)

may cause falsely low readings

strongly oxidizing or reducing agents,
organic ammonium compounds such as urea or amines

may interfere with the measurement

high content of nitrate (V) - above 100 ppm

may cause slightly falsely high readings

19.10 Method Z230 – Total ammonia NH₄ fresh water

Specification

Description:	Test for determining the total ammonia concentration in fresh water
Range:	0,1 -5 mg/l
Resolution:	0,05 mg/l
Wavelength:	610 nm

Reagent set

Product Code	Description	List of components
8230	Set of reagents for method Z230, Total ammonia NH ₄ fresh water (reagents for approx. 55 tests)	<ul style="list-style-type: none"> ✓ Reagent NH₄-1 ✓ Reagent NH₄-3 ✓ powder Reagent NH₄-2 ✓ spatula

Performing the measurement

1. Select the **Z230 Ammonium NH₄ fresh water** method (Methods → Select method → Z230 Ammonium NH₄ Fresh). How to select the method, see [8.1 Choosing method](#).

NOTE:

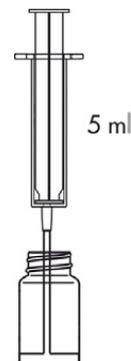
It is recommended to use the **GUIDE** system by pressing the context button **GUIDE** on the photometer. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.

2. Rinse the vial and the syringe three times with the tested water.

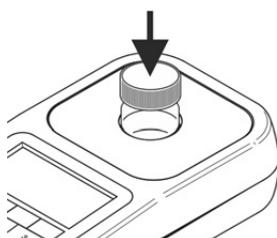
Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

Make sure no air bubbles are present in the syringe.
Trapped air bubbles can affect accuracy of the measurement.



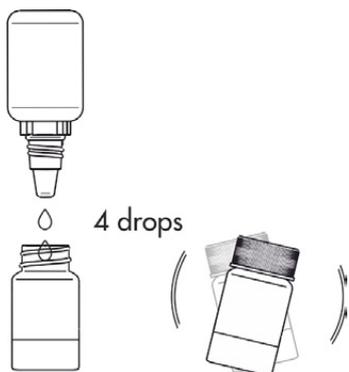
3. Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-**", which means the device is ready for measurement.



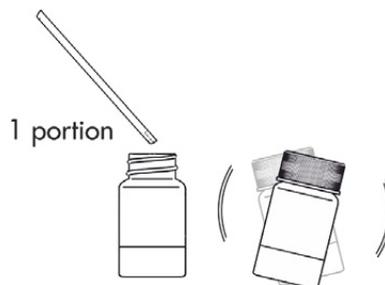
26 08 20		12:45	
NH ₄	Z230 Ammonium NH ₄	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:45	
NH ₄	Z230 Ammonium NH ₄	tag 1	
-0.0- mg/l			
ZERO	MEAS	GUIDE	

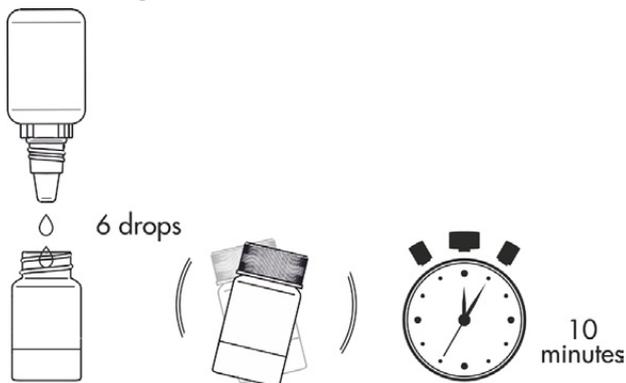
4. Add 4 drops of **Reagent NH₄-1** and shake to mix.



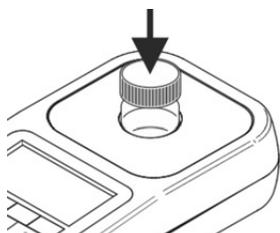
5. Add 1 portion of **powder Reagent NH₄-2** with the spatula and shake until the powder is dissolved



6. Add 6 drops of **Reagent NH₄-3** and shake to mix. Wait exactly 10 minutes before taking a measurement.



7. Insert the vial into the round vial holder and press the **MEAS** key to take a measurement. The result (**the concentration of ammonium/ammonia**) is displayed in **mg/l (ppm)**.



26 08 20		13:00	
NH ₄	Z230 Ammonium NH4	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		13:00	
NH ₄	Z230 Ammonium NH4	tag 1	
1.10 mg/l			
ZERO	MEAS	GUIDE	REC

There are also available alternative units to display: ppm and N mg/l.

They can be accessed by pressing the **left / right** cursors on the keyboard.

The result acc. to method Z230 [mg/l]	The pH of the water				
	7,0	7,5	8,0	8,5	9,0
0,2	0,002	0,004	0,01	0,02	0,05
0,5	0,005	0,01	0,02	0,05	0,13
1	0,01	0,02	0,04	0,10	0,25
2	0,02	0,04	0,08	0,20	0,50
3	0,03	0,06	0,12	0,30	0,75
5	0,05	0,10	0,20	0,50	1,25

 Harmful concentration
 dangerous to aquatic life

Table 1
Effect of pH on toxic ammonia release

It should be noted that in the presence of ammonium compounds, pH above 7 may become dangerous to aquatic life due to rapid conversion of harmless ammonium ions to toxic ammonia. For that reason, the content of ammonium compounds above 0,5 mg/l presents a potential risk.

Potential interferences

too high or too low temperature

may cause false readings, maintain optimal temperature 25°C

phosphate content

may cause falsely low readings

19.11 Method Z231 – Total ammonia NH₄ marine water

Specification

Description:	Test for determining the total ammonia concentration in marine water
Range:	0,1 - 3 mg/l
Resolution:	0,05 mg/l
Wavelength:	610 nm

Reagent set

Product Code	Description	List of components
8231	Set of reagents for method Z231, Total ammonia NH ₄ marine water (reagents for approx. 35 tests)	<ul style="list-style-type: none"> ✓ Reagent NH₄-1 ✓ Reagent NH₄-2 ✓ Reagent NH₄-3

Performing the measurement

1. Select the **Z231 Ammonium NH₄ marine water** method (**Methods** → **Select method** → **Z231 Ammonium NH₄ Marine**). How to select the method, see [8.1 Choosing method](#).

NOTE:

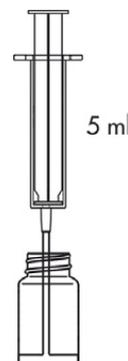
It is recommended to use the **GUIDE** system by pressing the context button **GUIDE** on the photometer. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.

2. Rinse the vial and the syringe three times with the tested water.

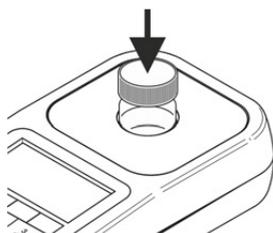
Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



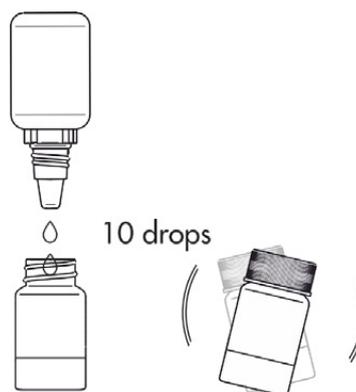
3. Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-**", which means the device is ready for measurement.



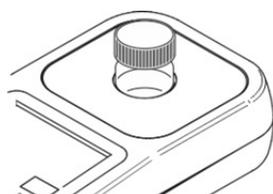
26 08 20		12:45	
NH ₄	Z231 Ammonium NH ₄	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:45	
NH ₄	Z231 Ammonium NH ₄	tag 1	
-0.0- mg/l			
ZERO	MEAS	GUIDE	

4. Add 10 drops of **Reagent NH₄-1** and shake to mix.
5. Add 10 drops of **Reagent NH₄-2** and shake to mix.
6. Add 10 drops of **Reagent NH₄-3** and shake to mix.
7. Before taking a measurement, wait exactly **10 minutes**.



8. Insert the vial into the round vial holder and press the **MEAS** key to take a measurement. The result – **the concentration of ammonium/ammonia** – is displayed in **mg/l (ppm)**.



26 08 20		13:00
NH ₄	Z231 Ammonium NH4	tag 1
Measuring ...		
ZERO	MEAS	GUIDE

26 08 20		13:00
NH ₄	Z231 Ammonium NH4	tag 1
1.50 mg/l		
ZERO	MEAS	GUIDE
		REC

There are also available alternative units to display: ppm and N mg/l. They can be accessed by pressing the **left / right** cursors on the keyboard.

The result acc. to method Z231 [mg/l]	The pH of the water				
	7,0	7,5	8,0	8,5	9,0
0,2	0,002	0,004	0,01	0,02	0,05
0,5	0,005	0,01	0,02	0,05	0,13
1	0,01	0,02	0,04	0,10	0,25
2	0,02	0,04	0,08	0,20	0,50
3	0,03	0,06	0,12	0,30	0,75
5	0,05	0,10	0,20	0,50	1,25

Harmful concentration dangerous to aquatic life

Table 1
Effect of pH on toxic ammonia release

It should be noted that in the presence of ammonium compounds, pH above 7 may become dangerous to aquatic life due to rapid conversion of harmless ammonium ions to toxic ammonia. For that reason, the content of ammonium compounds above 0,5 mg/l presents a potential risk.

Potential interferences

too high or too low temperature	may cause false readings, maintain optimal temperature 25°C	
phosphate content	may cause falsely low readings	
high content of magnesium (Mg)	- above 2000 ppm	may result in precipitation
high content of calcium (Ca)	- above 600 ppm	may result in precipitation

19.12 Method Z240F/ Z240M – Phosphate PO₄

Specification

Description:	Test for determining the content of phosphate in fresh and marine water
Range:	0,05 -10 mg/l
Resolution:	0,01 mg/l
Wavelength:	610 nm

Reagent set

Product Code	Description	List of components
8240	Set of reagents for: method Z240F, Phosphate PO ₄ in fresh water method Z240M, Phosphate PO ₄ in marine water (reagents for approx. 35 tests)	<ul style="list-style-type: none"> ✓ Reagent PO₄-1 ✓ powder Reagent PO₄-2 ✓ spatula

Performing the measurement

- To measure the content of phosphate in fresh water select the **Z240F Phosphate PO₄ Fresh** method, in marine water the **Z240M Phosphate Marine** method (Methods → Select method → Z240F/Z240M Phosphate PO₄). How to select the method, see [8.1 Choosing method](#).

NOTE:

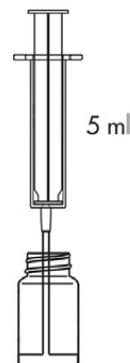
It is recommended to use the **GUIDE** system by pressing the context button **GUIDE** on the photometer. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.

- Rinse the vial and the syringe three times with the tested water.

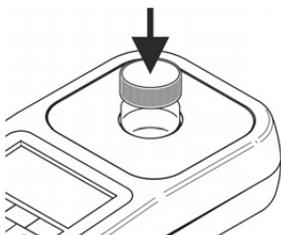
Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



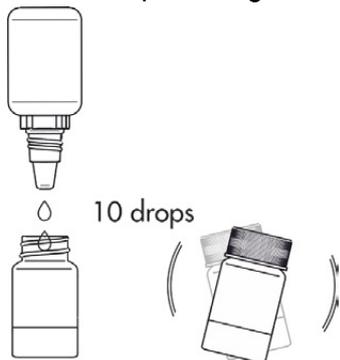
- Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-**", which means the device is ready for measurement.



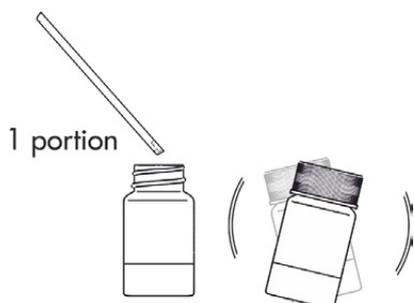
26 08 20		12:45	
PO ₄	Z240F Phosphate PO	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:45	
PO ₄	Z240F Phosphate PO	tag 1	
-0.0- mg/l			
ZERO	MEAS	GUIDE	

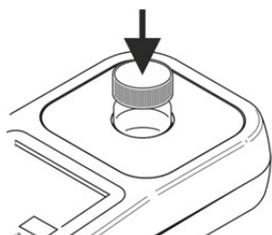
4. Add 10 drops of **Reagent PO₄-1** and shake to mix.



5. Add 1 portion of **powder Reagent PO₄-2** with the spatula, and shake until powder has dissolved. 6. Before taking a measurement wait **10 minutes**.



7. Insert the vial into the round vial holder and press the **MEAS** key to take a measurement. The result - **the concentration of phosphate** - is displayed in **mg/l (ppm)**.



26 08 20		13:00	
PO ₄	Z240F Phosphate PO	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		13:00	
PO ₄	Z240F Phosphate PO	tag 1	
0.65 mg/l			
ZERO	MEAS	GUIDE	REC

There are also available alternative units to display: ppm and P mg/l. They can be accessed by pressing the **left / right** cursors on the keyboard.

Potential interferences

the presence of:

iron (Fe)	- above 50 ppm	
copper (Cu)	- above 10 ppm	may interfere with the measurement
silica content	- above 50 ppm	
silicate content	- above 10 ppm	may interfere with the measurement
hydrogen sulphide, arsenate or high buffering capacity		may interfere with the measurement

19.13 Method Z410 – Iron Fe

Specification

Description:	Test for determining the content of iron in fresh and marine water
Range:	0,05-10 mg/l
Resolution:	0,01 mg/l
Wavelength:	520 nm

Reagent set

Product Code	Description	List of components
8410	Set of reagents for method Z410, Iron Fe (reagents for approx. 30 tests)	<ul style="list-style-type: none"> ✓ powder Reagent Fe ✓ spatula

Performing the measurement

- Select the **Z410 Iron Fe** method (**Methods** → **Select method** → **Z410 Iron Fe**).
How to select the method, see [8.1 Choosing method](#).

NOTE:

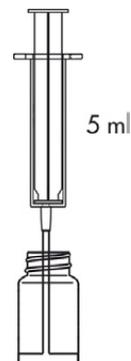
It is recommended to use the **GUIDE** system by pressing the context button **GUIDE** on the photometer. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.

- Rinse the vial and the syringe three times with the tested water.

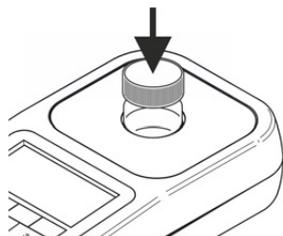
Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



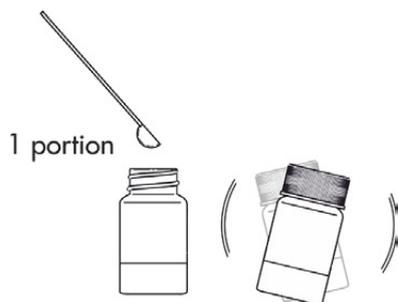
- Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-**", which means the device is ready for measurement.



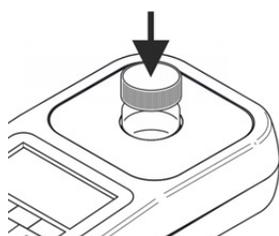
26 08 20		12:35	
Fe	Z410 Iron Fe	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:35	
Fe	Z410 Iron Fe	tag 1	
-0.0- mg/l			
ZERO	MEAS	GUIDE	

4. Add 1 portion of **powder Reagent Fe** with the spatula into vial, shake until the powder has dissolved.
5. Before taking a measurement, wait exactly **5 minutes**.



6. Insert the vial into the round vial holder and press the **MEAS** key to take a measurement. The result – **the concentration of iron** – is displayed in **mg/l (ppm)**.



26 08 20		12:40	
Fe	Z410 Iron Fe		
	tag 1		
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:40	
Fe	Z410 Iron Fe		
	tag 1		
0.15 mg/l			
ZERO	MEAS	GUIDE	REC

Potential interferences

the presence of:

- copper (Cu) - above 5 ppm
- nickel (Ni) - above 5 ppm
- zinc (Zn) - above 5 ppm
- cadmium (Cd) - above 5 ppm

may interfere with the measurement

19.14 Method Z420 – Manganese Mn

Specification

Description:	Test for determining the content of manganese in fresh water
Range:	0,05-5 mg/l
Resolution:	0,01 mg/l
Wavelength:	470 nm

Reagent set

Product Code	Description	List of components
8420	Set of reagents for method Z420, Manganese Mn, fresh water (reagents for approx. 35 tests)	<ul style="list-style-type: none"> ✓ powder Reagent Mn-1 ✓ Reagent Mn-2 ✓ Reagent Mn-3 ✓ Reagent Mn-4 ✓ spatula

Performing the measurement

- Select the **Z420 Manganese** method (**Methods** → **Select method** → **Z420 Manganese Mn**).
How to select the method, see [8.1 Choosing method](#).

NOTE:

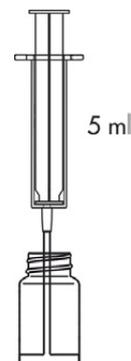
It is recommended to use the **GUIDE** system by pressing the context button **GUIDE** on the photometer. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.

- Rinse the vial and the syringe three times with the tested water.

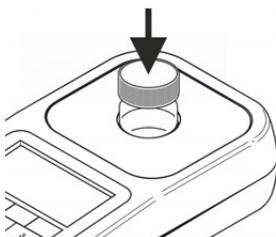
Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



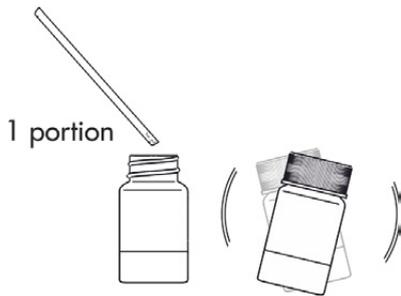
- Insert the vial into round vial holder and press the **ZERO** key. The display will show **"-0.0-"**, which means the device is ready for measurement.



26 08 20		12:35	
Mn	Z420 Manganese Mn		
	tag 1		
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:35	
Mn	Z420 Manganese Mn		
	tag 1		
-0.0- mg/l			
ZERO	MEAS	GUIDE	

4. Add 1 portion of **powder Reagent Mn-1** with the spatula, shake until the powder has dissolved.

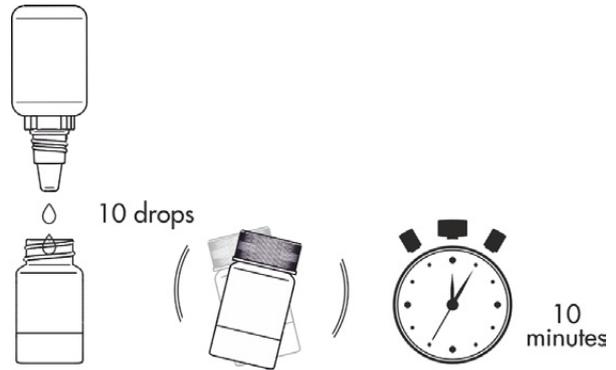


5. Add 10 drops of **Reagent Mn-2** and shake to mix.

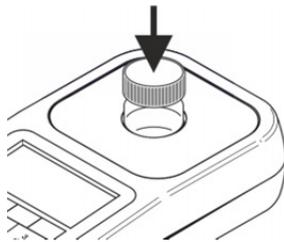
6. Add 10 drops of **Reagent Mn-3** and shake to mix.

7. Add 10 drops of **Reagent Mn-4** and shake to mix.

8. Before taking a measurement, **wait 10 minutes**.



9. Insert the vial into round vial holder and press the **MEAS** key to take a measurement. The result - **the concentration of manganese** - is displayed in **mg/l (ppm)**.



26 08 20		12:40	
Mn	Z420 Manganese Mn	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:40	
Mn	Z420 Manganese Mn	tag 1	
1.20 mg/l			
ZERO	MEAS	GUIDE	REC

Potential interferences

phosphate content

- above 20 ppm

may cause falsely low readings

19.15 Method Z430F / Z430M – Copper Cu

Specification

Description:	Test for determining the content of copper in fresh and marine water
Range:	0,02-5 mg/l – fresh water 0,08-3 mg/l – marine water
Resolution:	0,02 mg/l
Wavelength:	610 nm

Reagent set

Product Code	Description	List of components
8430	Set of reagents for method Z430F, Copper Cu in fresh water method Z430M, Copper Cu in marine water (reagents for approx. 70 tests)	✓ Reagent Cu-1 ✓ Reagent Cu-2

Performing the measurement

- To measure the content of copper in fresh water select the **Z430F Copper Fresh** method, in marine water the **Z430M Copper Marine** (Methods→Select method→Z430F / Z430M Copper Cu).
How to select the method, see [8.1 Choosing method](#).

NOTE:

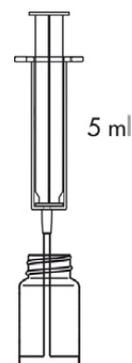
It is recommended to use the **GUIDE** system by pressing the context button **GUIDE** on the photometer. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.

- Rinse the vial and the syringe three times with the tested water.

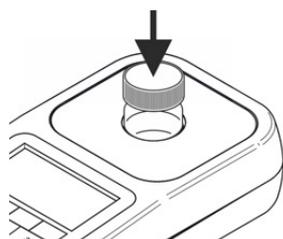
Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



- Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-**", which means the device is ready for measurement.

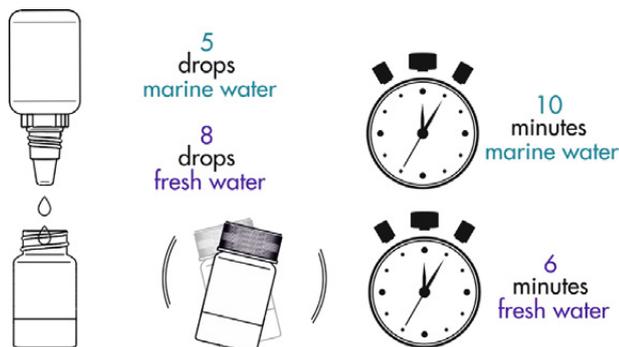


26 08 20		12:35	
Cu	Z430F Copper Cu Fr	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:35	
Cu	Z430F Copper Cu Fr	tag 1	
-0.0- mg/l			
ZERO	MEAS	GUIDE	

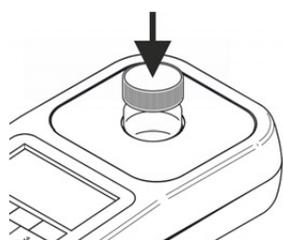
4. Add 5 drops of **Reagent Cu-1** and shake to mix.

5. **For fresh water:**
 - add 8 drops of **Reagent Cu-2**
for marine water:
 - add 5 drops of **Reagent Cu-2**
 and shake to mix.



6. Before taking a measurement wait:
 - **6 minutes** for sample with **fresh water**,
 - **10 minutes** for sample with **marine water**.

7. Insert the vial into the round vial holder and press the **MEAS** key to take a measurement.
 The result – **the concentration of copper cations** – is displayed in **mg/l (ppm)**.



26 08 20		12:38	
Cu	Z430F	Copper Cu Fr	
	tag 1		
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:38	
Cu	Z430F	Copper Cu Fr	
	tag 1		
0.12 mg/l			
ZERO	MEAS	GUIDE	REC

Potential interferences

The presence of:

chromium (Cr III), chromium (Cr VI),
 iron (Fe), manganese (Mn), zinc (Zn)

- above 10 ppm

cobalt (Co), carbonate and phosphate

- above 50 ppm

high content of copper (Cu)

- above 10 ppm may cause falsely low readings

NOTE:

A high content of copper inhibits the reaction and results in an erroneously low absorbance value. Although rare in the case of aquarium or natural water, if the copper content is suspected to exceed 10 ppm, eliminate its interference by diluting the sample several times before the measurement.

19.16 Method Z440 – Silicon Si

Specification

Description:	Test for determining the content of silicon in marine and fresh water
Range:	0,05 - 7 mg/l
Resolution:	0,01 mg/l
Wavelength:	610 nm

Reagent set

Product Code	Description	List of components
8440	Set of reagents for method Z440, Silicon Si, fresh and marine water (reagents for approx. 55 tests)	<ul style="list-style-type: none"> ✓ Reagent Si-1 ✓ powder Reagent Si-2 ✓ spatula

Performing the measurement

1. Select the **Z440 Silicon Si** method (**Methods** → **Select method** → **Z440 Silicon Si**).
How to select the method, see [8.1 Choosing method](#).

NOTE:

*It is recommended to use the **GUIDE** system by pressing the context button **GUIDE** on the photometer. It will provide you with step-by-step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.*

2. Rinse the vial and the syringe three times with the tested water.

NOTE:

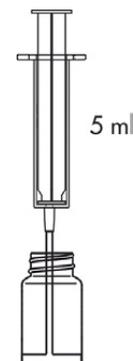
If you use the vial for the first time, before taking the tested water:

- a. *rinse the vial with water after adding six drops of Reagent Si-1,*
- b. *put the cap on the vial and shake vigorously for a few seconds,*
- c. *remove all water from the vial by turning it upside down and tapping lightly on the folded paper towel,*
- d. *rinse the vial and the syringe three times with the tested water.*

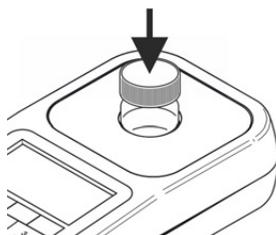
3. Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



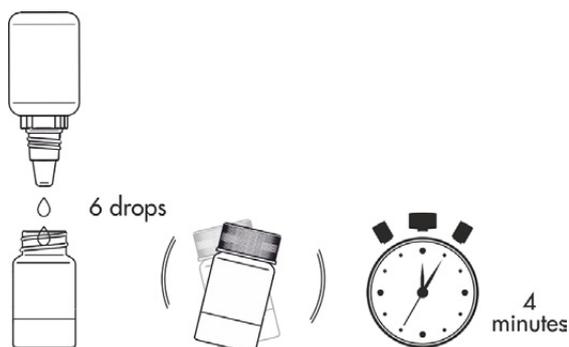
4. Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-**", which means the device is ready for measurement.



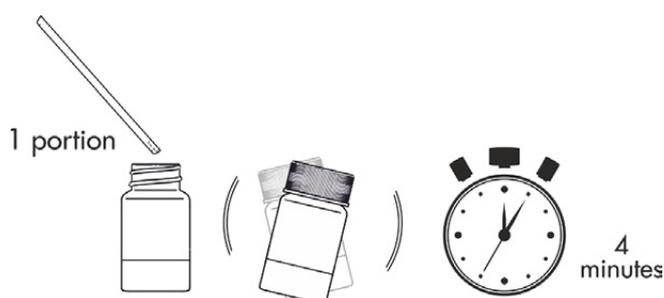
26 08 20		12:35	
Si	Z440 Silicon Si	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:35	
Si	Z440 Silicon Si	tag 1	
-0.0- mg/l			
ZERO	MEAS	GUIDE	

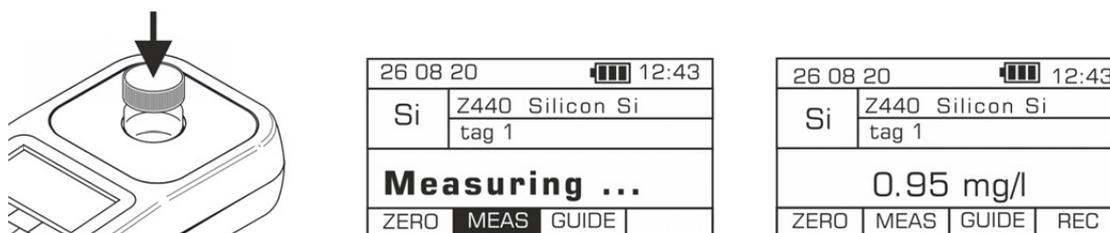
5. Add 6 drops of **Reagent Si-1**, shake to mix and wait **4 minutes**.



6. Add 1 portion of **powder Reagent Si-2** with the spatula, shake until the powder has dissolved. Before taking a measurement wait **4 minutes**.



7. After 4 minutes insert the vial into the round vial holder and press the **MEAS** key to take a measurement. The result – **the concentration of silicon** – is displayed in **mg/l (ppm)**.



There are also available alternative units to display: ppm and SiO₂ mg/l. They can be accessed by pressing the **left / right** cursors on the keyboard.

Potential interferences

the presence of:

iron (Fe) - above 0,5 ppm

phosphate - above 50 ppm

may cause falsely low readings

high content of sulphide

may cause falsely low readings

19.17 Method Z450H – Potassium K High range

Specification

Description:	Test for determining the content of potassium in fresh water
Range:	10 - 150 mg/l
Resolution:	0,5 mg/l
Wavelength:	610 nm

Reagent set

Product Code	Description	List of components
8450	Set of reagents for method Z450H, Potassium K High range (reagents for approx. 25 tests)	<ul style="list-style-type: none"> ✓ powder Reagent K ✓ spatula ✓ 1 ml syringe

NOTE:

To perform this method measurement it is required to have also deionized water available as a separate product (no 8903/100 ml bottle).

Performing the measurement

1. Select the **Z450H Potassium K High range** method (Methods → Select method → Z450H Potassium K high range). How to select the method, see [8.1 Choosing method](#).

NOTE:

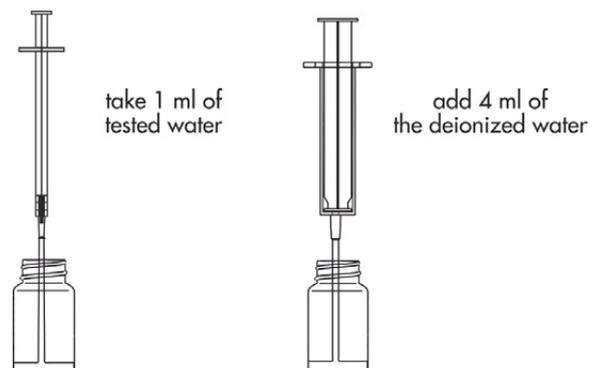
It is recommended to use the **GUIDE** system by pressing the context button **GUIDE** on the photometer. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.

2. Rinse the vial and the syringe three times with the tested water.

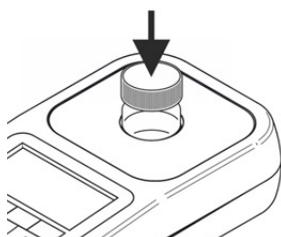
Take exactly 1 ml of the tested water with 1 ml syringe and pour into the vial, then add 4 ml of the deionized water and shake to mix.

NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



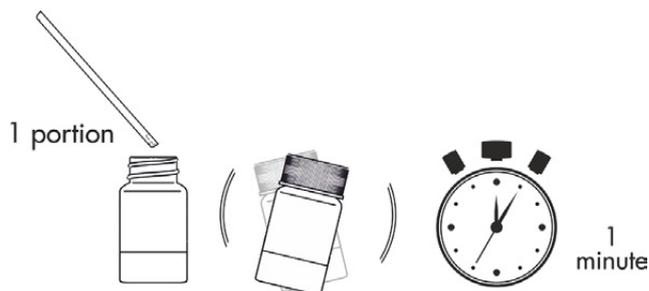
3. Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-"**, which means the device is ready for measurement.



26 08 20		12:35	
K	Z450H Potassium K	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

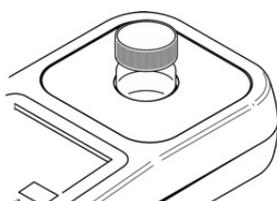
26 08 20		12:35	
K	Z450H Potassium K	tag 1	
-0.0- mg/l			
ZERO	MEAS	GUIDE	

4. Add 1 portion of **powder Reagent K** with the spatula into the vial, replace the cap and mix thoroughly. Before making a measurement wait exactly **1 minute**.



NOTE:
Press the powder in the spatula groove and make sure it is completely filled.

5. After exactly 1 min insert the vial into the round vial holder and press the **MEAS** key to take a measurement. The result - **the concentration of potassium** - is displayed in **mg/l (ppm)**.



26 08 20		12:36	
K	Z450H Potassium K	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:36	
K	Z450H Potassium K	tag 1	
35.5 mg/l			
ZERO	MEAS	GUIDE	REC

Potential interferences

ammonia content - above 3 ppm may interfere with the measurement

very high content of:

calcium (Ca) - above 4 000 ppm

magnesium (Mg) - above 4 000 ppm

sodium (Na) - above 8 000 ppm

chloride - above 12 000 ppm

phosphate - above 50 ppm may interfere with the measurement

19.18 Method Z450L – Potassium K Low range

Specification

Description:	Test for determining the content of potassium in fresh water
Range:	2 - 20 mg/l
Resolution:	0,1 mg/l
Wavelength:	610 nm

Reagent set

Product Code	Description	List of components
8450	Set of reagents for method Z450L, Potassium K Low range (reagents for approx. 25 tests)	<ul style="list-style-type: none"> ✓ powder Reagent K ✓ spatula

Performing the measurement

1. Select the **Z450L Potassium Low range** method (Methods → Select method → Z450L Potassium K low range). How to select the method, see [8.1 Choosing method](#).

NOTE:

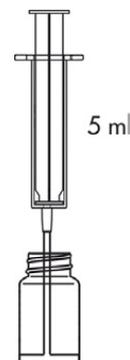
It is recommended to use the **GUIDE** system by pressing the context button **GUIDE** on the photometer. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.

2. Rinse the vial and the syringe three times with the tested water.

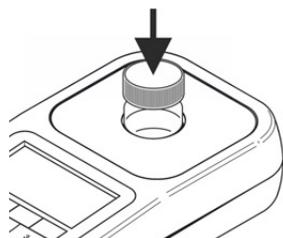
Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



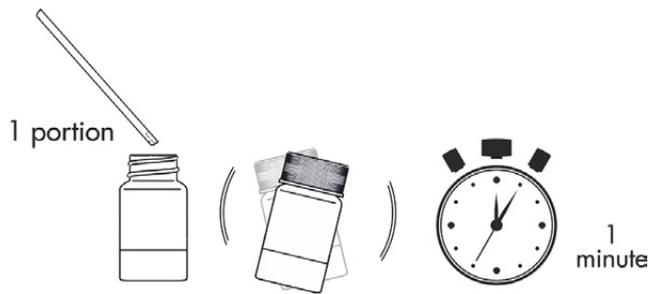
3. Insert the vial into the round vial holder and press the **ZERO** key. The display will show "-0.0-", which means the device is ready for measurement.



26 08 20		12:35	
K	Z450L Potassium K	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:35	
K	Z450L Potassium K	tag 1	
-0.0- mg/l			
ZERO	MEAS	GUIDE	

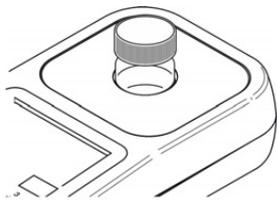
4. Add 1 portion of **powder Reagent K** with the spatula into the vial, replace the cap and mix thoroughly. Before making a measurement wait exactly **1 minute**.



NOTE:

Press the powder in the spatula groove and make sure it is completely filled.

5. After exactly 1 min insert the vial into the round vial holder and press the **MEAS** key to take a measurement. The result - **the concentration of potassium** - is displayed in **mg/l (ppm)**.



26 08 20		12:36
K	Z450L Potassium K	tag 1
Measuring ...		
ZERO	MEAS	GUIDE

26 08 20		12:36
K	Z450L Potassium K	tag 1
13.3 mg/l		
ZERO	MEAS	GUIDE REC

Potential interferences

ammonia content - above 3 ppm may interfere with the measurement

very high content of:

calcium (Ca) - above 4 000 ppm

magnesium (Mg) - above 4 000 ppm

sodium (Na) - above 8 000 ppm

chloride - above 12 000 ppm

phosphate - above 50 ppm

may interfere with the measurement

19.19 Method Z462 – Calcium Ca marine water

Specification

Description:	Test for determining the content of calcium in marine water
Range:	200-600 mg/l
Resolution:	8 mg/l
Wavelength:	610 nm
Extra feature:	exat:ir method guided by the innovative photometric system for easy and convenient titration, see 1.5 Titration method .

Reagent set

Product Code	Description	List of components
8462	Set of reagents for method Z462, Calcium Ca marine water (reagents for approx. 40 tests)* * for the average content of Ca 425 mg/l	<ul style="list-style-type: none"> ✓ Reagent Ca-1 ✓ Reagent Ca-3 ✓ powder Reagent Ca-2 ✓ spatula ✓ 1 ml syringe with tip ✓ vial

Performing the measurement

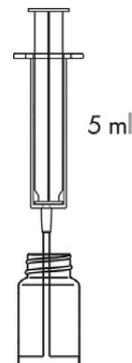
1. Select the **Z462 Calcium Ca marine water** method (**Methods** → **Select method** → **Z462 Calcium Ca marine**).
How to select the method, see [8.1 Choosing method](#).

NOTE:

*It is recommended to use the **GUIDE** system by pressing the context button **GUIDE** on the photometer. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.*

2. Rinse the vial and the syringe three times with the tested water.

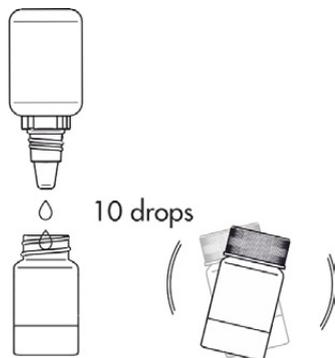
Take exactly 5 ml of the tested water with the syringe and pour into the vial.



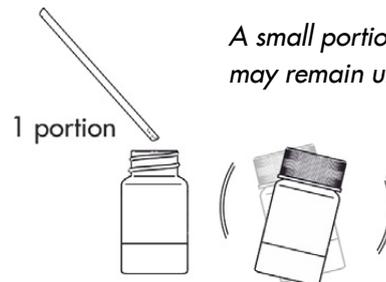
NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.

3. Add 10 drops of **Reagent Ca-1** and shake to mix.



4. Add 1 portion of **Reagent Ca-2** with the spatula, shake until the powder has dissolved.

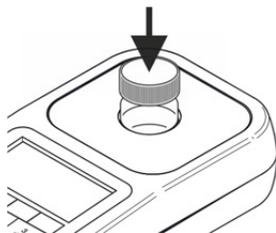


NOTE!

Make sure that the spatula is completely filled.

A small portion of sediment may remain undissolved.

5. Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-"**, which means the device is ready for measurement.



26 08 20		12:35	
Ca	Z462	Calcium Ca Ma	tag 1
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:35	
Ca	Z462	Calcium Ca Ma	tag 1
-0.0- mg/l			
ZERO	MEAS	GUIDE	

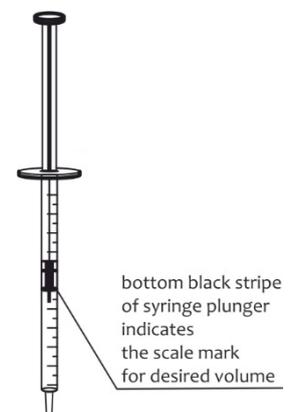
NOTE:

Before starting the measurement, it is highly recommended to make sure the test vial is clean and dry. Liquid residues remaining on the vial walls may adversely affect reliability of results.

6. Replace the cap with a hole on the vial. Attach the tip on the end of the 1 ml syringe and take 1 ml of the **Reagent Ca-3**. The bottom black stripe of the syringe plunger should be on the scale mark for the desired volume, see [18.3.1 Proper use of syringe](#).

NOTE:

Make sure no air bubbles are present in the syringe or in the tip. Trapped air bubbles can affect accuracy of the measurement.



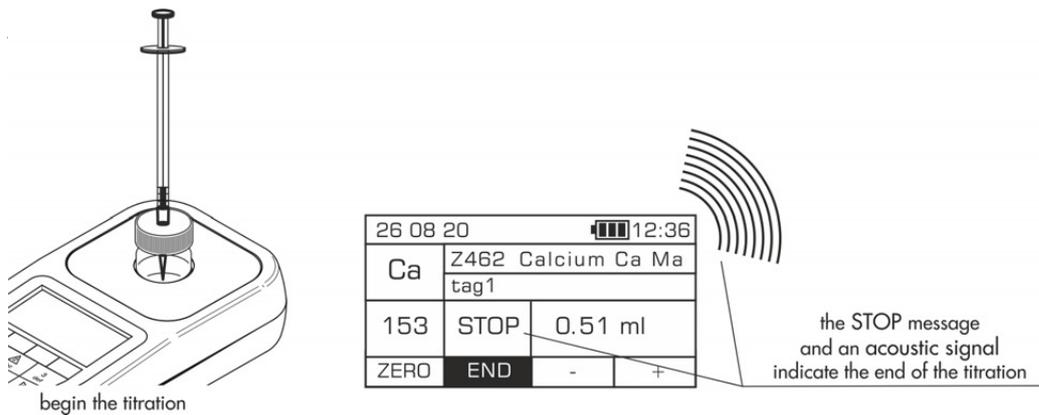
1 ml syringe

- Place the syringe with the Reagent Ca-3 in the hole cap. Press the **MEAS** key and begin the titration by carefully adding **Reagent Ca-3** in small portions. If the entire volume of the syringe is emptied and there is no end of titration, take another portion (1 ml) of Reagent Ca-3 and continue titration.

NOTE:

To obtain accurate results of titration shake carefully the instrument with the vial after each portion of Reagent Ca-3 is added to mix well.

The end of the titration is indicated by an acoustic signal and the message **STOP** appears on the instrument.



NOTE:

Remember not to switch off the beeper message before taking a measurement, see [12.7 Beeper](#). It will disable the acoustic signal which indicates the end of the titration.

- Read the volume of added **Reagent Ca-3** in ml on the syringe scale and enter the value using the „+“ button or any other key on the keyboard apart from the **Power key** and the **minus key**. Press the **END** key. The result – **the concentration of calcium** – is displayed in mg/l (ppm).



NOTE:

For this method a few different units of measurement are available. To switch between **mg/l** and **ppm** use left/right cursors in the result section of the main screen.

the high content of bi- or multivalent metals
- mainly manganese (Mn) and iron (Fe)

may cause falsely high readings

19.20 Method Z463 – Magnesium Mg marine water



Specification

Description:	Test for determining the content of magnesium in marine water
Range:	500 - 1600 mg/l
Resolution:	18 mg/l
Wavelength:	610 nm
Extra feature:	exat:tr method guided by the innovative photometric system for easy and convenient titration, see 15 Titration method .

NOTE:

Firstly, take a measurement according to the method Z462, Calcium Ca marine water (product no 8462).

For the correct determination of the magnesium content in the method Z463, it is necessary to enter the previously measured calcium content in accordance with the method Z462. In case of seawater the calcium content of **400 mg/l** can be taken as a typical level of this element, and it will not affect the accuracy of measurement. Exaqua allows you to transfer the calcium content from the recently performed compatible calcium method to the currently performed magnesium method. However, it should be remembered that the recorded result is deleted from the photometer internal memory after any 4 consecutive measurements are performed. Thus, no more than 4 other measurements should be made between the calcium measurement and the corresponding magnesium measurement.

Reagent set

Product Code	Description	List of components
8463	Set of reagents for method Z463, Magnesium Mg marine water (reagents for approx. 40 tests)* * for the average content of Ca 425 mg/l and Mg 1550 mg/l	<ul style="list-style-type: none"> ✓ Reagent Mg-1 ✓ Reagent Mg-2 (2 pcs.) ✓ 1 ml syringe with tip ✓ vial

Performing the measurement

1. Select the **Z463 Magnesium Mg marine** method (**Methods** → **Select method** → **Z463 Magnesium Mg marine**). How to select the method, see [8.1 Choosing method](#).

NOTE:

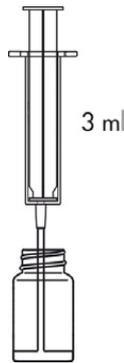
It is recommended to use the **GUIDE** system by pressing the context button **GUIDE** on the photometer. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.

2. Rinse the vial and the syringe three times with the tested water.

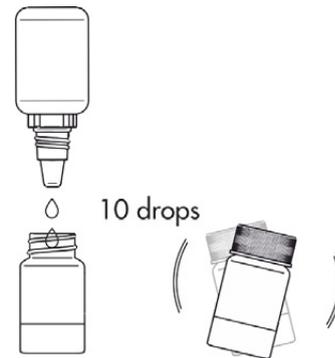
Take exactly 3 ml of the tested water with the syringe and pour into the vial.

NOTE:

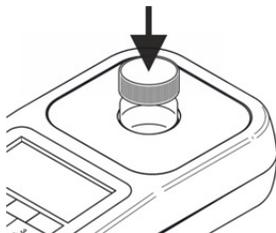
Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



3. Add 10 drops of **Reagent Mg-1** and shake to mix.



4. Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-"**, which means the device is ready for measurement.



26 08 20		12:35	
Mg	Z463 Magnesium Mg	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:35	
Mg	Z463 Magnesium Mg	tag 1	
-0.0- mg/l			
ZERO	MEAS	GUIDE	

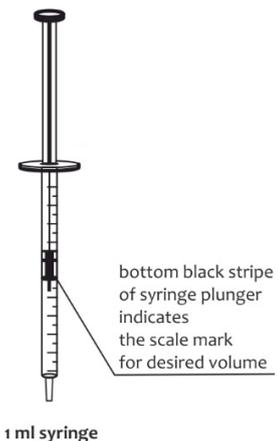
NOTE:

Before starting the measurement, it is highly recommended to make sure the test vial is clean and dry. Liquid residues remaining on the vial walls may adversely affect reliability of results.

5. Replace the cap with a hole on the vial. Attach the tip on the end of the 1 ml syringe and take 1 ml of the **Reagent Mg-2**. The bottom black stripe of the syringe plunger should be on the scale mark for the desired volume, see [18.3.1 Proper use of syringe](#).

NOTE:

Make sure no air bubbles are present in the syringe or in the tip. Trapped air bubbles can affect accuracy of the measurement.

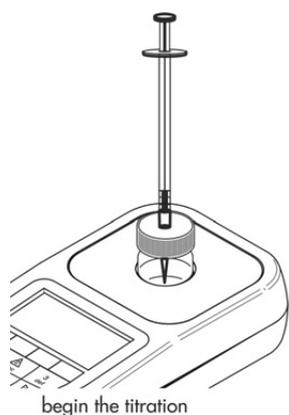


6. Place the syringe with the **Reagent Mg-2** in the hole cap. Press the **MEAS** key and begin the titration by carefully adding **Reagent Mg-2** in small portions. If the entire volume of the syringe is emptied and there is no end of titration, take another portion (1 ml) of **Reagent Mg-2** and continue titration.

NOTE:

To obtain accurate results of titration shake carefully the instrument with the vial after each portion of **Reagent Mg-2** is added to mix well.

The end of the titration is indicated by an acoustic signal and the message **STOP** appears on the instrument.



NOTE:
Remember not to switch off the beeper message before taking a measurement, see [12.7 Beeper](#). It will disable the acoustic signal which indicates the end of the titration.

26 08 20		12:36	
Mg	Z463 Magnesium Mg		
	tag1		
187	STOP	0.83 ml	
ZERO	END	-	+

the STOP message and an acoustic signal indicate the end of the titration

7. Read the volume of added **Reagent Mg-2** in ml on the syringe scale and enter the value using the „+“ button or any other key on the keyboard apart from the **Power key** and the **minus key**. Press the **END** key.

8. **If the calcium content has been previously measured (according to method Z462)** its value will be displayed on the screen. You can accept it by pressing the **OK** key or enter the default value (400 mg/l) by pressing the **DEF** key.

Linked value		12:36	
Enter value			
Ca 432.1 mg/l			
Result from Z462			
DEF	LAST		OK

If the calcium content has NOT been previously measured (according to method Z462) the default/typical for marine water value (400 mg/l) will be displayed on the screen. To accept it, press the **OK** key.

Linked value		12:36	
Enter value			
Ca 400.0 mg/l			
Default value			
DEF			OK

Apart from accepting default or previously measured calcium content it is also possible to enter your own result for calcium by using the keyboard keys (0-9). To accept it, press the **OK** key.

9. The result – **the concentration of magnesium ions** – is displayed in **mg/l (ppm)**.

26 08 20		12:36	
Mg	Z463 Magnesium Mg		
	tag1		
187	STOP	0.83 ml	
ZERO	END	-	+

26 08 20		12:36	
Mg	Z463 Magnesium Mg		
	tag 1		
1274.7 mg/l			
ZERO	MEAS	GUIDE	REC

Potential interferences

the high content of bi- or multivalent metals
- mainly manganese (Mn) and iron (Fe) may cause falsely high readings

Specification

Description:	Test for determining the content of calcium in fresh water
Range:	5-300 mg/l
Resolution:	3,2 mg/l
Wavelength:	610 nm
Extra feature:	exat:tr method guided by the innovative photometric system for easy and convenient titration, see 1.5 Titration method .

Reagent set

Product Code	Description	List of components
8472	Set of reagents for method Z472, Calcium Ca fresh water (reagents for approx. 40 tests)* * for the average content of Ca 84 mg/l	<ul style="list-style-type: none"> ✓ Reagent Ca-1 ✓ Reagent Ca-3 ✓ powder Reagent Ca-2 ✓ spatula ✓ 1 ml syringe with tip ✓ vial

Performing the measurement

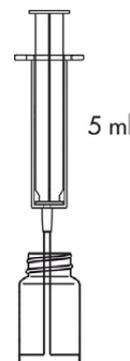
1. Select the **Z472 Calcium Ca fresh water** (Methods → Select method → Z472 Calcium Ca Fresh).
How to select the method, see [8.1 Choosing method](#).

NOTE:

*It is recommended to use the GUIDE system by pressing the context button **GUIDE** on the photometer. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.*

2. Rinse the vial and the syringe three times with the tested water.

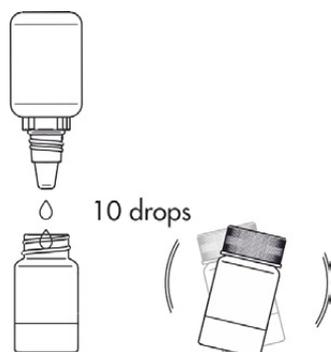
Take exactly 5 ml of the tested water with the syringe and pour into the vial.



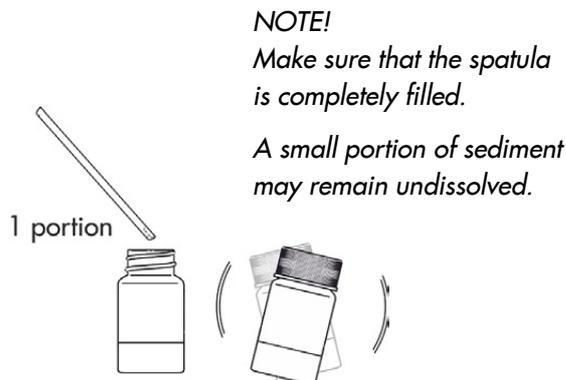
NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.

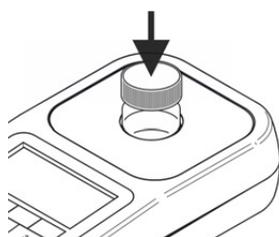
3. Add 10 drops of **Reagent Ca-1** and shake to mix.



4. Add 1 portion of **Reagent Ca-2** with the spatula, shake until the powder has dissolved.



5. Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-"**, which means the device is ready for measurement.



26 08 20		12:35	
Ca	Z472	Calcium Ca Fr	
	tag 1		
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:35	
Ca	Z472	Calcium Ca Fr	
	tag 1		
-0.0- mg/l			
ZERO	MEAS	GUIDE	

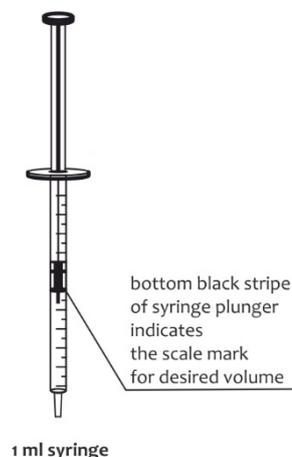
NOTE:

Before starting the measurement, it is highly recommended to make sure the test vial is clean and dry. Liquid residues remaining on the vial walls may adversely affect reliability of results.

6. Replace the cap with a hole on the vial. Attach the tip on the end of the 1 ml syringe and take 1 ml of the **Reagent Ca-3**. The bottom black stripe of the syringe plunger should be on the scale mark for the desired volume, see [18.3.1 Proper use of syringe](#).

NOTE:

Make sure no air bubbles are present in the syringe or in the tip. Trapped air bubbles can affect accuracy of the measurement.

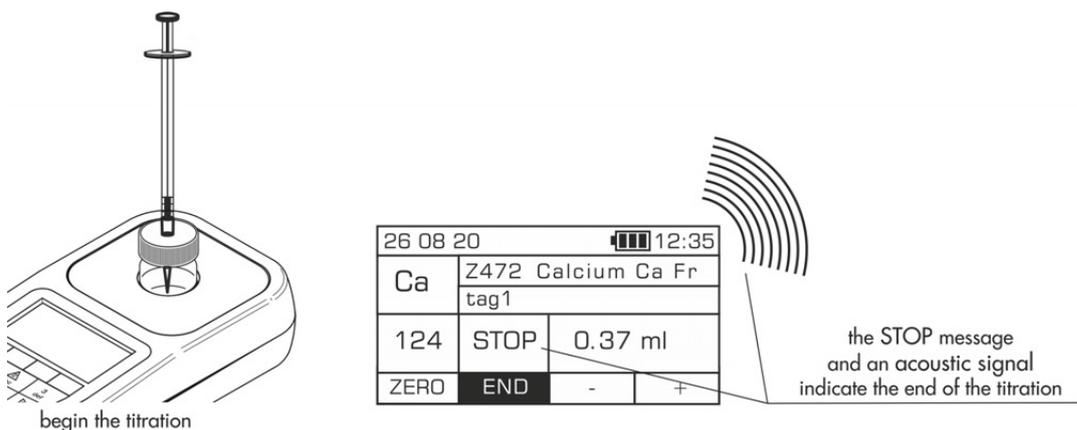


- Place the syringe with the Reagent Ca-3 in the hole cap. Press the **MEAS** key and begin the titration by carefully adding **Reagent Ca-3** in small portions. If the entire volume of the syringe is emptied and there is no end of titration, take another portion (1 ml) of Reagent Ca-3 and continue titration.

NOTE:

To obtain accurate results of titration shake carefully the instrument with the vial after each portion of Reagent Ca-3 is added to mix well.

The end of the titration is indicated by an acoustic signal and the message **STOP** appears on the instrument.



NOTE:

Remember not to switch off the beeper message before taking a measurement, see [12.7 Beeper](#). It will disable the acoustic signal which indicates the end of the titration.

- Read the volume of added **Reagent Ca-3** in ml on the syringe scale and enter the value using the „+“ button or any other key on the keyboard apart from the **Power key** and the **minus** key. Press the **END** key. The result – **the concentration of calcium** – is displayed in mg/l (ppm).

26 08 20		12:35	
Ca	Z472 Calcium Ca Fr tag1		
124	STOP	0.37 ml	
ZERO	END	-	+

26 08 20		12:35	
Ca	Z472 Calcium Ca Fr tag 1		
62.2 mg/l			
ZERO	MEAS	GUIDE	REC

NOTE:

For this method a few different units of measurement are available. To switch between **mg/l** and **ppm** use left/right cursors in the result section of the main screen.

Potential interferences

the high content of bi- or multivalent metals
- mainly manganese (Mn) and iron (Fe)

may cause falsely high readings

19.22 Method Z473 – Magnesium Mg fresh water



Specification

Description:	Test for determining the content of magnesium in fresh water
Range:	3 - 150 mg/l
Resolution:	1 mg/l
Wavelength:	610 nm
Extra feature:	exat:ir method guided by the innovative photometric system for easy and convenient titration, see 1.5 Titration method .

NOTE:

Firstly, take a measurement according to the method Z472, Calcium Ca fresh water (product no 8472).

For the correct determination of the magnesium content in the method Z473, it is necessary to enter the previously measured calcium content in accordance with the method Z472. Exaqua allows you to transfer the calcium content from the recently performed compatible calcium method to the currently performed magnesium method. However, it should be remembered that the recorded result is deleted from the photometer internal memory after any 4 consecutive measurements are performed. Thus, no more than 4 other measurements should be made between the calcium measurement and the corresponding magnesium measurement.

Reagent set

Product Code	Description	List of components
8473	Set of reagents for method Z473, Magnesium Mg fresh water (reagents for approx. 40 tests)* * for the average content of Ca 65 mg/l and Mg 15 mg/l	<ul style="list-style-type: none"> ✓ Reagent Mg-1 ✓ Reagent Mg-2 ✓ 1 ml syringe with tip ✓ vial

Performing the measurement

1. Select the **Z473 Magnesium Mg fresh water** method (Methods → Select method → Z473 Magnesium Mg Fresh). How to select the method, see [8.1 Choosing method](#).

NOTE:

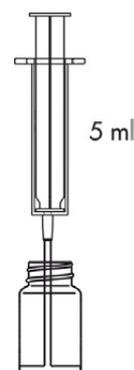
It is recommended to use the **GUIDE** system by pressing the context button **GUIDE** on the photometer. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.

2. Rinse the vial and the syringe three times with the tested water.

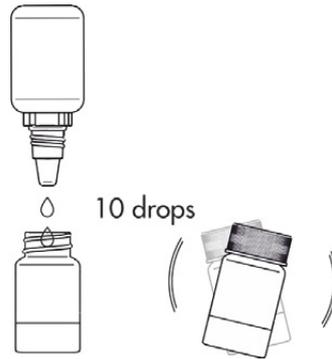
Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

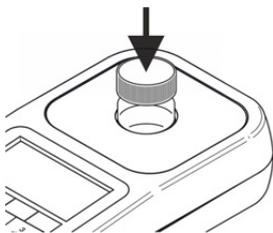
Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



3. Add 10 drops of **Reagent Mg-1** and shake to mix.



4. Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-"**, which means the device is ready for measurement.



26 08 20		12:35	
Mg	Z473 Magnesium Mg	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:35	
Mg	Z473 Magnesium Mg	tag 1	
-0.0- mg/l			
ZERO	MEAS	GUIDE	

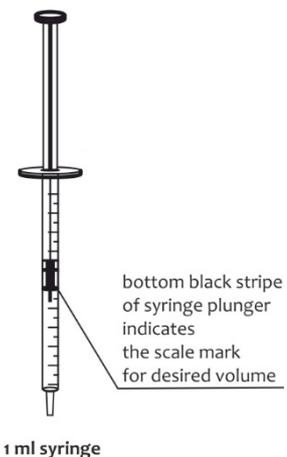
NOTE:

Before starting the measurement, it is highly recommended to make sure the test vial is clean and dry. Liquid residues remaining on the vial walls may adversely affect reliability of results.

5. Replace the cap with a hole on the vial. Attach the tip on the end of the 1 ml syringe and take 1 ml of the **Reagent Mg-2**. The bottom black stripe of the syringe plunger should be on the scale mark for the desired volume, see [18.3.1 Proper use of syringe](#).

NOTE:

Make sure no air bubbles are present in the syringe or in the tip. Trapped air bubbles can affect accuracy of the measurement.

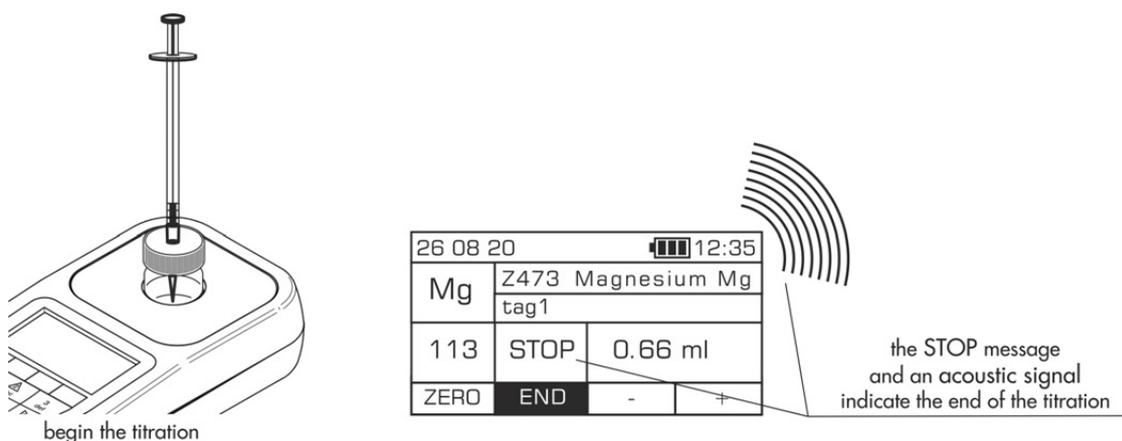


6. Place the syringe with the **Reagent Mg-2** in the hole cap. Press the **MEAS** key and begin the titration by carefully adding **Reagent Mg-2** in small portions. If the entire volume of the syringe is emptied and there is no end of titration, take another portion (1 ml) of **Reagent Mg-2** and continue titration.

NOTE:

To obtain accurate results of titration shake carefully the instrument with the vial after each portion of **Reagent Mg-2** is added to mix well.

The end of the titration is indicated by an acoustic signal and the message **STOP** appears on the instrument.



NOTE:

Remember not to switch off the beeper message before taking a measurement, see [12.7 Beeper](#). It will disable the acoustic signal which indicates the end of the titration.

7. Read the volume of added **Reagent Mg-2** in ml on the syringe scale and enter the value using the „+“ button or any other key on the keyboard apart from the **Power key** and the **minus key**. Press the **END** key.

8. If the calcium content has been previously measured (according to method **Z472**) its value will be displayed on the screen. You can accept it by pressing the **OK** key or enter the default value (0 mg/l) by pressing the **DEF** key.

Linked value 12:36			
Enter value			
Ca 62.2 mg/l			
Result from Z472			
DEF	LAST		OK

If the calcium content has NOT been previously measured

(according to method **Z472**) the default value (0 mg/l) will be displayed on the screen. To accept it, press the **OK** key.

Linked value 12:36			
Enter value			
Ca 0.0 mg/l			
Default value			
DEF			OK

Apart from accepting default or previously measured calcium content it is also possible to enter your own result for calcium by using the keyboard keys (0-9). To accept it, press the **OK** key.

9. The result – **the concentration of magnesium ions** – is displayed in **mg/l (ppm)**.

26 08 20 10:25			
Mg	Z473 Magnesium Mg tag1		
113	STOP	0.66 ml	
ZERO	END	-	+

26 08 20 10:25			
Mg	Z473 Magnesium Mg tag 1		
28.1 mg/l			
ZERO	MEAS	GUIDE	REC

Potential interferences

the high content of bi- or multivalent metals
- mainly manganese (Mn) and iron (Fe)

may cause falsely high readings

19.23 Method Z610F – Sulphate SO₄ fresh water

Specification

Description:	Test for determining the content of sulphate in fresh water
Range:	8 - 200 mg/l
Resolution:	2 mg/l
Wavelength:	470 nm

Reagent set

Product Code	Description	List of components
8610	Set of reagents for method Z610F, Sulphate SO ₄ fresh water (reagents for approx. 70 tests)	<ul style="list-style-type: none"> ✓ Reagent SO₄-1 ✓ powder Reagent SO₄-2 ✓ spatula

Performing the measurement

1. Select the **Z610F Sulphate SO₄ fresh water** method (Methods → Select method → Z610F Sulphate SO₄ Fresh). How to select the method, see [8.1 Choosing method](#).

NOTE:

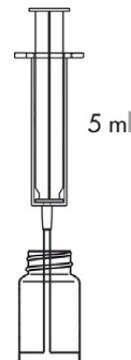
It is recommended to use the **GUIDE** system by pressing the context button **GUIDE** on the photometer. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.

2. Rinse the vial and the syringe three times with the tested water.

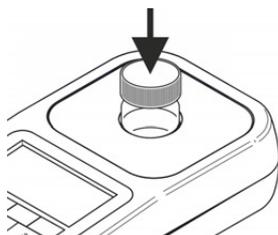
Take exactly 5 ml of the tested water with the syringe and pour into the vial.

NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



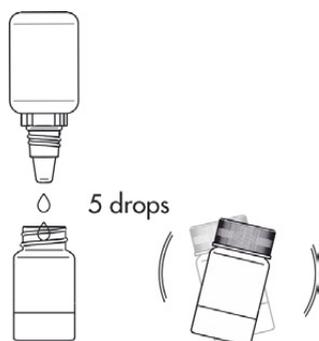
3. Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-"**, which means the device is ready for measurement.



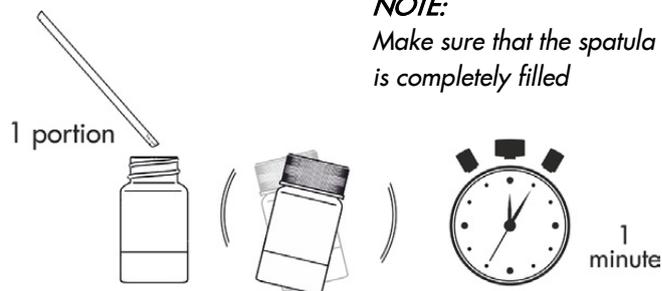
26 08 20	12:35	
SO ₄	Z610F Sulphate SO ₄	tag 1
Measuring ...		
ZERO	MEAS	GUIDE

26 08 20	12:35	
SO ₄	Z610F Sulphate SO ₄	tag 1
-0.0- mg/l		
ZERO	MEAS	GUIDE

4. Add 5 drops of **Reagent SO₄-1** and shake to mix.

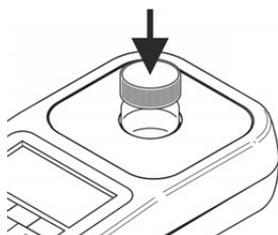


5. Add 1 portion of **powder Reagent SO₄-2** with the spatula into the vial and mix thoroughly. Before making a measurement wait exactly **1 minute**.



NOTE:
Make sure that the spatula is completely filled

6. After exactly 1 min insert the vial into the round vial holder and press the **MEAS** key to take a measurement. The result - the concentration of sulphate - is displayed in **mg/l (ppm)**.



26 08 20		12:36
SO ₄	Z610F Sulphate SO4	tag 1
Measuring ...		
ZERO	MEAS	GUIDE

26 08 20		12:36
SO ₄	Z610F Sulphate SO4	tag 1
50.0 mg/l		
ZERO	MEAS	GUIDE REC

Potential interferences

the high content of organic matter

may reduce precipitation

the high content of:

calcium (Ca)

above 20 000 ppm

manganese (Mg)

above 10 000 ppm

chloride

above 40 000 ppm

silica

above 500 ppm

may interfere with the measurement

19.24 Method Z610M – Sulphate SO₄ marine water

Specification

Description:	Test for determining the content of sulphate in marine water
Range:	200-3000 mg/l
Resolution:	20 mg/l
Wavelength:	470 nm

Reagent set

Product Code	Description	List of components
8610	Set of reagents for method Z610M, Sulphate SO ₄ marine water (reagents for approx. 70 tests)	<ul style="list-style-type: none"> ✓ Reagent SO₄-1 ✓ powder Reagent SO₄-2 ✓ spatula ✓ 1 ml syringe

NOTE:

To perform this method measurement it is required to have also deionized water available as a separate product (no 8903/100 ml bottle).

Performing the measurement

1. Select the **Z610M Sulphate SO₄ marine water** method (**Methods** → **Select method** → **Z610M Sulphate SO₄ Marine**). How to select the method, see [8.1 Choosing method](#).

NOTE:

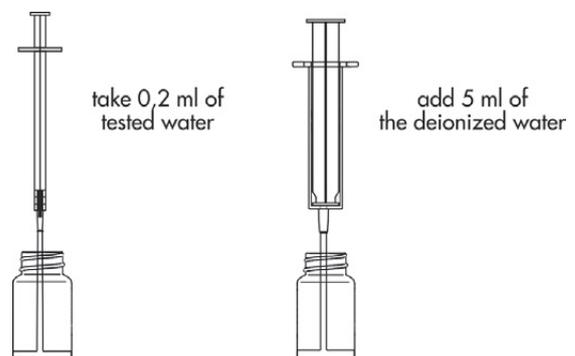
It is recommended to use the **GUIDE** system by pressing the context button **GUIDE** on the photometer. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.

2. Rinse the vial and the syringe three times with the tested water.

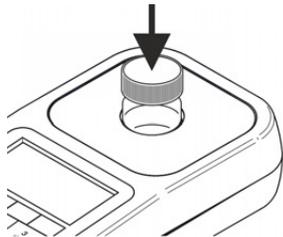
Take exactly 0,2 ml of the tested water with the syringe, pour into the vial, then add 4,8 ml of the deionized water.

NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



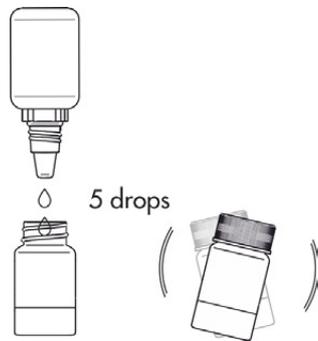
3. Insert the vial into the round vial holder and press the **ZERO** key. The display will show "-0.0-", which means the device is ready for measurement.



26 08 20		12:35	
SO ₄	Z610M Sulphate SO4	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:35	
SO ₄	Z610M Sulphate SO4	tag 1	
-0.0- mg/l			
ZERO	MEAS	GUIDE	

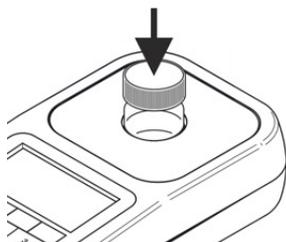
4. Add 5 drops of **Reagent SO₄-1** and shake to mix.



5. Add 1 portion of **powder Reagent SO₄-2** with the spatula into the vial and mix thoroughly. Before making a measurement wait exactly **1 minute**.



6. After exactly 1 min insert the vial into the round vial holder and press the **MEAS** key to take a measurement. The result - the concentration of sulphate - is displayed in **mg/l (ppm)**.



26 08 20		12:36	
SO ₄	Z610M Sulphate SO4	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

26 08 20		12:36	
SO ₄	Z610M Sulphate SO4	tag 1	
270.0 mg/l			
ZERO	MEAS	GUIDE	REC

Potential interferences

the high content of organic matter

may reduce precipitation

the high content of:

calcium (Ca)

above 20 000 ppm

manganese (Mg)

above 10 000 ppm

chloride

above 40 000 ppm

silica

above 500 ppm

may interfere with the measurement

19.25 Method Z630 – Carbon dioxide CO₂

Specification

Description:	Test for determining the content of carbon dioxide in fresh water
Range:	1 - 50 mg/l
Resolution:	0,25 mg/l
Wavelength:	560 nm
Extra feature:	exat:jr method guided by the innovative photometric system for easy and convenient titration, see 1.5 Titration method .

Reagent set

Product Code	Description	List of components
8630	Set of reagents for method Z630, Carbon dioxide CO ₂ fresh water (reagents for approx. 40 tests)* * for the average content of CO ₂ 20 mg/l	<ul style="list-style-type: none"> ✓ Reagent CO₂-1 ✓ Reagent CO₂-2 (2 pcs.) ✓ 1 ml syringe with tip ✓ vial

Performing the measurement

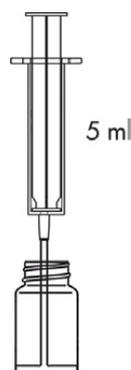
1. Select the **Z630 Carbon dioxide CO₂** method (Methods → Select method → Z630 Carbon dioxide CO₂). How to select the method, see [8.1 Choosing method](#).

NOTE:

*It is recommended to use the GUIDE system by pressing the context button **GUIDE** on the photometer. It will provide you with step-by step basic instruction how to perform measurement and a timer with beeper to count down reaction time. To enable this function press the button **GUIDE**.*

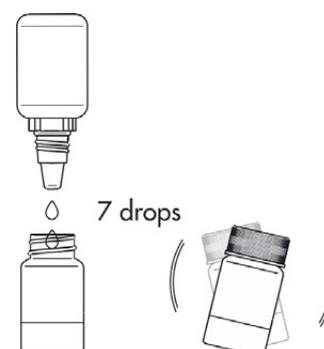
2. Rinse the vial and the syringe three times with the tested water.
3. Add 7 drops of **Reagent CO₂-1** and shake to mix.

Take exactly 5 ml of the tested water with the syringe and pour into the vial.

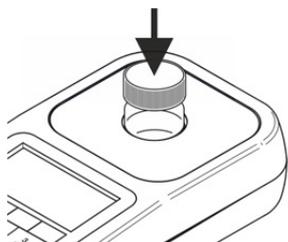


NOTE:

Make sure no air bubbles are present in the syringe. Trapped air bubbles can affect accuracy of the measurement.



- Insert the vial into the round vial holder and press the **ZERO** key. The display will show **"-0.0-"**, which means the device is ready for measurement.



25 03 21		12:35	
CO ₂	Z630 Carbon dioxide	tag 1	
Measuring ...			
ZERO	MEAS	GUIDE	

25 03 21		12:35	
CO ₂	Z630 Carbon dioxide	tag 1	
-0.0- mg/l			
ZERO	MEAS	GUIDE	

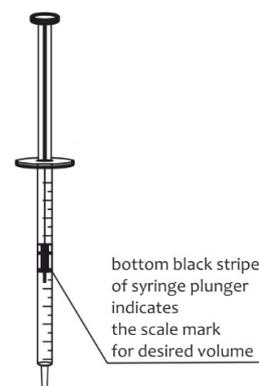
NOTE:

Before starting the measurement, it is highly recommended to make sure the test vial is clean and dry. Liquid residues remaining on the vial walls may adversely affect reliability of results.

- Replace the cap with a hole on the vial. Attach the tip on the end of the 1 ml syringe and take 1 ml of the **Reagent CO₂-2**. The bottom black stripe of the syringe plunger should be on the scale mark for the desired volume, see [18.3.1 Proper use of syringe](#).

NOTE:

Make sure no air bubbles are present in the syringe or in the tip. Trapped air bubbles can affect accuracy of the measurement.



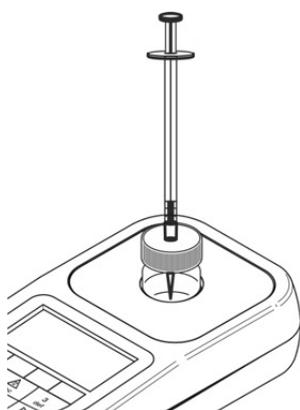
1 ml syringe

- Place the syringe with the Reagent CO₂-2 in the hole cap. Press the **MEAS** key and begin the titration by carefully adding **Reagent CO₂-2** in small portions. If the entire volume of the syringe is emptied and there is no end of titration, take another portion (1 ml) of Reagent CO₂-2 and continue titration.

NOTE:

To obtain accurate results of titration shake carefully the instrument with the vial after each portion of Reagent CO₂-2 is added to mix well.

The end of the titration is indicated by an acoustic signal and the message **STOP** appears on the instrument.



25 03 21		12:35	
CO ₂	Z630 Carbon dioxide	tag1	
100	STOP	1.28 ml	
	END	-	+

the STOP message and an acoustic signal indicate the end of the titration

NOTE:

Remember not to switch off the beeper message before taking a measurement, see [12.7 Beeper](#). It will disable the acoustic signal which indicates the end of the titration.

7. Read the volume of added **Reagent CO₂-2** in ml on the syringe scale and enter the value using the „+“ button or any other key on the keyboard apart from the  **Power key** and the  **minus key**. Press the **END** key. The result – **the concentration of carbon dioxide** – is displayed in mg/l (ppm).

25 03 21		 12:35	
CO ₂	Z630 Carbon dioxide tag1		
100	STOP	1.28 ml	
ZERO	END	-	+

25 03 21		 12:35	
CO ₂	Z630 Carbon dioxide tag 1		
32.00 mg/l			
ZERO	MEAS	GUIDE	REC

Potential interferences

alkaline reaction of water

may cause false readings

The content of CO₂ in water of pH ≥ 8.3 is close to zero. In these conditions, measurements of CO₂ do not make sense.

20. Warranty

The Exaqua photometers are covered by a warranty of 1 year from the date of purchase. The instrument is warranted against defects in materials and workmanship that are determined within the period of warranty, exclusive of all defects caused by the user such as a mechanical damage, improper handling or negligence in use not in accordance with the written manufacturer instructions, unauthorized opening or individual repair of the instrument.

During the warranty, a claim photometer will be repaired or replaced or all amounts paid by the buyer refunded, if Zoolek, at its sole discretion, determines it to be covered by this warranty. A warranty claim extends to restoring the photometer to readiness for use but not however to any further claim for damages.

To ascertain the warranty liability, write or call your local distributor or contact Exaqua Service Centre in Lodz, send the instrument and the proof of purchase, transportation paid or prepaid. The repaired or replaced photometer will be warranted for the balance of the original warranty period.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ZOOLEK LIABILITY UNDER THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT OF THE PRODUCT, AND THIS SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY. ZOOLEK EXPRESSLY DISCLAIMS ALL LIABILITY FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY.

21. How to order

If you need any information about the Exaqua photometers, their use, available accessories, ordering details or distributors contact Exaqua Customer Service.

Contact

tel / fax (+48 42) 653 44 57
email: biuro@exaqua.com
www.exaqua.com

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