OPERATING MANUAL

ba41107e08 11/2018

photoLab® S6

PHOTOMETER

WTW

a xylem brand

For the most recent version of the manual, please visit www.WTW.com.

Scope of delivery

- Photometer
- Power pack
- Product documentation

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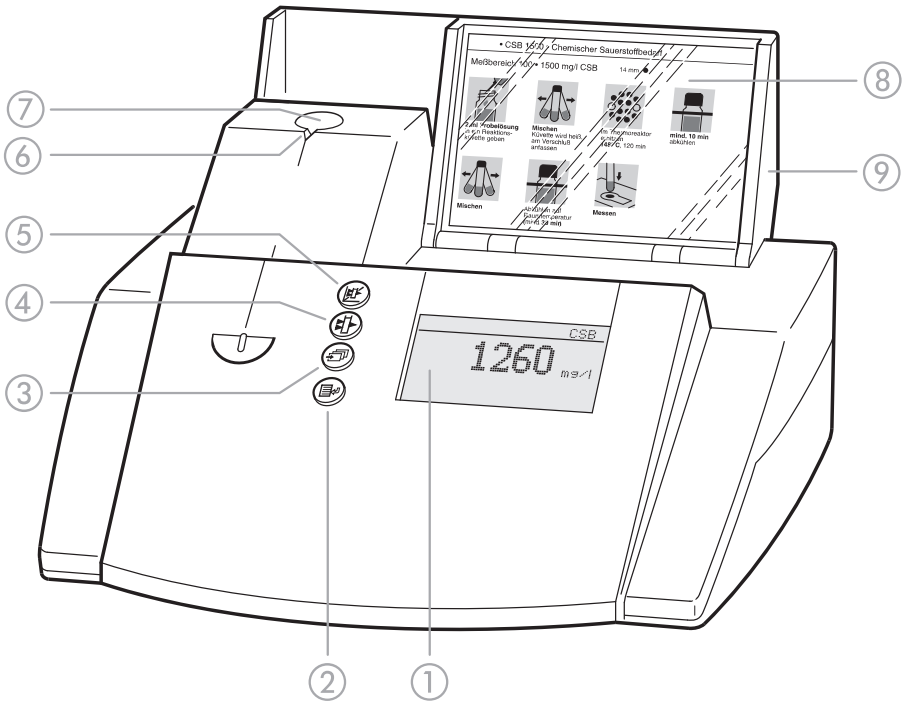
1. Overview

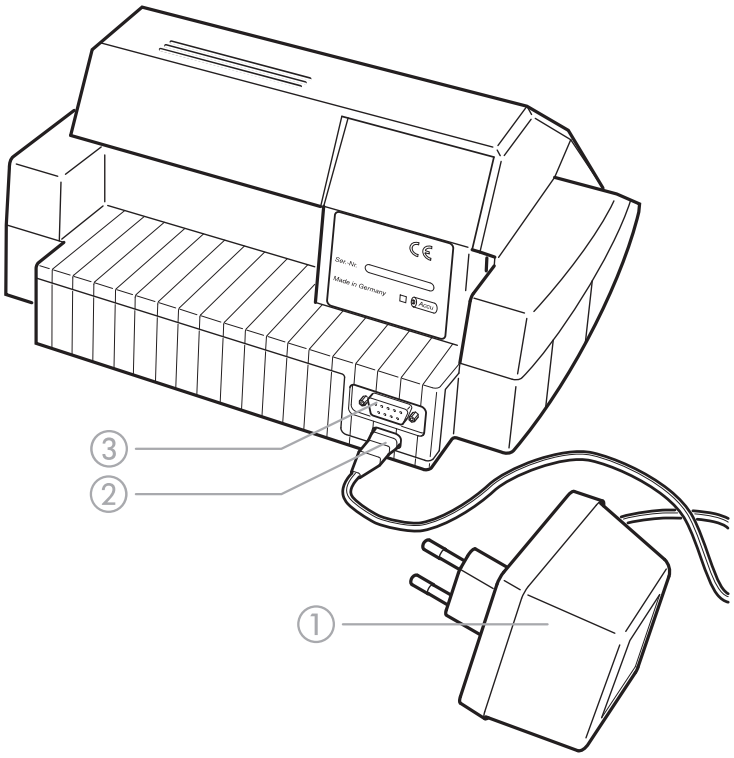
1.1 Description of the operating elements



① Display
② Menu call/Enter key
③ Scroll key
④ Absorbance measurement key
⑤ Concentration measurement key
⑥ Notch for cell alignment
⑦ Round cell shaft
⑧ Storage space for analysis regulations (short form)
⑨ Cover with integrated on/off switch

1.2 Identifying the connectors

① Power pack
② Connection for power pack
③ RS 232 interface



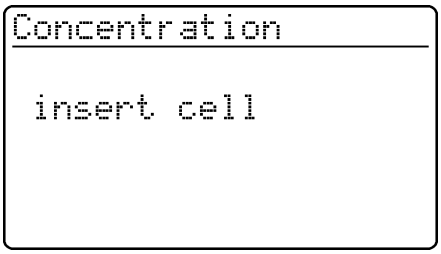
1.3 Short manual

The short manual lists all of the steps necessary to determine the concentration of a sample and to activate AQA2 at a glance.

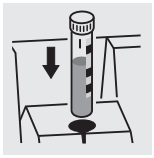
1.3.1 Measuring the concentration

– To switch on the photometer, open the cover.

The photometer performs a check (*Self-Check*) of the entire system and then switches automatically to the *concentration measuring mode*.



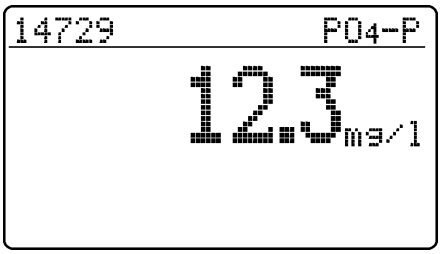
Measuring mode, *concentration*



– Insert the round cell with barcode in the round cell shaft until it clicks into place.

Align the line mark to the notch of the photometer. The message *measuring... appears.*

If the *select method* menu is displayed, align the line mark of the round cell to the notch of the photometer.



The measured value appears on the display.
Measured values outside the specified measuring range are output in small numerals.
Repeat the measurement:

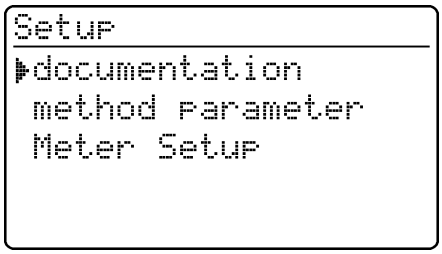
– Press .

1.4 Selecting and calling up the menu items

– To switch on the photometer, open the cover.

– Press .

The following display appears:



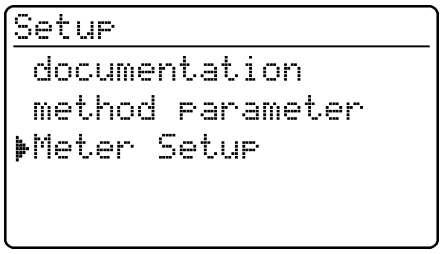
Example:

The *documentation* menu item is preselected in the *setup* menu (▶).

Select a menu item, e. g. *meter setup*:

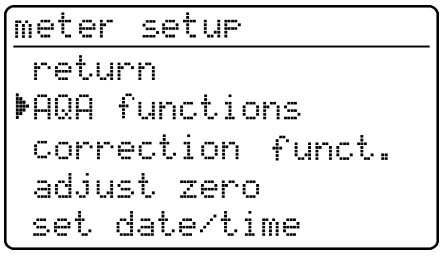
– Press .

The following display appears:



The *meter setup* menu item is preselected (▶).

– Call up the *meter setup* submenu by pressing .



The required menu item is

– selected using

– called up using .

Selection lists:

– Changes to the settings are accepted after confirmation by pressing

– Current settings are marked by "✣".

– Change to other configuration levels by

- Selecting the menu item, *return*
- Pressing

– Scroll with .

Character input:

– by using ,
the character to be input is shown in reverse video.

– Confirm each input with .

2. Safety

This operating manual contains basic instructions to be followed in the commissioning, operation and maintenance of the meter. Consequently, all responsible personnel must read this operating manual before working with the meter.
The operating manual must always be available in the vicinity of the meter.

2.1 Authorized use

The photometer is authorized exclusively for analyzing substances in water and aqueous solutions using round cells or rectangular cells (special optical glass). Observe the technical specifications of the cells according to chapter 15 TECHNICAL DATA.
Any other use is considered **unauthorized**.

2.2 General instructions

The photometer is constructed and tested according to the EN 61010-1 safety regulations for electronic measuring instruments. It left the factory in a safe and secure technical condition.
The smooth functioning and operational safety of the photometer can only be guaranteed under the climatic conditions specified in chapter 15 TECHNICAL DATA of this operating manual.
Opening the photometer or adjustment, maintenance and repair work must only be performed by personnel authorized by the manufacturer.
The only exceptions to this are the activities described in chapter 14 MAINTENANCE, CLEANING, DISPOSAL. Non-compliance results in the loss of warranty claims.
Follow the points listed below when operating the photometer:

- Follow local safety and accident prevention regulations.
- Observe the enclosed instructions concerning reagents and accessories.
- Observe the regulations when dealing with dangerous substances.
- Follow the operating instructions at the workplace.
- Use only original spare parts.

2.2.1 Labeling of notes

indicates notes that you must read – for your own safety, the safety of others and to protect your meter from being damaged.

indicates notes that draw your attention to special features.

2.2.2 Dangers of disregarding the safety instructions

Disregarding the safety instructions can adversely affect the safety of both the user and the environment as well as the equipment.

Non-compliance with the safety instructions will result in the loss of any warranty claims.

2.2.3 Qualification of the personnel

The personnel responsible for the commissioning, operation and maintenance must have the necessary qualifications for this work. If the personnel do not have the required skills they have to be instructed.

Furthermore, it must be ensured that the personnel read and completely understand the present operating manual.

2.2.4 Technical state of the meter

2. Safety

It is the responsibility of the operator to continuously observe the overall technical condition (externally recognizable deficits and damage as well as alterations to the operational behavior) of the meter.
If safe operation is no longer possible, the equipment must be taken out of service and secured against inadvertent operation.

Safe operation is no longer possible if

- the equipment has been damaged in transport
- the equipment has been stored under adverse conditions for a lengthy period of time
- the equipment is visibly damaged
- the equipment no longer operates as prescribed.

If you are in any doubt, please contact the supplier of the photometer.

3. Commissioning

The photometer operates at an environmental temperature of +5 °C to +40 °C. During transport from cold to warm surroundings, condensation can form resulting in the malfunction of the meter.

Before putting the photometer into service, wait until it has adapted to the new environmental conditions (see also chapter 15 TECHNICAL DATA).

3.1 Preparing the photometer

– Place the photometer on a hard, flat surface and protect it against intensive light and heat.

Line operation

– Plug the original power pack into the socket on the photometer
– Plug the power pack into the line socket
– Switch on the photometer (open the cover).

Battery operation

– Charge the battery for approx. 5 hours before the initial commissioning. To do this:
  - Plug the original power pack into the socket on the photometer
  - Plug the power pack into the line socket and then the battery will be charged.

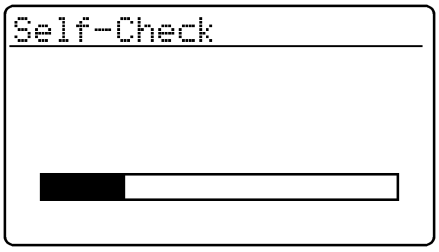
During battery operation or when the meter is at a standstill for longer periods of time, the battery runs down. This can result in your photometer no longer being ready for operation.

When the following symbol is displayed, charge the battery: 

3.2 Switching on the photometer

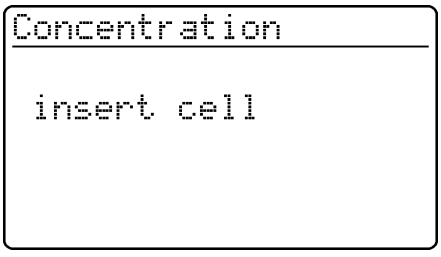
– To switch on the photometer, open the cover.

The photometer performs a check (*Self-Check*) of the entire system and then switches automatically to the *concentration* measuring mode.



Self-check of the photometer

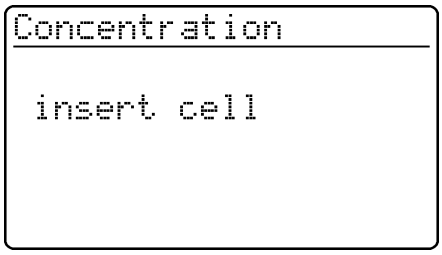
After approx. 5 s:



Automatic change to the measuring mode, *concentration*

4. Measuring the Concentration

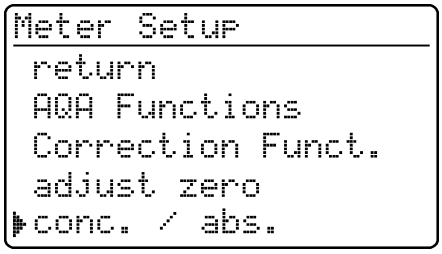
– Call up the *concentration* measuring mode by actuating .



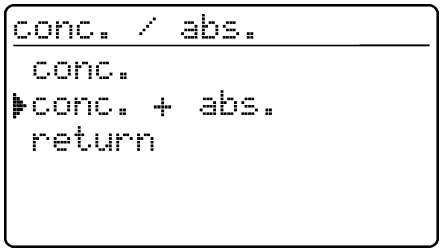
Measuring mode, *concentration*

4.1 Display of concentration and absorption

– Press to call up the *setup* menu
– Call up the *meter setup* submenu.



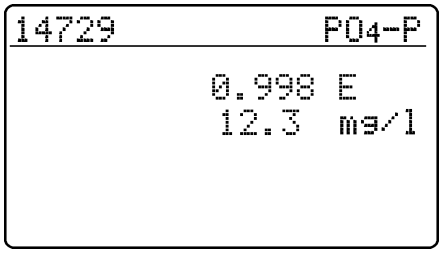
– In the *meter setup* menu, call up the *conc. / ext.* submenu.



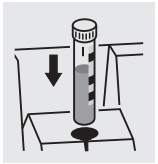
Selection of the measuring mode:

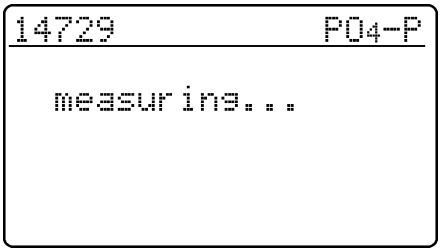
- *conc.*
- *conc. + abs.*

Example



4.2 Measuring using cell tests

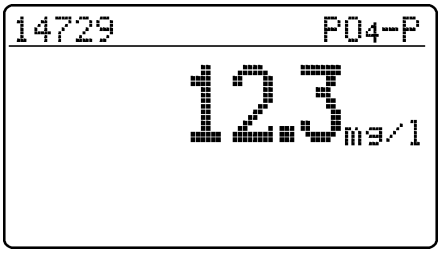




– Insert the round cell with barcode into the round cell shaft until it clicks into place.
  Align the line mark to the notch of the photometer.

The photometer reads the barcode of the round cell and automatically selects the relevant method.

After approx. 2 s:



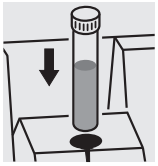
The measured value appears on the display.

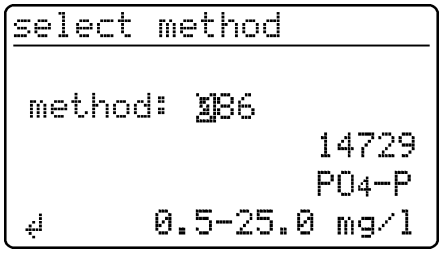
If the *select method* menu is displayed, align the line mark of the round cell to the notch of the photometer.

4. Measuring the Concentration

4.3 Measuring using tests without barcode (manual method selection)

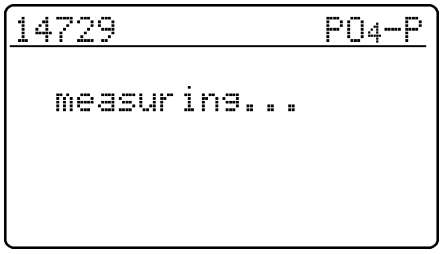
When measuring using cell tests without barcode, the method must be selected manually.



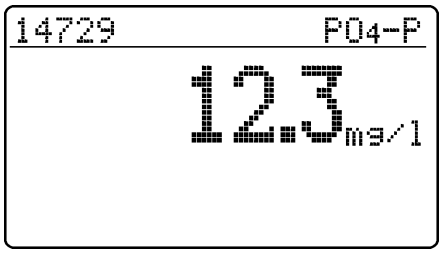


The last method set up manually appears on the display.

– Select the required method with
– Confirm with .



After approx. 2 s:

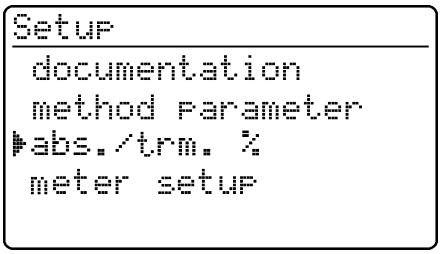


The measured value appears on the display.

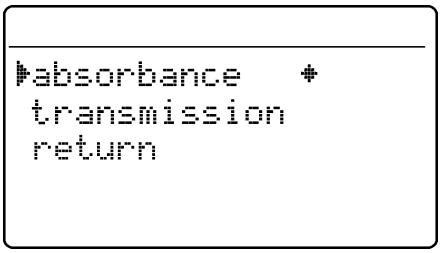
5. Measuring the Absorbance/Transmission

5.1 Switching to the Absorbance/ Transmission measuring mode

– Call up the *setup* measuring mode by actuating .



– In the *setup* menu, call up the *abs./trm. %* submenu.

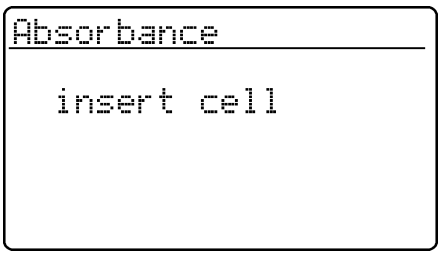


Selection of the measuring mode:

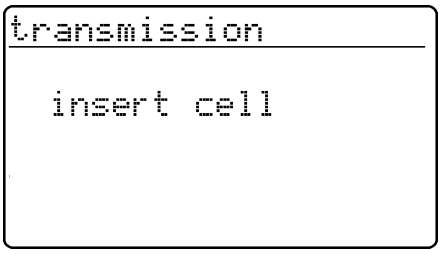
- *absorbance*
- *transmission*

5.2 Measuring the absorbance or transmission

– Call up the *absorbance* or *transmission* measuring mode (depending on the selection in the *abs./trm. %* menu) by actuating .



Measuring mode, *absorbance*



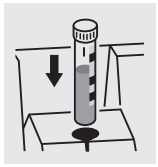
Measuring mode, *transmission*

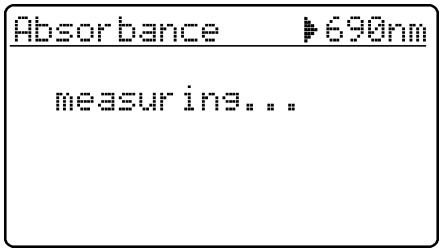
The transmission measurement is not described separately in the following example as it operates in exactly the same way as the absorbance measurement. However, the result of the measurement is displayed as % Transmission instead of A for Absorbance.

A measured reference absorbance is also effective in the measuring mode, *transmission*. It is displayed as reference absorbance.

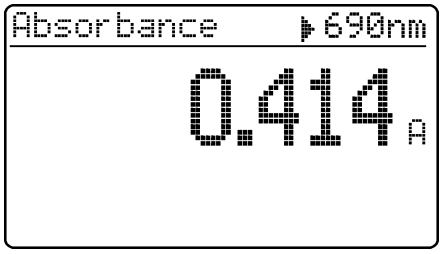
5. Measuring the Absorbance/Transmission

5.3 Measuring using cell tests



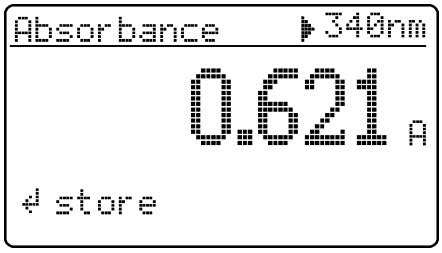


– Insert the round cell with barcode into the round cell shaft until it clicks into place.
Align the line mark to the notch of the photometer.

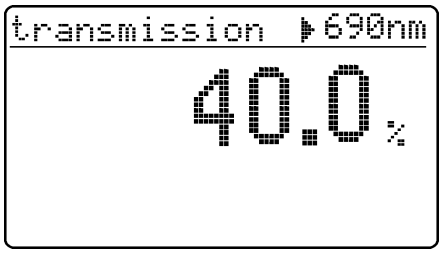


The measured value for the wavelength displayed at the top right appears. This measured value is automatically stored.
If necessary, call up further wavelengths:

– with .

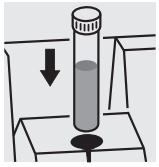


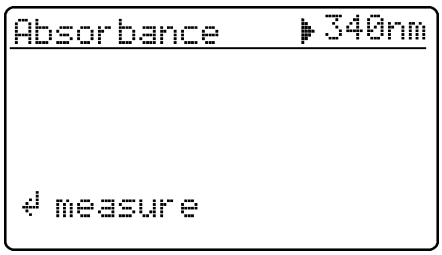
The measured value for the selected wavelength appears and can be stored and output to the interface with .



– Sample display for transmission measurement

5.4 Measuring using tests without barcode





The last wavelength measured appears on the display.

– Select the wavelength:
with

– Start the measurement:
Press .

6. Documentation

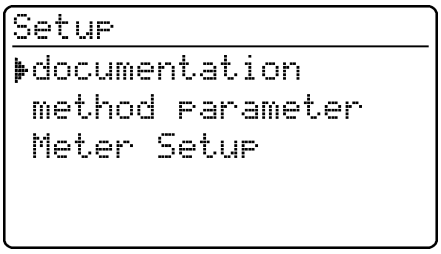
The measured values can be documented as follows:

- Storage in the measured value memory
- Output to a connected printer via the serial interface (automatic when a printer is connected)
- Transmission to a PC for further processing (by using the relevant software, e.g. Multi/ACHATII or – less conveniently – by means of a terminal program).

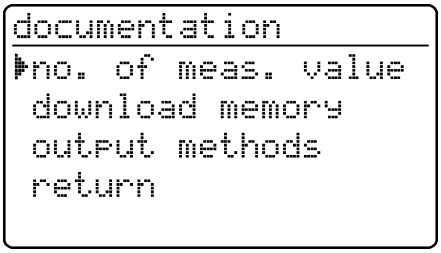
– To switch on the photometer, open the cover.

– Press  .

The following display appears:



– Call up the *documentation* menu with  .



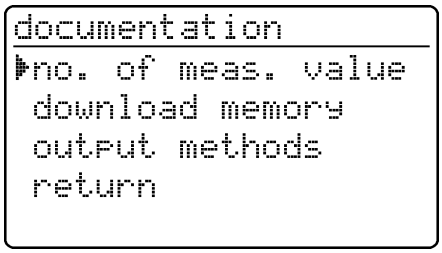
The following functions can be selected:

- *no. of meas. value*
  - reset the number
- *download memory*
  - total
  - from date
- output methods
  - all

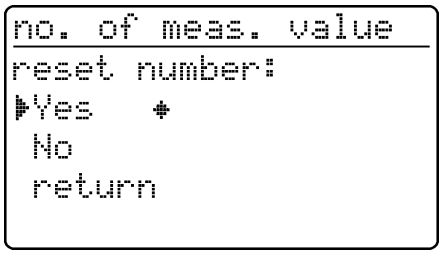
The current settings are marked by "✣" in the selection lists of the respective submenus.

6. Documentation

6.1 Resetting the number of the measured value



– Call up the *no. of meas. value* submenu.



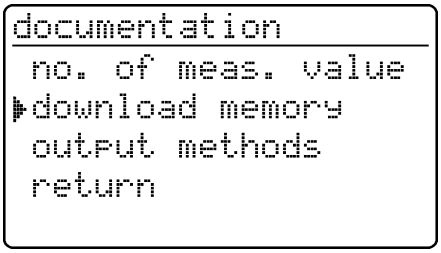
- *yes*
  The numbering of the measured values starts again with 001 (default)
- *no*
  Consecutive numbering of the measured values (from 001 to 999)

– Select the menu item with 

– Confirm with  .

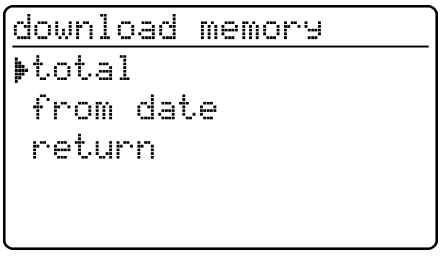
6.2 Download memory

The measured value storage can be selectively downloaded to either the display or serial interface.
The selection of the output medium is made after the specification of the sorting criteria.



– Call up the *download memory* submenu.

The *download memory* menu item only appears after at least one measurement has been performed.



The following sorting criteria can be set:

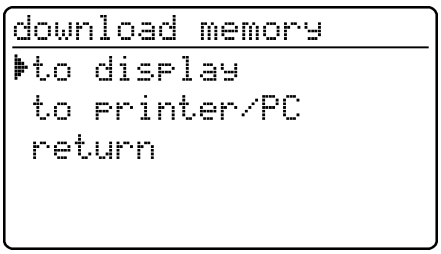
- *total* – all stored measured values
- *from date* – all measured values from a special date

– Select the menu item with 

– Confirm with  .

6. Documentation

Selecting "total"



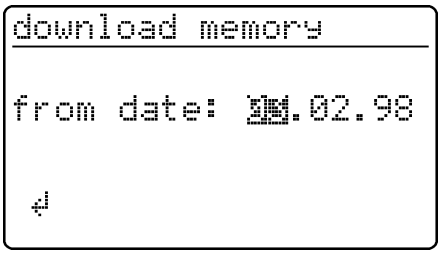
Select the output medium:

- *to display*
- *to printer/PC* (serial interface).

– Select the menu item with

– Confirm with to start the memory download.

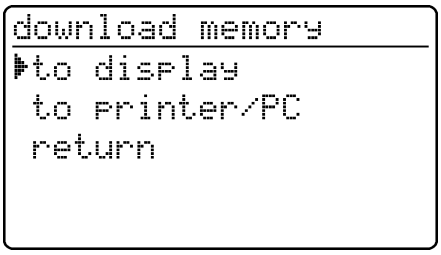
Selecting "from date"



– Input the date using

– Erase the input using C

– Confirm with .



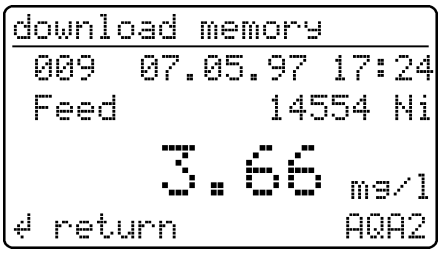
Select the output medium:

- *to display*
- *to printer/PC* (serial interface).

– Select the menu item with

– Confirm with to start the memory download.

Memory download to display

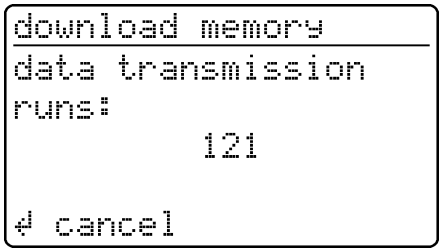


Each data record appears individually on the display beginning with the data record just measured.
The display shows:

- no. of meas. value
- date/time
- I. D. number
- method designation
- citation
- meas. value
- unit
- Where necessary, AQA ID, e.g. AQA2.

– Scroll with .

Memory download to printer/PC



Memory download to the serial interface:

- Display of the transmitted no. of measured value (continuation display) beginning with the last measured value.

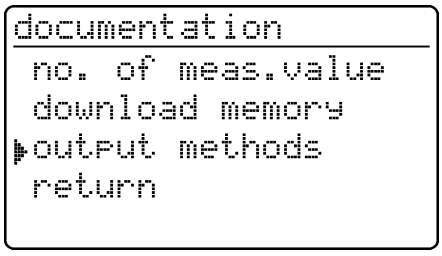
– Cancel with .

Sample printout:

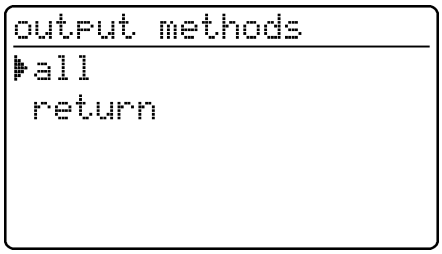
003	14541	10.02.98	11:56:33	t	80	mg/l	COD
002	14541	10.02.98	11:54:21	t	70	mg/l	COD
001	14729	03.02.98	18:30:53	*	0.3	mg/l	PO4-P

6.3 Download of the methods list

The stored methods are downloaded to the printer/PC via the serial interface.



– Call up the *output methods* submenu.



The following parameters can be set:

- *all* – Download of all stored methods

– Select the menu item with .

– Start the download with .

7. Method Parameters

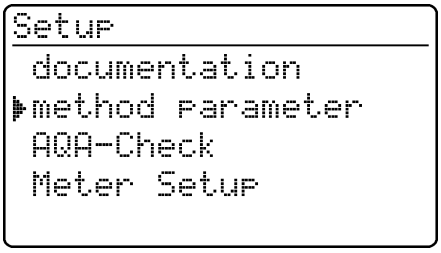
The following parameters can be set in the *method parameters* menu:

- citation
- unit

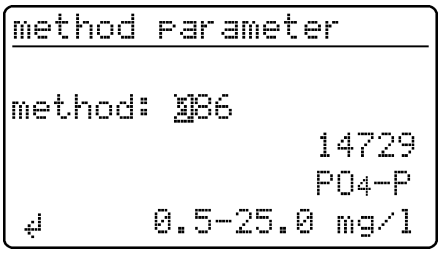
– To switch on the photometer, open the cover.

– Press .

The following display appears:

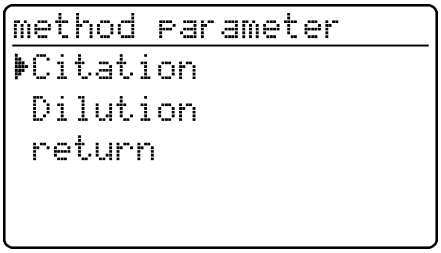


– Call up the *method parameters* submenu.



– Input the method number

– Confirm with .



– Select the menu item with

– Call up the parameter by pressing .

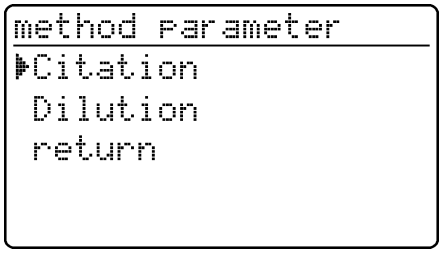
7. Method Parameters

7.1 Citation form

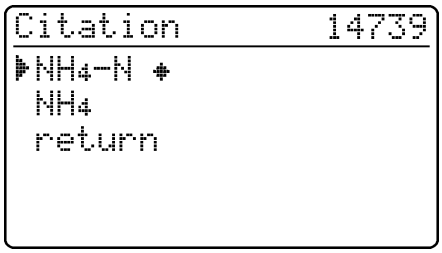
7.1.1 Changing the citation form

Example:

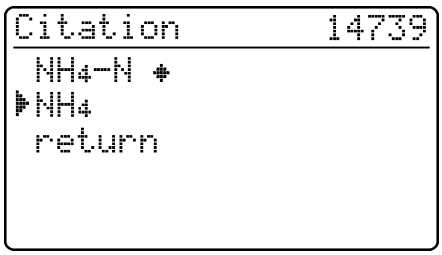
Change the citation form from "NH_4-N" to "NH_4".



– Call up the *citation* submenu.

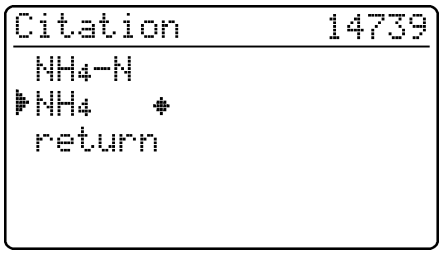


The current setting: *NH_4-N* (✥).



– Using , scroll to *NH_4*

– Confirm with .



– Citation form *NH_4* is set (✥).

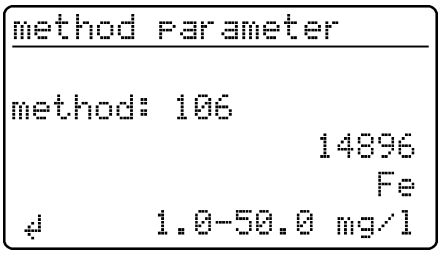
7.1.2 Performing a difference measurement

Difference measuring is possible for some methods (e.g. Iron II/III, Ca-/Mg Hardness).

For more information on this, see part, "Analysis specifications".

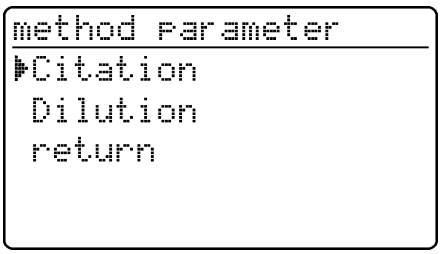
Example:

Determination of iron (II) and iron (III).

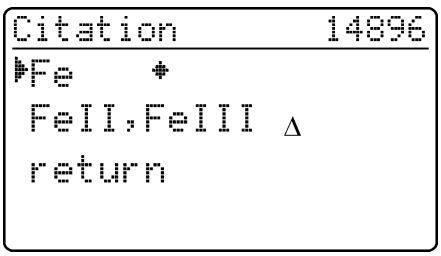


– Enter method *106*

– Confirm with .



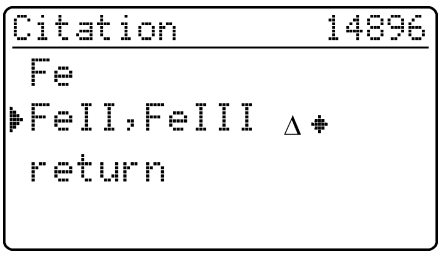
– Call up the *citation* menu item.



The current setting: *Fe*

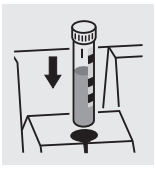
– Using scroll to *Fe II*, *Fe III*Δ

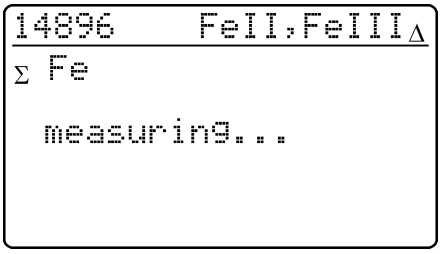
– Confirm with .



– Citation form *Fe II*, *Fe III*Δ (✥) is set.

– Change to measuring by pressing .

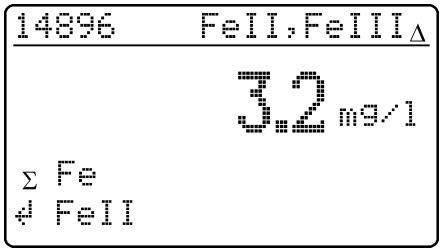




– Start the 1st measurement by inserting cell 1.

7. Method Parameters

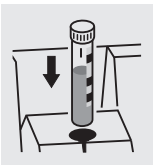
After approx. 2 s:

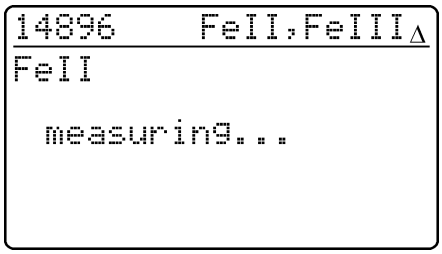


The 1st measured value appears on the display: Σ *Fe*.

– Remove cell 1

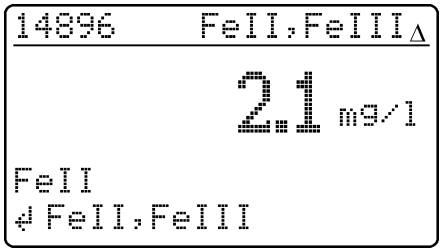
– Press .





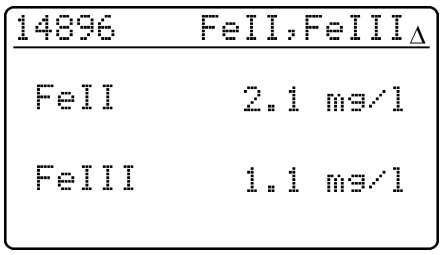
– Start the 2nd measurement by inserting cell 2.

After approx. 2 s:



The 2nd measured value appears on the display: *Iron II*.

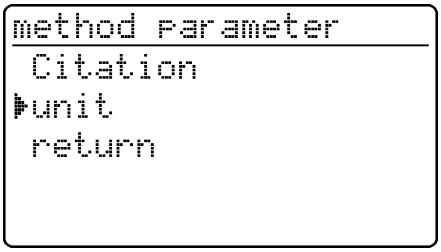
– Continue to the display of both measured values using .



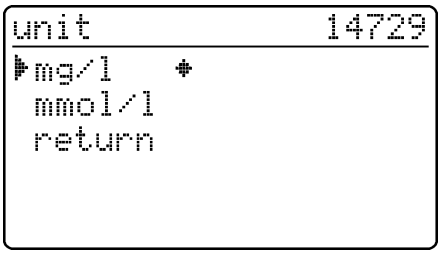
Display of both measured values as a summary.

7.2 Selecting the unit

The preset unit is "mg/l".
It can be changed to "mmol/l".



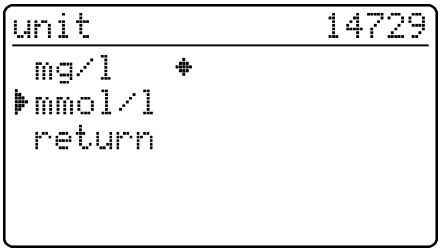
– Call up the *unit* submenu.



The current setting: *mg/l* (✥)

– Using scroll to *mmol/l*

– Confirm with .



– Unit *mmol/l* (✥) is set.

8. Analytical Quality Assurance (AQA)

Analytical quality assurance (AQA) can be performed in two steps:

- **AQA1** – Photometer monitoring
- **AQA2** – Total system monitoring with standard solutions

The total system monitoring (AQA2) is a method-specific check using standard solutions.
If this is performed successfully, it also includes photometer monitoring (AQA1).

See also part "General information" for further information on Analytical Quality Assurance (AQA).

The AQA mode must be activated in the photometer. In the delivery state it is switched off.

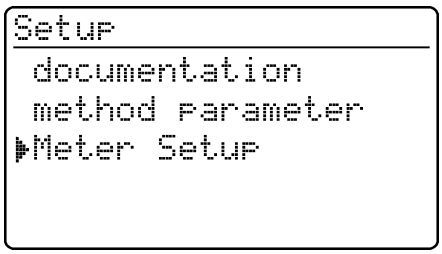
The AQA mode is activated by using a menu to select
- monitoring of the photometer (AQA1)
- monitoring of the total system using standard solutions (AQA2)

8.1 Activating AQA

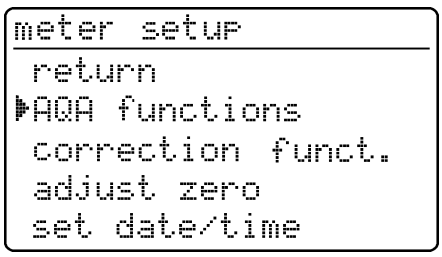
– To switch on the photometer, open the cover.

8.1.1 Activating AQA via the menu guide

– Press .



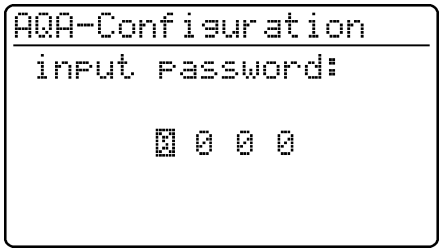
– Call up the *meter setup* submenu.



The *meter setup* submenu appears with the *AQA functions* menu item preselected.

– Confirm with .

A password request appears:

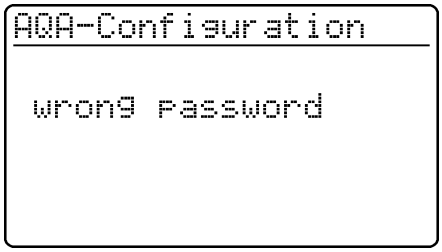


A separate password protects settings of the AQA-configuration against unauthorized access (Changing the password see section 8.1.5).

– Input the password with :
Only **numeric** characters are allowed.
Default: *0000*

– Confirm with .

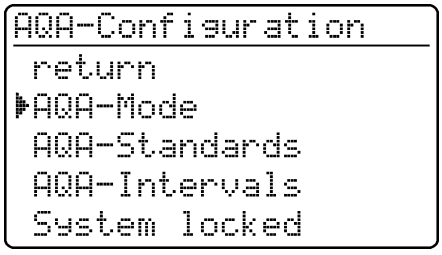
If the input was incorrect:



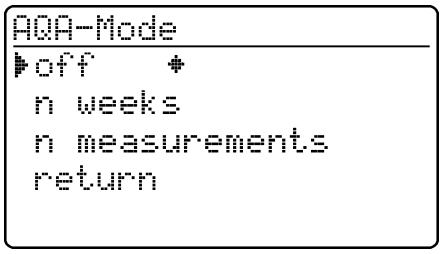
– Repeat the input.

If you have forgotten the password, contact the service department.

After the password has been successfully input, the *AQA configuration* submenu appears:

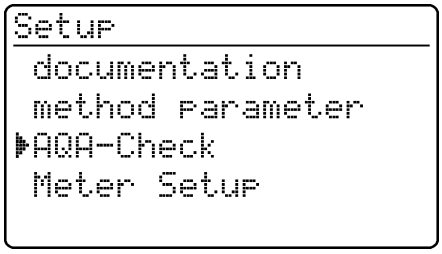


– Call up the *AQA mode* function.

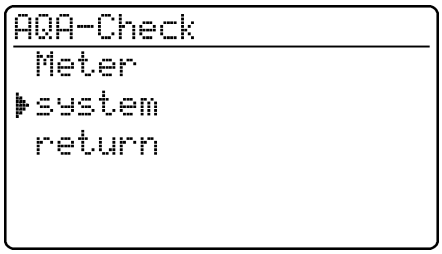


Default: *off* (no monitoring)

– Select *AQA mode*:
  – *off*
  – *n weeks*
  – *n measurements*
– Confirm with .



– In the *setup* menu, call up the *AQA check* submenu.



Selection of the AQA mode:

- *meter*
- *system*

The menu item, *meter*, only appears after the corresponding PhotoCheck standards have been input (see section 8.2.1).

8.1.2 Changing AQA intervals

AQA intervals specify the interval between two AQA checks. A fixed time interval (*n weeks*) or a number of measurements (*n measurements*) can be specified as the interval.
The respective values that were input remain stored even if they are not activated.
Additionally, two separate intervals can be set up for both photometer monitoring (AQA1) and system monitoring (AQA2).

For the total system monitoring (AQA2), a change of the time interval (*n weeks*) even retroactively applies to monitoring processes that are already running.

Changing the number of measurements (*n measurements*) does not affect monitoring processes already running.
Thus, individual numbers of measurements can be set for different methods.

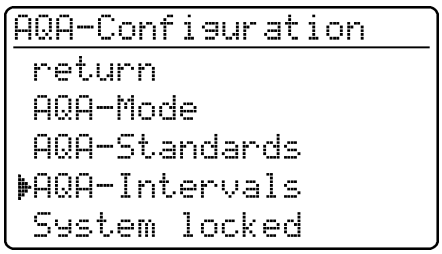
After an interval has expired, the following consequences become effective:

- Warning and loss of AQA identification
- Locking of the method for concentration measurements (as long as the locking is active).

Setting ranges:

- Photometer monitoring (AQA1):
  - 1 to 52 weeks (default: 12 weeks) or
  - 1 to 9999 measurements (default: 1500)
- Monitoring of the total system using standard solutions (AQA2):
  - 1 to 52 weeks (default: 4 weeks) or
  - 1 to 9999 measurements (default: 100)

With the *n measurements* setting, a difference measurement (see section 7.1.2) is counted as one measurement only.



– In the *AQA configuration* menu, call up the *AQA intervals* submenu.
According to the selection in the *AQA mode* menu, a fixed time interval (*n weeks*) or a number of measurements (*n measurements*) is set in the *AQA intervals* menu.

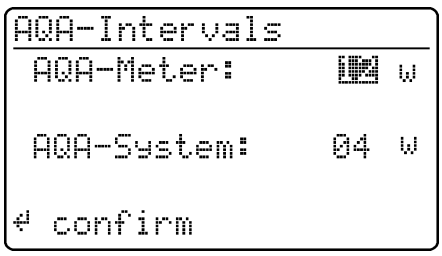
If the *AQA mode* function is switched off, the *AQA intervals* submenu is not available.

AQA interval, "n weeks"

The AQA interval, *n weeks*, is only effective if the *n weeks* setting is active for the *AQA mode* function.
The specified number of *n weeks* applies to:

- the photometer with AQA1
- all methods with AQA2.

– In the *AQA intervals* menu, call up the *n weeks* submenu.



– To return without change, press three times
– Enter the time interval for *AQA meter* with , confirm with .

AQA interval, "n measurements"

The AQA interval, *n measurements*, is only effective if the *n measurements* setting is active for the *AQA mode* function.
The AQA2 check starts the monitoring for one method at a time.

The specified number of *measurements* applies to:

- the instrument with AQA1 (total number of measurements performed, independent of whether AQA2 is active for some parameters)
- each method an AQA check will then be performed for with AQA2.
  Thus, it is possible to define individual numbers of measurements for different methods.
  The measurements are counted separately for each monitored method.

The monitoring intervals of AQA2 monitoring processes already started for other methods are not affected by changing the number of *measurements*. Thus the number of *measurements* can be set for further methods no matter which monitoring processes were started before.

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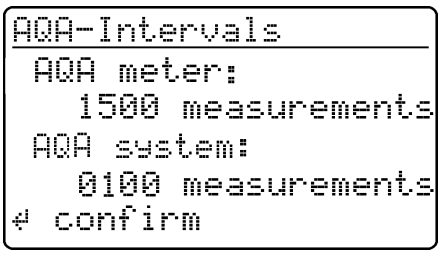
When an AQA2 check is performed, the number of *measurements* last set in the *AQA intervals* menu is automatically taken over.

Therefore, you should check and, if necessary, change the currently set number of *measurements* before each AQA2 check.

The currently set number of *measurements* for the AQA2 check is saved for the active method and output in the report individually (section 8.3.4).

– In the *AQA intervals* menu, call up the *n measurements* submenu.



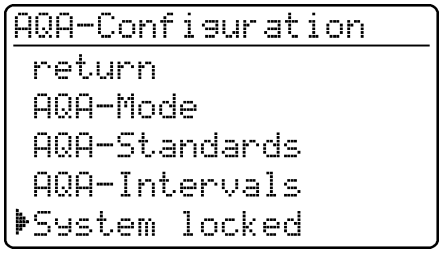
– To return without change, press ↵ three times
– Enter the number of measurements for *AQA meter* with ▲▼, confirm with ↵
– Enter the number of measurements for *AQA system* with ▲▼, confirm with ↵

8.1.3 Locking the system

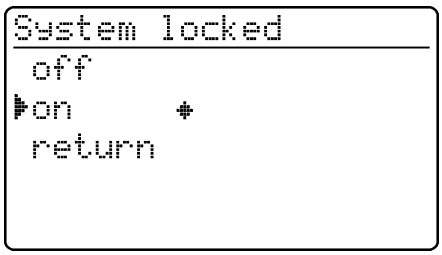
The function *system locked* is effective if, for a monitored method,

- no AQA check was performed,
- the AQA check “system” has expired.

As a result, a concentration measurement is not possible for this method.



– Call up the *system locked* submenu.

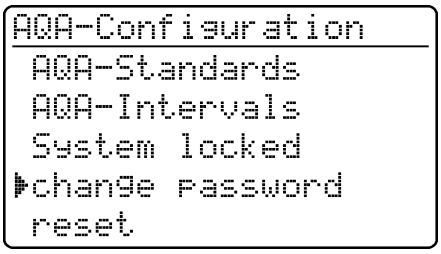


– Select the menu item with 

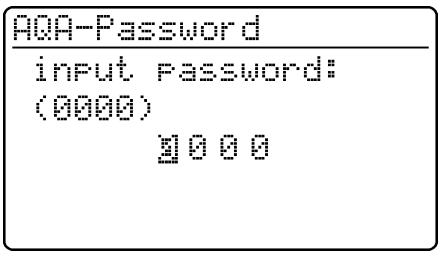
– Confirm with  .

8.1.4 Changing the password

When delivered, the default password is *0000*. This password can be changed as follows:



– Call up the *change password* submenu.
– Confirm with .

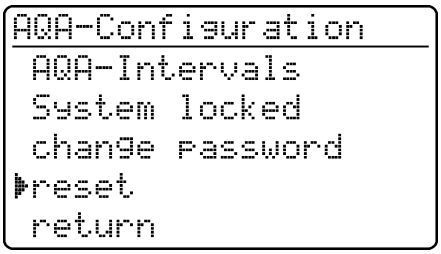


– Input the required password, e.g. *0100*, with .
– Confirm with .

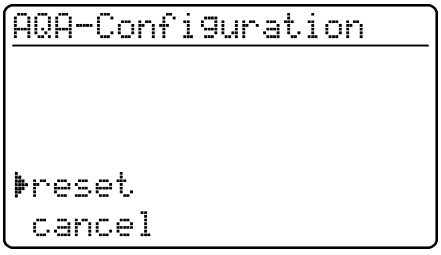
– Input the password once again:
– Confirm with .

8.1.5 Performing an AQA reset

If the Analytical Quality Assurance is to be switched off completely or reset to the delivery state, this can be made via the *reset* function in the *AQA configuration* submenu.



– Call up the *reset* submenu
– Confirm with .



– Select the *reset* menu item
– Confirm with .

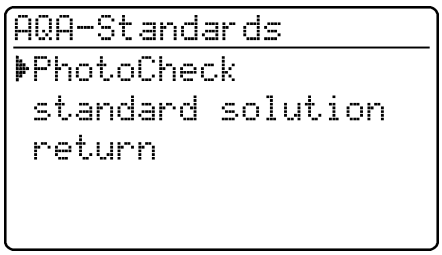
An AQA reset is performed.

8.2 Photometer monitoring (AQA1)

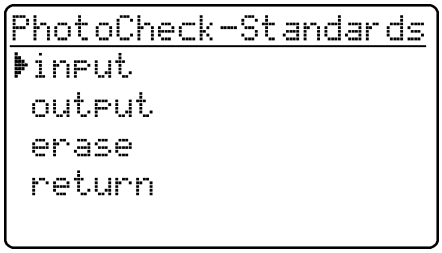
8.2.1 Entering PhotoCheck standards

A Spectroquant® PhotoCheck is required to perform the photometer monitoring (AQA1). **At least 1 standard** must be input. We recommend, however, to input all available standards.

– Press to call up the *setup* menu
– Call up the *meter setup* submenu.
– Call up the *AQA functions* submenu.
– Input the password
– Call up the *AQA standards* submenu and the following display appears:



– Call up the *PhotoCheck* submenu.



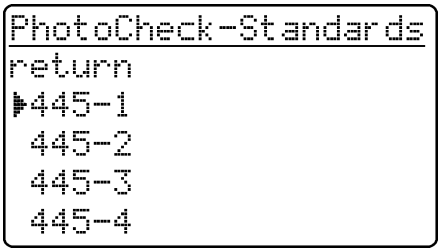
Select between

- *input*
  Input the theoretical value (absorbance) from the lot certificate of Spectroquant® PhotoCheck
- *output*
  Print/display theoretical values
- *erase*
  Erase theoretical values.

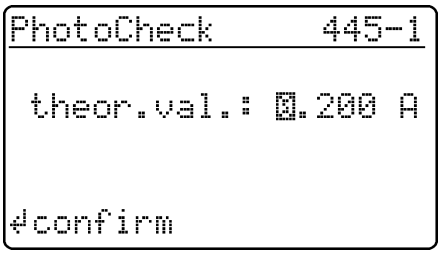
The *erase* and *output* menu items only appear after at least one standard has been input.

Example:

445-1 nm, theoretical value (absorbance) 0.200,
admissible tolerance ± 0.020

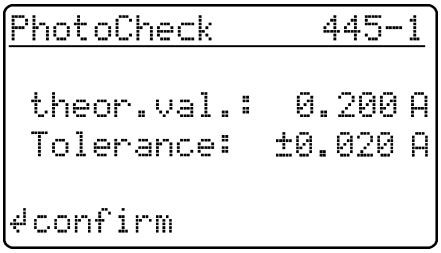


– Select with
– Quit via the menu item, *return*
– Confirm with .

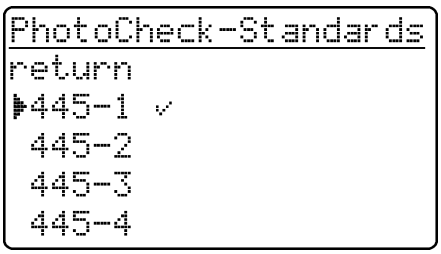


– Input the theoretical value, 445-1
– Confirm with .

If the standard is already stored, this value appears on the display.



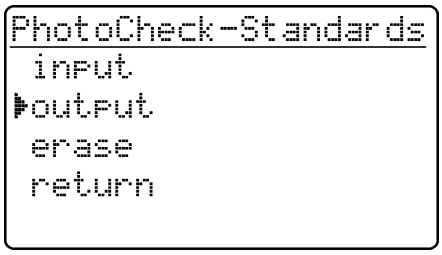
– Input the tolerance with
– Confirm with .



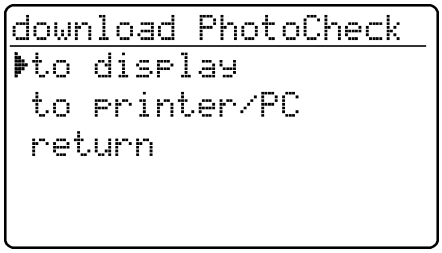
PhotoCheck standard 445-1 is input.

– Select the next one with
– Input all PhotoCheck standards in this way.

8.2.2 Download of PhotoCheck standards



– In the *PhotoCheck standards* submenu, call up the *output* menu item.



Select the output medium:

- *to display*
- *to printer/PC* (serial interface).

– Select with

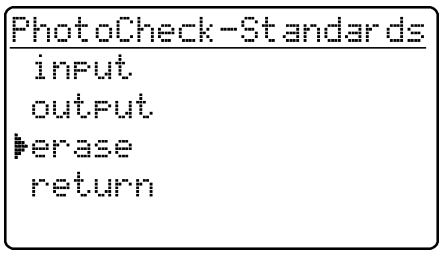
– Confirm with to start the download.

Example: Report output

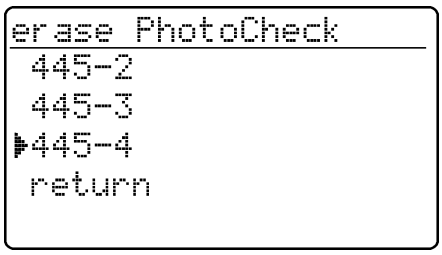
AQA check meter		AQA1		
26.08.97		13:19		
AQA interval		12 weeks		
test sol.	unit	theor. val.	tolerance	AQA date
445-1	A	0.200	0.020	26.08.97

8.2.3 Erasing PhotoCheck standards

At least 1 standard must still be stored to be able to perform the AQA check function (meter monitoring).



– In the *PhotoCheck standards* submenu, call up the *erase* menu item.



Displays the stored PhotoCheck standards:

– Select with

– Quit via *return*

– Erase with .

8.2.4 Performing Photometer monitoring

Photometer monitoring (AQA1) includes a check of the

- Light barriers using the L1/L2 cells (contained within the scope of delivery of the Spectroquant® PhotoCheck)
- Absorbance measurement using PhotoCheck standards.

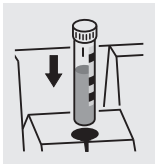
– Press to call up the *setup* menu
– Call up the *AQA check* submenu
– Call up the *meter* submenu.

The following display appears:

```
L-Check

 use L1


↲ cancel
```



– Insert the L1 cell.

After approx. 1 s:

```
L-Check

  L1 ok
```

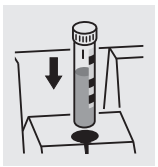
If the *error* message appears, clean the cell shaft with a damp, lint-free cloth and repeat the check.
If the message reoccurs, inform the service department.

After approx. 4 s:

```
L-Check

 use L2


↲ cancel
```



– Insert the L2 cell.

After approx. 1 s:

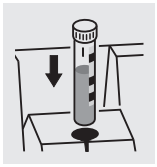
```
L-Check

 L2 ok
```

8. Analytical Quality Assurance (AQA)

After successful light barrier testing, the PhotoCheck standards (test solutions) are measured.

Example:



```
PhotoCheck        445-1

 use test
 solution        445-1

↵ cancel
```

– Insert a cell with the test solution, 445-1.
The photometer measures the absorbance of the test solution and compares the result with the value entered.

Absorbance test OK...

After approx. 3 s:

```
PhotoCheck        445-1

                0.211 A

          ok
```

...or error message

```
PhotoCheck        445-1

                ----- A

        Error
```

- Insert the next test solution
- Cancel:
  To cancel the check means no release for the next “meter" AQA interval!

Error elimination:

1. Repeat the measurement (insert the cell again)
2. If necessary, perform a zero adjustment and repeat the check
3. Exchange the test solution (each packet contains two identical test solutions)
4. Use a new Spectroquant® Photo-Check packet
5. Quit and have the photometer checked in the factory

The absorbance test is terminated if an error message occurs and the meter is **not released**. On switching on, the warning message "AQA interval expired" appears until the AQA was successfully performed or the AQA mode was switched off.

Example: Report output

AQA check meter			AQA1		
26.08.97			10:23		
operator:					
AQA interval			12 weeks		
AQA check AQA1			ok		
L check			ok		
test sol.	meas. value	unit	theor. val.	tolerance	result
445-1	0.211	A	0.200	0.020	ok

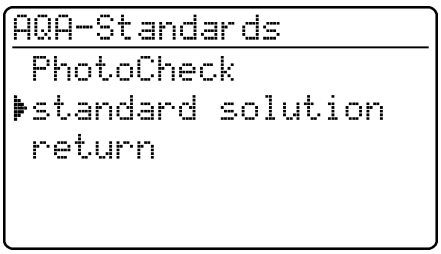
8. Analytical Quality Assurance (AQA)

8.3 Total system monitoring with standard solutions (AQA2)

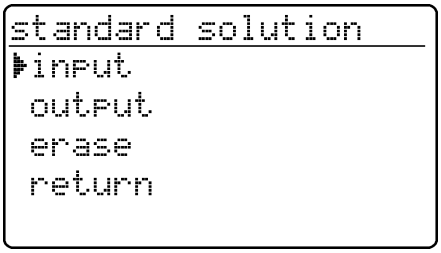
8.3.1 Entering standards

The standards compiled in the table “Spectroquant® CombiCheck and standard solutions” (see part "General information") are already stored method-specifically in the photometer. These values can be overwritten.
For **total system monitoring** (AQA2), only one standard per test can be stored at a time. The input of a standard is only complete with the input of the tolerances for finding it again, i.e. it is then first stored (no premature quitting).

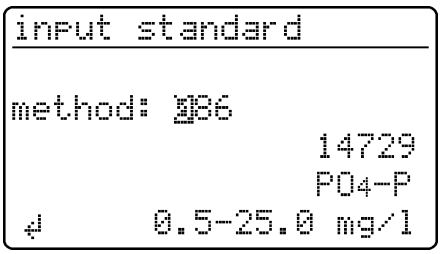
– Press to call up the *setup* menu
– Call up the *meter setup* submenu.
– Call up the *AQA functions* submenu
– Input the password
– Call up the *AQA standards* submenu and the following display appears:



– Call up the *standard solutions* submenu.



Select between
- *input*
  Enter standards
- *output*
  Print/display standards
- *erase*
  Erase standards.



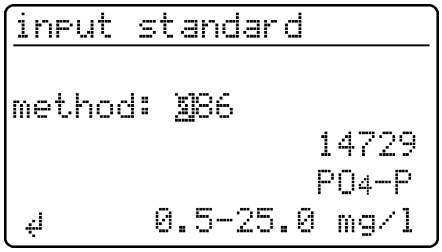
Displays the last selected method.

– Select the method with
– Confirm with
– Input the standards.

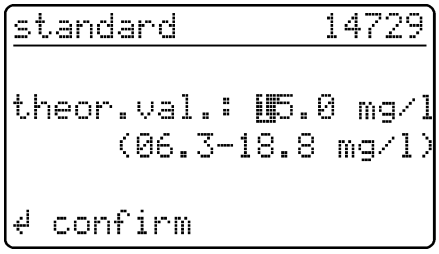
Example:

Method 14729 with a preset theoretical value of 15.0 mg/l and tolerance of 1.0 mg/l (CombiCheck 80).

Change to: theoretical value = 8 mg/l, tolerance = 0.7 mg/l (CombiCheck 20).

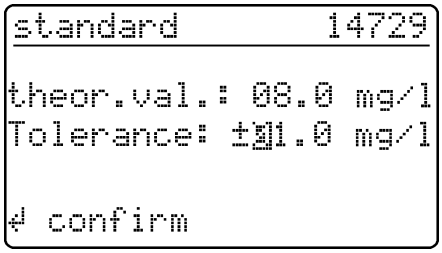


– Confirm with .



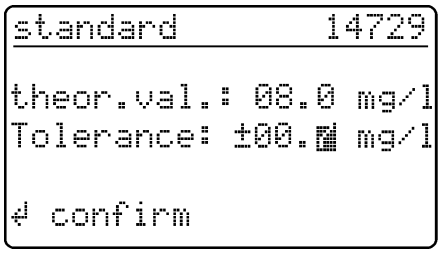
– Enter the new theoretical value, e.g. 8.0 mg/l, with .
Values in parentheses indicate the range in which the theoretical value should move.

– Confirm with .



– Input the tolerance (0.7 mg/l) with .

– Confirm with .

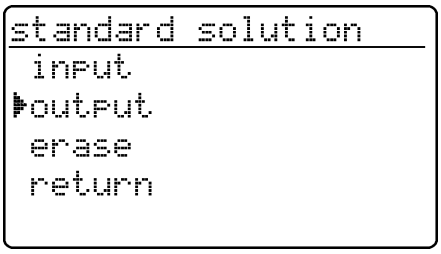


Both standard and tolerance values have been overwritten.

– Confirm with .

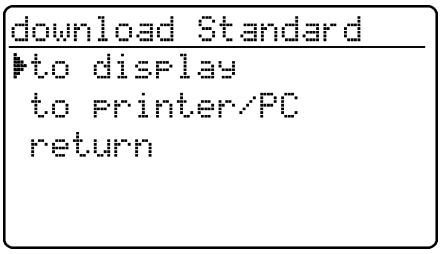
8.3.2 Output of standards

The current list of stored standards is output via the RS 232 interface (PC/printer) or via the display.



– Select the *output* submenu

– Confirm with  .



Select the output medium:

- *to display*
- *to printer/PC* (serial interface).

– Select with 

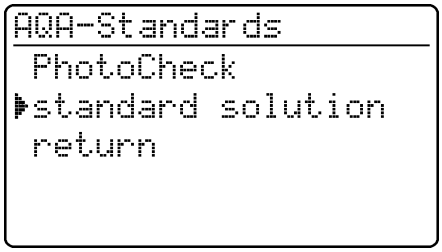
– Confirm with  to start the download.

Example: Report output

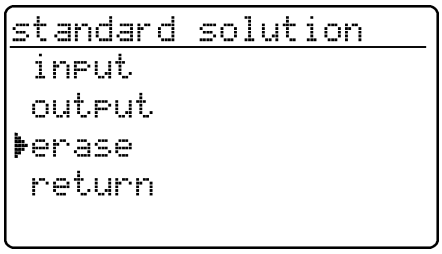
AQA check system		AQA2		
26.08.97		13:57		
system locked		on		
method	unit	theor. val.	tolerance	AQA date
14554	mg/l	2.00	0.20	24.08.97
14555	mg/l	5000	400	26.08.97

8.3.3 Erasing standards

Erasing the method-specific standard solutions leads to the change of the measured value identification from AQA2 to AQA1 (with activated AQA mode).

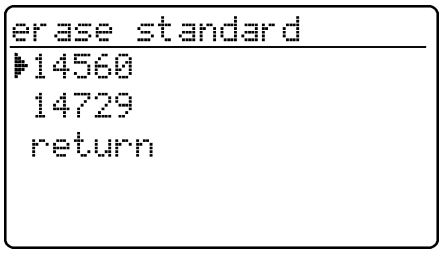


– Call up the *standard solutions* submenu.



– Select the menu item, *erase* with

– Confirm with .



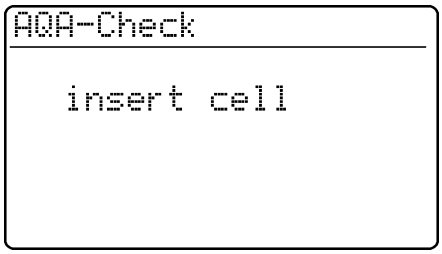
– Select the standard to be erased with

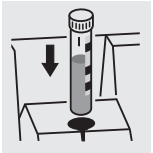
– Erase with .

8.3.4 Monitoring of the total system using standard solutions

The AQA2 check can be performed after it has been activated (see section 8.1).
The following display appears:

For AQA2 with the setting, *n measurements*, we recommend to check and, if necessary, change the currently set number of *measurements* before each AQA check (8.1.2 CHANGING AQA INTERVALS).

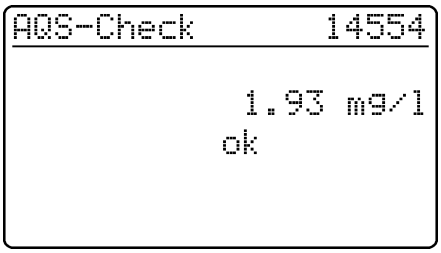




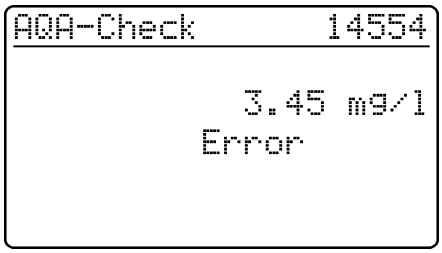
– Insert cell with prepared solution ready to be measured (e.g. using Spectroquant ® Combi-Check). The photometer reads the barcode, identifies the method and performs the AQA2 check.

AQA check OK ...

After approx. 2 s:



...or error message



– Repeat the check
If the error is repeated, perform troubleshooting of the error. See "Analytical Quality Assurance" in part "General information".

The *system* AQA2 check must be performed **separately** for each method monitored.
The release is stored with the date and the specified interval. The AQA2 interval *system* set up for the respective method begins again.

Example: Report output (*AQA mode*: *n weeks*)

AQA check system AQA2
26.08.97 11:02
operator:

AQA interval 4 weeks

method	meas. value	unit	theor. val.	tolerance	result
14554	1.95	mg/l	2.00	0.20	ok

Example: Report output (*AQA mode*: *n measurements*)

AQA check system AQA2
26.08.97 11:02
operator:

AQA interval 100 measurements

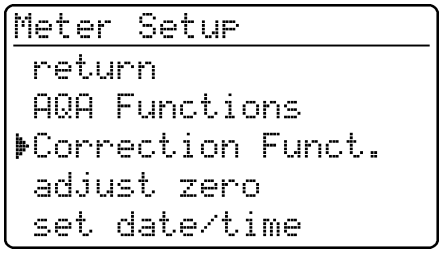
method	meas. value	unit	theor. val.	tolerance	result
14554	1.95	mg/l	2.00	0.20	ok

9. Correction functions

– To switch on the photometer, open the cover.

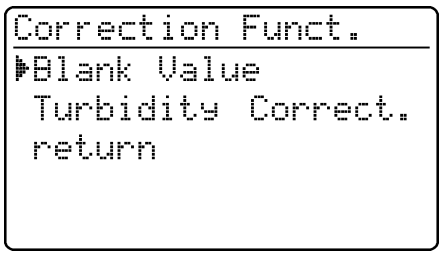
– Press .

– In the *setup* menu, call up the *meter setup* submenu.
The following display appears:



– Call up the *correction funct.* submenu.

The following display appears:



Select the correction function:

- blank value
- turbidity correct.

– Confirm with .

9.1 Blank value

The blank value (= reagent blank value) for each method is stored in the photometer. When the *blank value* function is active, the stored value is ignored and the measured value of a self-prepared reagent blank solution is used instead.

This procedure increases the measuring accuracy for some tests (for more information, see part "Analytical procedures").

A blank value is always stored for the method that was just called up.
A blank value remains stored until it is erased (menu item, *erase blank value*) or overwritten.
The *reset setup* function sets the *blank value* to *off*.
The stored blank values, however, remain stored.

The *reset total* function resets all settings and blank values at once.

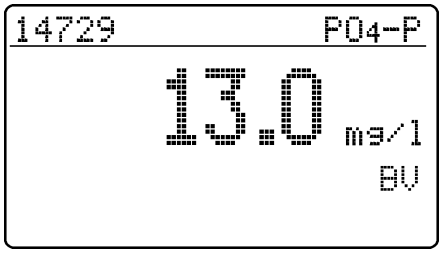
If a measured blank value is stored and the *blank value* function is active for a method, this blank value is used for determining the measured value and the measured value is documented accordingly.

The *blank value* function is not active when delivered.

9. Correction functions

Measuring the concentration with a blank value

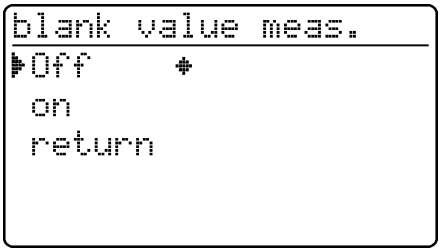
– Press to call up the *concentration* measuring mode.



The value measured against the prepared blank solution is displayed.

9.1.1 Activating the blank value measurement

– In the *correction funct.* menu, call up the *blank value* submenu. The following display appears:



The *blank value meas.* function appears:

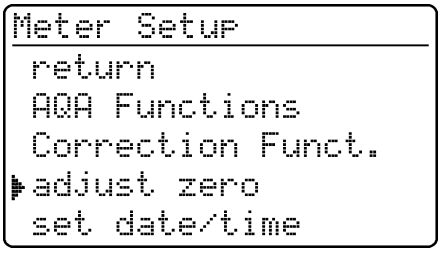
– Select the *on* menu item with

– Confirm with .

The stored blank values determined from blank solutions prepared by the user can be deactivated by switching off the blank value measurement. When doing so, the blank values remain stored in the memory and can be reactivated later.

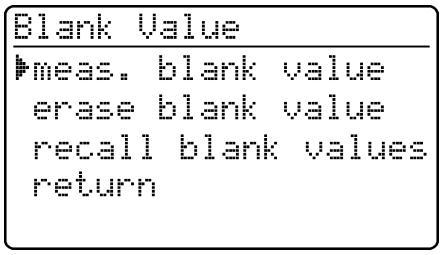
Activating or deactivating the blank value function applies to all measurements using methods a blank value was stored for in the memory.

The *blank value* function is active and appears in the *setup* menu:



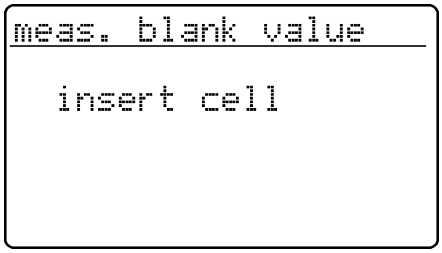
– To measure the blank value, call up the *blank value* submenu in the *setup* menu.

9.1.2 Measuring the blank value



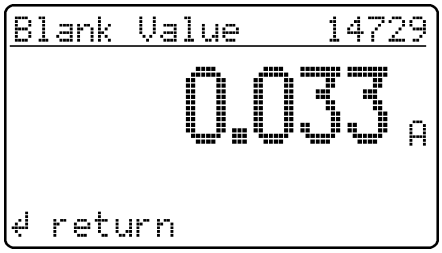
– Call up the *meas. blank value* menu item.

The menu items, *erase blank value* and *recall blank values* first appear after at least one blank value has been measured.



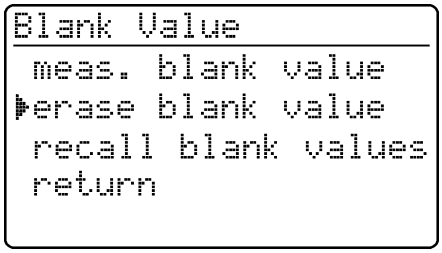
– Insert a cell with blank solution to start a measurement.
The message, *measuring...,* appears on the display.

After approx. 2 s:



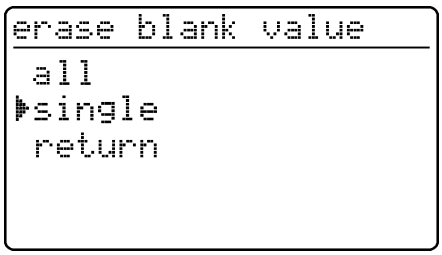
9.1.3 Erasing blank values

A measured blank value is erased via the menu item, *erase blank value*.



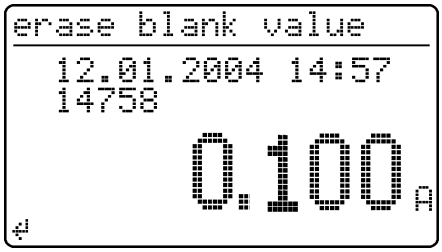
– Select the *erase blank value* menu item
– After confirming with the *erase blank value* menu opens.

The *erase blank value* menu item first appears after a blank value has been measured.



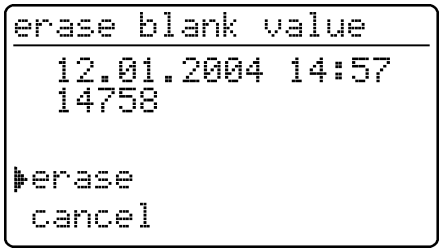
Select between

- *all*
  Erase all stored blank values
- *single*
  Erase individual stored blank value



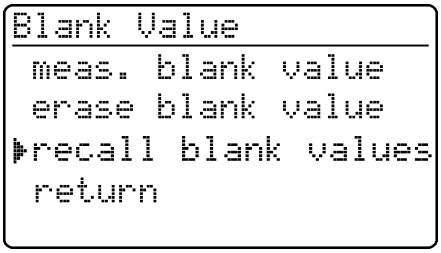
Each stored blank value is displayed with the date of the blank value measurement and the relevant method designation.

– Select the blank value with
– Erase the displayed blank value with .

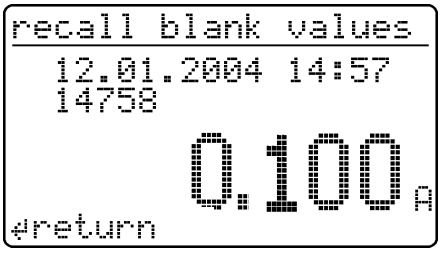


– Select the *erase* menu item with
– Confirm with .

9.1.4 Recalling blank values



– Select the *recall blank values* menu item with
– Confirm with .



– Select the blank value with
– Return with .

9. Correction functions

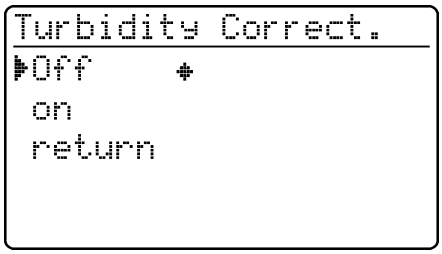
9.2 Turbidity correction

Turbidity correction is used in sample solutions that contain finely distributed suspended particles. The suspended particles cause a light absorption.
This leads to incorrect (too high) measured values. The function remains permanently switched on after it has been activated. Values that were measured using turbidity correction are given an identifier in the **display** and in the **documentation** (printout and storage).

The *turbidity correct.* function is not active when delivered.

i This function is not necessary, or useful, in all methods. If the turbidity correction is active, the photometer automatically decides whether to perform the function or not depending on the method.

– In the *correction funct.* menu, call up the *turbidity correct.* submenu.
The following display appears:

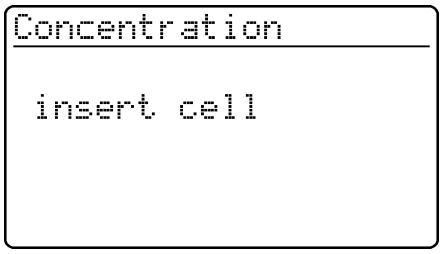


The *turbidity correct.* function appears:

– Select the *on* menu item with

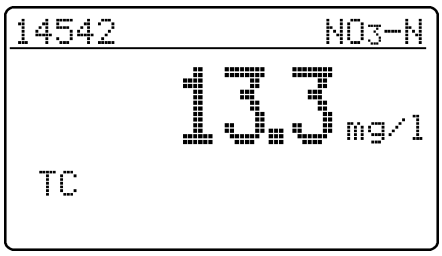
– Confirm with .

– Press to call up the *concentration* measuring mode.



– Insert the measuring cell.

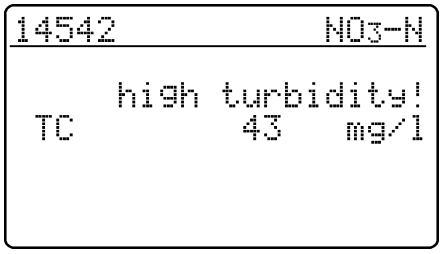
After approx. 2 s:



Display of the measured value with turbidity correction switched on: Identified by *TC.*

Warning of excessive turbidity:

If the turbidity absorbance of *0.100 A* is exceeded, the meter displays the measured value together with a warning.



10. Zero adjustment

Zero adjustment is necessary

- after changing the lamp
- after the error message, *PhotoCheck* (AQA1) occurs
- on initial commissioning
- if the photometer was mechanically stressed, e.g. percussion, transport
- if the ambient temperature changed by more than 5 °C since the last zero adjustment
- at least every six months.

When performing the zero adjustment observe the following points:

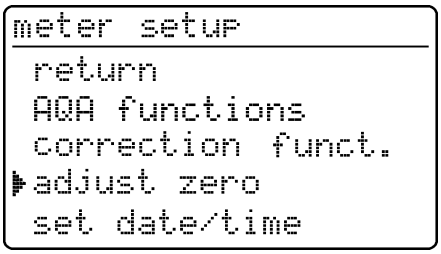
- Only use a clean, scratch-free round cell with distilled water. A prepared zero cell is provided with your photometer. In addition, a prepared zero cell is contained in the scope of delivery of the *PhotoCheck* (article 14693).
- If the round cell is visibly contaminated, or at least every 24 months, clean and refill it (minimum filling level 20 mm). Then check the cell for scratches.

Only perform the zero adjustment against distilled water in an optically perfect cell.

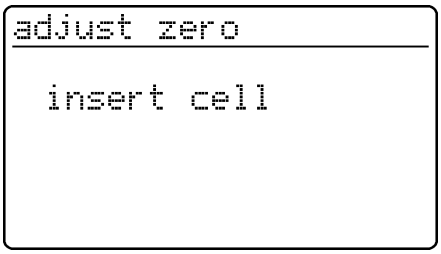
– Press 

– In the *setup* menu, call up the *meter setup* submenu.

The following display appears:



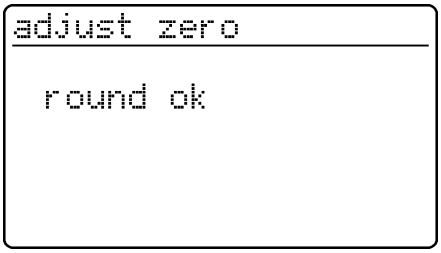
– Call up the *zero adjustment* submenu with  .



– Insert a cell with distilled water.

The message, *measuring...*, appears on the display.

After approx. 2 s:



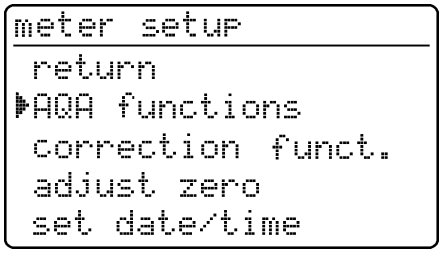
Successful zero adjustment

11. Meter Setup

– To switch on the photometer, open the cover.

– Press 

– In the *setup* menu, call up the *meter setup* submenu.
The following display appears:



This chapter describes four functions of the *meter setup* menu:

- *select language*
- *set date/time*
- *Performing a meter reset*
- *system info*

11.1 Selecting the language

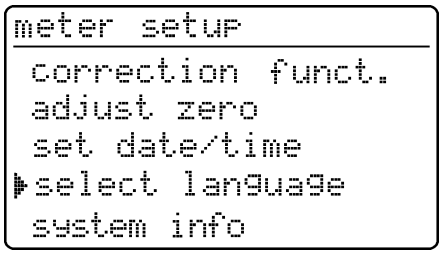
The following languages are stored in the photometer:

- Deutsch (German)
- English
- Français (French)
- Italiano (Italian)
- Português (Portuguese)
- Polski (Polish)
- Dansk (Danish)
- Svenska (Swedish)
- Español (Spanish)
- Nederlands (Dutch)
- Indonesia (Indonesian)
- Ceština (Czech)
- Magyar (Hungarian)
- Russkij (Russian)
- Türkçe (Turkish)
- Brasil (Brasilian)

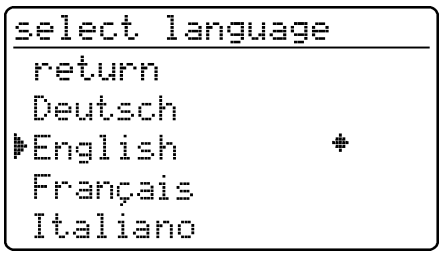
This is the order in which the available languages appear in the *select language* menu.

The available languages are listed in the language of the respective country in the photometer.

When *Russkij* is selected as the language, the Cyrillic alphabet is used for the user guidance. Method designation and ID numbers are always displayed in Latin script.
For output to the RS 232 C interface, Cyrillic characters are converted to Latin characters according to GOST.



– Call up the *select language* menu item.



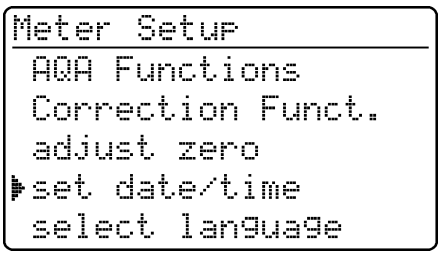
– Select a language, e.g. English

– Confirm with 

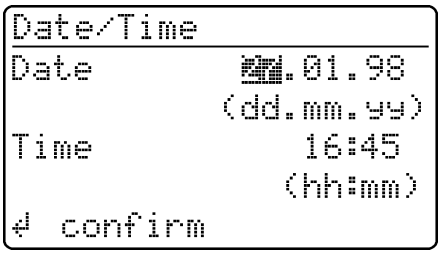
– Press the  key again:
Return to the *meter setup* submenu.

The displays appear in English.

11.2 Setting the date/time



– Call up the *set date/time* menu item.

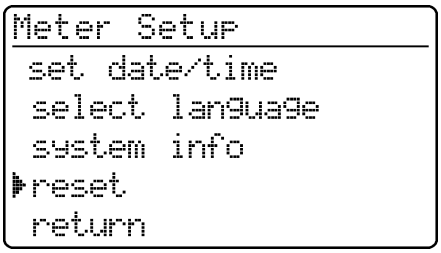


– Input the date using
– Confirm with
– Input the time with
– Confirm with .

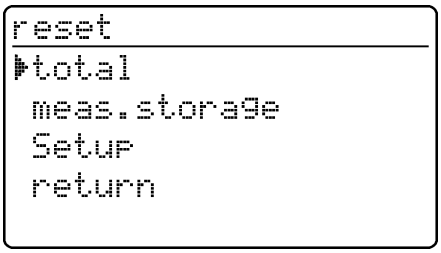
11.3 Reset

It is possible to reset the photometer to its factory settings (delivery state) in single steps. The *reset total* function resets all settings and blank values at once.

All AQA functions are retained when *meter setup* is used.
See section 8.1.5 for AQA reset.



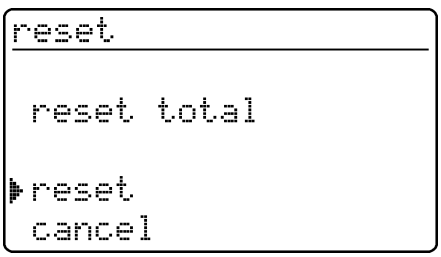
– Call up the *reset* menu item.



Select between

- *total*
  Erase the measured value storage and reset the settings to the delivery state
- *meas. storage*
  Erase the measured value storage
- *setup*
  Reset all settings to the delivery state.

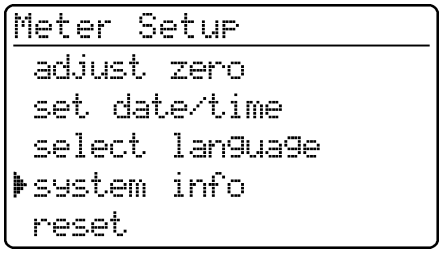
Example: Performing a total reset



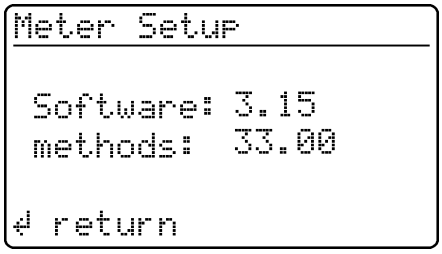
– Select the *reset* menu item
– Confirm with .

A meter reset is performed (measured value memory and setup).

11.4 System info



– Call up the *system info* menu item.



Sample display

12. Updating method data

You will always find the latest method data for your photometer on the Internet. A method update contains all new test sets and methods respectively. Additionally, minor modifications of already existing methods are transferred with it. With a method update, you receive all new methods and, at the same time, can easily and conveniently update all method data.

The software provided for downloading contains the program file and method data. It can be downloaded from our homepage with a mouse click.
The files are packed in a self-decompressing archive file (*.exe) or in a zip file (*.zip) and can be decompressed after the download.

To download and update the photometer method data via the built-in RS232 interface, you need the following:

- PC (Win 95 or higher) with Internet connection
- PC cable (available as an accessory)
- An *.exe or *.zip file from the Internet; contains the "UpdateMethodData.exe" program file and 6 method data files (pls6md.xxx, pls12md.xxx, plspekmd.xxx, nova30md.xxx, nova60md.xxx, nova400md.xxx; xxx = version).

Carry out the update as follows:

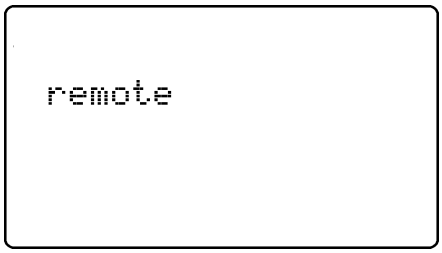
– Switch on the photometer (open the cover).
– Switch on the PC.
– Download from the Internet the software including the method data (*.exe or *.zip) and copy it into a separate directory or on a floppy disk.
– Decompress the *.exe file with a double-click or decompress the *.zip file with Winzip.
– Connect the serial interfaces of the PC and photometer with the cable.
– Start the "UpdateMethodData.exe" program file by double-clicking. The "Update Method Data" window appears. In the upper half of the window there is the name of your photometer (among other things), behind it there is the method version in brackets (e.g. 8.00).

All method data are reloaded into the photometer with the update. The old method data are overwritten by this.

– Click on the "Search meter" button.
The program automatically recognizes the connected photometer. Another "Update Method Data" window appears.
– Click on the "Start" button to start the method download. The process takes approx. 3 minutes. You can terminate it at any time by clicking on the "Cancel" button. In this case, however, the download has to be carried out once again completely so that the photometer can save the method data and is operative.

12. Updating method data

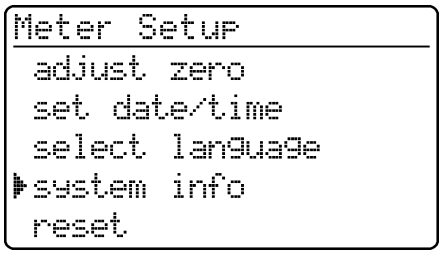
During the download, the following display appears on the photometer screen:



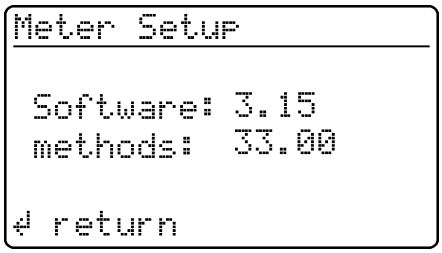
– After the download, confirm the "Data successfully downloaded" message. The download is finished. The photometer returns to the *concentration* measuring mode.

You can check whether the new method data are stored in the photometer.
To do so, proceed as follows:

– In the setup menu, call up the meter setup submenu.



– Call up the *system info* menu item.



Sample display (the software version is irrelevant here).
The method version (here: 33.00) has to agree with the method version for your photometer in the "Update Method Data" window during the download.

Error messages

Message	Meaning	Remedy
No meter found	Connection PC - photometer out of order or not available	– Tightly connect the cable to the serial interfaces of the PC and photometer.
		– Use the correct cable
	Photometer not recognized	– Select the photometer manually

13. RS 232 C interface

Via the interface, data can be

- output to a printer and
- exchanged with a personal computer (PC)

For this, the following items are available as accessories:

- Printer cable
- Printer
- Interface cable
- Communication software.

13.1 Principle course of the remote control

String to meter	Reply from meter	Operating mode
S <CR>	> <CR>	Remote (remote control)
Command xx (see 15.2 command list)	Reply string command xx <CR>	Remote (remote control)
.		
.		
.		
CLOC <CR>		Concentration measurement

The keyboard of the photometer is locked in the *remote* operating mode.

13.2 Command list

Command	Function
S	Begin communication
CLOC	Switchover to normal operation (concentration measurement)
CDAT [anz]	Reads out stored measured values; [anz] = number of the measured values to be output
CMES [MMM]	Measurement and transmission of the concentration value with date/time; [MMM] = method number (e.g. 086 for method 14729)
CEXT [LLL]	Measurement and transmission of the absorbance value for the wavelength; [LLL] = wavelength
CBLA [MMM]	Measurement and transmission of the sample blank value; [MMM] = method number
CCLB [MMM]	Erase measured sample blank values; [MMM] = method number

The error message, *Invalid command,* appears if commands are unknown or cannot be carried out (e. g. if optional parameters do not agree with the cell coding). Optional parameters [MMM] and [LLL] need only be input for uncoded cells.

13. RS 232 C interface

13.3 Output format of measured values

Character	Meaning
3	consecutive number (not required for interface commands CMES, CEXT and CBLA)
5	method designation
6	I. D. number
17	date and time
4	special characters
9	meas. value
10	unit
12	citation
4	AQA ID (AQA2/AQA1)

Notes:
Data fields are separated by spaces.
Character set: IBM, code page 437

Meaning of the special characters:

! = Measuring with blank value (concentration) or reference absorbance (absorbance)

t/T = Measurement with turbidity correction/with high turbidity

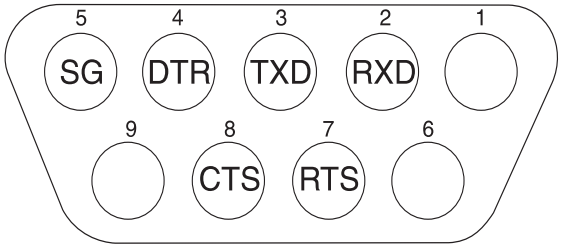
* = Measured value outside the measuring range

Q = AQA measurement

13.4 Data transmission

Baud rate	4800
Data bits:	8
Stop bits:	1
Parity:	none
Handshake:	Hardware
Max. cable length	15 m

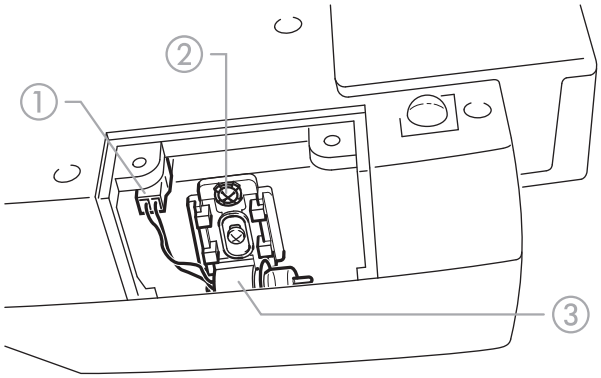
13.5 Pin assignment



Photometer 9-pin socket	Computer 9-pin socket	25 pin plug	Printer with RS 232 C interface
1	4	20	-
2	3	2	TXD
3	2	3	RXD
4	1 and 6	6	-
5	5	7	SG
6	4	20	-
7	8	5	-
8	7	4	DTR (if not available: short-circuit CTS and RTS)
9		-	-

14. Maintenance, cleaning, disposal

14.1 Maintenance - Changing the lamp



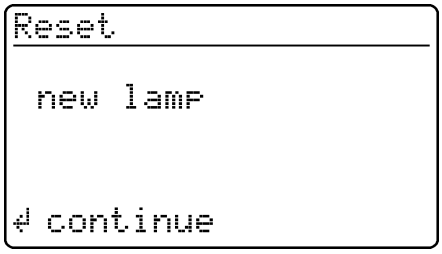
– Switch off the photometer and disconnect it from the power line
– Carefully turn up the photometer and park it safely
– Screw off the lamp cover on the underside of the photometer

Let the lamp of the photometer cool down.

– Pull out the plug ①
– Unscrew the screw ②
– Remove the lamp with its holder ③ by pulling it gently upwards

Do not touch the new light bulb of the photometer.

– Insert a new preset lamp and screw it tight using the screw ②
– Connect the plug ① of the new lamp
– Screw the lamp cover on again
– Set up the photometer again and connect it to the power line
– Press and hold
– Switch on the meter (open the cover) and after the following display appears, release :



– Press

14.2 Cleaning - Actions to take if a cell is broken

Do not rotate the photometer to pour out the liquid!

The photometer has a draining mechanism under the cell shaft that, when operated correctly, prevents any liquid coming into contact with electronic components.
– Switch off the photometer (close the cover) and disconnect it from the line power
– Let the liquid drain off
– Carefully remove any pieces of glass, e.g. using tweezers
– Carefully clean the cell shaft with a damp, lint-free cloth
– Let the cell shaft dry

After it is dry, check the photometer:
– Perform a photometer monitoring (see section 8.2).

14. Maintenance, cleaning, disposal

14.3 Disposal

Packing

The measuring instrument is sent out in a protective transport packing.
We recommend: Keep the packing material in case you have to send the measuring instrument back for service. The original packing prevents the measuring instrument from being damaged during transport.

Measuring instrument

Dispose of the measuring instrument as electronic waste at an appropriate collection point. It is illegal to dispose of it in household refuse.
Within the European Union, the batteries are removed at a specialized treatment center at the instrument's end of life. The instruments are taken to one of those specialized treatment centers via the recycling system set up for this purpose.

15. Technical Data

Optical measuring principle	Filter photometer with reference beam absorption measurement; simultaneous recording of all wavelengths
Light source	Tungsten halogen lamp, preset
Receiver	6 x photo diode array
Optical filters	340 nm, 445 nm, 525 nm, 550 nm, 605 nm, 690 nm, Accuracy: ±2 nm; Half width: 340 nm = 30 nm ±2 nm; all others = 10 nm ±2 nm
Photometric reproducibility	0.001 A at 1.000 A
Photometric resolution	0.001 A
Warm-up time	none
Measuring time	approx. 2 s
Types of measurement	Concentration (method dependent, selectable display form), absorbance, transmission
Measuring range absorbance	–0.300 A to 3.200 A
Measuring range transmission	0.1 % to 1000 %
Balancing	Permanently stored
Drift correction	Automatic on each Self-Check
Retrofitting of new methods	via the Internet
Bar code recognition	automatic selection of the method; automatic recognition of the reagents lot
Cell recognition	automatic
Self-Check	*Test:* Memory, optics, electronic measured value recording, barcode recognition, cell recognition *Automatic calibration:* Optics, electronic measured value recording, barcode recognition
Time/Date	Real-time clock in the photometer
Dimensions	H: 140 mm, D: 270 mm, W: 260 mm
Weight	approx. 2.3 kg (battery version: 2.8 kg)
Meter safety	EN 61010, IEC 1010
Safety class	EN 61010-1/class 3
Power pack	FRIWO FW 7555O/15 Friwo Part. No. 1822367 --- RiHuiDa RHD20W150100 --- Input: 100 ... 240 V ~ / 50 ... 60 Hz / 400 mA Output: 15 V DC / 1 A
Power consumption in line operation	max. 1300 mA
Batteries	
● **Backup battery**	1 x 3,0 V Lithium battery, soldered in the instrument
● **Battery (optional)**	Built-in battery: NiMH rechargeable battery 7.2 V/2500 mAh, operating time with new, fully charged battery: typical 40 hours with 10 measurements per hour, trickle charging in line operation, approx. 5 h charging time for a discharged battery, total discharge protection
EMC	Directive 2004/108/EU EN 61326-1 EN 61000-3-2 EN 61000-3-3 FCC class A
Climatic class	2, VDI/VDE 3540
Ambient temperature	Storage: –25 °C to +65 °C Operation: +5 °C to +40 °C
Allowable relative humidity	Annual mean: 75 % 30 days/year: 95 % other days: 85 %
Test certificate	CE

15. Technical Data

Operating elements	On/off switch actuated by opening/closing the lid of the cell shaft cover Silicon keyboard with 4 function keys Cell shaft – for round cells (flat cell floor, external/internal diameter 16 mm / 13.8 mm) –
Display	Graphical display 128 x 64 pixels
Connections	
● **Digital interface**	RS 232 C 9-pin socket to connect to PC or printer
● **Power supply**	2-pin socket to connect the plug-in power supply unit
Data storage	Cyclical memory to record 500 measured values

Equipment Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Software settings when delivered	
Measured value number:	1
blank value is:	Off
turbidity correct.:	Off
language:	English
Date of the last valid AQA1 check:	invalid (not yet measured)
AQA1 interval:	12 weeks
AQA2 interval:	4 weeks
AQA password:	0000
AQA mode:	Off
Lock measurement if AQA2 expired:	Off
Checks to be measured with AQA1:	none
AQA2 values:	none

Settings after reset - total
Measured value storage and setup reset

Settings after reset - meas. storage	
Meas. value number:	1
Measured values:	none

Settings after reset - setup	
Measured value number:	1
blank value:	Off
reference absorbance:	Off
turbidity correct.:	Off
Language:	unchanged

Settings after reset - AQA	
Date of the last valid AQA1 check:	invalid (not yet measured)
AQA1 interval:	12 weeks
AQA2 interval:	4 weeks
AQA password:	0000
AQA mode:	Off
Lock measurement if AQA2 expired:	Off
Checks to be measured with AQA1:	none (Input theoretical values and tolerances are not erased and are offered again with the next input).
AQA2 values:	none (theoretical values and tolerances of all methods are set to default values according to the "Spectroquant® CombiCheck and standard solutions" table in the part "General information".)

16. What to do if…

The display remains blank when switched on	Connect the photometer to the line power via the power pack. In the case of battery operation: Battery empty, charging required (approx. 5h); line operation is possible without restrictions during charging time.
 **appears**	Battery nearly empty. Charging required (see chapter 3 COMMISSIONING).
Date/time is lost when switched off	The backup battery of the real time clock is empty and has to be replaced. Send the photometer to the service department for this.
Password forgotten	Inform the service department.
Photometer does not react	The connected printer is off line. Switch on the printer or pull out the interface cable.
Error messages:	
remove cell	The message remove cell appears on the display although no cell is inserted. Clean the cell shaft with a damp, lint-free cloth. If the error message still appears, return the photometer to the service department.
lamp defective	Replace the lamp (see chapter chapter 14 MAINTENANCE, CLEANING, DISPOSAL).
no zero adjustment	No zero adjustment is stored in the meter for the cell. Perform zero adjustment (see chapter chapter 11 ZERO ADJUSTMENT).
method invalid	No data is stored in the photometer for the selected method. Update method data (see chapter chapter 12 UPDATING METHOD DATA).
wrong method	During a difference measurement, the method was changed between the first and second measurement. During a difference measurement, the method must remain identical.
E_0	Hardware error: Send the photometer to the service department.
E_1*, *E_2* or *E_3	Replace the lamp (see chapter chapter 14 MAINTENANCE, CLEANING, DISPOSAL). If the error message remains, send the meter to the service department.

What can Xylem do for you?

We're a global team unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

For more information on how Xylem can help you, go to xyleminc.com.

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