

RQflex 2



Manual English



Contents

1	Introduction	3
2	Description of the instrument	5
	display, keys	6
	technical data	8
3	Setting up the instrument	9
	insertion of batteries	10
	setting the time and date	11
4	Coding	13
	reasons for coding	14
	coding procedure	14
5	Measurement	15
	method procedures A, B, C, D	16
6	Handling measurement results	21
	storing measurement results	22
	displaying stored data	23
	data transfer to a PC	23
	deleting data	24
7	Maintenance of the instrument	25
	handling	26
	cleaning the adapter	26
	recalibration	27
8	Trouble-shooting	29
	error messages, problems, solutions	30

Introduction

Introduction

Please read the RQflex 2 instruction manual carefully before operating.

The manual is well structured and illustrated. We recommend that you read the manual in conjunction with using your instrument. For the analysis procedure please follow the detailed description in the package insert of the respective Reflectoquant® tests.



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Description of the instrument



Description of the instrument

Your RQflex 2 is a versatile, precise instrument. It is part of the Reflectoquant® system with the components:

- Instrument RQflex 2
- Reflectoquant® strips
- Test- and batch-specific bar-code strip

According to the principle of reflectometry (remission photometry), reflected light from the strip is measured. Just as in classical photometry, the difference in intensity of emitted and reflected light allows a quantitative determination of the concentration of specific analytes.

Display and operation keys (buttons)

Operation keys (buttons) 1

Display for the display of messages and information 2

Interface, connection to PC 3

For RQdata only (see p. 23)

Do not use to connect an external power supply!

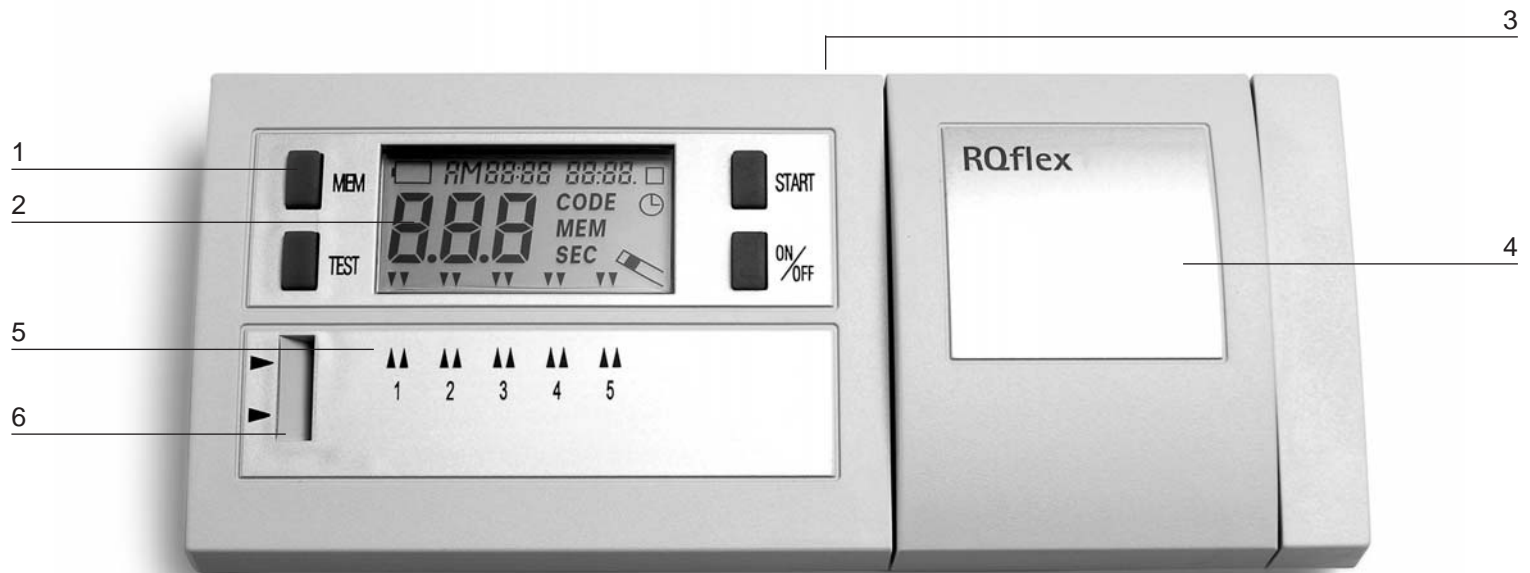
Lid 4

Method register 5

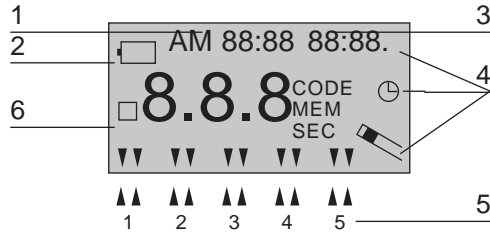
Up to five analytical methods, e.g. nitrate, pH value, can be stored simultaneously. Methods are loaded by means of the bar-code strip.

Bar-code scanner 6

All information necessary to run the instrument is communicated via the bar-code strip. The bar code contains information for wavelength correction and for the batch-specific calibration curve.

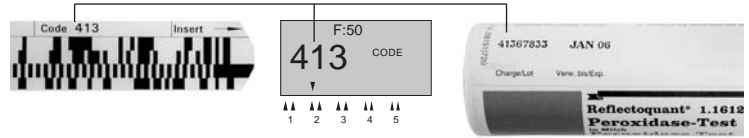


After switching on the RQflex 2 a self-diagnosis is performed for about 1 second. Ensure that all functions, especially the multifunctional digit display, are shown correctly.



Time	1
LOW BATTERY change of batteries	2
Date	3
Symbols for measurement procedure	4
Methods	5
Multifunctional display	6

Instrument, tests, and bar-code strips are tuned to each other. Ensure that the reference number (code) for all three components matches.



Technical data

Dimensions:	19 x 8 x 2 cm
Weight:	275 g
Memory:	5 methods, 50 measurements results
External output:	Yes
Light source:	4 LEDs (570/657 ± 10 nm), double optics
Power source:	4 AAA batteries (> 1000 measurements)
Display:	LCD
System diagnosis:	Yes
Measurement range:	4-90% rel. remission
Reflection area:	4 x 6 mm
Resolution:	0.1% rel. remission
Photom. accuracy:	0.5% rel. remission (measurement to measurement, instrument to instrument)
Operating temperature:	5-40°C for ideal measurements
Operating humidity:	Below 90% for ideal measurements

Setting up the instrument




Setting up the instrument

Insert the four supplied batteries into the instrument (AAA).

Insertion of batteries


When?

Before first use or when the LOW BATTERY sign  is shown in the display.

How?

1. Remove the lid of the battery compartment on the back of the instrument by pressing carefully in the indicated direction.
2. Insert the batteries into the compartment, heeding the + and – pole signs.
3. Close the battery compartment.

Important

When the LOW BATTERY sign  first appears, approximately 20 measurements can still be performed. Afterwards the instrument cannot be switched on.

After screen shutdown, data will be safe for at least two minutes. To avoid losing stored data, replace batteries immediately.



Setting the time and date

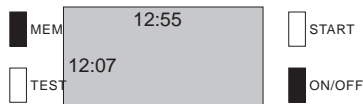
When?

1. With a new instrument.
2. With the change of summer/winter time.
3. Check after replacement of batteries.

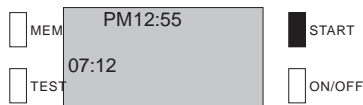
How?

1. Switch off instrument.
2. Press the MEM button and simultaneously press the ON/OFF key.
The time and date display blinks after 2 seconds.
3. To select the international or American date press the START button.
4. Press the TEST button to access hour, minute, day, and month.
5. Press the START button to adjust the time (hour, minute) and the date (day, month).
6. The clock is then activated by pressing the MEM or ON/OFF key.

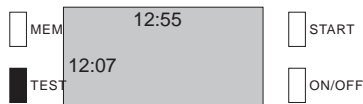
2



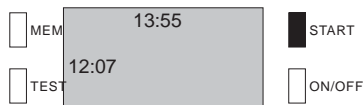
3



4



5



A close-up photograph of a Merck RQflex 2 test strip. The strip is black and rectangular, with a white label at the top left corner containing the number '12'. The strip is partially inserted into a white plastic holder. The holder has a small white arrow pointing to the right, indicating the direction of insertion. The background is a plain, light-colored surface.

12

Merck RQflex 2

RQflex 2 uniquely combines the simplicity of test strips and test kits with the accuracy of instrumental mobile on-site analysis.

Coding



Coding

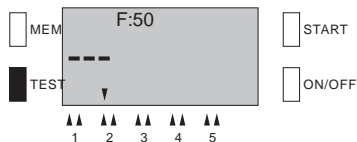
When?

1. With a new instrument.
2. With a new batch of Reflectoquant® strips.
3. When overwriting an existing method.
4. When loading a new method (test).

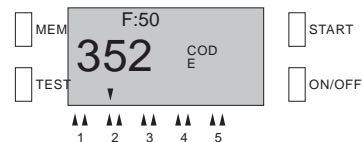
How?

1. Remove the specific bar-code strip from the Reflectoquant® pack.
Certain tests require two bar-code strips.
2. Switch on the instrument by pressing the ON/OFF button and open the lid. The display of F:50 indicates that all 50 memory slots are available.
3. Press the TEST button until the arrow points to the corresponding method where you wish to store the new code.
4. Insert the bar-code strip along the bar-code reader in one uninterrupted movement from left to right (indicated direction) as far as it will go. Then remove it.
5. The coding process is successfully finished when the left-hand three digits of the batch number are displayed. In addition a beeper sounds. The small arrow in the display indicates the memory place (1–5) where the test data are stored.
6. Repeat this procedure until the beeper sounds. Entry is now complete.
7. Return the bar-code strip to the Reflectoquant® pack. (Keep it safe, but do not put the bar-code strip into the aluminium tube!)

3



5



Important

Overwriting a method

- A coded (memorized) method is overwritten when a new bar code is scanned in.
- All measurement data stored for a given method is lost when it is overwritten.
- The blinking MEM in the display indicates that measurement data are stored. If these data are still required they must be recorded separately by pressing the MEM button (see data handling).

Methods that require two bar-code strips

- After scanning in the first bar-code strip, methods needing two bar-code strips show the three-digit reference number and the symbol --- in the display alternately.
- As soon as the second bar code has been scanned in (the sequence is of no importance) only the batch reference number is shown.

Measurement



Measurement

There are four distinct measurement procedures, A, B, C, D. The four procedures are very similar and differ only in the first steps. Each measurement procedure is test-specific. The procedure cannot be selected by the user, but instead is transferred to the instrument via the bar code. All steps involved to obtain the result are displayed on the screen by different symbols. Please also refer to the respective Reflectoquant® package insert.



Procedure A

In this procedure, only the reaction time of the Reflectoquant® strip has to be considered.

How?

1. Switch on the instrument by pressing the ON/OFF button.
2. Press the TEST button until the pointer indicates the desired method.

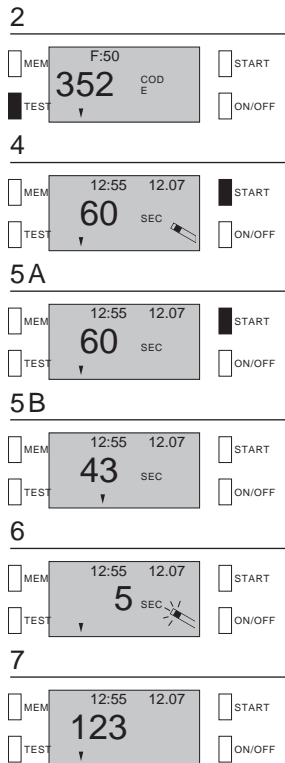
3. Compare the first three digits of the batch number of the Reflectoquant® pack. This reference number must be the same as the one displayed (if not, see Coding).

4. Press the START button. The test-specific reaction time is shown (seconds).

5. Immerse the strip into your sample as described in the Reflectoquant® instruction leaflet and at the same time press the START button (A). Allow excess liquid to run off via the long edge of the strip onto an absorbent paper towel. The stopwatch function of the instrument is now activated. The remaining reaction time is shown as it counts down (B).

6. Five seconds before the end of the reaction time the beeper sounds and the blinking strip symbol is displayed. Now insert the strip all the way into the measurement chamber.

7. The measurement result is shown in the display in the units for the respective test, e.g. (mg/l), and is automatically stored in sequence.



Procedure B

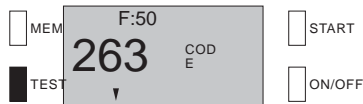
Besides the reaction time of the Reflectoquant® strips this procedure also considers the reaction times of auxiliary reagents.

Procedure B is indicated by the watch symbol.

How?

1. Switch on the instrument by pressing the ON/OFF button.
2. Press the TEST button until the pointer indicates the desired method.
3. Compare the first three digits of the batch number of the Reflectoquant® pack. This reference number must be the same as the one displayed (if not, see Coding).
4. Press the START button. The reaction time of the auxiliary reagent appears in the display, e.g. 120 sec (A). Proceed as described in the respective Reflectoquant® package insert. Press the START button again to activate the stopwatch function (B). When the reaction time of the auxiliary reagent has expired, a strip symbol appears in the display and the reaction time of the strip, e.g. 60 sec., is shown (C).
5. Immerse the strip into your sample as described in the Reflectoquant® instruction leaflet and at the same time press the START button (A). Allow excess liquid to run off via the long edge of the strip onto an absorbent paper towel. The stopwatch function of the instrument is now activated. The remaining reaction time is shown as it counts down (B).

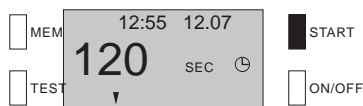
2



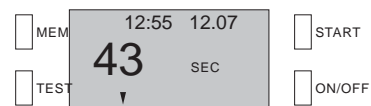
5A



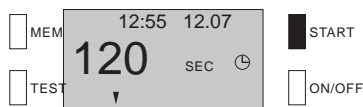
4A



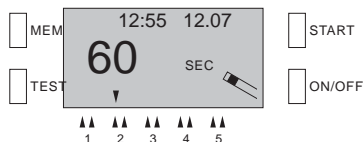
5B



4B



4C



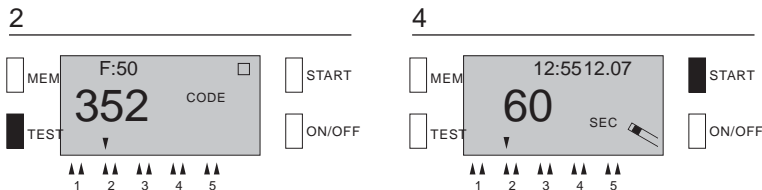
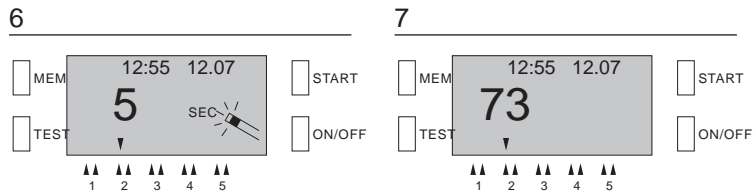
- Five seconds before the end of the reaction time the beeper sounds and the blinking strip symbol is displayed. Now insert the strip all the way into the measurement chamber.
- The measurement result is shown in the display in the units for the respective test, e.g. mg/l, and is automatically stored in sequence.

Procedure C

With this procedure the instrument is calibrated by means of an unused Reflectoquant® strip.

How?

- Switch on the instrument by pressing the ON/OFF button.
- Press the TEST button until the pointer indicates the desired method.
- Compare the first three digits of the batch number of the Reflectoquant® pack. This reference number must be the same as the one displayed (if not, see Coding). The blank square symbol prompts you to insert a dry unused Reflectoquant® strip.
- Press the START button. The instrument is now calibrated. For measurement follow the respective procedure A or B.



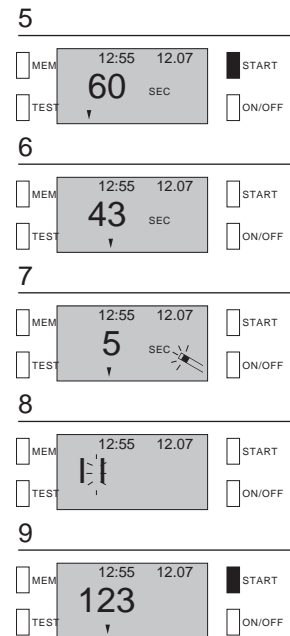
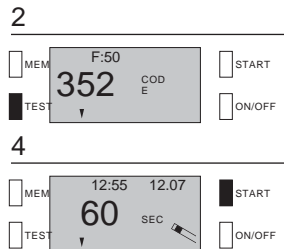
Procedure D

This procedure is used to calibrate the instrument by means of an already used Reflectoquant® strip.

How?

1. Switch on the instrument by pressing the ON/OFF button.
2. Press the TEST button until the pointer indicates the desired method.
3. Compare the first three digits of the batch number of the Reflectoquant® pack. This reference number must be the same as the one displayed (if not, see Coding).
4. Press the START button. The test-specific reaction time is shown (seconds).
5. Immerse the strip into your sample as described in the Reflectoquant® package insert and at the same time press the START button. Allow excess liquid to run off via the long edge of the strip onto an absorbent paper towel.
6. The stopwatch function of the instrument is now activated. The remaining reaction time is shown as it counts down.
7. Five seconds before the end of the reaction time the beeper sounds and the blinking strip symbol is displayed. Now insert the first strip all the way into the measurement chamber.

8. Two alternately blinking strip symbols in the display prompt you to remove the first strip and to insert the second strip into the measurement chamber.
9. After inserting the second strip press the START button anew. The measurement result is shown on the display in the units for the respective test, e.g. mg/l, and is automatically stored in sequence.



Important

Interrupting the measurement procedure (menu guidance)

When?

1. To repeat a measurement e.g. when the strip was inserted incorrectly or too late.
2. For serial measurements.

How?

Once the first measurement has been completed, a further measurement can be carried out simply by pressing the START button. In the case of procedure D the START button has to be pressed twice in brief succession. In all these cases the instrument makes the measurements immediately. The result is displayed and stored automatically.

Remarks regarding serial measurements

If you wish to measure e.g. several nitrate samples, it is advisable to follow the procedure below. For repeat serial measurement the countdown function is not available and an additional stopwatch is needed.

1. Run the standard measurement (Procedure A) once.
2. Immerse separate Reflectoquant® strips into your sample at 15-second intervals. Shake off any excess liquid and allow each strip to react outside the instrument.
3. After completion of the reaction time (60 seconds) insert each strip into the instrument. Press the START button to perform the measurement (i.e. a strip is inserted and measured every 15 seconds).

Warning

The reaction times of the strips must be monitored precisely. Differences from the default value may cause (false-low) errors in the result due to changes in strip colour with time. To save batteries the instrument switches off after 2 minutes if no key is pressed within this time period.

Handling measurement results



Handling measurement results

When?

1. To store measurement results.
2. To recall measurement results.
3. To transfer measurement results to a PC.
4. To delete stored measurement results.

Storing measurement results

How?

Measurement results are automatically stored together with the time and date.

The instrument stores up to 50 results.

When the batch number is shown the number of available memory slots,

e.g. F:21, is displayed instead of the time and date.

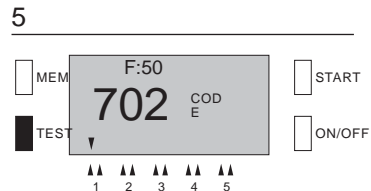
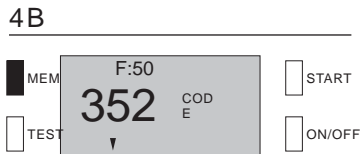
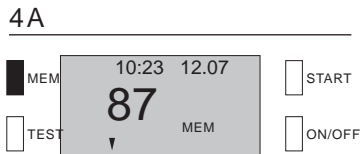
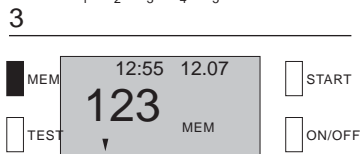
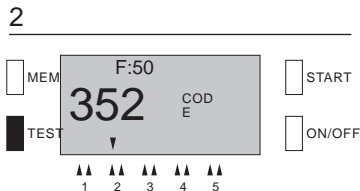
Important

The display of F:00 indicates that all 50 storage slots are occupied. The next measurement result overwrites the oldest one (i.e measurement 51 replaces 1).

Displaying stored data

How?

1. Switch on the instrument by pressing the ON/OFF button.
2. Press the TEST button until the pointer indicates the desired method. The three-digit reference code is shown.
3. Press the MEM button. The last stored result of the method in question is shown. If no data are stored, a beeper sounds. The display still shows the reference number.
4. Repeated pressing of the MEM button displays the stored data in reverse time and date order (A).
The display of the reference code in conjunction with the sound of the beeper indicates that no further data are stored (B).
5. To select stored data of another method press the TEST button to set the pointer. Then press the MEM key to display the data.
6. To finish the operation press the ON/OFF (or the TEST) button.



Transferring data to a PC

When?

For quality assurance and/or documentation of measurement results.

How?

The instrument is connected to your computer via a special interface. For this you need a special software program – RQdata – that provides you with the necessary instructions.

Deleting data

When?

1. To delete the last result.
2. In the case of an incorrect measurement.
3. To delete all measurement results.

How?

When the reference code is displayed, press the MEM button for three seconds. This deletes the most recent stored result. During this procedure, the result to be deleted blinks in the display and a beeper sounds.

Deletion is complete when the display shows 000. Press the TEST button.

The reference code appears again.



Important

All stored data for a method are deleted when the instrument is coded with a new bar-code strip!

Maintenance of the instrument



Maintenance of the instrument

To obtain consistently exact measurement results please follow these instructions for cleaning and maintenance.

Handling

1. The instrument is very robust. Nevertheless you should handle it carefully as with any other electronic device.
2. Do not expose the instrument to excessive humidity and heat or cold (see Technical data).
3. The outside case and the display can be cleaned with a moist cloth. Do not use solvents or abrasive cleaning agents.



Cleaning the strip adapter

When?

The strip adapter must be cleaned immediately if an error message (OPT or ERR) is displayed.

The strip adapter should be thoroughly cleaned (dismantling the strip adapter into its individual components) on a regular basis. Please refer to the Reflectoquant® insert for the recommended period of use.

How?

1. Switch off the instrument.
2. Carefully pull the strip adapter out of the case.
3. Dismantle the adapter into its three components.
4. Clean the components with water and a mild detergent. If necessary use ethanol. NEVER clean the white section with abrasive cleaner as this will destroy its reflective properties.
5. Dry the components carefully and reassemble the adapter.
6. Reinsert the adapter into the instrument.

Recalibration

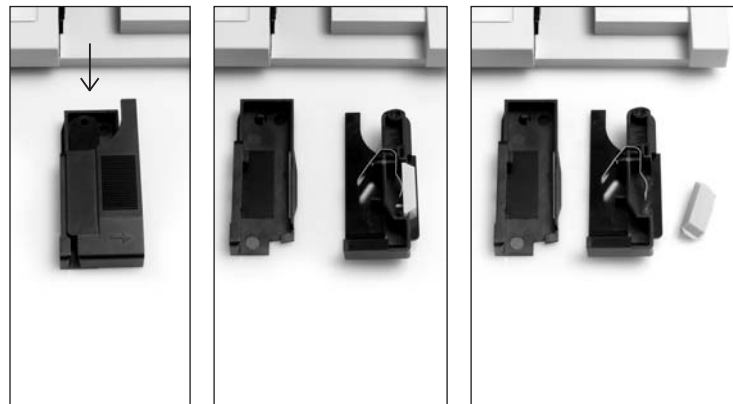
The recalibration set consists of an internal standard (grey plastic part), a bar-code strip for calibration, and a white calibration strip.

When?

1. In the case of suspect measurement results.
2. After a change of the strip adapter and/or the internal standard.
3. After severe mechanical distress (e.g. fall).
4. In the case of the error message (OPT or ERR).

How?

1. Clean the strip adapter thoroughly. Take care that the internal standard has not changed colour (if necessary exchange the internal standard).
2. Store the instrument at 18-22 °C for at least 30 minutes.
3. Insert the adapter and switch on the instrument.
4. Insert the bar-code strip for calibration. CAL appears in the display.
5. Insert the calibration strip, checking for proper alignment. Always ensure that the calibration strip is clean.
6. Press the START button. The instrument is recalibrated, the CAL symbol disappears, and the instrument switches off automatically.
7. Store the calibration set carefully in the case provided.



Important

When the batteries are low (display) the instrument will not accept a recalibration. Change the batteries first.

If the white calibration strip is not inserted into the measurement chamber, the beeper sounds after the START button is pressed.

The blinking CAL symbol in the display prompts you to insert the white calibration strip.

Merck RQflex 2

More than 50 different parameters can be measured quantitatively by using the different Reflectoquant® strips.



Trouble-shooting



Trouble-shooting

The following table shows explanations of the error messages and tips on how to avoid incorrect measurements.

The most commonly encountered problems are caused by:

- strips not being inserted correctly.
- the reaction time of the strip not being right (too long or too short).
- incorrect use of strips (e.g. pH not correctly adjusted, tube for strips not closed etc.).

Problem	Cause	Solution
• No display	<ul style="list-style-type: none"> • Batteries not inserted properly • Batteries are drained 	<ul style="list-style-type: none"> • Check batteries • Check polarities • Use new batteries
• Display LO	<ul style="list-style-type: none"> • Concentration is lower than the measurement range of the strips 	<ul style="list-style-type: none"> • Report the result as lower than the detection limit of the respective RQ strip

Problem	Cause	Solution
• Display HI	<ul style="list-style-type: none"> • Concentration is higher than the measurement range of the strips 	<ul style="list-style-type: none"> • Dilute the sample; do not forget to consider the factor for dilution when reporting the result
• Display - - -	<ul style="list-style-type: none"> • No code programmed 	<ul style="list-style-type: none"> • New coding required
• Display OPT	<ul style="list-style-type: none"> • Optics or strip adapter is dirty 	<ul style="list-style-type: none"> • Clean optics and adapter and switch the RQflex 2 on and then off again. Recalibrate, if necessary.
• Display ERR	<ul style="list-style-type: none"> • Optical error • Strip adapter is assembled incorrectly 	<ul style="list-style-type: none"> • Clean optics and adapter. Recalibrate. If necessary call Customer Service.
• Display E-1	<ul style="list-style-type: none"> • Surrounding is too bright. • Strip adapter is assembled incorrectly 	<ul style="list-style-type: none"> • Repeat measurement in a darker place; if necessary, close the lid of the RQflex 2 before switching on
• Display E-2	<ul style="list-style-type: none"> • Measurement result is incorrect 	<ul style="list-style-type: none"> • Repeat measurement