Vet Photometer
DP 700
Operating Manual
Version 5.9

Edition 2024-01

Dear customer,

We are pleased that you have chosen the Vet Photometer from Diaglobal GmbH and thank you for the confidence you have placed in us.

The Vet Photometer belongs to a new generation of small mobile devices developed by Diaglobal GmbH and specially designed for on-site analysis.

With the software version V5.3 and higher, an automatic test of the device function has also been integrated.

With the Vet Photometer, 4 clinical-chemical parameters can be determined from serum/plasma and blood: NEFA (free fatty acids), Calcium, Magnesium and Lactate.

The kits and accessories required for the test are also available from Diaglobal GmbH.

The Vet Photometer was specially developed for analyses in veterinary medicine, however it is universally applicable.

All the best for your work with the new Vet Photometer!

Yours
Diaglobal GmbH

Table of contents

1. General information on the Photometer

Device name:	Vet Photometer
Model:	DP 700
Features:	In-vitro diagnostics, measuring device for the determination of NEFA (Free fatty acids) and Magnesium from serum/plasma, Calcium from plasma and Lactate from plasma/blood.

Manufacturer:

Diaglobal GmbH
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12555 Berlin

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http://www.diaglobal.de

CE The conformity of the device with Directive 2006/95/EC is confirmed by the use of the CE marking.

2. Installation

For trouble-free operation of the device, the following environmental conditions must be met:

- Ambient temperature: 0 °C ... 40 °C
- No direct exposure to sunlight or similar sources of radiant heat
- Free from excessive dust
- Free from vibrations
- Free from interference by electromagnetic waves
- Operation on a horizontal surface

Please observe the following instructions for use:

Insert a rechargeable battery or normal battery if the device is to be operated independently of a power supply or connect the photometer to a power supply unit.

Press the **<ON/ENTER>** key (Fig. 1) to activate the internal device check which is automatically carried out by the device.

The device is then immediately ready for measurement.

3. Description of the device

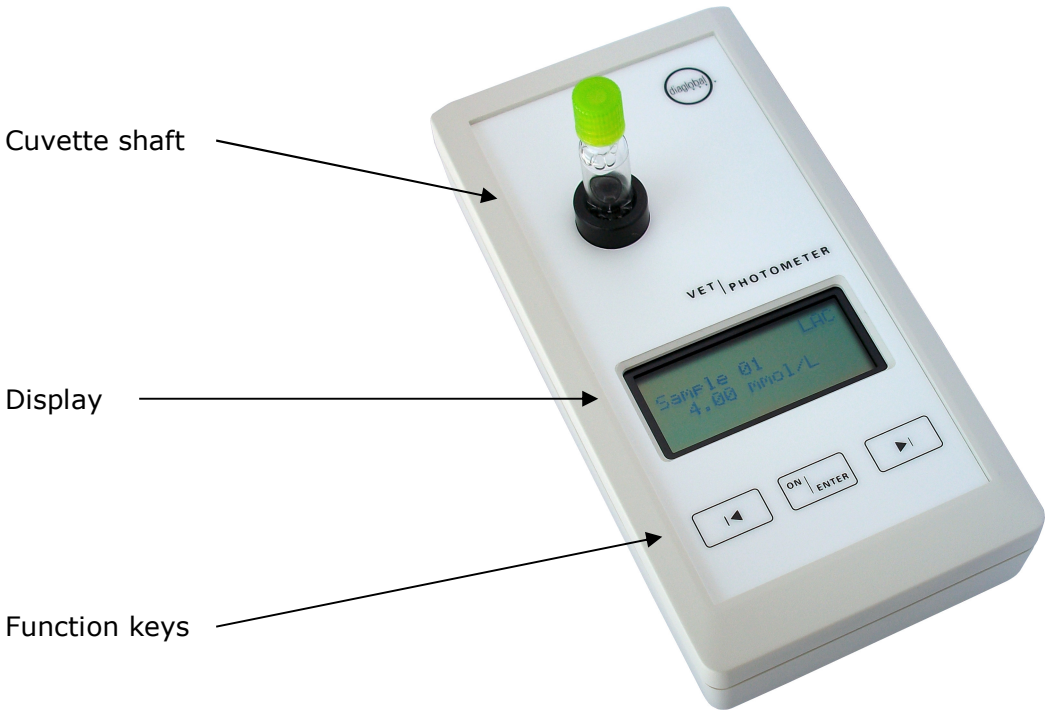


Fig. 1

3.1 Power supply

The Vet Photometer can be operated as desired using a power supply, a (9V block) battery or (model 6F22 or PP3) rechargeable battery.

3.1.1 Mains power operation

The photometer is supplied with a power supply unit for operation on a mains voltage in the range of 100 V ... 240 V AC. The mains plug is marked with a Diaglobal logo (sticker).
The connector plug of the power supply unit is connected to the power supply socket on the back of the device.

3.1.2 Mains-independent operation

To insert the rechargeable battery or the normal battery:
Unscrew the knurled screws on the bottom of the device and remove the battery compartment cover. Connect the battery to the push-button contact and insert it into the device. Replace the battery compartment cover and screw in the knurled screws.

Please note:
The Vet Photometer can be operated using a power supply without the need to remove the rechargeable battery or the normal battery.
The rechargeable battery cannot be charged while it is installed. A separate battery charger is required for this purpose.

3.2 Measuring system

The optical section is shown in Fig. 2.

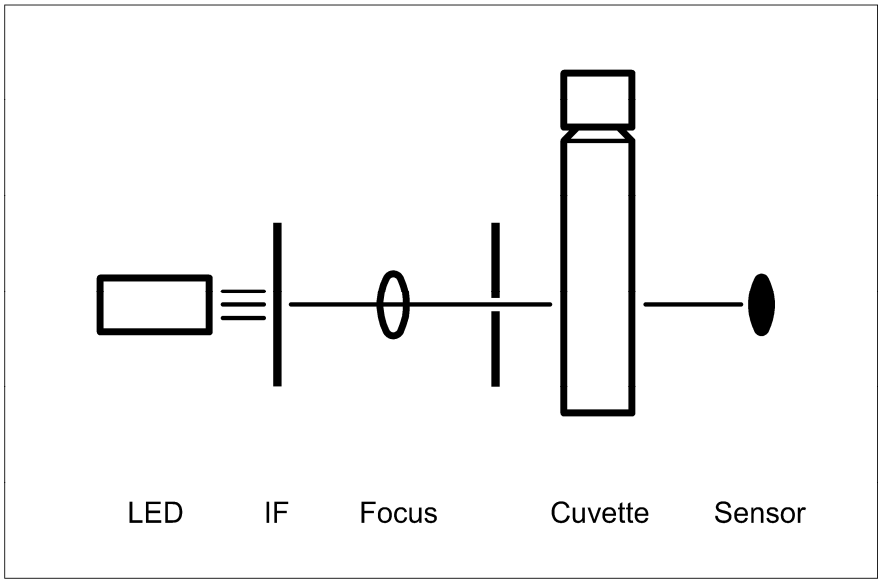


Fig. 2

The light emitted by an LED is first selected into its wavelength range (520 nm) by an interference filter IF (FWHM ~ 5 nm) and then bundled and directed onto the cuvette in the shaft. After passing through the cuvette, a broadband photosensor converts the light falling on its sensor surface into a current, proportional to the intensity.

4. Service

4.1 Adjustment and calibration

The device is adjusted and calibrated at the factory on delivery, adjustment by the customer is not necessary.
Adjustment is carried out via the interface socket on the rear panel. It can only be carried out at the factory, adjustments by the customer are not possible.
Information on calibrating the device can be found in chapter 6 Quality control according to the Guideline of the German Medical Association.

4.2 Maintenance

The device is maintenance-free. Maintenance after the warranty period is recommended, but not mandatory.
Due to the integrated test of the unit functions (chapter 8.5) and regular tests with control material, maintenance is only recommended if one of these two test functions indicates an error message.

4.3 Cleaning instructions

Commercially available decontaminating solutions commonly used in clinical chemistry laboratories, such as Mikrozid® AF Liquid, Bacillol® plus, 3 % Kohrsolin® or similar, are recommended for cleaning the device and the surface. Before cleaning the unit with a soft cloth and the decontaminating solution, it must be switched off and the electrical power supply must be disconnected.

Make sure that no liquids get into the device. There is no protection against penetrating liquids (Code IP X0).

The cuvette shaft must not be cleaned by the user of the device, as this may damage the device. If cleaning is necessary, especially because of leaking liquids or broken glass, please contact Diaglobal GmbH.

4.4 Malfunctions

If any malfunctions or problems occur, simply call us. Most questions can be answered on the phone. Non-functional units should be sent to our Berlin address. We will provide a loan device for the duration of the repair.

4.5 Disposal

Diaglobal GmbH will take back and dispose of units that are no longer needed or cannot be repaired, free of charge.

5. Required reagents and laboratory accessories

5.1 Expiration date of consumables

It is important to ensure that all consumables may only be used within the expiration date.

5.2 Reagents / parameter list

The following tests can be measured with the Vet Photometer:

Parameter	Sample material			Tests / pack	Art. no.
	Blood	Serum	Plasma		
Free fatty acid	-	+	+	50	NEFA 013
Lactate	+	-	+	40	LAC 142
Calcium	-	-	+	65	CA 015
Magnesium	-	+	+	65	MG 013

5.3 Control materials

Art. no.	Description	Contents
LAC QS	Lactate control set 2 mmol/L ; 4 mmol/L ; 10 mmol/L	3 x 4 mL
CA QS	Calcium- and Magnesium control	3 x 1.5 mL
CA ST	Calcium- and Magnesium standard solution	1 x 25 mL
NEFA ST	Free fatty acid standard solution	1 x 10 mL

5.4 Laboratory aids and accessories

Art. no.	Description	Contents
LH 006	Cuvette rack	1
LH 007	Micropipetter (pipetting aid)	1
LH 009	Cellulose swabs	500
LH 011	Alcohol pads, non-sterile	100
LH 026	Capillaries 10 µL, with ring mark	250
LH 050	Reaction tubes to separate the plasma	500
LH 053	Pipette tips 500 - 5000 µL clear, for pipette LH 504	200
LH 054	Pipette tips 2 - 200 µL yellow, for pipette LH 550	1000
LH 075	Cuvettes with screw caps	40
LH 504	Pipette variable 500 - 5000 µL	1
LH 550	Pipette fix 50 µL	1

All reagent kits, control materials and other materials are supplied by Diaglobal GmbH and can be stored and transported together with the Vet Photometer in a practical case.

6. Internal quality control

We recommend using the Diaglobal control solution LAC QS to check the accuracy of lactate determinations.

We recommend using the control solution CA QS for checking the accuracy of determinations of calcium and magnesium.

7. Measuring procedure

7.1 Multipoint measurement with consideration of the sample blank value and recognition of the endpoint

After measuring the sample blank value (= measurement 1) the colour reaction in the cuvette is started. The reaction process is monitored by the device (= measurement 2). The measuring process is terminated as soon as the endpoint is reached.

The time needed to reach the endpoint depends on the temperature. It is normally 2 - 6 minutes for the lactate test. If temperatures are close to freezing point, measuring times can take up to 20 minutes, depending on the parameters.

You can choose between single and series measurements up to a maximum of 20 samples.
For single measurements, the samples are processed one after the other.
For series measurements, all A1 values are measured first.

Parameter: Lactate (LAC)
Calculation: Concentration in plasma = ΔA x Factor

7.2 Endpoint measurement taking standard

Measurement of absorbance after reaching the endpoint in relation to the reagent blank value and taking standard.

Parameters: Free fatty acids (NEFA), Calcium (CA) and Magnesium (MG)
Calculation: Concentration = Factor x $(A_{Analysis} - A_{Blank}) / (A_{Standard} - A_{Blank})$

8. Measurement

8.1 Switching the device on

Press the **<ON/ENTER>** key

8.2 Self-test when switching on

When the device is switched on, a self-test of the digital and analogue circuitry is conducted. The operational device check proceeds automatically after it is switched on. It takes approx. 5 seconds, after which the unit is ready for measuring.

Note:
If it becomes obvious during the test that one of the device functions does not correspond to the required settings, <SERVICE> will appear in the display.

In this case, switch the device off.
Please call Diaglobal GmbH service (Tel. +49 (0) 30 6576 2597) or contact your specialist retailer.

8.3 Test selection

Press the **<ON/ENTER>** key.

The desired test is selected from the menu with the right or left arrow key:

NEFA - LAC - CA - MG - ABS520

Pressing the right arrow key activates the next test while pressing the left arrow key returns to the previous test. The selected test is shown in the upper right corner of the display.

Confirm test selection with the **<ON/ENTER>** key.

8.4 Switching the device off

To switch the device off, press both arrow keys simultaneously.

8.5 Integrated operational device checks

Self-test when switching on

Testing of the digital and analogue circuits of the device is automatically performed by the device when it is switched on.
Please see chapter 8.2, Self-test when switching on.

Differential measurements

All measurements are based on differential measurements. I. e. after selecting the desired test, the device requests a zero measurement with a blank value cuvette. This creates a reference base to the measured value so that minor deviations can be compensated.

Measuring range controls

The measuring ranges of all measurement results shown in the display are verified by an integrated measuring range control. If the measuring range is exceeded, an error is displayed.

The measuring ranges that are separately defined for each parameter are documented on the respective package inserts as well as in this operating manual, chapter 9, Technical Data.

Plausibility controls

For multi-point measurements, the absorbance measured first forms the reference basis. The programme verifies the plausibility of the individual measured values. If specific requirements (e.g. A2 > A1 for ascending reactions) are not met, an error message is displayed.

8.6 Notes on taking samples and carrying out measurements

To carry out the measurements, please also refer to the tutorials on our website, www.diaglobal.de.

For safety instruction, see chapter 10.

This chapter addresses the most common errors that can occur during taking samples and measuring samples. Errors in taking samples will always lead to incorrect measurement results.

1. Before measuring, cuvettes stored in a refrigerator must be brought to room temperature. If the cuvettes are too cold, they will become misty with water on the outer wall due to the humidity, which will lead to incorrect measurement results.

2. Never touch the lower part of the cuvette (where the liquid is) with bare hands. If this should happen accidentally, clean the vials with a fluff-free cloth before use.

   Cleaning with a fluff-free cloth is recommended in any case. Even if the package is still new and unopened. Fingerprints on the cuvette lead to incorrect measurement results.

3. Make sure that the blood drop is large enough to fill the capillary with the required sample volume in one go. Repeated filling of the capillary leads to air bubbles that cannot be removed from the capillary. If air bubbles form, discard the capillary and start sampling again.

4. The capillary must be filled exactly up to the black ring mark.

   Please note: A deviation of only 1 mm from the ring mark is sufficient to obtain a completely incorrect measurement result!

   If the sample is above the black ring mark, this will lead to incorrect positive measurement results. A cellulose swab can be used to carefully soak up too much blood.

   If the sample is below the black ring mark, this will lead to incorrect negative measurement results. In this case, correction is hardly possible due to the air bubble that will form when trying to collect more blood.

5. Before the capillary is placed in the cuvette, the lower area must be carefully wiped on the outside with a cellulose swab to remove sample particles attached to the capillary. Otherwise, this would lead to incorrect positive measurement results.

6. With the help of the micropipetter, the sample is completely transferred into the cuvette. The complete transfer of the sample is done by ejecting it several times with the help of the push button on the micropipetter.

   Please note: The micropipetter is only used when the capillary is filled with the sample. It is not needed for filling the capillary. The capillary is filled by the capillary action alone.

7. When changing the cap with the starter cap, make sure that the substance in the starter cap has completely dissolved. Failure to do so will result in a non-linear kinetic reaction process, which will lead to an error message in the display or unreliable measurement results.

9. Technical data

Storage temperature:	-20 °C ... 70 °C
Operating temperature:	0 °C ... 40 °C
Dimensions:	200 x 100 x 50 mm
Weight:	450 g
Measuring principle:	Absorption measurement with single beam photometer (Fig. 2), chopped operation
Projector:	LED
Spectral apparatus:	Interference filter
Measuring wavelengths:	520 nm
Spectral half-width value:	~ 5 nm
External light influence:	Negligible
Interface:	V24 (9600, 8, n, 2)
Power supply:	6 V ... 12 V DC
Current consumption:	max. 250 mA
Warm-up time:	0 min
Interference suppression:	According to DIN VDE 0871 and DIN VDE 0875
Inaccuracy:	< 0.5 % at A = 1.000
Relative photometric short-time standard deviation:	< 0.1 %

Measuring ranges:	DP 700
Free fatty acids	0.02 - 4.00 mmol/L
Lactate	0.2 - 30 mmol/L
Calcium	0.10 - 5.00 mmol/L
Magnesium	0.10 - 2.10 mmol/L
ABS 520 nm	A = 2.500

10. General guidelines, standards and notes

1. Low-Voltage Directive 2006/95/EC
2. EN ISO 9001, Quality Management Systems, Model for quality assurance in design, development, production, installation and customer service
3. EN 61010 -1, Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements
4. EN 61326 -1, Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

Note on electromagnetic compatibility

The photometer meets the requirements for electromagnetic radiation and interference immunity as described in the IEC 61326 series of standards.

Do not use this device near sources of intense electromagnetic radiation because they may interfere with correct functioning. A distance of at least 1 m should be maintained between an operational (switched on) mobile phone and the photometer during measurement.

Note on the unit's internal quality control

The functionality of the device is checked when it is switched on. In addition, electronically controlled checks are carried out for individual tests during the measurement, which leads to an error message if specified requirements are not met.

Safety instruction

Personal protective equipment (gloves, gown) must be worn when handling potentially infectious materials (patient samples).

11. Appendix: "Step-by-step measurement"

See the following pages

Step by step instructions

Device manual

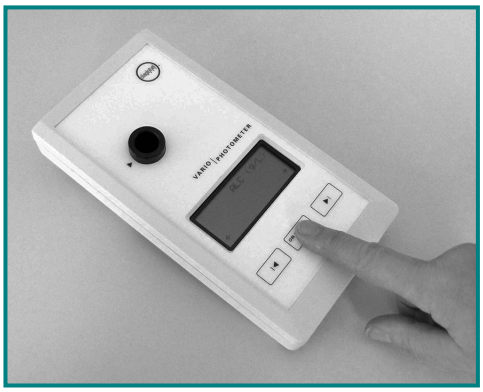
1. Switch on:

Press ON/ENTER key

Wait for device check and confirm with ON/ENTER

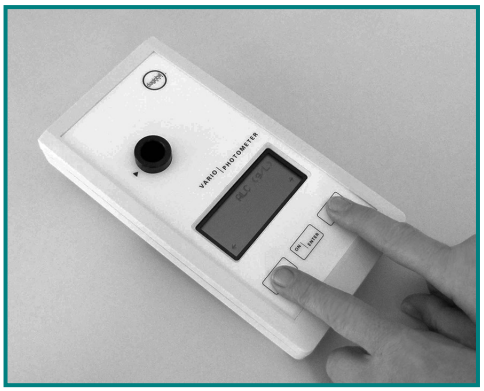
2. Select test:

Press arrow key until required test appears



3. Confirm required test:

Press ON/ENTER



4. Switch off:

Press both arrow keys at the same time

Note:
If SERVICE appears in the display after the device check, the device has a defect.

In this case, please contact our customer service at +49 (0) 30 6576 2597.

Step by step instructions

NEFA (Free fatty acids)

Example: 2 samples

Additionally required: Free fatty acids standard (NEFA ST), Diaglobal Round Cuvettes (LH 075)

1. Prepare the reagent solutions according to the instructions

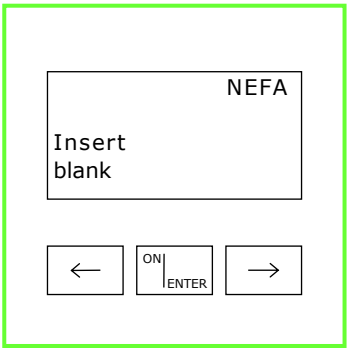
Then pipette 1000 µL solution R1a from the bottle into each cuvette

2. Pipette samples into cuvettes, mix well and leave them for 10 minutes

Cuvette 1: nothing (= Blank for zero point)
Cuvette 2: 50 µL Standard
Cuvette 3: 50 µL Sample 1
Cuvette 4: 50 µL Sample 2

3. After a waiting time of 10 minutes, pipette 500 µL solution R2a from the bottle into each cuvette

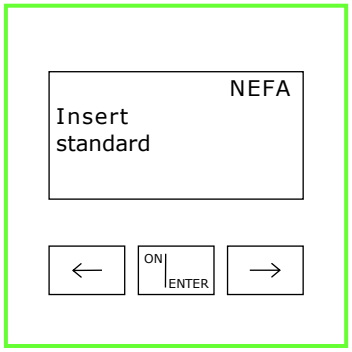
Close the cuvettes, mix and allow to stand for another 10 minutes at room temperature



4. Switch photometer on with ON/ENTER key

Wait for device check, confirm with ON/ENTER

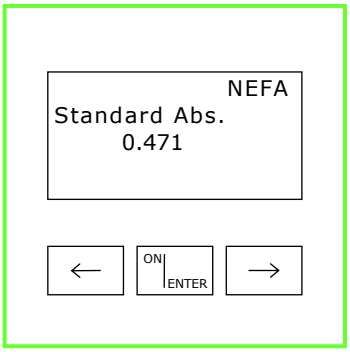
Select NEFA, confirm with ON/ENTER



5. Zero point adjustment: Insert cuvette 1 (blank for zero point) into photometer

Zero point is stored in memory

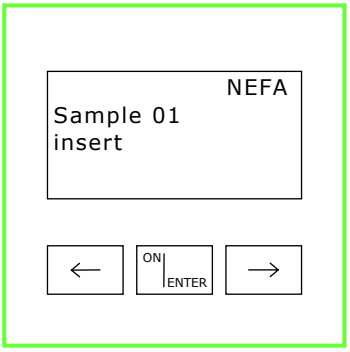
Remove cuvette after signal tone



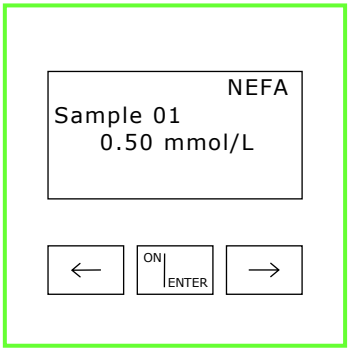
6. Insert cuvette 2 (standard) into photometer

Photometer shows the standard absorbance

Note: If necessary, note this value for documentation purposes



7. Remove cuvette 2 (standard)



8. Insert cuvette 3 (sample 1) and then cuvette 4 (sample 2) into photometer

Read measured values one after the other

In regard to series measurement:

After zero point and standard setting any number of additional samples can be measured

Step by step instructions

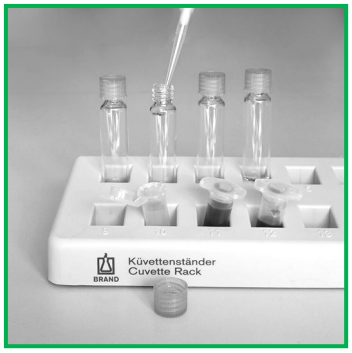
CA 015 / MG 013

Example: 2 samples

Additionally required: Calcium-Magnesium-Standard (CA ST), Diaglobal Round Cuvettes (LH 075)

1. According to the working instructions pipette the specified quantities of buffer or colour solution into 4 cuvettes

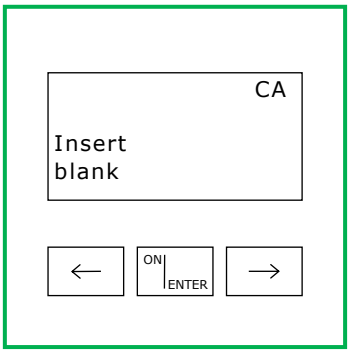
Then pipette the standard and the two samples (Fig. 2)



2. Pipette samples into cuvettes, mix well

Cuvette 1: nothing (= Blank for zero point)
Cuvette 2: Standard
Cuvette 3: Sample 1
Cuvette 4: Sample 2

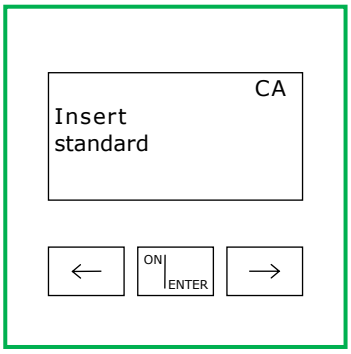
CA 015: 50 µL / no waiting time
MG 013: 10 µL / 5 minutes waiting time



3. Switch photometer on with ON/ENTER key

Wait for device check, confirm with ON/ENTER

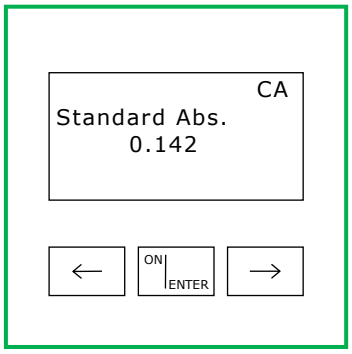
Select the required test, confirm with ON/ENTER



4. Zero point adjustment: Insert cuvette 1 (blank for zero point) into photometer

Zero point is stored in memory

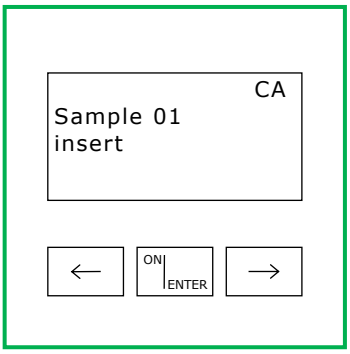
Remove cuvette after signal tone



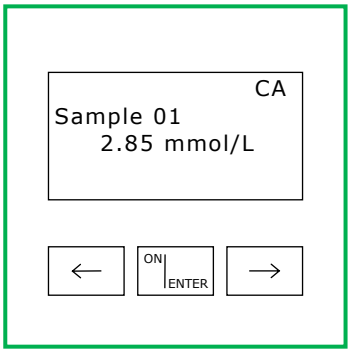
5. Insert cuvette 2 (standard) into photometer

Photometer shows the standard absorbance

Note: If necessary, note this value for documentation purposes



6. Remove cuvette 2 (standard)



7. Insert cuvette 3 (sample 1) and then cuvette 4 (sample 2) into photometer

Read measured values one after the other

In regard to series measurement:

After zero point and standard setting any number of additional samples can be measured

Quality assurance

Recommended control material: Calcium-Magnesium-Control

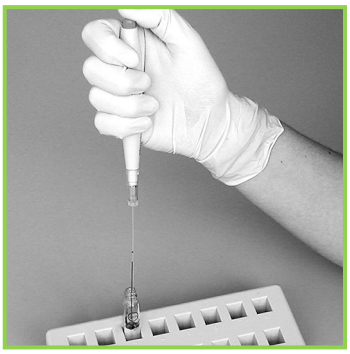
(Art. No. CA QS)

Step by step instructions

LAC 142 / LAC 342 / GLU 142 / CHO 142 / TRI 142

Single measurement

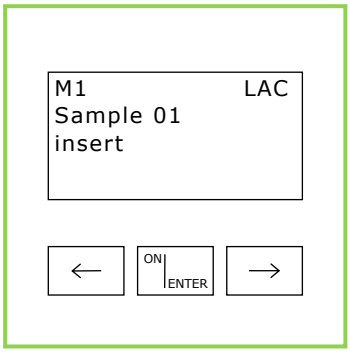
1. Insert capillary with 10 µL sample into cuvette



2. Eject sample several times with micropipetter into cuvette

3. Screw cap on

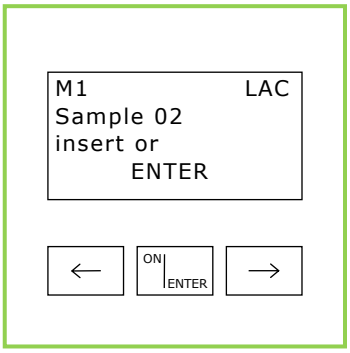
Turn cuvette upside down several times



4. Switch photometer on with ON/ENTER key

Wait for device check, confirm with ON/ENTER

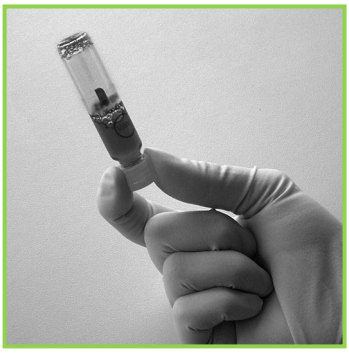
Select the required test, confirm with ON/ENTER



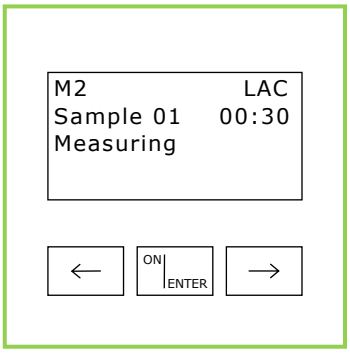
5. Zero point adjustment: Insert cuvette with sample (Fig. 3) into photometer, zero point is stored in memory

Remove cuvette after signal tone

6. Replace screw cap with starter cap



7. Turn cuvette upside down several times



8. First press ON/ENTER

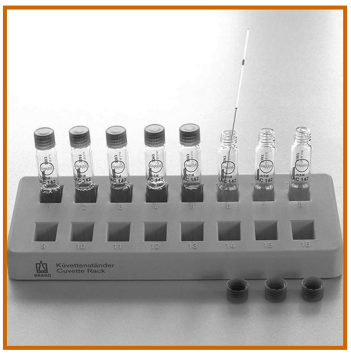
Then insert cuvette into photometer

9. Time is displayed, wait for measured value

Step by step instructions

LAC 142 / CHO 142 / TRI 142

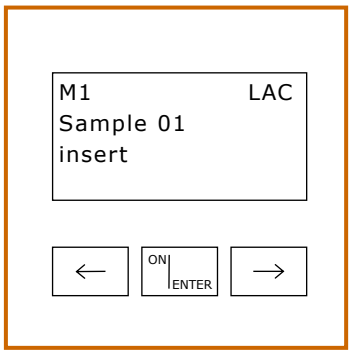
Number of samples per series: Up to 20 samples at the same time



1. Eject all samples one after the other several times with micropipetter into cuvette

2. Screw all caps on again

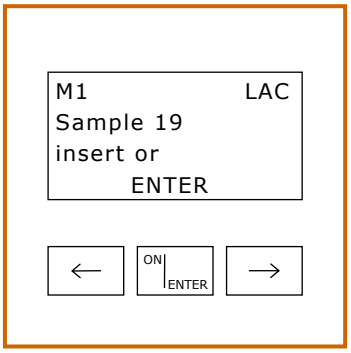
Turn cuvettes upside down several times



3. Switch photometer on with ON/ENTER key

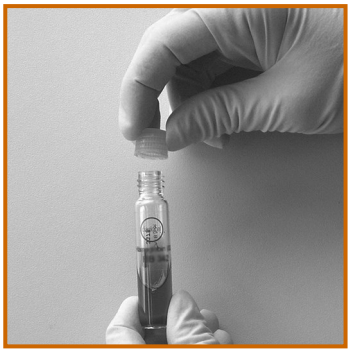
Wait for device check, confirm with ON/ENTER

Select the required test, confirm with ON/ENTER

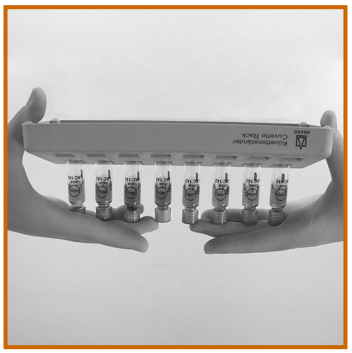


4. Zero point adjustment: Insert cuvettes with samples (Fig. 2) one after the other into photometer, all zero points are stored in memory

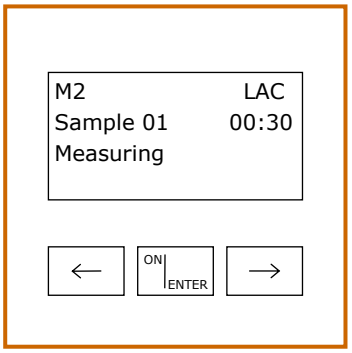
Note: Ensure the correct order of the samples!



5. After the zero point adjustment of the last cuvette replace all screw caps with starter caps



6. Turn all cuvettes **simultaneously** upside down, repeat several times



7. First press ON/ENTER key

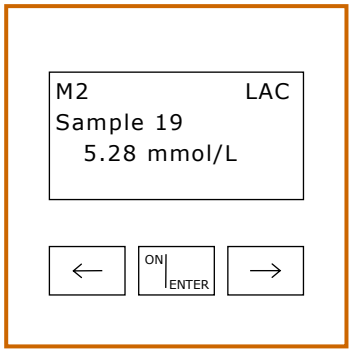
Then insert 1st cuvette into photometer

Time is displayed, wait for measured value

8. Read the measured value of the 1st cuvette, remove cuvette

Insert 2nd cuvette, read the measured value, remove cuvette,

and so on



9. Insert the last cuvette, read the measured value, remove cuvette

Note: Ensure the correct order of the samples!