

Biodiesel Photometer
DP 800
Operating Manual
Version 5.10

Dear customer,

Thank you for selecting Diaglobal's Biodiesel Photometer and for the confidence you have placed in us.

The Biodiesel Photometer belongs to a new generation of small mobile instruments which are being developed by Diaglobal GmbH and are specially designed for on-site analysis.

The Biodiesel Photometer can be used to determine the parameters triglycerides - glycerol as a quick single measurement as well as a serial measurement - and the parameters ethanol and methanol in biodiesel and bioethanol respectively.

The kits and accessories which are required to carry out the tests and measurements are also available from Diaglobal GmbH.

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

Yours
Diaglobal GmbH

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1. General information regarding the Photometer

Device name: Biodiesel Photometer
Model: DP 800
Features: Measuring instrument for the determination of triglycerides and glycerol

The Biodiesel Photometer is in conformity with the following standards or other normative documents:

EN 61326 - 1

EN 61010

following the provisions of Directives 89 / 336 / EWG (EMC)

Manufacturer
Diaglobal GmbH
Innovationspark Wuhlheide
Köpenicker Str. 325
D-12555 Berlin
Germany

Tel: +49 - 30 - 65 76 25 97

Fax: +49 - 30 - 65 76 25 17

E-mail: info@diaglobal.de

<http://www.diaglobal.de>

2. Installation

Please observe the following instructions for use:

Insert the rechargeable battery if the instrument is to be used network-independent
or
connect the photometer to the power supply unit.

Press the key



to activate the internal instrument check which is automatically carried out by the instrument.

Following this, the instrument is immediately ready for measuring.

3. Description of the instrument

Cuvette shaft

Display

Function keys

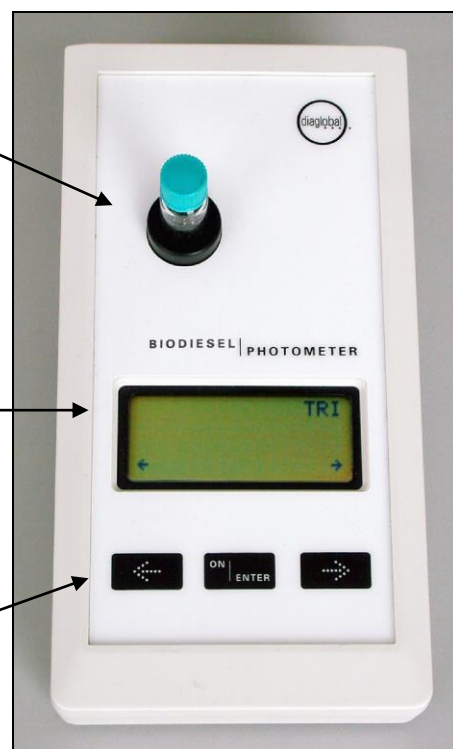


Fig. 1

3.1. Power supply

The Biodiesel 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 power supply connector plug is connected to the instrument's socket.

The Biodiesel Photometer is provided with a power supply unit (6-9V=) for operation at 220V/50 Hz.

3.1.2 Network-independent operation

Insertion of the rechargeable battery or the normal battery:

Unscrew the knurled screws on the bottom side and remove the cap. Connect the rechargeable battery or the normal battery using the push-button contact and insert it. Place the cap back on top and fasten the knurled screws.

The rechargeable battery cannot be charged whilst it is installed. A separate battery charger is required for this purpose.

Please note:

The Biodiesel Photometer can be operated using a power supply and it is not necessary to remove the rechargeable battery or the normal battery for this purpose.

3.2 Measuring system

The optical section is shown in fig. 2.

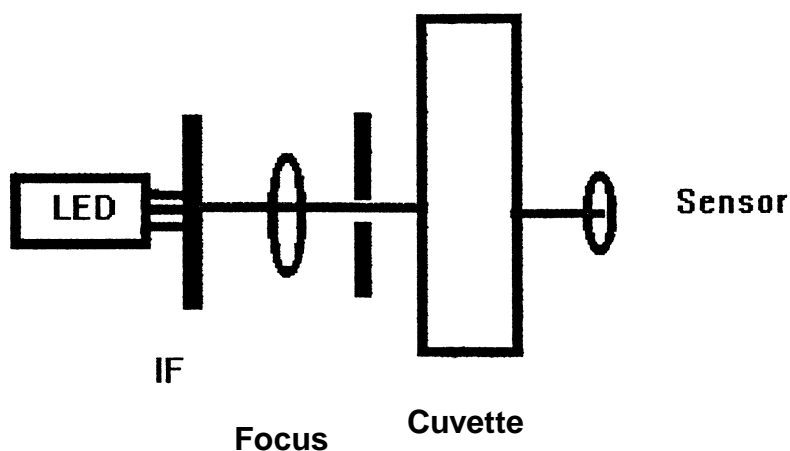


Fig. 2

The light emitted by an LED is first selected by an interference filter IF (HBW ~ 5 nm) in its spectral ranges (520 nm) and then guided concentrated to the cuvette in the shaft. After it has passed through the cuvette, a broadband photo sensor converts the light falling onto its sensor surface to current, proportional to its intensity.

4. Service

4.1 Calibration

The instrument is works calibrated when supplied – it is not necessary for the customer to calibrate it.

4.2 Maintenance

We recommend regular yearly maintenance of the instrument.

4.3 Disturbances

If any disturbances or problems occur, simply call us. We can answer most questions on the telephone. Faulty instruments must be sent to our Berlin address. We can lend our customers an instrument whilst theirs is being repaired.

4.4 Disposal

We take back instruments free of charge which are no longer needed or cannot be repaired and dispose of them.

5. Required reagents and laboratory accessories

5.1 Reagents / parameter list

The following tests can be measured by the Biodiesel Photometer:

Parameter	Tests/pack	Order no.
Triglycerides	40	TRI 742
Glycerol	40	GLY 742

5.2 Laboratory aids

Order no.	Description	Contents
LH 004	Capillaries 10 μ L, with ring mark	1
LH 006	Cuvette rack	1
LH 007	Micropipettor (pipetting aid)	1
LH 021	Capillaries 1 - 5 μ L, with ring mark	250
LH 032	Accessories box for dilution of biodiesel	1
LH 056	Capillaries 50 μ L, end-to-end	100

The above-named test packs and laboratory aids are supplied by Diaglobal GmbH and can be stored and transported together with the Biodiesel Photometer in a practical case.

6. Measuring process

Multipoint measurement, taking the sample's blank point and recognition of the end point into account

After measurement of the sample blank value (= measurement 1), the colour reaction is started in the cuvette. The reaction process is monitored by the instrument (= measurement 2). The measuring procedure is stopped as soon as the end point is reached.

The time needed to reach the end point is temperature-dependent. It is normally 2 minutes for the two tests, triglycerides and glycerol. If temperatures are close to freezing point, measuring times of up to 20 minutes may result, dependent on the parameters.

Both single measurements and series measurements can be selected.

If single measurements are made, the samples are measured one after another. For series measurements, all A1 values are measured first.

Calculation = Absorbance Difference x Factor

Triglycerides:

Reagent for quantitative determination of triglycerides in biodiesel

Mode <TRI>

Calculation:

Absorbance Difference x Factor = TRI [g/dL]

Measurement range: 0.1 - 15.0 g/dL

Dilute when exceeding the measurement range

If the measurement range is exceeded (display: > 15 g/dL) dilute the sample with freed biodiesel 1+10 and repeat the measurement in mode <TRI conc.> with 1 µL diluted sample.

Mode <TRI conc.>

Calculation: Absorbance Difference x Factor x 11 = TRI [g/dL]

Measurement range: 1.1 - 165 g/dL

Glycerol:

Reagent for quantitative determination of glycerol in biodiesel and in aqueous glycerol solutions

Mode <GLY org.>

Calculation: Absorbance Difference x Factor = GLY [mg/dL]

GLY [Ma%] = c [mg/dL] / density (biodiesel) / 1000

Density of biodiesel: 0.8776 g/cm³

Measurement range: 0.001 - 0.250 Ma%

Mode <GLY aqu.>

Calculation: Absorbance Difference x Factor = GLY [mg/dL]

Measurement range: 12.6 - 126 mg/dL resp. 10 - 100 %

Sample preparation: See packing insert

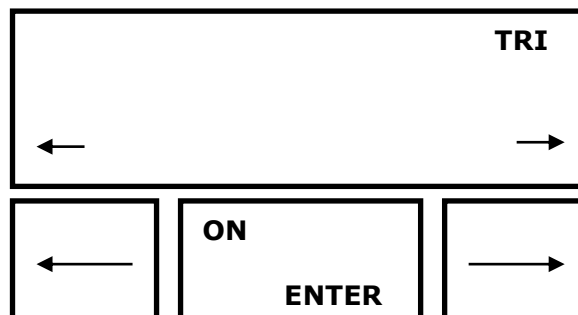
7. Measurement

7.1 Switching the instrument on

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



The following display is shown:



The instrument is instantly ready for operation after being switched on.

7.2 Test selection

The desired test is selected with the left or right arrow key.

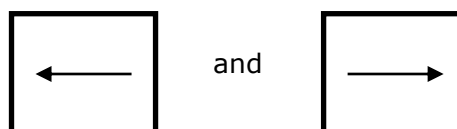
The selected test is displayed in the upper right corner of the display.

Pressing the key **<ON / ENTER>** starts the desired test.

Pressing the key **<ON / ENTER>** again, causes program termination and returns back to the menu.

7.3 Switching the instrument off

To switch the instrument off, press the keys together:



7.4 Measurement Example <TRI conc.>

- Select the **<TRI conc.>** program

The following display is shown:



- Insert sample 1 in the photometer.
Beep: 1st measurement
The following display is shown:



- Remove the cuvette.
The following display is shown:

M 1	TRI conc.
Sample 02	
Insert or	
ENTER	

ON
ENTER

A) Single measurement

Only **one** sample is measured:

Unscrew the light yellow sealing cap and swivel the cuvette in a manner which enables the solids in the cap to loosen completely.

This activates the reaction in the cuvette.

Turn the **<ON / ENTER>** key to measurement 2.

Insert the cuvette into the photometer immediately.

B) Series measurement (Example: triglycerides, 3 samples)

Measurement 1

Severall samples - 20 at the most - are measured simultaneously.

For this purpose, **all** M1 measurements for all existing samples must be carried out:

After measurement of sample 1,

- sample 2 is inserted in the photometer.
Beep: measurement 1
This display is shown:

M 1	TRI conc.
Sample 02	

- Remove the cuvette.
This display is shown:

M 1	TRI conc.
Sample 03	
insert or	
ENTER	

- Insert sample 3 in the photometer.
Beep: measurement 1
This display is shown:

M 1	TRI conc.
Sample 03	

- Remove the cuvette.
This display is shown:

M 1	TRI conc.
Sample 04	
insert or	
ENTER	

- Start reaction in *all* cuvettes with the yellow caps.

Use the **<ON / ENTER>** key to switch over to measurement 2.

ON
ENTER

Measurement 2

- This display is shown:

M 2	TRI conc.
Sample 01	00:19
insert	

- Insert the 1st cuvette from the series in the photometer immediately.
This display is shown:

M 2	TRI conc.
Sample 01	00:39
Measuring	

- The instrument now calculates the end point of the measurement reaction independently. After this end point has been reached, the result is displayed

Sample 01	TRI conc.
72 g/dL	

- Remove the cuvette.
This display is shown for series measurements:

M 2	TRI conc.
Sample 02	
insert	

- Insert sample 2.
The result of the 2nd sample is displayed

Sample 02	TRI conc.
55 g/dL	

- Insert and measure the other samples.
The initial screen is displayed after the final measurement:

	TRI conc.
←	→

←	ON	→
	ENTER	

8. 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:	Absorbance metering with a single-beam photometer (fig. 2), chopped operation
Projection:	LED
Spectroscopic apparatus:	Interference filter
Measuring wavelengths:	520 nm
Spectral half-width value:	~ 5 nm
Extraneous light influence:	Negligible
Interface:	V24 (9600, 8, n, 2)
Power supply:	9V battery or rechargeable battery block 6F22 or PP3 optional plug-in power pack
Warm-up time:	0 min
Interference suppression:	According to DIN VDE 0871 and DIN VDE 0875
Measuring ranges:	TRI: 0.1 - 23.0 g/dL TRI conc: 1.1 - 165 g/dL GLY aqu: 12.6 - 200 mg/dL 10 - 110 % GLY org: 0.001 - 0.250 Ma%
Inaccuracy:	< 0.5 % at E = 1.000
Relative photometric short-term standard deviation:	< 0.1 %

9. General Guidelines and Notes

EC Directives

1. Directive 98/79/EC on in vitro diagnostic devices

EN / ISO standards

2. EN ISO 9001:1994, Quality Management Systems, Model for quality assurance in design, development, production, installation and servicing
3. EN ISO 13485, Medical devices, Requirements for regulatory purposes
4. EN ISO 14971, Medical devices - Application of risk management to medical devices
5. EN 61010 -1, Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements
6. EN 61010 -2-101, Safety requirements for electrical equipment for measurement, control and laboratory use - Part 2-101: Particular requirements for in vitro diagnostic (IVD) medical equipment
7. EN 61326 -1, Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements
8. EN 61326-2-6, Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-6: Particular requirements - In vitro diagnostic (IVD) medical equipment
9. EN 592, Instructions for use for in vitro diagnostic instruments for professional use

National directives and recommendations (Germany)

10. Guidelines for Quality Assurance of Laboratory Examinations of the German Medical Association of 24.08.2001

Note on electromagnetic compatibility

- a) This photometer meets the requirements of the IEC 61326 series of standards regarding electromagnetic radiation and interference immunity.
- b) Do not use this unit near to sources of intense electromagnetic radiation as these may disturb its correct functioning. During the measurement, a distance of at least 1 m should be kept between an operative (turned on) mobile telephone and this photometer.

Note on the unit's internal quality control

This unit checks its functionality when it is turned on.

Moreover, it performs electronically controlled individual tests during the measurement causing an error message when defined conditions are not met.

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

Please refer to the illustrations in the how-to manual "Step by Step"



Diagnostica aus Berlin

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Diagnostica

Step by Step

Biodiesel Photometer

Version 5.10

General manual

Switching-on and test selecting



1



Switch on
Press ON/ENTER,
confirm with ON/ENTER

2



Select test
Press arrow key

3



Confirm test
Press ON/ENTER

4



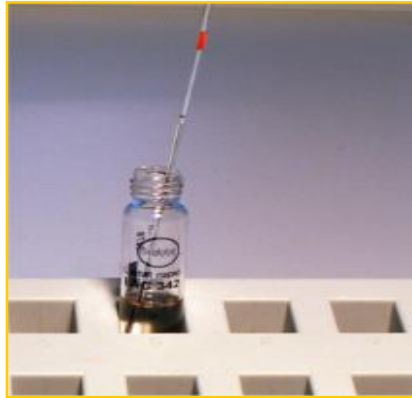
Switch off
Press both keys
at the same time

1



Withdraw 1 μL biodiesel with a 1-5 μL capillary

2



Insert capillary into cuvette

3



Wash out sample with micropipettor

4

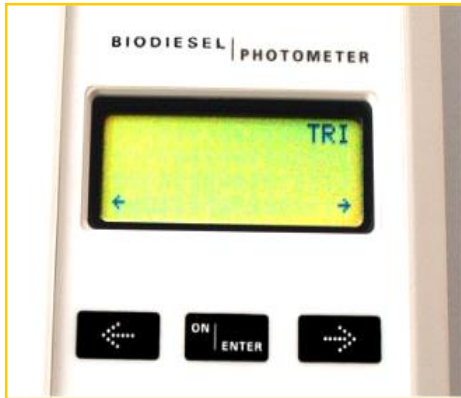


Screw on turquoise-coloured cap again

Mix the cuvette thoroughly for 30 seconds.

Wait for 1 min. before use.

5



Switch on photometer
Press ON/ENTER
Select parameter and
confirm with ON/ENTER

6



Insert cuvette with
biodiesel sample in
photometer (blank
value); photometer
saves blank value

After signal tone,
remove cuvette

7



Exchange
turquoise-coloured
cap for yellow cap

8



Turn cuvette upside
down several times

9



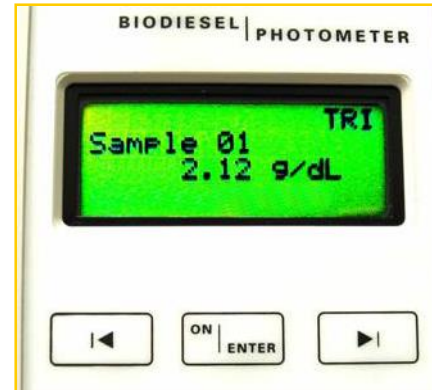
At first press ON/ENTER

10



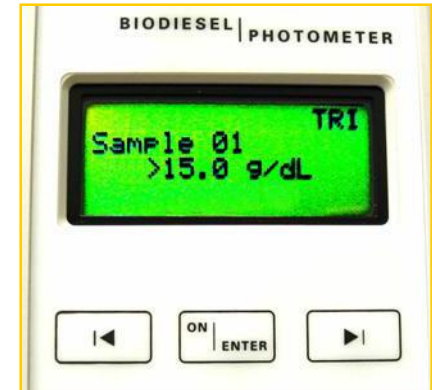
Afterwards insert
cuvette in
photometer
Wait for result

11



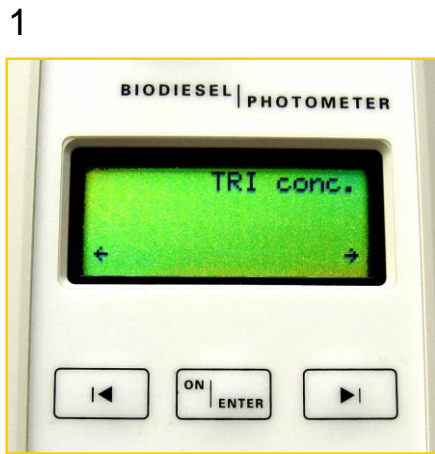
Read result

Concentration above measuring
range:

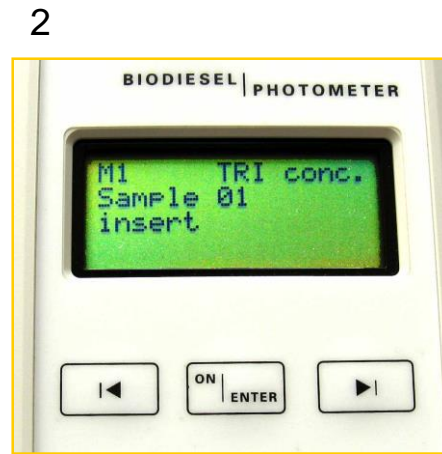


In case of exceeding
measuring range, dilute
biodiesel sample 1+10 and
repeat measurement using
mode „TRI conc.“

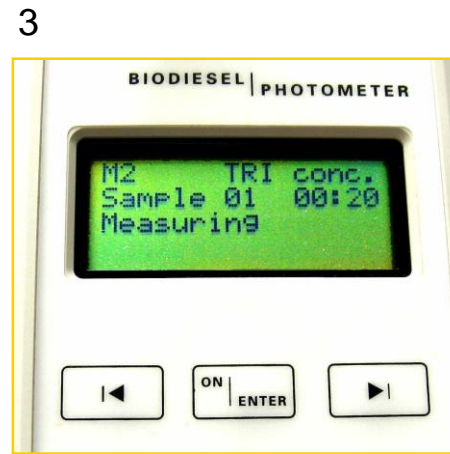
Concentration above measuring range:



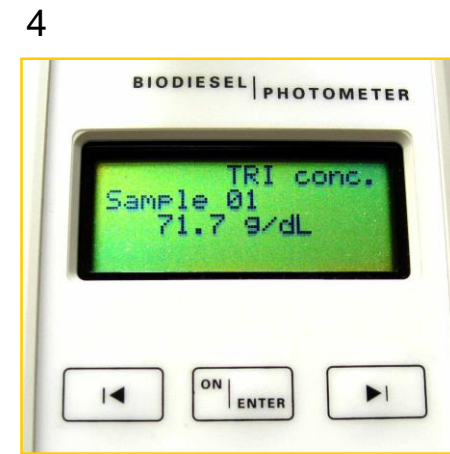
Select TRI conc. and confirm with ON/ENTER



Insert cuvette with diluted sample into photometer and follow steps 7,8,9 of TRI



Insert cuvette with yellow cap into photometer
Wait for result



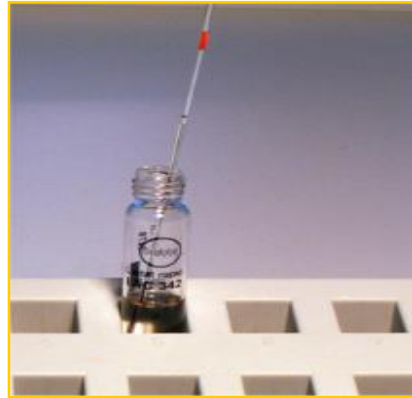
Read result:
The result is already calculated with all diluting steps

1



Withdraw 1 μL sample (glycerol phase) with a 1-5 μL capillary

2



Insert capillary into cuvette

3



Wash out sample with micropipettor

4

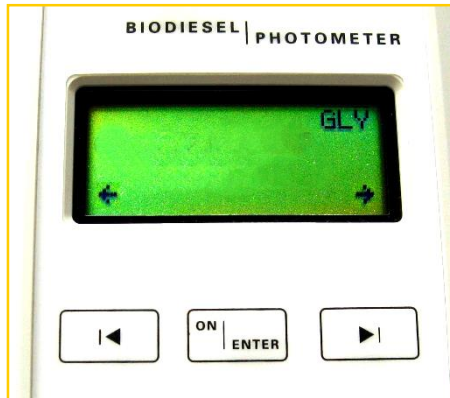


Screw on turquoise-coloured cap again

Mix the cuvette thoroughly for 30 seconds.

Wait for 1 min. before use.

5



Switch on photometer
Press ON/ENTER
Select GLY and confirm
with ON/ENTER

6



Insert cuvette with
biodiesel sample in
photometer (blank
value); photometer
saves blank value

After signal tone,
remove cuvette

7



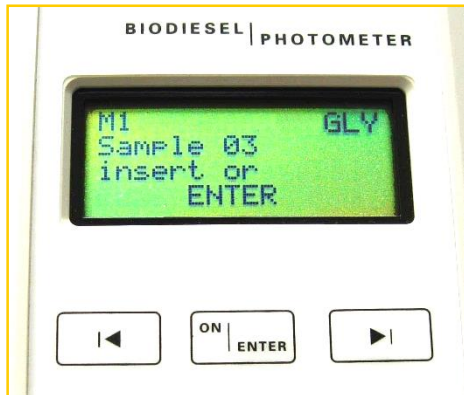
Exchange
turquoise-coloured
cap for yellow cap

8



Turn cuvette upside
down several times

9



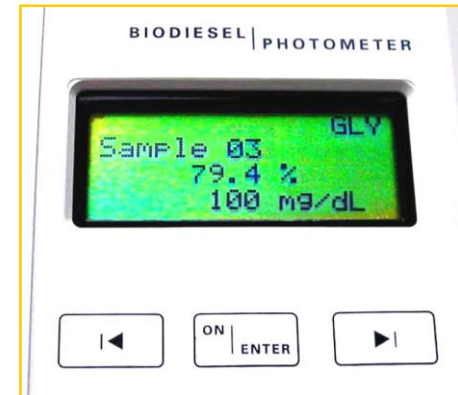
At first press ON/ENTER

10



Afterwards insert
cuvette in
photometer
Wait for result

11



Read result