

HANDHELD PHOTOMETER ET2020

USER MANUAL

2015

1. Photometer Design

Photometer "ET2020" is a small-sized portable device (**Fig. 1**), which is powered by a 6V AC adapter or by 4 AA batteries.

The device consists of a cuvette compartment suitable for a standard 10 mm cuvette (**1**), display (**2**), and keypad (**3**). Inside, there is an optical unit, and a control and data processing unit.

The optical unit includes 2 or 8 highly stable semiconductor LEDs, which are used as light sources. The photodiode incorporated in the optical units serves as light radiation receiver. The control unit providing self-diagnostic control functions, data processing and wavelength selection is based on a microprocessor.



The unit can be connected to PC via the built-in RS-232 interface (**4**). The interface is placed on the upper end wall (**Fig. 2**). Next to the interface is a socket for a connection to an external power supply (**5**).

The alternative power supply source of 4 AA batteries can be inserted in the compartment located on the bottom wall. A removable cover closes the compartment with the batteries. The device readings are on the LCD display with a bright backlight (**Fig. 1-2**). The display is located on the upper part of the front panel.



The keypad with six buttons (**Fig. 3**) is on the same panel and located between the LCD and the cuvette compartment. The keypad controls are responsible for the use of the following functions:

ENTER --- confirmation of action and display backlight on/off

CANCEL – cancellation of action

«←» selection of the wavelength in decreasing mode;

«→» selection of the wavelength in increasing mode;

ON- turn on;

OFF- turn off;

Both above mentioned keys could be used also for selection of the mode "Autoselect" which helps to find a wavelength providing a maximum absorbance value for the solution to be analyzed. *

2. Photometer Preparation and Testing

2.1. Remove the cover from the batteries compartment. Insert 4 AA batteries into the compartment, or connect the AC adapter to the power socket.

2.2. Press on the **ON** button. On the display will appear **"Self –Diagnostic"**. The battery status and all wavelengths values will be displayed. If the instrument works promptly after 25 sec on the display will appear starting wavelength value **xxx nm**.

2.3. If the display says **"Defective xxx nm source"** (where **xxx** --- the wavelength of the defective source), you have to send the device to the repair service for a replacement.

2.4. If you will read on the display **"Defective photo element"** the device should be sent for repairing.

2.5. If **"Low battery"** will be displayed on the screen it means that there is insufficient voltage. In this case you have to replace the batteries.

2.6. To return to the wavelength selection, press the **"CANCEL"** button.

2.7. To turn on the backlight, press and hold the **"ENTER"** key until the display lights up. Turn off the backlight by pressing again and holding down the **"ENTER"** button until light goes out.

2.8. To turn the device off, press and hold the **"OFF"** key for 2 seconds.

3. Calibration and Measurements

3.1. Prepare standard solutions for the photometer calibration according to the selected measurement procedures.

3.2. Turn on the photometer by pressing the **"ON"**.

3.3. Once the screen displays **"xxx nm"** (where **xxx** --- automatically selected wavelength value of the first starting set) find the required wavelength by pressing the **«←»** and **«→»**.

3.4. Transfer 2-3 mL of the background solution to a 10 mm standard cuvette. Insert a cuvette with the background solution in the cuvette compartment and put a cap on the cuvette. The orientation of the acrylic cuvette transparent planes should be toward the keypad.

3.5. Press the **"ENTER"** key. The screen of the instrument will display **"Measure background?"** Press the **"ENTER"** button again to confirm. The screen will return in a countdown time mode, after the screen will display **"Background measured."** * *

3.6. Insert the cuvette containing 2-3 mL of a sample solution (first standard) into the cuvette compartment. Put a cup on the cuvette. Press the **"ENTER"** key. The screen of the instrument

will display "**Measure sample?**" Press the "**ENTER**" button again to confirm. The screen will return in a countdown time mode, after the screen will display Absorbance (**A**) and Transmittance (**T**) values in formats **A = h.hhh** and **T = xx.xx %**.

3.7. In order to construct the calibration curve measure Absorbance (**A**) or Transmittance (**T**) in all prepared standard solutions as described in 3.6.

3.8. Plot the calibration curve from the obtained data in coordinates "Concentration"- "Absorbance" or "Transmittance".

3.9. Carry out the measurement of the Absorbance (**A**) or Transmittance (**T**) in the solutions to be analyzed as described in 3.4- 3.6 and find the substances concentration with using the calibration curve.

3.10. The calibration curve could be built using Excel software.

* The wavelength providing a maximum absorbance value could be found in the mode "**Autoselect**" as described in the paragraphs 3.4-3.6

**The background measurement should be realized after every changing of a wavelength value