

HANDHELD PHOTOMETER ET2020

USER MANUAL

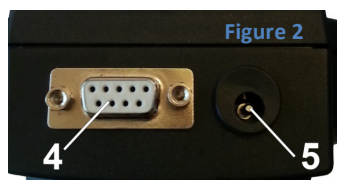
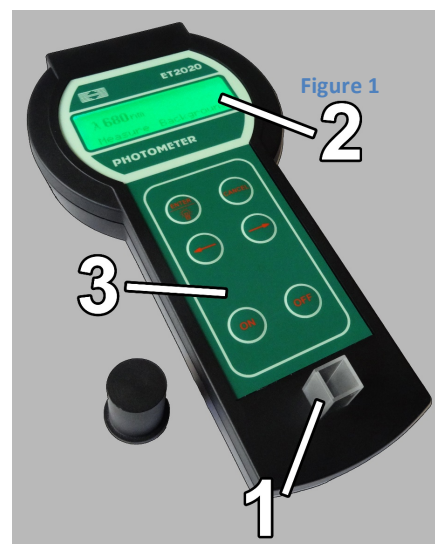
2015

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.

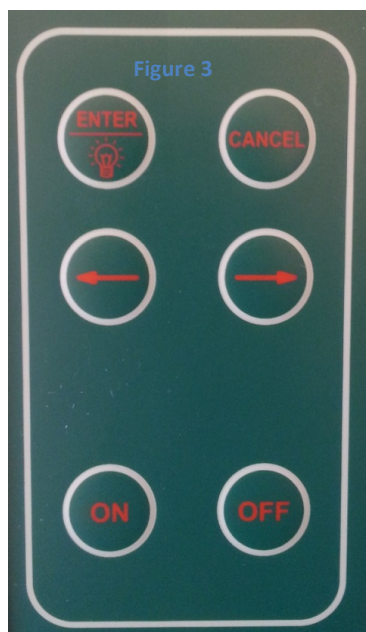
The device consists of a cuvette compartment suitable for a standard 10 mm cuvette (**1**), display (**2**), and keypad (**3**). Inside, there is an optical unit, and a control and data processing unit.

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 cap 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