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ELECTRONIC EBULLIOMETER

USER'S GUIDE

CONTENTS:

1. GENERAL INFORMATION

1.1. Applications

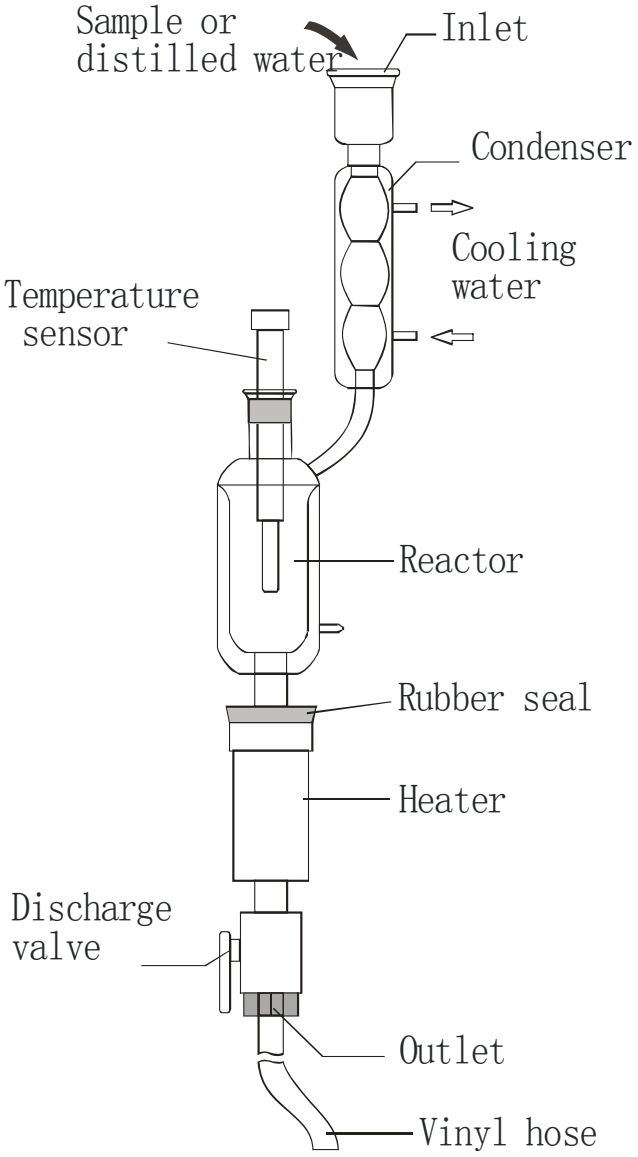
THE ELECTRONIC EBULLIOMETER is designed for volume content measurement of ethyl alcohol in wine by measuring the sample boiling temperature.

2. DESCRIPTION

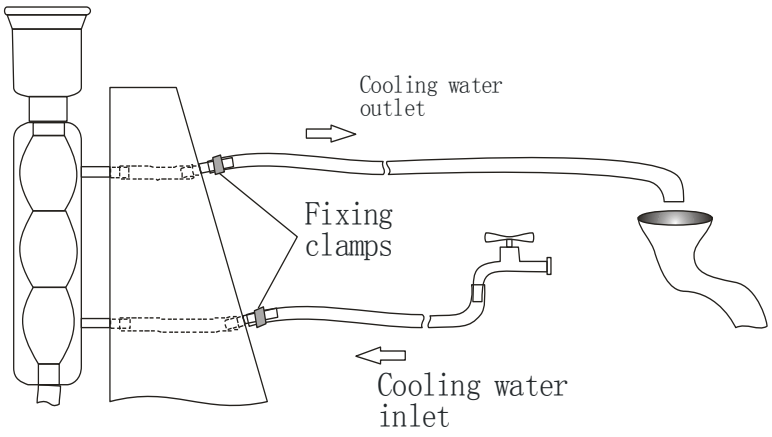
Parts, accessories and spare parts

Electronic Ebulliometer	1 pc.
Vinyl hose 8 mm x 1.5 m	2 pcs
Fixing clamp	2 pcs
Vinyl hose 3 mm x 1.5 m	1 pc.
Power Supply Cable	1 pc.
User's Guide	1 pc.

2.1. Measuring system – Fig. 1



2.2. Schematic of cooling system connections - Fig. 2



3. CHARACTERISTICS

3.1. Measuring characteristics:

- at alcohol content measurement:

Range (% by volume)	0 -15	15 - 25
Resolution	0.01 %	0.01 %
Repeatability	±0.05 %	±0.1 %
Measurement accuracy (absolute)	±0.1 %	±0.2 %

- at boiling temperature measurement:

Range	50 -105 °C
Resolution	0.01 °C
Repeatability	±0.02 °C
Accuracy (absolute)	±0.1 °C

Quantity of sample measured (cleaning and analysis) about 150 ml
Time per measurement ..... < 6 min.

3.2. Operating conditions:

Ambient temperature ..... 15- 35 °C
Relative ambient humidity…….. ..... 30-80 %
Temperature of sample measured ..... 10-45 °C

3.3. Power source:

Stationary ..... 220/110 V AC +10/-15% 50/60 Hz
Power consumption ..... < 200VA

3.4. Additional characteristics:

Overall dimension (H x W x D) ..... 474 x 230 x 215 mm
Weight ..... 9 kg

4. INSTALLING AND PREPARATION FOR WORK

4.1. Cooling system installation

Attention!
During this procedure the power plug should be disconnected!

Place the meter in vertical position on a smooth and level surface (table, writing desk, etc.).
The source of cooling water shall meet the following requirements:

- Temperature - not higher than 25°C
- Flow rate - from 0.5 to 1.0 L/min.

Accessories for cooling system installation:
- Vinyl hose 8 mm x 1.5 m - 2 pcs (from the package);
- Fixing clamp –2 pcs (from the package);
- Fitting for connecting the hose to the tap (not supplied by the producer) – consult a technician for supplying a suitable part;
- Screwdriver;
- 1 liter graduated vessel for adjusting flow rate;

Put both Vinyl hoses 8mm x 1.5 m and tighten the fixing clamps at the inlet and outlet of the cooling system.
Connect the cooling system inlet to a water supply network or another source of cooling water as shown in Fig. 2. Consult a technician for supplying of suitable part.

Water at the cooling system outlet is taken away to the sewerage network by gravity.

Turn on cooling water, adjust the flow rate from 0.5 to 1.0 L/min (using tap) and check for leaks at connection points.

Attention: Make sure the output hose of cooling system is not blocked (folded, pressed, squeezed etc.) The output hose blockage leads to flooding of measuring system and serious damage of the device.

4.2. Measuring system installation

Remove the polyethylene bag covering the inlet of the measuring system.
Put the free end of the 3 mm x 1.5 m vinyl hose connected to the discharge valve (Fig. 2) into a suitable vessel for collection of samples measured or directly to the sewerage.
Connect the power cable to the meter.
Connect the power cable to a mains supply source of nominal voltage in accordance with the nameplate at the rear panel of the meter.
ATTENTION: Power device from 3-prong grounded schuko plug only.

5. OPERATING MODES

5.1. Mode: Indication check

Turn on power of the meter by the <On/OFF> switch located at the rear panel. Before operating the meter check the indication. This mode allows you to check if all indicators are functioning accurately.

5.2. Mode: Preheating

Upon finishing the indicators check, the meter will automatically switch over to the mode of preheating. This will be indicated by a "running" middle segment of the indicators.

5.3. Mode: Readiness

Upon finishing the preheating the meter will automatically switch over to mode **Readiness**. This is indicated by an "illuminating line" of the middle segments of the indicators.

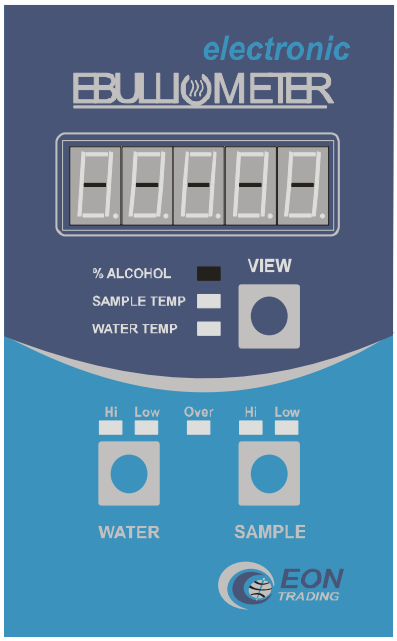


Fig. 5

When in this mode, press repeatedly push-button <VIEW> to select which one of the following parameters is to be shown on the display: percent of alcohol measured, sample boiling temperature or water boiling temperature.

5.4. Mode: Water

This mode is used to determine the boiling temperature of distilled water. The so measured temperature becomes a reference point for the meter in the determination of the alcohol content in the samples measured.

Important: This mode must be always used at the beginning of the work days before starting the Sample mode and in case of atmospheric pressure change.

Flush the measuring system with distilled water several times before starting the mode for determination of water boiling temperature, close the discharge valve (see Fig. 1), measure about **50 mL** distilled water and pour it in the measuring system.

Adjust the water volume to the printed mark on the reactor by opening the valve to drain the excess water. During the volume adjustment, the mark should be at your eye level.

After starting the measurement by push-button <WATER> the meter will automatically start on the high power of the heater – this will be indicated with the illumination of red LED above the <WATER> button.

Note: If temperature is below 45° C the meter will indicate:

Next the indication shows the current value of the water temperature measured.

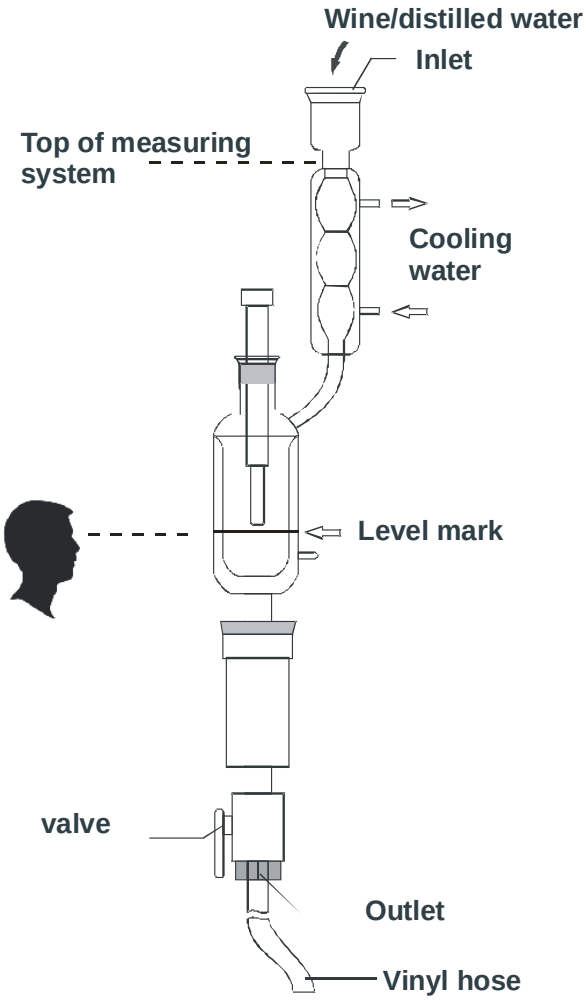
After reaching a temperature close to the water boiling temperature, the meter will automatically switch to low power of the heater – this will be indicated by the illumination of a yellow LED above the <WATER> button. The indication shows the current value of the water temperature measured .
After reaching a temperature equal to the water boiling temperature, the meter will automatically turn off the heater, record the measured temperature in EEPROM (Electronically Erasable Programmable Read-Only Memory) and switch to mode **Readiness** (see Fig. 5).
After the measurement completion open the discharge valve to evacuate the measurement system for alcohol sample or water.

If the meter is in mode **Water,** it can be terminated at any time by pressing the push-button <VIEW>. In this mode the meter will turn the heater off and switch to mode **Readiness** without memorizing a new value for the water boiling temperature in the EEPROM.

In this mode you have the possibility to determine the time of reading the water boiling temperature by pressing push-button <WATER>. In this event, the meter will turn the heater off, switch to mode **Readiness** and memorize in the EEPROM the currently displayed temperature as water boiling temperature.

5.5. Mode: Sample

Attention: During this procedure tab water must flow through the cooling system



Before starting the mode for determination of the boiling temperature of the alcohol sample and calculation of the ethyl alcohol volume percentage, the measuring system should be flush with wine to be measured.

Close the discharge valve (see Fig. 1), and fill the measuring system to the top with wine to be measured (about 100 ml). Then open the discharge valve to evacuate the measuring system. This way the measuring system will be flushed and prepared for measurement.

Close the discharge valve, measure another 50 mL from the sample and pour it into the inlet of the measuring system.

Adjust the wine volume to the printed mark on the reactor by opening the valve to drain the excess wine. During the volume adjustment, the mark should be at your eye level.

Attention: The precise wine volume is very important for the accuracy of ebulliometer!

After the start of the measurement by pushing button <SAMPLE> the meter will automatically switch the heater to high power – this will be indicated by illumination of the red LED above the <SAMPLE> button.
Note: If temperature is below 45° C the meter will indicate:

Next the indication will show the current value of the measured temperature of the sample.

After reaching a temperature close to the sample boiling temperature, the meter will automatically switch to low power of the heater – this will be indicated by the illumination of the yellow LED above the <SAMPLE> button. The indication will show the current value of the measured temperature of the sample.

After reaching a temperature equal to the sample boiling temperature, the meter will automatically turn the heater off, switch to mode **Readiness** and show the ethyl alcohol percentage in the sample.

After the measurement completion open the discharge valve to evacuate the measuring system.

If the meter is in mode **Sample,** it can be terminated at any time by pressing the push-button <VIEW>. In this mode the meter will turn the heater off and switch to mode **Readiness** and the indication will show the result from the previously measured sample.

In this mode you have the possibility to determine the time of reading of the sample boiling temperature by pressing push-button <SAMPLE>. In this event, the meter will turn the heater off, switch to mode **Readiness** and the percentage of alcohol is calculated on the basis of the sample temperature currently displayed.

Notes:
1. Please ignore the measurement result of the first measurement done after measuring the water boiling temperature determination. Repeat the measurement with a new sample from the same wine.
2. Please be aware the residual sugar in the wine affects the measurement result accuracy. For achieving best results it is recommended the meter to be calibrated with wines with known alcohol content and sugar content. That differs from the sugar content of the tested samples with no more than ±5%. In order to calibrate the meter please, use ***Alcohol correction mode*** *(see chapter 5.6.).*

5.6. Mode: Alcohol correction

In this mode you can make a correction of the measured percentage of ethyl alcohol.
To enter this mode:

1. Turn off the meter and wait for about 20 seconds.
2. Press and hold push-button <VIEW> and at the same time turn on the power by the <ON/OFF> switch.
3. Hold push-button <VIEW> pressed until completion of **Indication check** mode**.**
4. The message "Corr" will be shown by the indication and the LED “% ALCOHOL" will illuminate.
5. Release push-button <VIEW>.
6. The indication will show "**c 0.00**".
7. The correction (the readout of the meter respectively) can be increased in a step of 0.02 % by push-button <WATER> and decreased by push-button <SAMPLE>.
8. Confirm the selected correction with push-button <VIEW>. This correction will be memorized in the non volatile EEPROM memory and will be added to all measurements. Upon entering a zero value as a correction of the alcohol content (“**c 0.00**”) the indication will show the total sum of all corrections of the alcohol percentage made until the present time.
9. The meter will automatically switch over to mode **Readiness.**

5.7. Mode: Temperature correction

In this mode you can make a correction directly to the temperature measured in both **Water** and **Sample** modes.
To enter this mode:

1. Turn off the meter and wait for about 20 seconds.
2. Press and hold push-button <WATER> and at the same time turn on power by the <ON/OFF> switch.
3. Hold push-button <WATER> pressed until completion of mode **Indication Check .**
4. The message "Corr" will be shown by the indication and both "SAMPLE TEMP" and "WATER TEMP" LEDs will illuminate.
5. Release push-button <WATER>.
6. The indication will show "**c 0.00**".

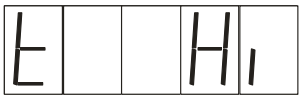
7. The correction (the readout of the temperature respectively) can be increased in a step of 0.02°C by push-button <WATER> and decreased by push-button <SAMPLE>.
8. Confirm the selected correction with push-button <VIEW>. This correction will be memorized in the non volatile EEPROM memory and will be added to all measurements. Upon entering a zero value as a correction of the temperature value ("**c 0.00**") the indication will show the total sum of all corrections of the temperature until the present time.
9. The meter will automatically switch over to mode **Readiness.**

6. MESSAGES AND ERRORS

6.1. Message < t Lo >

Message on display :
Description: The measured temperature is below 45 °C.

6.2. Message < t Hi >



Message on display:
Description : The measured temperature is above 120 °C.

6.3. Error < Er tA >

Message on display:
Description: Error in the temperature sensor or ADC.

6.4. Error < Er t5 >

Message on display:
Description: No synchronization with power supply source.

6.5. Error < Er P1 >

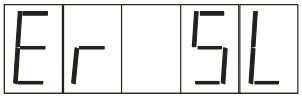
Message on display:
Description: Error in the non volatile EEPROM memory– some of the following parameters are of incorrect value:
- The last measured boiling temperature taken in mode **Water**
- Correction of percentage of alcohol
- Correction of temperature

Note: This error is not critical to the operation of the meter. Before proceeding further enter again the required values of corrections for the percentage of alcohol and measured temperature and take a new measurement in mode **Water** (see 5.4.)

6.6. Error < Er PF >

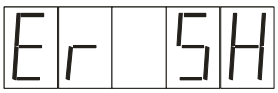
Message on display:
Description: The non volatile EEPROM memory is damaged and needs to be replaced with a new one. Contact an authorized service engineer or the manufacturer.

6.7. Error < Er 5L >



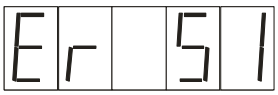
Message on display:
Description: emperature of the measuring block is low. Contact an authorized service engineer or the manufacturer.

6.8. Error < Er 5H >



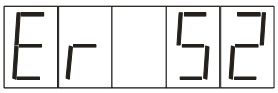
Message on display:
Description: Temperature of the measuring block is high. Contact an authorized service engineer or the manufacturer.

6.9. Error < Er 51 >



Message on display:
Description: Temperature sensor of the measuring block is damaged. Contact an authorized service engineer or the manufacturer.

6.10. Error < Er 52 >



Message on display:
Description: Temperature of the measuring block is outside the permissible range. Contact an authorized service engineer or the manufacturer.

6.11. Error < Er C1 >

Message on display:
Description: Error in the ADC when measurement of the thermocouple temperature is taken. Contact an authorized service engineer or the manufacturer.

6.12. Error < Er CL >

Message on display:
Description: Temperature of the heater is low or thermocouple is damaged (short circuit). Contact an authorized service engineer or the manufacturer.

6.13. Error < Er CH >

Message on display:
Description: Temperature of the heater is above the permissible value or thermocouple is damaged (broken). Contact an authorized service engineer or the manufacturer.

6.14. Error < Er L1 >

Message on display:
Description: The meter has been working with high power longer than permitted.

6.15. Error < Er L2 >

Message on display:
Description: The meter has been working with low power longer than permitted. Check cooling water temperature and flow rate.

7. CLEANING

A regular and proper cleaning of the meter measuring system will assure accurate and reliable measurement results. You may apply different cleaning procedures depending on the samples tested:

1. In case you are measuring dry wines only it is enough if at the end of the working day you run the meter few times in <WATER> mode (see chapter 5.4.)
2. In case you are measuring sweet wines the cleaning procedure is to be made at the end of the working day by running the meter few times in <WATER> mode (see chapter 5.4.) but 5% of NaOH solution should be used instead of distilled water. Distilled water should be used then to flush the measuring system in order to remove NaOH remains.

8. PRINTING OUT THE RESULTS ON A SERIAL PRINTER

If you wish to print out the measurement results to have a hardcopy, it is necessary to connect a DEP 50 ESC/POS printer to the ebulliometer via the RS232 cable of the printer. Upon completion of the water boiling temperature or sample measurement the results will be automatically printed out.

9. WARRANTY CARD

This ebulliometer is warranted from the date of purchase. This warranty covers all expenses incurred in connection with defects in materials and workmanship in this product, excluding broken glass and water leakage defect. This warranty does not cover expenses incurred in connection with defects resulting from improper operation, maintenance or abuse.
This Warranty Card has to be filled in at the time of purchase of the meter. No claims will be accepted without the genuine Warranty Card or other evidence of purchase.
This warranty will be avoided in the case of modification or repair by unauthorized personnel or lack of a serial number.

Serial No:

Date:

Warranty months: 12