Labotronics



Octane and Cetane Tester

LB-100CT

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1. Safety Measures

1) The instrument is designed to operate safely and does not contain any sources of high voltage, fire hazards, or any other factors that could pose a risk to the health and safety of the operator. It has been constructed with safety in mind to ensure that users can work with it without exposure to potential dangers.
2) The measurement process should only begin after ensuring full compliance with all safety requirements established in the relevant normative documents that apply to the specific type of fuel being tested, whether it is petrol or diesel fuel. These requirements must be carefully reviewed and followed to prevent accidents, ensure accurate results, and maintain a safe working environment.
3) When handling fuel samples, it is essential to adhere to fire prevention and safety regulations by GOST standards. Proper precautions must be taken to minimize the risk of ignition, spills, or exposure to hazardous substances. This includes using appropriate protective equipment, working in well-ventilated areas, and following all recommended procedures to prevent accidents or fire-related incidents.

2. Introduction

Octane and Cetane tester LB-10OCT is a highly-sensitive portable tester, employs research and motor measuring methods (RON and MON) that measure both gasoline octane value and diesel cetane value. Features winter, summer, and arctic diesel measurements, and offers rapid measurement within 1 to 5 sec in accordance with international standards. Designed with large LCD liquid crystal display, has built-in memory, and USB interface for simple data processing.

3. Features

1. Portable tester measures both gasoline octane value and diesel cetane value with precision
2. Research and motor measuring methods (RON and MON)
3. High sensitivity, detects even minute changes in dielectric properties
4. Measures within 1 to 5 seconds, fast and accurate
5. Winter, summer, and arctic diesel measurement
6. Eliminates the requirement to ship fuel samples to laboratory
7. Large LCD liquid crystal display enables testing in all light conditions, simple monitoring
8. Built-in memory, user-friendly operation
9. Measures in accordance with international standards
10. Lightweight, durable, and easy to use
11. USB Interface for simple data processing

4. Specifications

Model No.	LB-10OCT
Type	Portable
Measuring Method	RON and MON
Octane Gasoline Measurement Range	40 to 125 ON
Octane Accuracy	± 0.5
Cetane Diesel Measurement Range	20 to 100 CN
Cetane Accuracy	±1.0
Max Inaccuracy of Diesel Fuel Freezing Point	±2 C°
Measurement Range of Kerosene Content in Diesel	0 to 95 %
Max Inaccuracy of Kerosene Content in Diesel	0.2 to 1 %
Measurement Range of Pour Point Depressant Content in Diesel	0.03
Max Inaccuracy of Pour Point Depressant Content in Diesel	0.0001
Gasoline Oxidation Stability Measurement Range	50 to 2400 min
Max Inaccuracy of Gasoline Oxidation Stability	0.05
Measure Time	1 to 5 s
Built-in Memory	Yes
Interface	USB
Service Life	6 years
Power Consumption	5.4 V
Unit Dimension	100 × 210 × 40 mm
Sensor Dimension	60 × 100 mm
Net Weight	850 g

5. Applications

Octane and Cetane tester are used for determining on-site octane number of gasoline that correlates to research and motor method (RON and MON), cetane value of diesel, pour point depressant & kerosene content in diesel, freezing point of diesel, gasoline oxidation stability, as well as temperature of the liquid under examination can be measured across laboratories, research, government departments, water quality testing, pipelines, terminals, etc.

6. Instrument Introduction

1) The principle of Octane Meter operation is in determining knock characteristic of gasoline, self-flammability of diesel fuel based on measurements of their dielectric permeability.
2) The instrument sensor is a solid construction in the form of a glass having a volume of 75 ml. Its volume specifies signal characteristics of the generator situated at the bottom of the sensor. The sensor also has a built-in element sensitive to fuel sample temperature changes.
3) The sensor is equipped with an imitator. This imitator allows conducting the performance check of the device without using fuel samples.

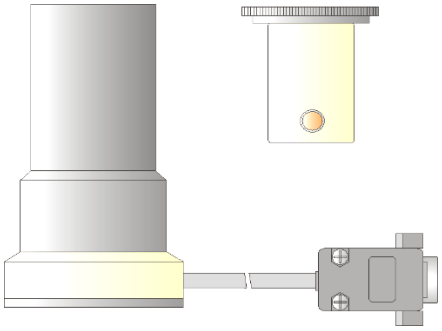


Figure-1 (Sensor and sample imitator)

4) The instrument electronic computing module processes sensor signals, performs all necessary calculations, and constantly tests the main functional modules of the instrument. The appearance of the electronic computing module is presented. On the left side of this module, there are sockets for connecting the sensors and for connection to a computer.

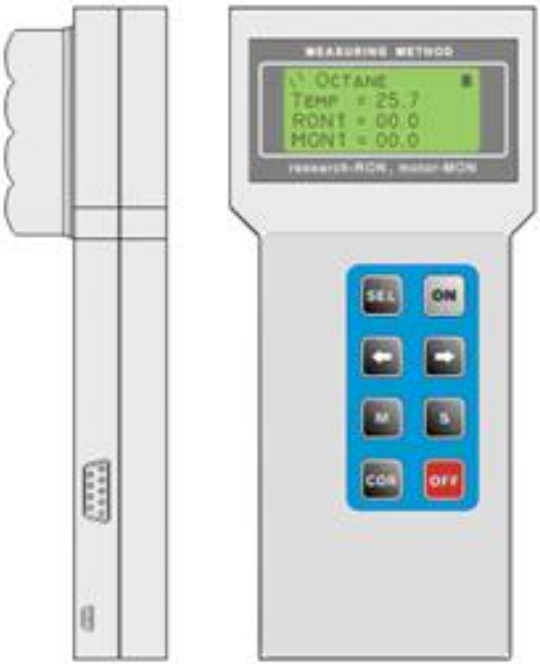


Figure-2 (Electronic module)

7. Installation

7.1 Control models

To carry out periodic checks of performance, adjustment and correction of the instrument readings both in laboratory and field conditions, the recommendation is to use reference isooctane.
The technical data on the reference isooctane are presented. Adjustments should be conducted in "**Measure**" mode.

Volumetric model
Liquid
Indication in Measure mode at t = 20 C^0
Reproducibility, units
Repeatability, units

7.2 Instrument performance check

Switch the instrument on. Choose Octane, RON, MON operating mode. Insert the linear model (imitator) into the analyzer sensor. The instrument is to display the values within the range 90-98.

7.3 Instrument adjustment

1) Switch the instrument on. Choose the Measure mode.
2) Fill up the sensor with the volumetric model (isooctane). The instrument is to display values of parameter “f”.
3) If the instrument readings differ from specified values, adjust with the use of a screwdriver. For this purpose, insert the screwdriver into a special aperture in the bottom part of the sensor and turning it to the left or right obtain the values specified above.
4) Pour out the volumetric model (isooctane), turn the measuring sensor upside down and remove the residues of the fuel. If necessary, wipe the sensor.

Note: The method of the instrument adjustment using isooctane supplements the possibilities to adjust the device by comparing the instrument readings with the motor engines complying. Moreover, it is required in case of using the instrument for technological purposes or for the analysis of petrol by blending of low octane (straight-run) petrol. In this situation, the instrument assures normal accuracy of measurements only within the range of octane numbers of those samples for which the correction has been made.

8. Operations

At the front panel of the device there is a liquid-crystal display and control buttons. Display indications are described in all details on the table below. The control button's function.

Button	Function	Additional Function
[ON]	Switching the instrument on	
[OFF]	Switching the instrument off	
[<=] [=>]	Selection of operating modes	Review of measuring results, parameters correction (+ -)
[SEL]	Selection of a parameter in the measurement mode	Selection of a parameter to be corrected
[S]	Results saving in the instrument's memory	Selection of operation (+-<>z) during correction
[M]	Switching to the mode of stored results review	
[COR]	Switching to correction mode	Deletion of all measuring results by instrument's memory (double press)

At the back panel of the electronic computing module, there is a battery compartment.

Use of the instrument

8.1 Operations restrictions

1) It is prohibited to fill up the instrument sensor with other liquids but petrol, diesel fuel, kerosene.
2) It is allowed to use the instrument in the following operating conditions: the ambient temperature must be in the range from minus 10 °C up to plus 45 °C. In case of conducting measurements out of the indicated range, the measured temperature reading will be blinking.
3) In case of using Octane Meter at lower temperatures, the liquid-crystal display of the device may become frozen. Measurement at higher temperatures may lead to distortion of measurement results due to intensive evaporation of the examined fuel sample light fractions.

8.2 Making ready

1) Octane Meter is completely equipped and does not require any pre-starting procedures.
2) Make sure that power supply elements are installed properly. The proper connection scheme is given in the battery compartment of the electronic computing module.
3) After transportation of the instrument under winter conditions, it is recommended to let the device stay indoors at acceptable ambient temperature for at least 2 hours.

8.3 Display indications

The instrument is equipped with a four-line matrix liquid-crystal display. The appearance of the display along with indications of all possible fields and symbols is presented below. Appearance of single fields depends on the current instrument operating mode.

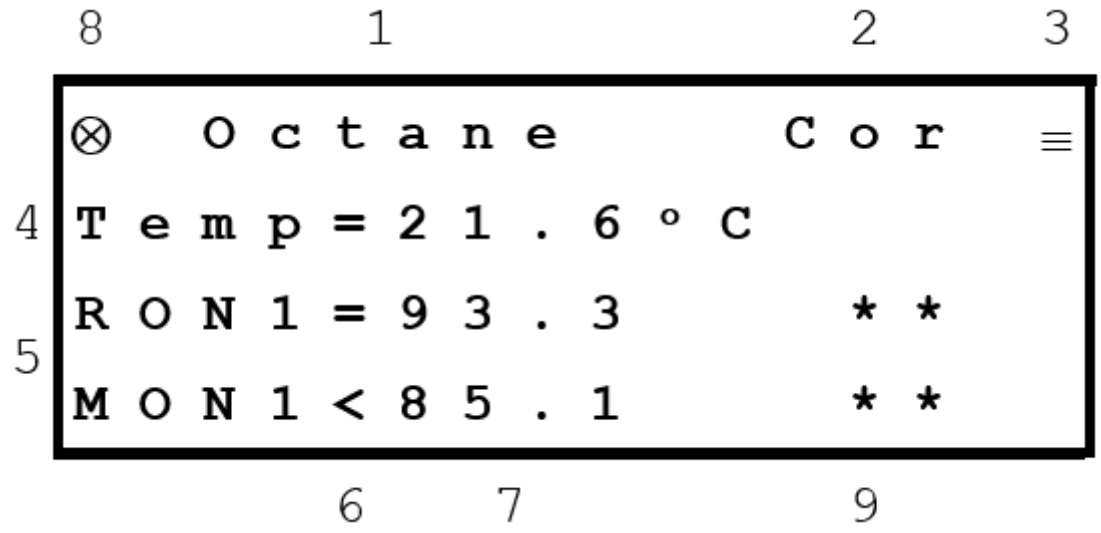


Figure-3 (Display symbols and fields)

1) The field that displays the instrument operating mode; this field can indicate different values: Octane, Cetane, Oct + Oct, Cet + Cet, Cet+%Keros, etc.
2) The field which is shown only when performing program correction of instrument readings.
3) Battery symbol displaying in this field demonstrates power supply elements condition. The full battery symbol indicates sufficient voltage. Displaying of a blinking battery contour warns of insufficient supply voltage; thus, it is necessary to replace batteries.
4) The field that displays the temperature of the examined fuel sample. It is indicated in any instrument operating mode.
5) The parameters measured in the current operating mode.
6) When conducting measurements, it always indicates the symbol "=". During program correction, it indicates the symbol of an operation being carried out with the current parameter.
7) Values of the measured parameters.
8) Displaying of a rotating symbol during the instrument's operation indicates its full serviceability.
9) Symbols that indicate presence of correction for parameters calculation in the current operating mode.

8.4 Instrument operating modes

By the purpose of expansion of adaptation capabilities of the device for various application conditions, additional operating modes are included.

Mode	Description
Octane Temp = RON = MON = AKI =	The first mode is basic. This mode is meant for measurement of commercial petrol octane numbers by research (RON) and motor (MON) methods. AKI (AKI=(RON+MON)/2), antiknock coefficient (pump octane number), is also indicated.
Octane 1 Temp = RON = MON = AKI =	This mode is used for measuring octane numbers of petrol, especially low-octane petrol created by blending based on fuel efficient production techniques or branch technical specifications, and for non-standard petrol analysis.
Oct + Oct Temp = RON = MON = AKI =	Additional mode. See "**Octane**" mode. This mode can be used for introducing the independent program correction.
Oct + Bd. time SEL: Temp = Tbd =	This mode is for the petrol breakdown time of oxidation determination. Petrol brand is selected by [SEL]. Complies [Tbd] – period (min)
Cetane Temp = Cet = TYPE TFL =	This mode is basic. It's meant for diesel fuels, the cetane number determination (Cet). Diesel fuel sample pour point is entered as an optional parameter (TFL). Fuel type (TYPE) is also indicated: S – summer (0-20^0); W – winter (-20 to -38^0); A – arctic (lower than -38^0).
Cet + Cet Temp = Cet = TYPE TFL =	Additional mode. See "Cetane" mode. This mode can be used for introducing the independent program correction.
Cet+%Keros Temp = Type = K =	This mode is for determination of kerosene content in diesel fuel. [Type] – fuel type (see "Cetane" mode) [K] – kerosene content in diesel fuel (%)
Measure	Service mode for instrument troubleshooting.

1) Instrument memory contains integral parameters of a considerable quantity of commercial petrol, oil and diesel fuel brands.
2) Readings of the instrument may differ for two samples of the same brand, if these samples are of different batches of oil, and that is why they have different compositions.
3) In this case, measurement accuracy may not satisfy the user. For that, the instrument has a function of making program correction of readings.

4) The computational algorithm modified by the user is saved in the instrument's independent memory after switching off the power supply.
5) It is not recommended to make any changes in Octane and Cetane modes, keeping them as reference modes, and for this purpose the Octane1, Oct + Oct, Cet + Cet modes may be used.
6) These modes are complete analogues of the first two, but they are specially meant for entering correction by the user. Switching of the instrument operating modes is carried out by pressing [<=] [=>] buttons.

8.5 Procedures of operation

1) Open the bag, take out the instrument sensor and put it on a horizontal surface. Position of the electronic computing module does not matter.
2) Make sure that there are no unwanted subjects (such as fixed residues or oil films) in the instrument sensor.
3) Switch the instrument on by pressing the [ON] button. Octane Meter automatically switches over to the operating mode at which it was switched off earlier. If necessary, choose a required operating mode through buttons [<=] [=>].
4) Instrument indications will set in 1 - 5 seconds. If the instrument sensor is empty, "zeros" are displayed. If the imitator is inserted into the sensor, the instrument is to indicate values from the range RON = 90-98.
5) Using laboratory glassware of 75 - 100 ml volume, fill up carefully the instrument sensor with an investigated fuel sample up to full admission. It is allowed switching the instrument on after the sensor is filled up.
6) The process of measurement and indications updating takes no more than 5 seconds. If the sample temperature differs from the ambient temperature, it is necessary to wait until the setting of the indications of the sample temperature. Write down the instrument readings. If parameters of the sample are out of the working range limits, the display indicates values "00.0".
7) This instrument model has a function of storing the measurement results in the instrument memory. To do this it is necessary to press the [S] button. The measurement results log saves data of the last 20 measurements. To identify these measurements, they are consistently numbered from RN01…RN20. Saved data can be viewed with the help of the instrument or the PC. You should push the [M] button and the instrument switches to the review mode. Push [<=] [=>] buttons to jump between measurements. Press button [COR] 2 times to delete all records. [M] – to exit from the review mode.
8) Pour out the fuel sample, turn the measuring sensor upside-down and empty it removing all fuel rests; if necessary, wipe it with cleaning rag or toilet paper. After conducting analysis of diesel fuel, the sensor is to be washed out with petrol.
9) Proceed to the next measurements or switch off the device.
10) To save power, the instrument has an automatic instrument switch-off in 4 minutes, if during this period no buttons were pressed or there was no call from the computer 15 seconds before power switch-off the device gives out a long sound signal to attract attention.

8.6 Program correction reading

Attention: It is necessary to remember that the oil products data set into the instrument's memory remains constant.

The process of program correction of reading modifies only the algorithm of calculations. Corrections entered into one of the operating modes do not influence the other modes functioning. Corrections reset (return to the base algorithm of calculations) is also made independently in each mode. In the correction mode in case of activation of the automatic power switch-off function, the changed corrections are saved. The program correction of readings is to be performed in the following order:

1) Choose the instrument operating mode to be corrected. Fill up carefully the instrument sensor with a fuel sample with known parameters (octane number for petrol or cetane number for diesel fuels). Perform the measurement and obtain the value, which needs to be corrected.
2) Enter into the correction mode. To do this it is necessary to press the [COR] button. At this, the device beeps a long sound signal, and a blinking field "Cor" and the correction symbol appear in the first line of the indicator. At this stage, the instrument does not perform any measurements, displaying the last obtained result.
3) Using [SEL] button choose the parameters to be corrected (RON or MON for petrol, Cet or TFL for diesel fuels).

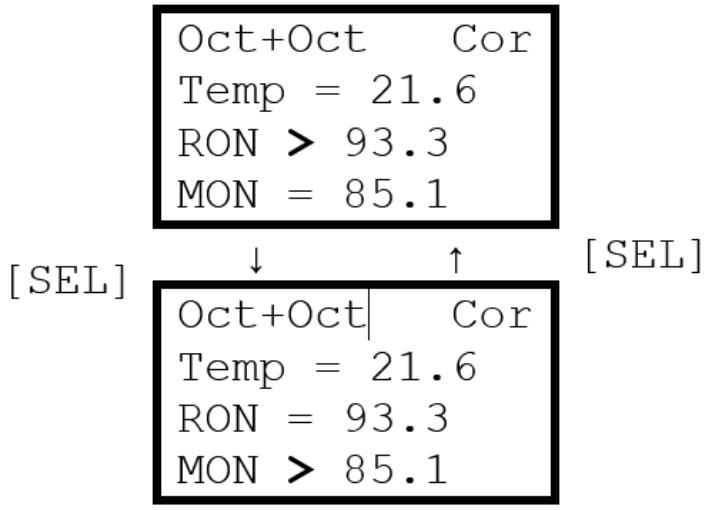


Figure-4 (Selection of parameter to be corrected)

4) Using [S] button choose symbol opposite the corresponding parameter «>», «<», «+», «–» or «Z». Example of indicator readings when performing these operations is presented.

"<", "+" - Increase of a parameter
">", "-" - Reduction of a parameter
"Z" - Zeroing(reset) of corrections

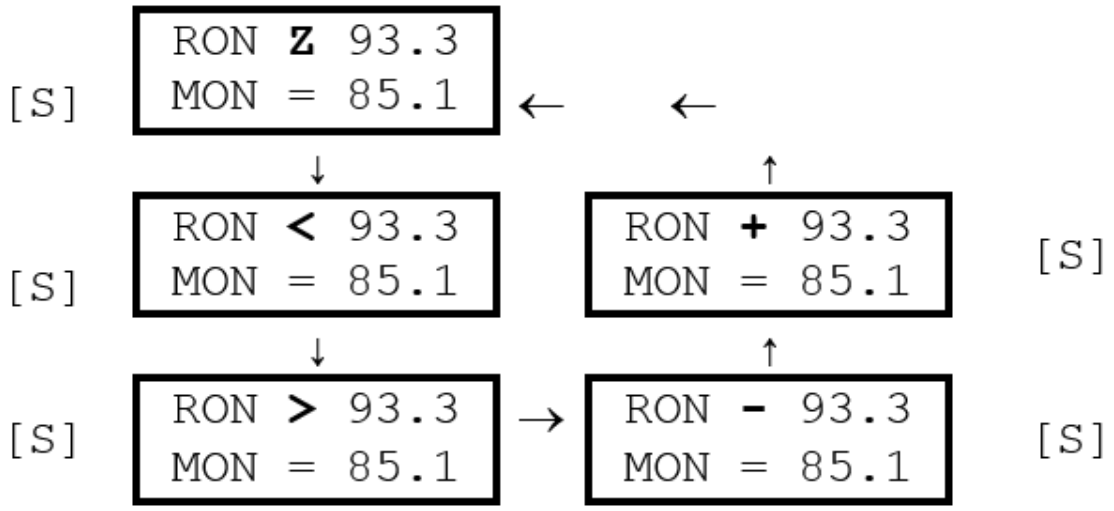


Figure-5 (Selection of correction operation)

The calibration characteristic stored in the instrument memory is strongly nonlinear, therefore, to correct readings of low-octane petrol (octane number is less than 80) it is recommended to use operations ">" and "<", and for high-octane petrol (octane number is more than 80) it is recommended to use operations "+" and "-". As a rule, readings of cetane numbers do not need to be corrected. Determination of diesel fuel pour point, and type is carried out as a reference parameter. In this connection, when making corrections of parameters "Cet" and "TFL" the operations are chosen at the operator's will.

Attention: There is a difference in effects of operations: «+» and "-" are performed independently for each parameter; "<" and ">" not only correct the chosen parameter, but also cause proportional changes of other parameter; "Z" makes zeroing (resetting) of corrections for both parameters at once, and, if you execute this operation in the top line (the line of parameters "RON" or "Cet"), zeroing (resetting) of the corrections entered using operations «+» and «-» occurs; if you execute "Z" in the bottom line (line "MON" or "TFL"), zeroing (resetting) of the corrections entered using any operations occurs.

5) Set the parameter being corrected to the required value. For this purpose, press the buttons [<=] or [=>]. At this, the symbol of operation is replaced with "*" symbol for a short period (the instrument processes the received information), then the parameter value changes. In Pictures 6 and 7, examples of the performance of operations «+» and «<» are presented. At using operations «+» and "-", each pressing of button [<=] or [=>] makes a change in the parameter by 0.1 units of octane (cetane) number. When using operations "<" and ">", the change in the parameter by 0.1 units of octane (cetane) number does not always occur, therefore it is needed to make, if necessary, several presses.

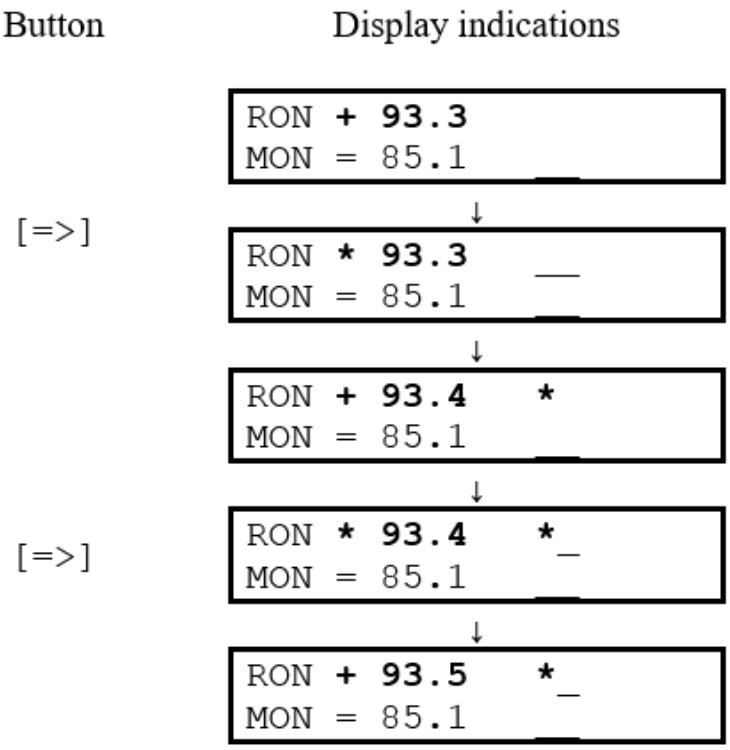


Figure-6 (Example of "+" operation)

Symbol '*' shows the presence of correction for RON1 value in relation to the factory presets. Underlining symbols are given for binding of correction indicators location; they are not displayed on the device screen.

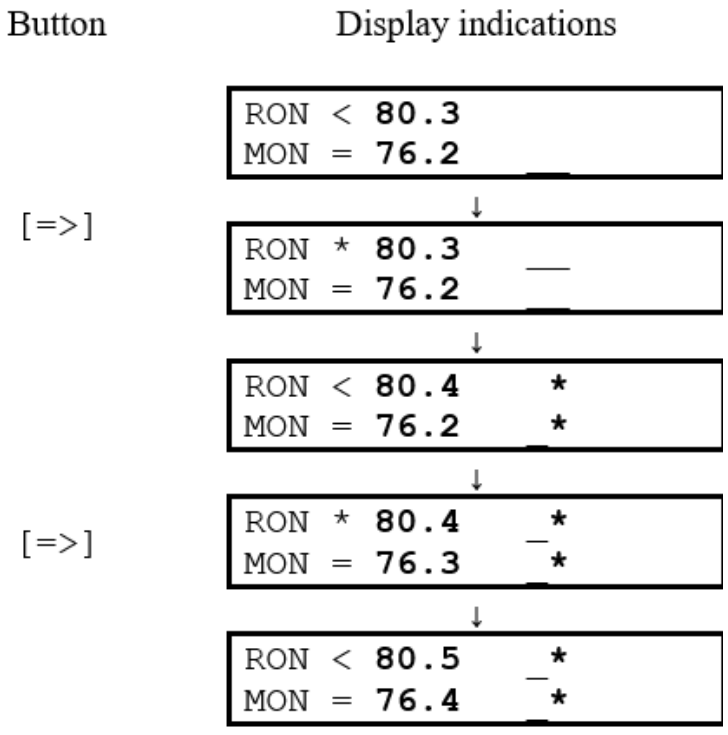


Figure-6 (Example of "<" operation)

After achieving the desirable result, quit the correction mode and enter the operating mode. To do this it is necessary to press the [COR] button. At this, a long sound signal is beeped.

Attention: It is necessary to remember that after the correction the instrument assures normal accuracy of measurements only within the range of those samples for which this correction has been made.

The corrections stored in the instrument memory can always be reset. For this purpose, it is necessary to enter the correction mode and execute the operation of corrections zeroing (resetting) "Z" in the bottom line (the line of "MON" or "TFL" parameters).

Software: The instrument can be used with a personal computer. The software allows the user to make measurements, save results into the computer's memory with the indication of date, location, and time of analysis in the format of Microsoft Excel or .txt, as well as make program correction.

Storage: The devices should be stored in the closed package at the ambient temperature from +5ºC up to +40ºC and relative air humidity not more than 98 % at 20 - 25ºC.

9. Maintenance

Intermediate maintenance and checking, as well as routine maintenance of the instrument, are performed by oneself or the authorized organizations, and by the standardization and metrology center having appropriate rights.