



MEGALOC-1

User manual

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User manual
MEGALOC-1

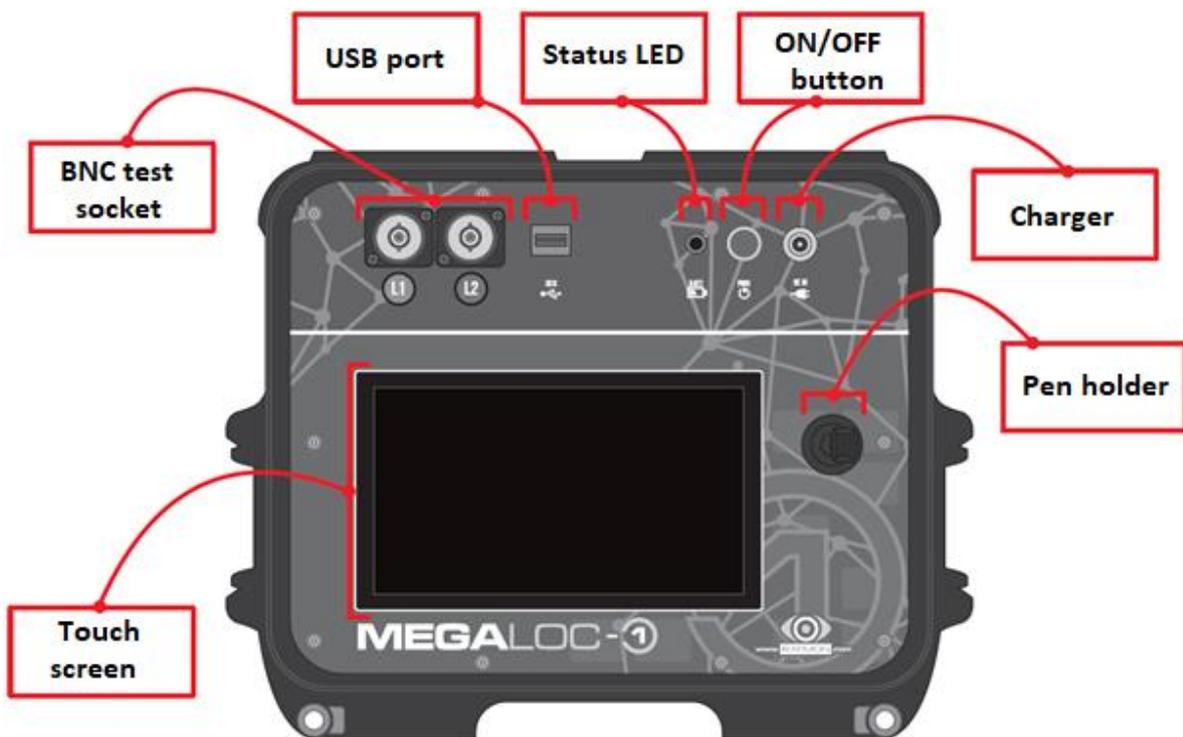
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1 Introduction

The MEGALOC-1 device is used to detect and locate faults in pre-insulated networks as well as in electric wires and cables. Basic functions of the device:

1. Insulation resistance test
2. Loop resistance test
3. Fault location by TDR technology
4. Fault location in resistance pipe networks
5. Communication with RATMON system

Description of front panel



2 Getting the device ready for working

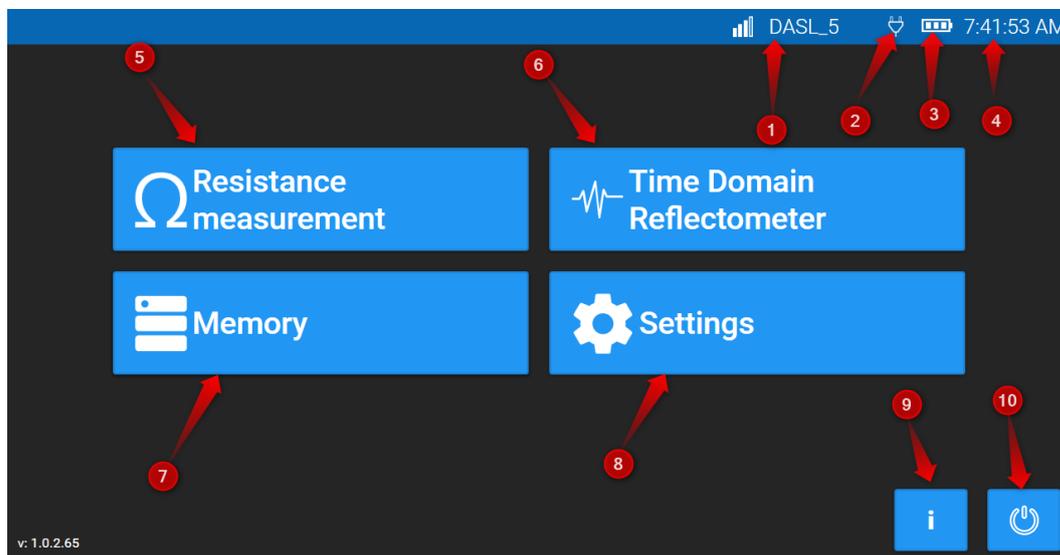
Content of the box: Megaloc-1, charger, bag, test leads.

Before start of working with the device, charge the internal battery with a dedicated charger. Charger socket is located on front panel. The charging process is described in chapter 13.3

The test leads should be connected to the BNC sockets on the front panel. The red marked wire should be connected to the red connector (L1) on front panel, and the green wire to the green connector (L2).

MEGALOC-1 is turned on and off with the button on front panel by holding the button for about 2 seconds. The device start-up time is approximately 50 seconds.

Description of main screen

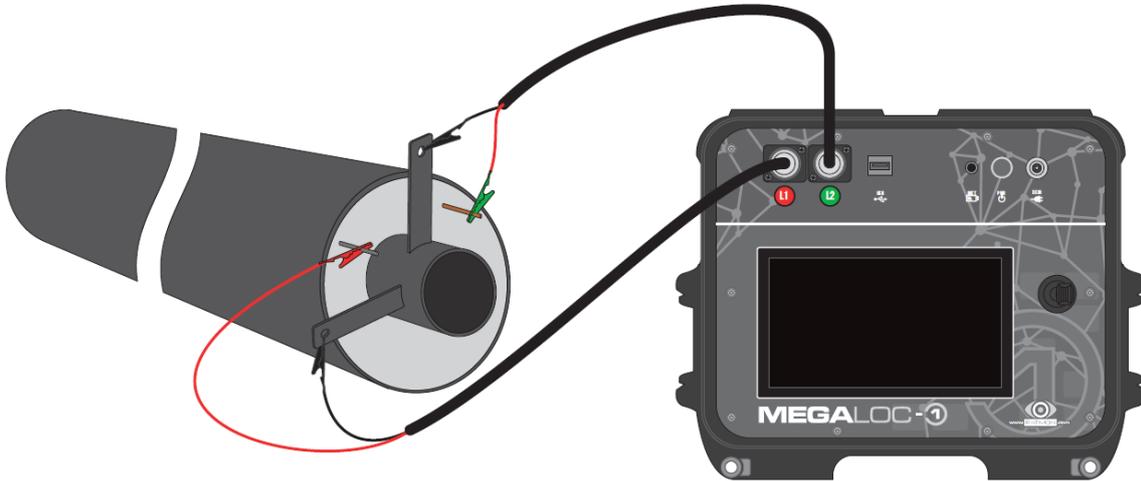


1. Strength and name of Wi-Fi network
2. Power mode indicator
3. Battery level
4. Time
5. Resistance measurements
6. TDR measurements
7. Memory
8. Settings
9. About software
10. Switch off button

3 Connection to the pipe

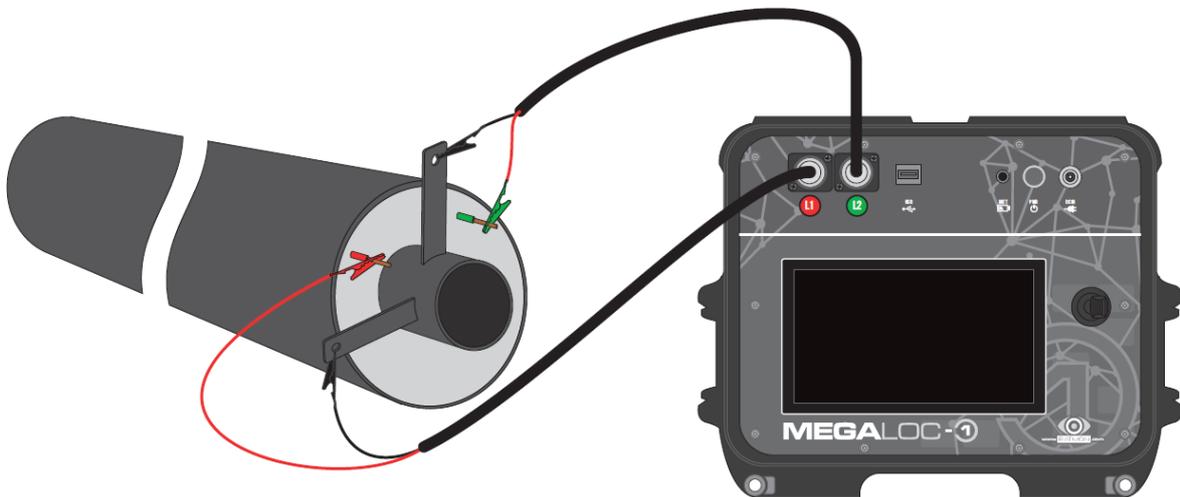
3.1 Nordic / Impulse system

Connect the red clips (L1) with the copper wire, the green clip with the tinned wire, and connect the black clips to the end of the steel pipe (banana inputs connected together).



3.2 Resistance network

Connect red clip (L1) with red wire, green clip with green wire and connect the black clips to the end of the steel pipe (banana inputs connected together).



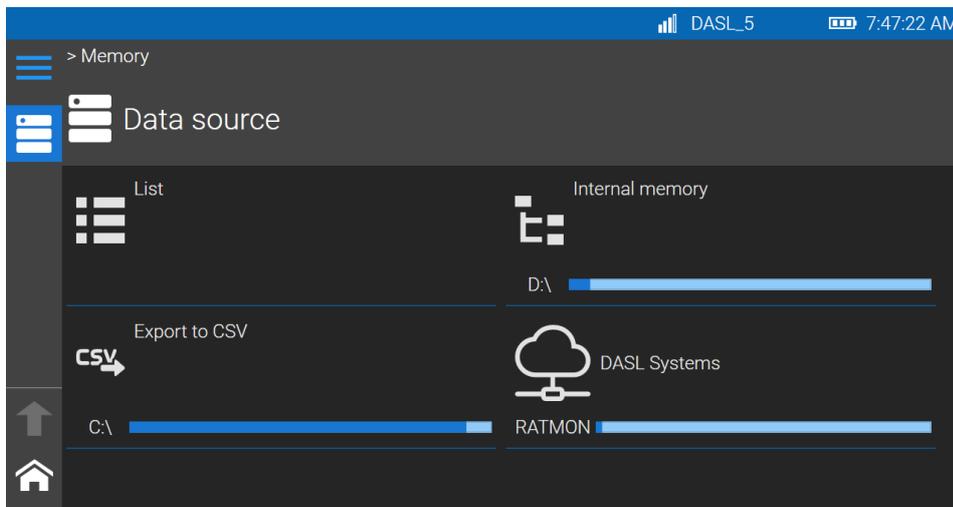
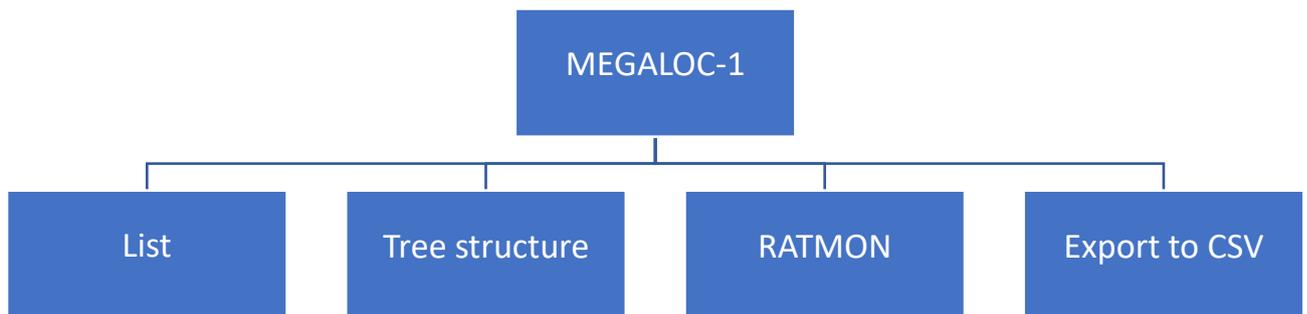
4 Memory and saving of data

After completion of the test, measured data can be saved as a simple list, tree structure, exported to CSV or sent to RATMON system.

Chapter 4.1 describes memory options.

4.1 Memory structure

Below chart shows types of available memory



a) List - a simple memory file, in the form of a list of saved results. The results are not sorted according to structure.

b) Tree structure - memory organized as a tree structure. Measurement results can be grouped in folders, circuits and measurement points.

c) Export to CSV - saving data from resistance measurements to a CSV file. The file can be edited by external editing programs.

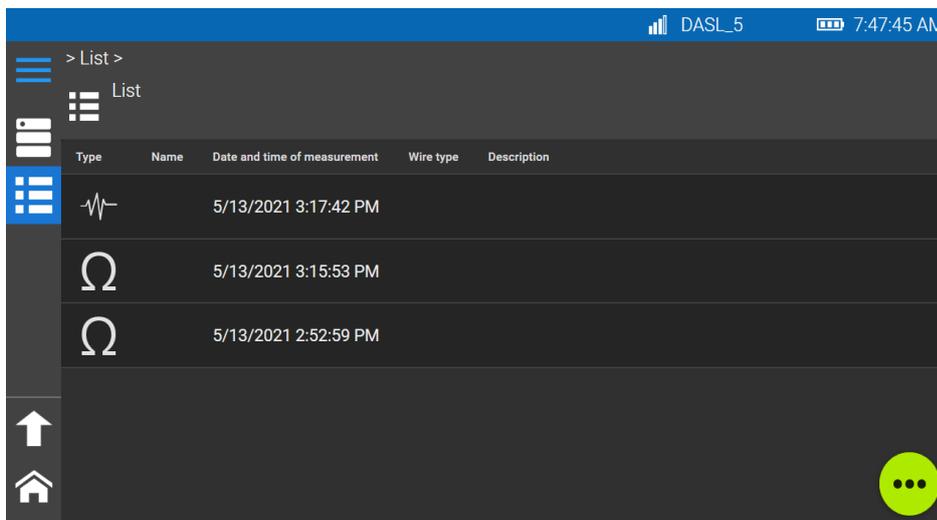
d) RATMON system - saving measurements directly in the RATMON system.

4.2 Internal memory (List)

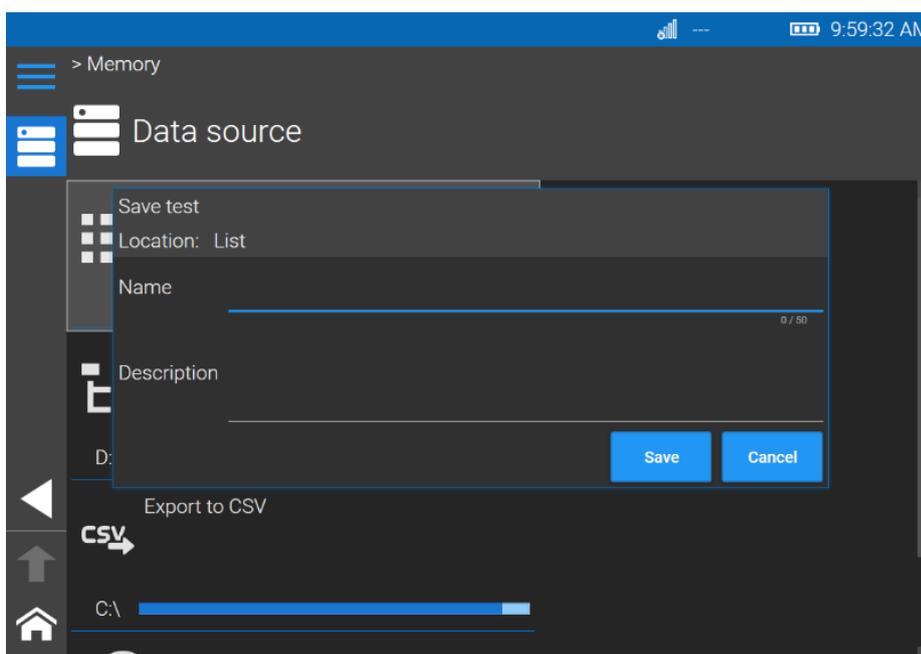
List is a flat structure where results are saved and sorted according to the date of measurements.

The following symbols appear in the table of results:

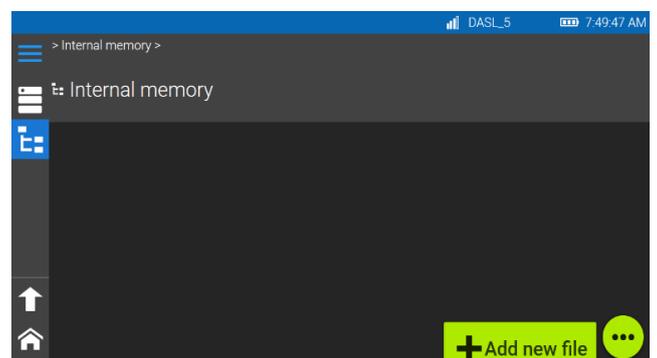
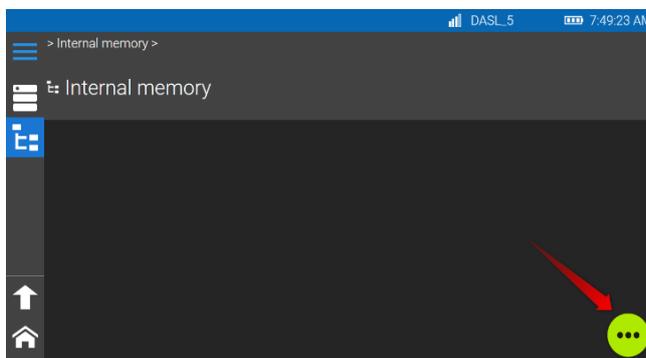
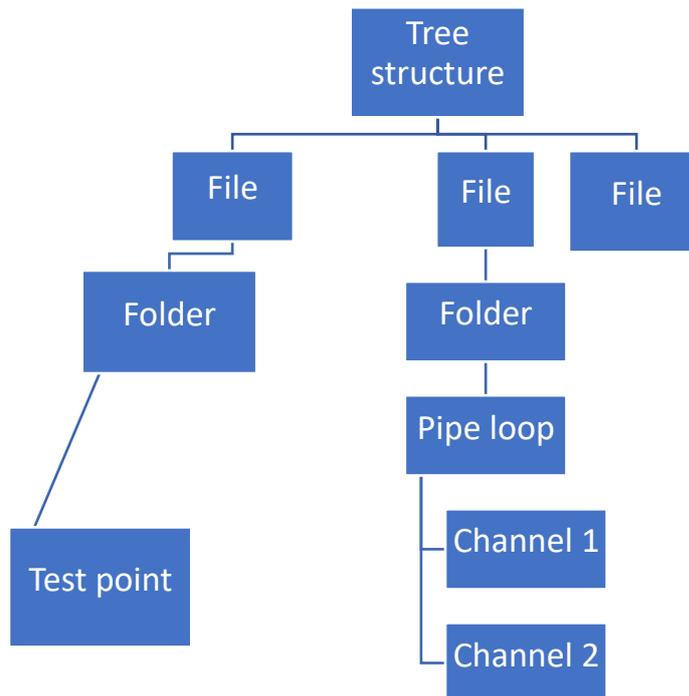
- Type of measurement:  - TDR measurement,  - resistance measurement
- Name – name of measurement, given during saving of measurement
- Date and time of measurement
- Description – additional description



In order to save test results in this memory, after measurement click on floppy disk, give name of the test (eventually additional description) and click save. Test result will be saved and sorted according to the date of measurement.



4.3 Internal memory (Tree structure)



In this case, the data are stored in folders, files and circuits linked in a hierarchical manner.

The structure aims to organize saved results so that it would be easy to locate the place of measurements in the future.

Each new structure begins with "File". The files store "Folders" and "Measurements". "Folders" are used to group "Measurements" to help organize the data in memory.

Measurement data is saved separately for each L1, L2 probe and can be saved directly to File, Folder or perimeter.

Adding and editing individual entries is initiated by the button in the lower right corner of the screen. We can save measurements from a specific place to the "Measurement point" - eg from a node, building or heating chamber. The "measuring point" stores the data in the form of a list of saved results. Data can be organized and saved also in accordance with the structure of the RATMON system by "Pipe loops".

“Pipe loop” can be divided by channels (1-4) and individual channels store single results of measurement

Example 1 – All structure elements sorter by Folders and test points

City A (*File*)

District X (*Folder*)

Node 1 (*Folder*)

Supply (*Folder*)

Measurement L1 (*Test point*) – resistance, TDR

Measurement L2 (*Test point*) – resistance, TDR

Measurement L1 (*Test point*) – resistance, TDR

Measurement L2 (*Test point*) – resistance, TDR

...

Return (*Folder*)

Measurement L1 (*Test point*) – resistance, TDR

Measurement L2 (*Test point*) – resistance, TDR

...

Example 2 – All structure elements sorter by Pipe loops and channels

City A (*File*)

District X (*Folder*)

Node 1 (*Pipe loop*)

Supply (*Folder*)

Measurement L1 (*Test point*) – resistance, TDR

Measurement L2 (*Test point*) – resistance, TDR

Measurement L1 (*Test point*) – resistance, TDR

Measurement L2 (*Test point*) – resistance, TDR

...

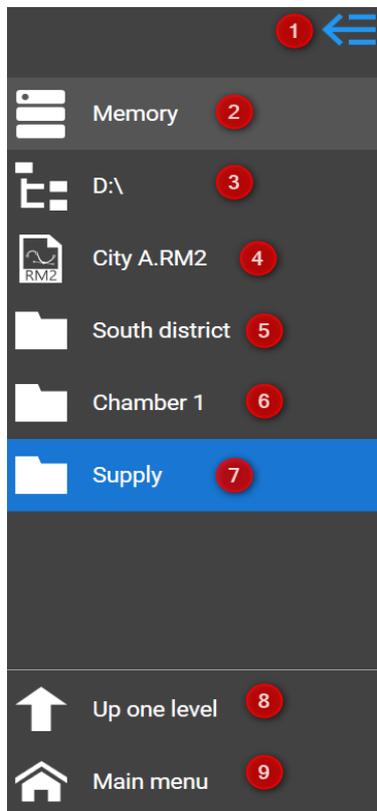
Return (*Folder*)

Measurement L1 (*Test point*) – resistance, TDR

Measurement L2 (*Test point*) – resistance, TDR

...

Moving between particular data in the structure is done by selecting the icon in the navigation bar on the left side of the screen.



- (1) Collapse / expand the side menu
- (2) Return to memory source selection
- (3) Selected memory (here PC drive D)
- (4) File
- (5) Folder
- (6) Folder
- (7) Folder
- (8) Go to place „above”
- (9) Return to main menu

After completion of measurement data can be saved in existing structure or user can add new test point to the structure. In order to do it, click of floppy disk, select icon of Structure and add new test point, creating File, Folder, Test point in the structure. When new test point has been added click save in order to save latest measurement to test point.

In case of TDR measurement, latest test can be saved as reference one, what can be used in the future for automated analysis of TDR measurement. Details please see in chapter 10.

Save test

Location: Internal memory\City A.RM2\South district\Chamber 1\Supply\Cha...

Name Measurement L2 14 / 50

Description

Set as referential

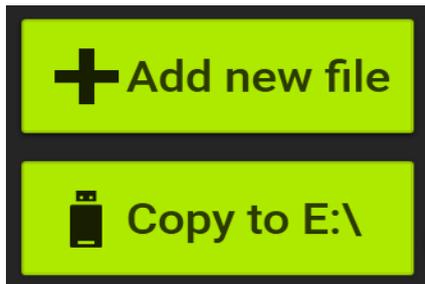
Save Cancel

4.4 Exchange of files between internal and external memory

Files with the entire structure and measurements can be saved on external media for exchange between computers.

Export of file

In order to copy file, please insert memory stick to USB port, select from main menu „Memory”, move to the list of files by clicking on button , select file and in the sub-menu select option „copy to...”.



Import of file

In order to import file, insert memory stick to USB port, in main menu select Memory, External memory, select file and from bottom menu select „Copy to Internal memory...”.



4.5 Memory – RATMON system

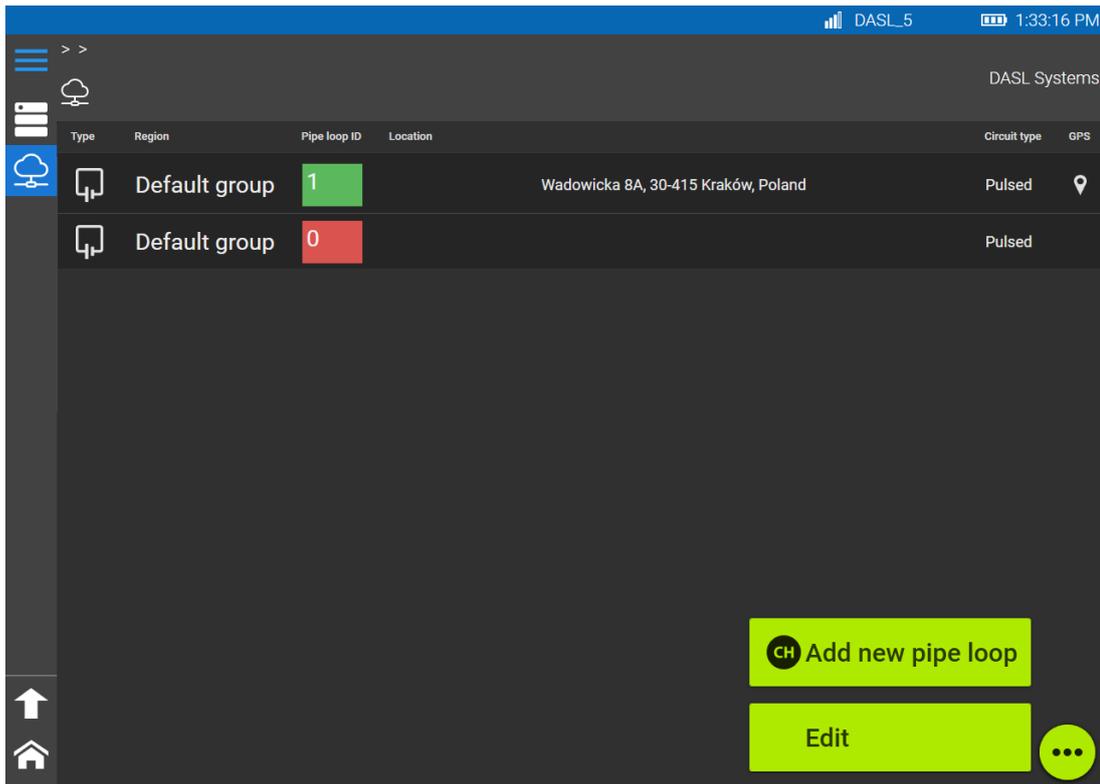
After logging in to the RATMON system, the user has access to the existing pipe loops and all the results. The user can create new pipe loops and edit the existing ones. To use an external RATMON server, you must first configure the data access, see chapter 11.2, and establish a connection to the Wi-Fi network (e.g. hot-spot from a phone), see chapter 11.4.

Please note that all changes will be saved and displayed in the RATMON system and visible to other users using the system.

Data structure in RATMON system is sorted as follows: Client-Group-Pipe loop-Channel-Measurement

Pipe loops can be connected same as Folders in File. Each pipe loop consists of channels CH, and channel is divided into measurements of probe L1 and L2.

In order to add new pipe loop from device, please select from bottom menu „Add new pipe loop” (1). The same way user can edit file, just click on „Edit” (2)).



In the window that opens, enter all the necessary information (in the case of editing - make changes), i.e. .:

- Enter the pipe loop ID;
- indicate the region (if required);
- Select the type of network - impulse, resistance (and specify the resistance value of one meter of the current wire), sensor wire or pipe loop with a zeroing tip;
- indicate the location on the map;
- Optional additional description
- Select the number of channels - 1, 2 or 4 and optionally rename the channels.

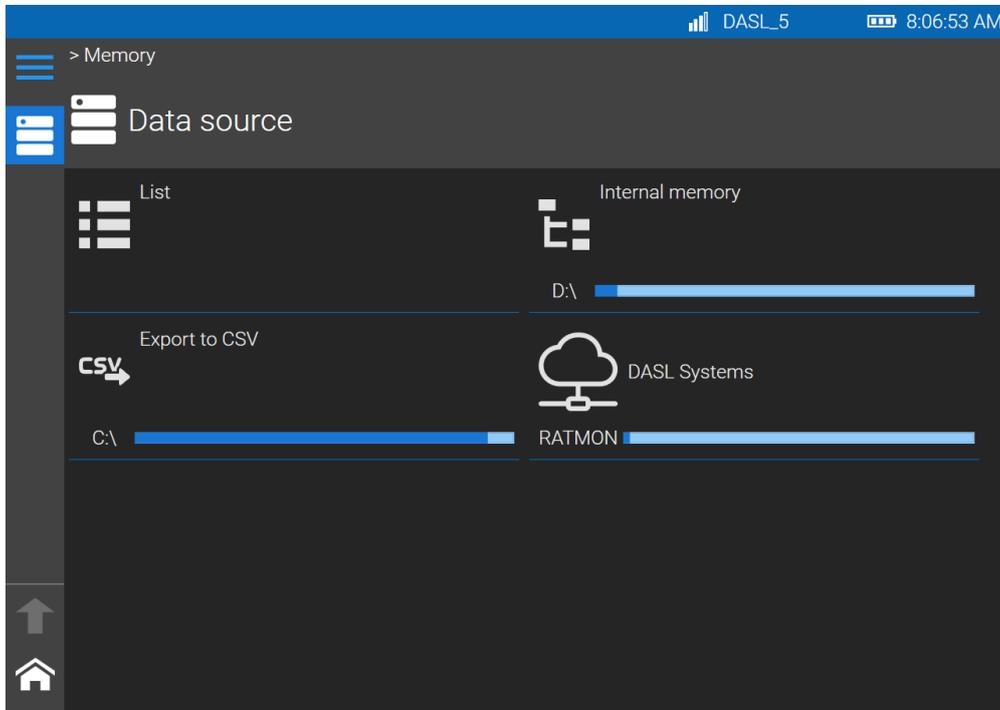
After entering or editing the information, press "Save". The indicated information will be displayed in the RATMON system.

Then, after performing the measurement and pressing the Save button, select Data source: DASL Systems - RATMON. The user can select an existing pipe loop to be saved or create a new one and add a new measurement to it.

In order to send data to RATMON system, Megaloc-1 must be connected to internet.

4.6 Export to CSV

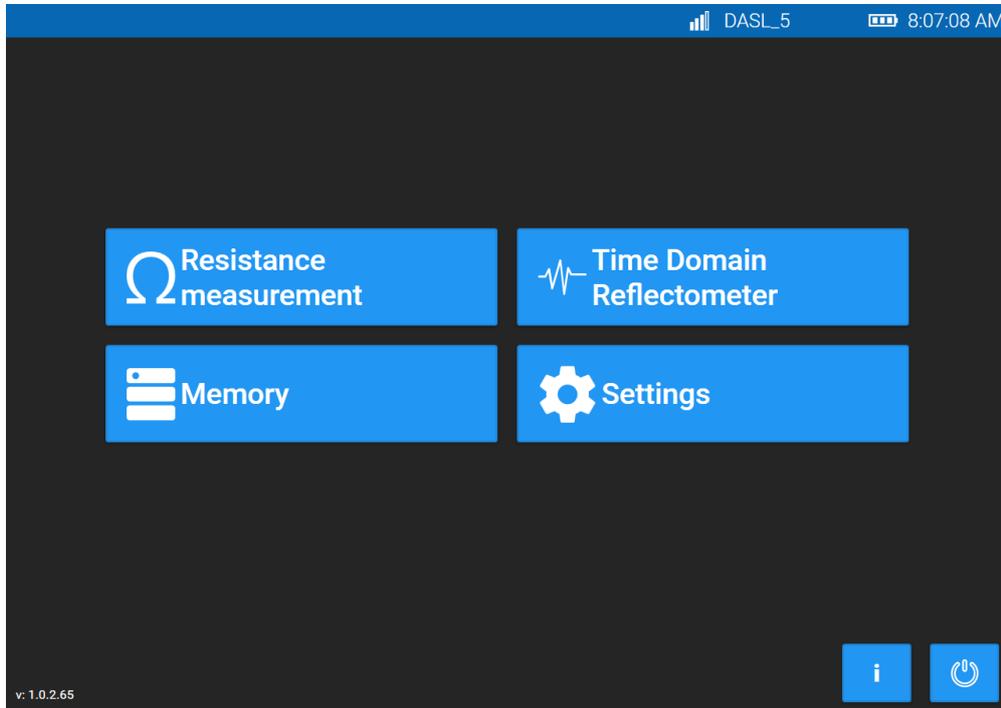
R1ISO (L1), R2ISO (L2) and RLOOP resistance measurements along with the set thresholds can be saved in CSV format. To do this, select the floppy disk after the measurement and select "Export to CSV".



After selecting from Menu / memory / Export to CSV - a list with saved files will appear. File import from the meter is described in chapter 4.2.

5 Working with Megaloc-1/ Megaloc-1b

After turning on the device below window occurs:



6 Resistance measurements.

To perform resistance measurements, select Resistance Measurement from the main menu. Measurement functions:

Insulation resistance measurement

The meter measures the insulation resistance between the L1 / L2 probe and the earth probe.

Continuity measurement

The meter measures the continuity of the circuit between the L1-L2 probes.

Measurement of galvanic voltage

The meter measures the galvanic voltage between the L1 / L2 probe and the earth probe.

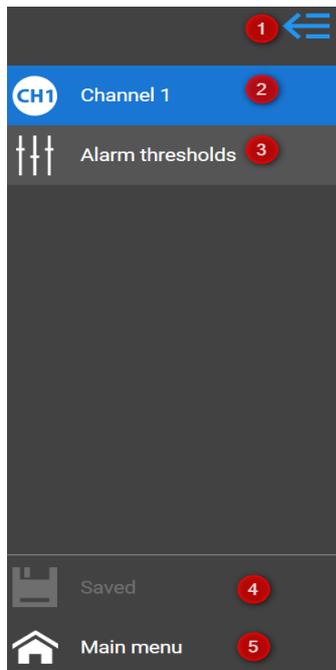
Leakage location in resistive networks (MEGALOC-1b)

The meter performs a measurement on the basis of which the leakage indication is made, expressed in% or m.

Control of connection

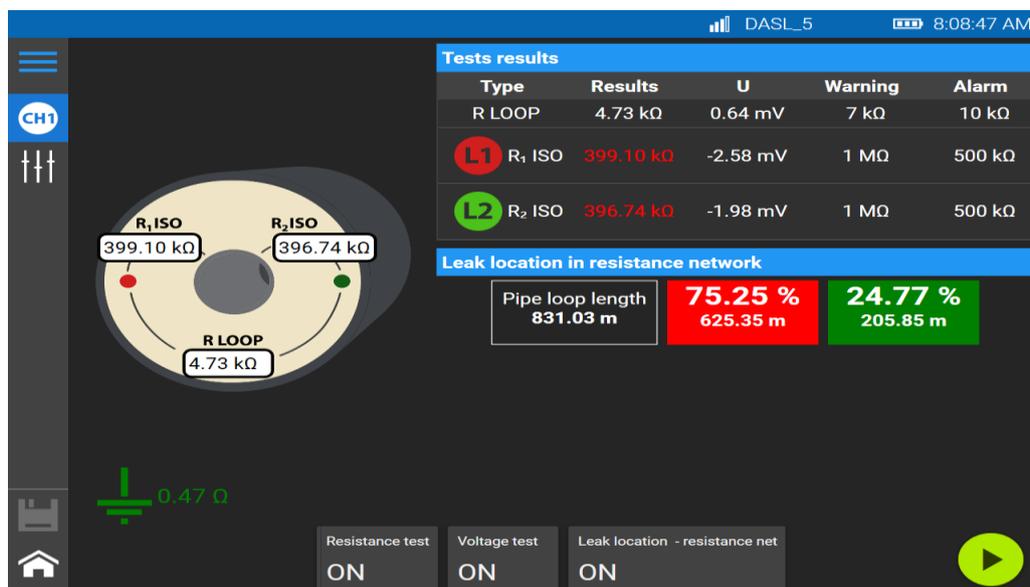
The meter controls the connection of test leads with the measured object. For the connection to be correct and effective, remember that both ground probes should be connected to the pipe or ground.

If one of the wires is disconnected or the contact resistance is too high, the tester will signal a problem with a red icon with a ground symbol. Individual measurements are performed in one measurement cycle. The individual measurement functions are activated in the lower part of the screen.

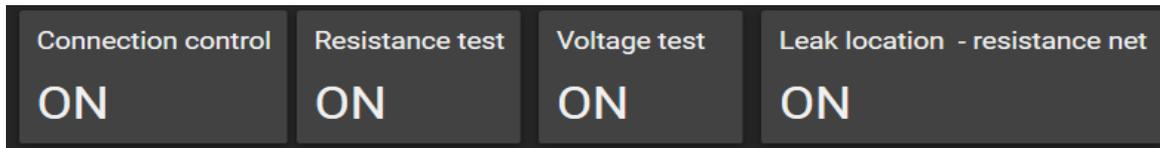


- (1) Collapse / expand the side menu
- (2) Resistance measurement on Channel 1
- (3) Configuration of alarm thresholds (resistance measurement)
- (4) Saving of measurement
- (5) Main menu

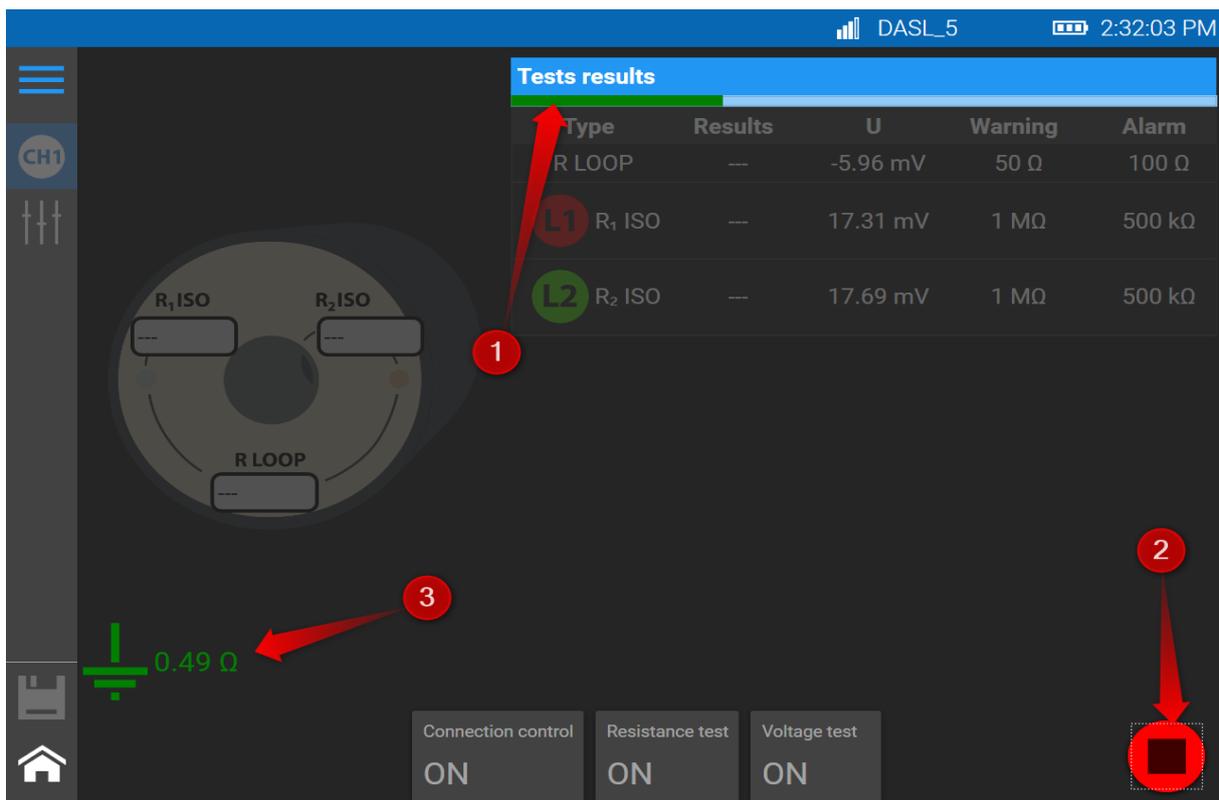
The measurement window shows a drawing of a pipe with alarm cables, a table with measurement results and alarm thresholds.



By pressing the button from the lower part of the screen, you can turn on or off individual measuring functions: (resistance measurement, voltage measurement, location and pipe connection control).



7 Resistance measurements



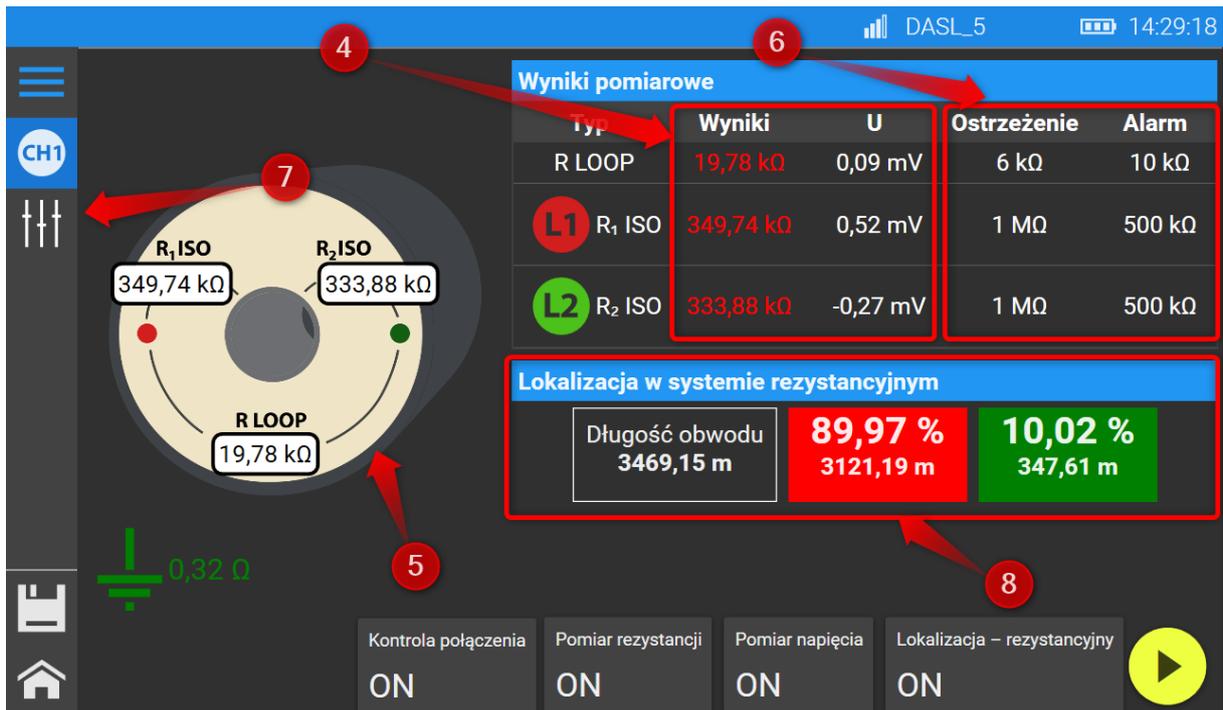
First, please connect the device to measured object. In the main menu select “Resistance measurements” and press STAR (2)  , in the right, lower corner. After triggering of measurement user can stop measurement at any time by pressing  .

Green progress bar (1), informs about the progress of measuring process. In the left, lower corner, we can see result of connection control test (3).

After measurement is completed, test results are shown in the table (4) and on the drawing (5). In columns "Warning" and "Alarm" are shown thresholds (6) that can be changed at any time (7) (see point 7.1). Next you can save test results by clicking on icon (6).

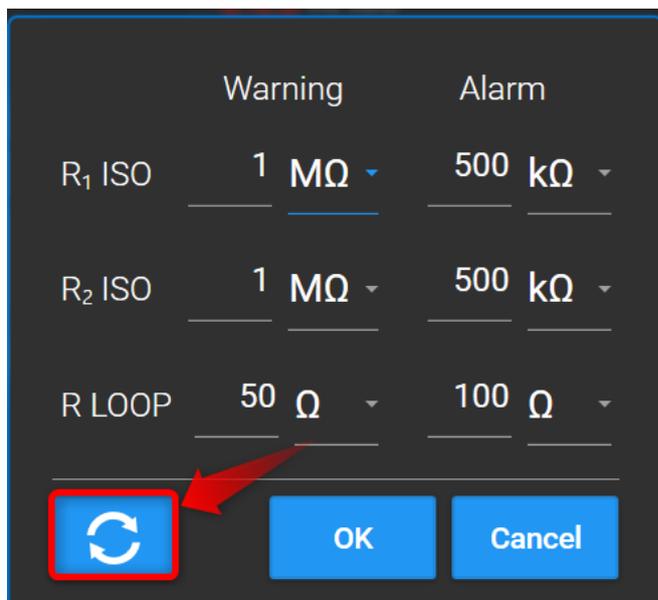
Leak location in resistance network

Megaloc-1b has additional function of leak location in resistance network. Test result is given in % or metres.



7.1 Configuration of alarm thresholds

In order to configure the warning and alarm thresholds displayed during the resistance measurement, select "Alarm thresholds" from the side menu (The side menu is described at the beginning of the chapter6).

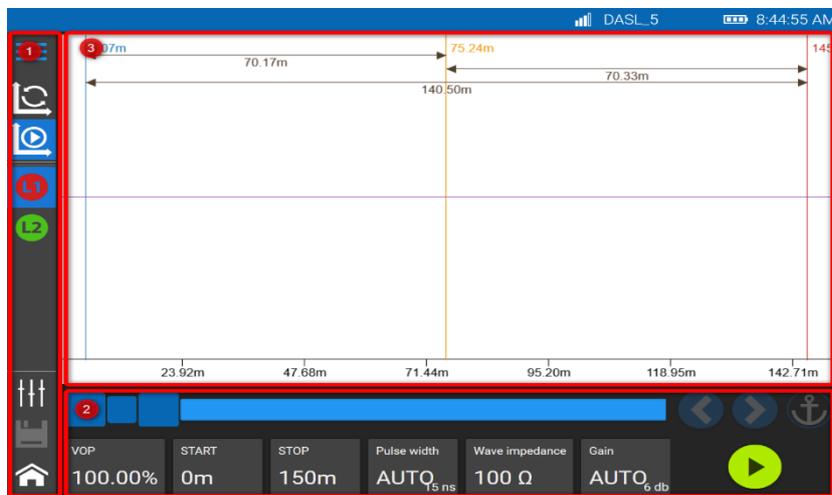


When configuring the warning and alarm thresholds, first select the correct unit (i.e. Ω, kΩ, MΩ) and then enter the numerical value.

To revert to the default settings, press the button in the lower left corner.

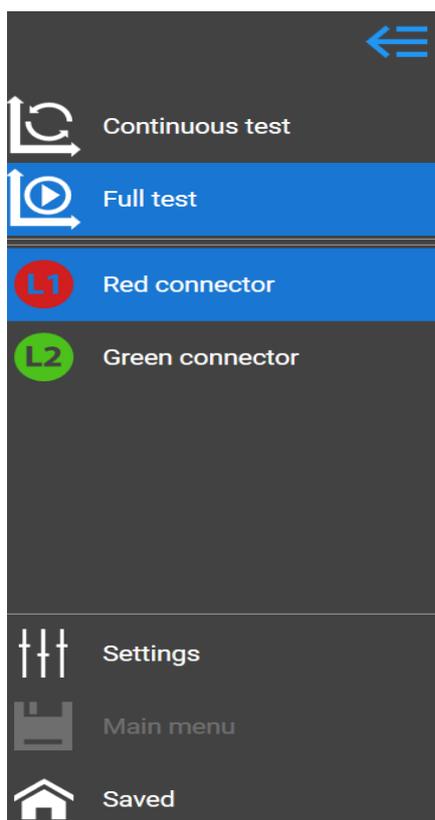
8 TDR measurement

After selecting from main menu "Time Domain Reflectometer", below window will appear, which is divided into 3 main areas:



1. Side menu
2. Settings of parameters
3. TDR curve

8.1 Side menu



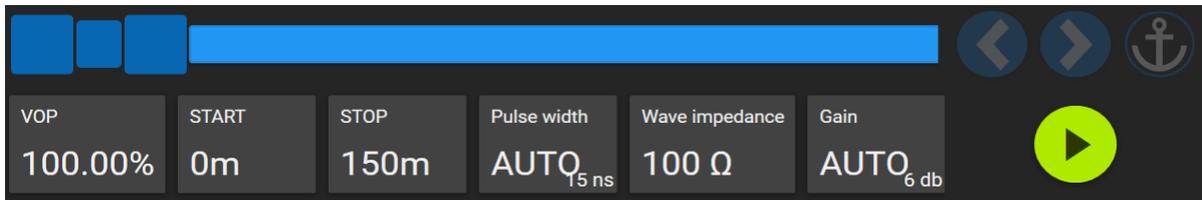
The reflectometer can work in two modes.

After selecting the "Continuous test" mode, the device carries out a series of measurements and reacts on an ongoing basis to changes in the tested object as well as to changes in measurement parameters. This mode is used to prepare the system and set the measurement parameters for a "Full test". Measurement from this mode cannot be saved in memory.

In order to save the measurement, select the "Full test" function with the parameters adopted by the "Continuous test". The red and green connectors represent the probes connected to the alarm wires. The mass attached to a steel pipe or other reference object is always used as the reference wire. If the alarm wires are looped, the L1 and L2 measurements stacked together will show mirror reflection.

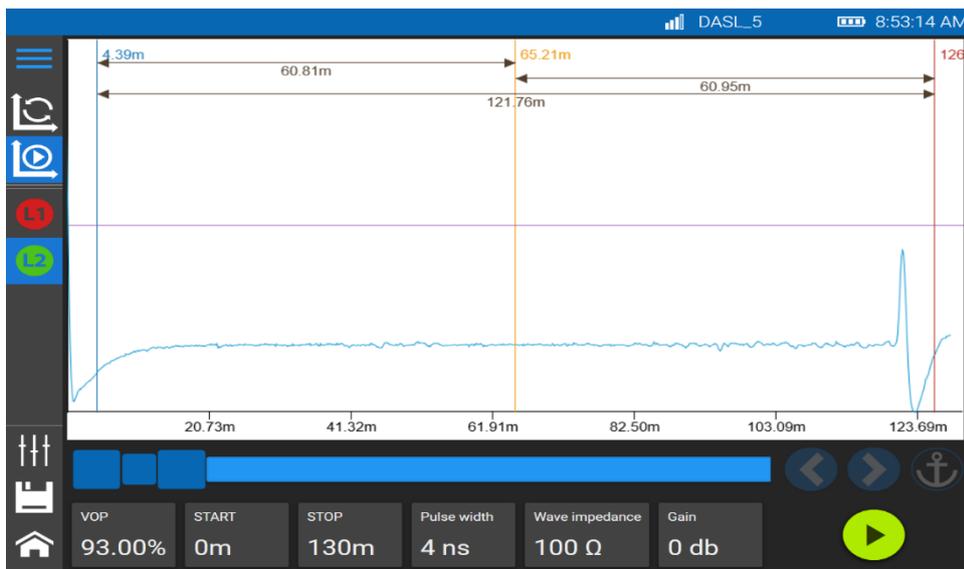
For example, when measuring from the L1 connector, the fault at the end of the loop, closer to the L2 connector, may be less visible on the graph. By switching to the L2 connector, we get a more visible image of the fault.

8.2 Settings of measurement



- VOP - pulse propagation factor. It is a percentage of the speed of the pulse in relation to the speed of light. It depends on the tested object. In impulse networks, it usually ranges from 92.0 to 93.5%. The exact value is indicated by the pipe manufacturer.
- START and STOP buttons define beginning and end of TDR curve, (length of measured section).
- Pulse width – pulse width is set in nanoseconds. Setting of this parameter depends of the length of measured section and level of noises. The wider is pulse is the longer section can be measured (loosing at the same time precision of measurement).
- Wave impedance – parameter of the guide and the environment in which it is located. It determines the resistance to propagation of an electromagnetic signal. This parameter should be given in data sheet of the pipe. The value of the wave impedance for pre-insulated pipes with uninsulated wire is 50 Ω
- Gain – additional gain of reflected pulse. It helps to sharpen the visibility of the fault, however at the same time all the noises are also sharpened.

8.3 TDR curve



Curve

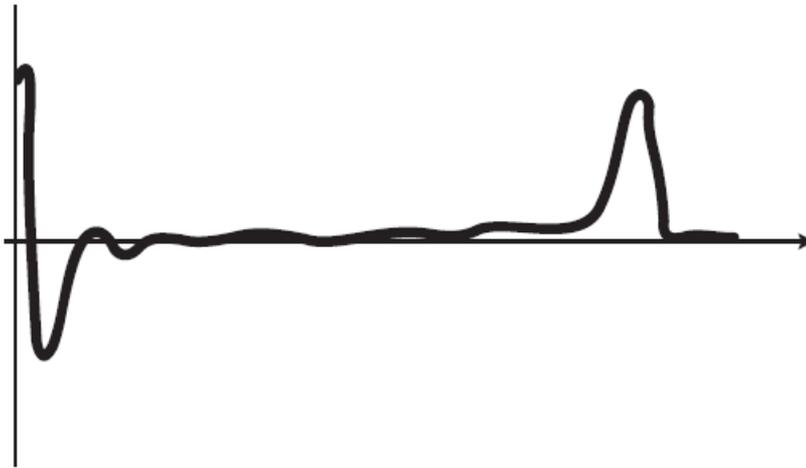
The reflectometric curve is drawn in the central area of the screen. Its shape reflects the signal course in the tested object. The changes may be of a different nature depending on the change in wave impedance along the signal wire.

Cursors

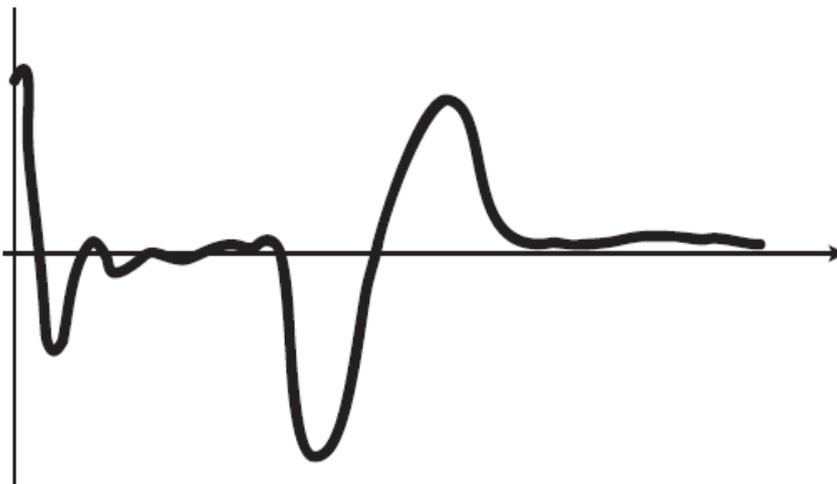
There are 3 auxiliary cursors on the screen. They are used to determine the distance between changes on the curve. Pressing the cursor will activate the arrows and the anchor symbol at the bottom of the screen. The arrows allow you to precisely move the cursor. Switching on the Anchor button will lock the cursor at a specific distance regardless of changes in measurement parameters.

8.4 Typical faults shown on the curve

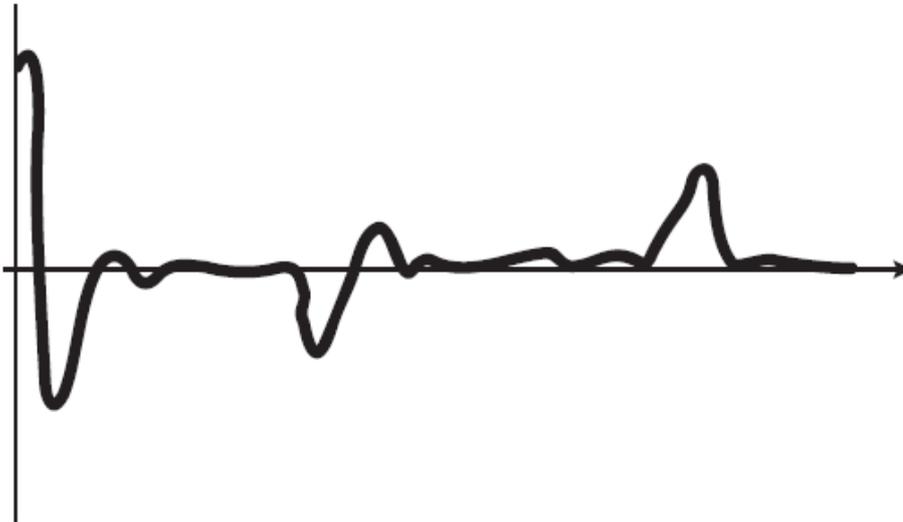
A. End of the loop – alarm wire:



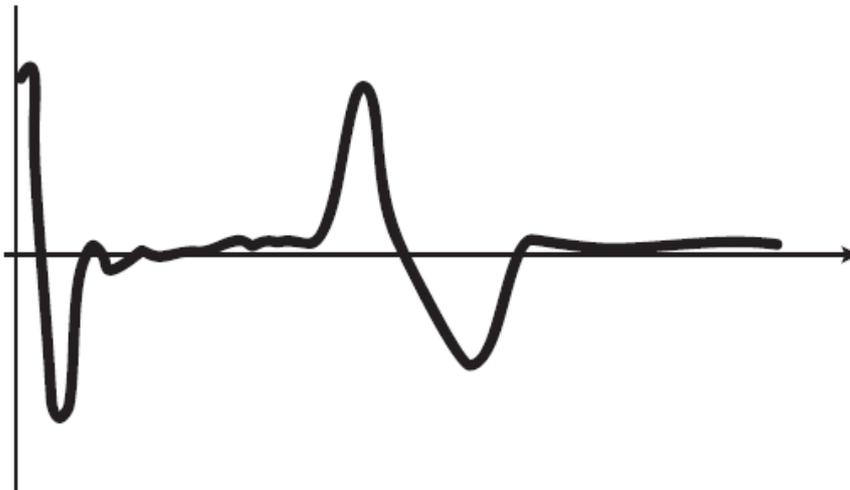
B. Short



C. Leak



D. Break



9 Performing of TDR measurement

First it is required to set all parameters in bottom menu.

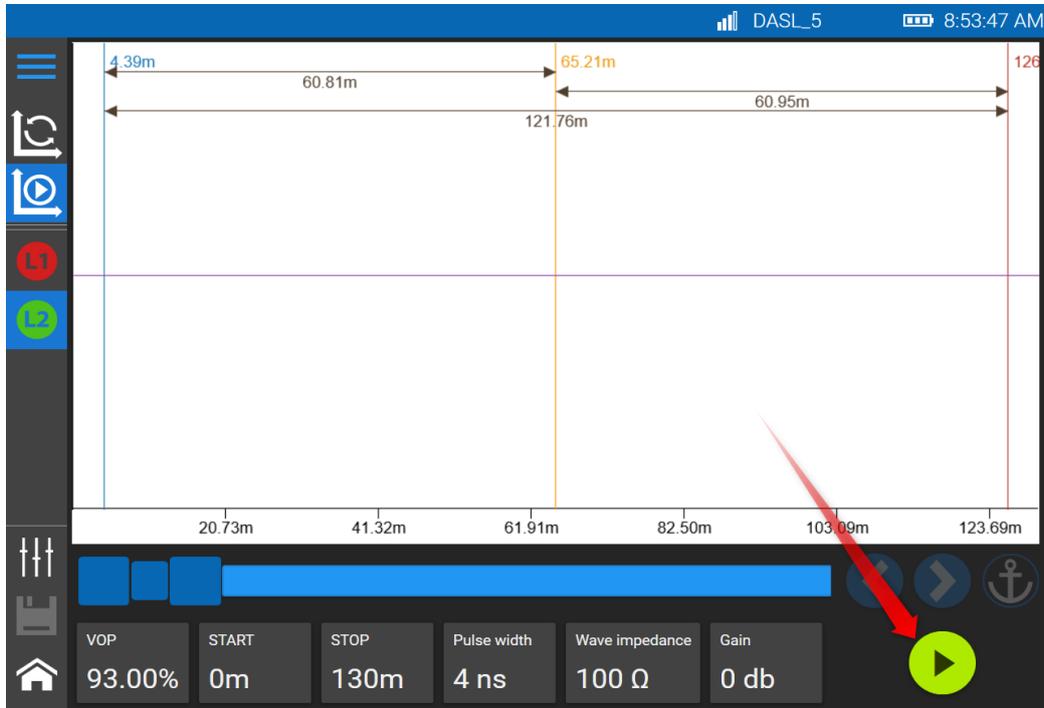
In case of continuous measurement curve will react immediately to any change of parameters or conditions of measured section.

In case of full test, measurement will be triggered by pressing button „Start“ .

The measurement should start with finding the end of tested object, therefore, knowing more or less the length of the object (e.g. alarm loop), using the STOP button, indicate its length with some length allowance. If the graph does not display the slope characteristic for the end of the object (graph "A" - chapter 8.4), the length of the tested object should be increased. If the test object has break, it will not

be possible to find the end. The break of the test section will be indicated on the characteristic waveform (graph D.).

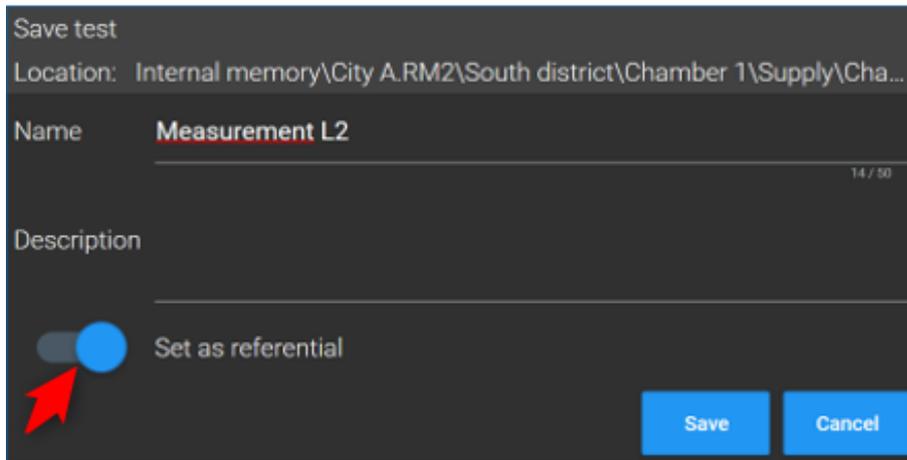
In order to make detailed measurement, it is always recommendable to make full test, that also enable the saving function.



The measurement time depends on the length of the test section. The measurement takes from a few to several seconds. After the measurement, the full graph will appear on the screen. After clicking on the floppy disk symbol, it can be saved in the internal memory or sent to RATMON system.

10 Analysis of TDR measurements

The analysis of reflectometric measurements is performed on the basis of reference data. Remember to save a new reference curve each time you expand the alarm system. For the analysis to be effective, a reference measurement should be performed and saved in the internal memory or in the RATMON system. To do this, perform the "Full TDR Test" and save it. When saving, mark the measurement as reference.



In case of periodical test please remember to connect the test leads the same way as reference one.

In order to start analysis of TDR measurement, first find in memory „Test Point” or „Pipe loop” with saved reference curve.

Remark! In the case of a measurement saved as “Pipe loop”, software automatically recognizes for which probe the settings are to be made. In the case of a measurement saved as “Test point”, the user decides about the current connection of probes for a given measurement.

Next set alarm thresholds.

The device will perform a control measurement and finally display the difference diagram with marked deviations from the standard diagram. In the normal state, the difference diagram should be close to a straight line.

Based on evaluation of the level of deviations of the current measurement in relation reference measurement, the alarm thresholds should be set on the level that any deviations caused by the fault will trigger the automatic fault detection and location.

In order to set alarm thresholds select from side menu  and next adjust alarm thresholds to current conditions.

Analysis parameters

Slope	50 + -
↔ Horizontal shift [m]	0 + -
↑ Vertical shift	100 + -
Smoothing	15 + -

Auto

Differential graph
 Alarm thresholds
 Referential test
 Current test

Description of parameters:

Horizontal shift: beginning of curve to be analysed

Slope: arc radius of alarm lines at the beginning of the curve

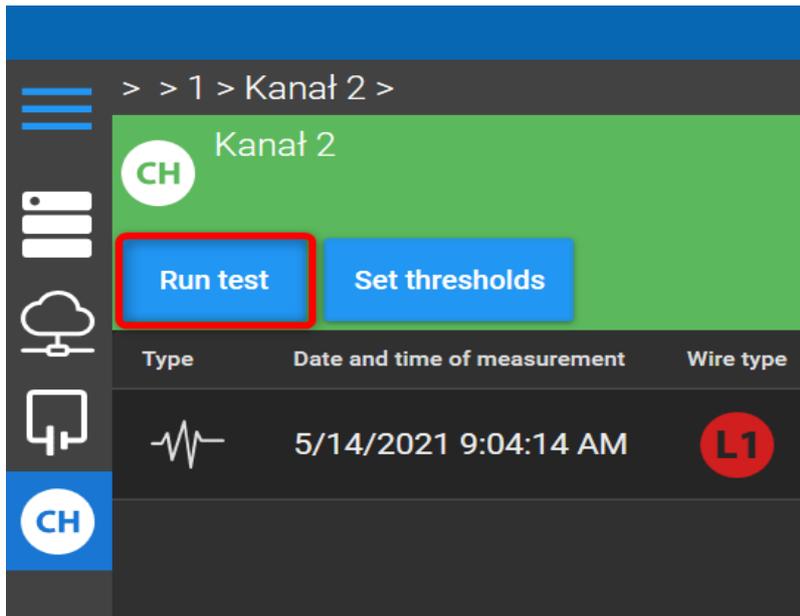
Vertical shift: distance between alarm thresholds and reference curve (sensitivity of alarm)

Smoothing – noise reduction, (default automatically)

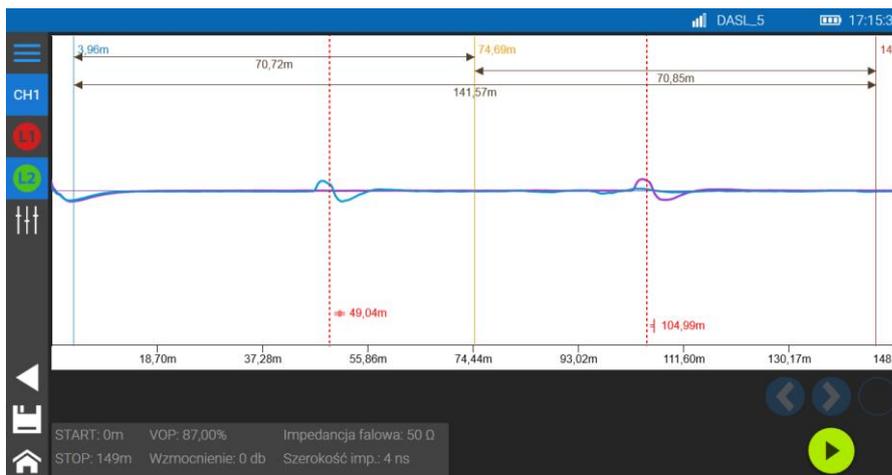
Any changes of settings must be confirmed by clicking on save icon  and by button “OK” return to presentation of settings on the curve.

In case of communication with RATMON system all settings will be sent and saved on the server.

Analysis is done by triggering of TDR test in selected „Test point” of „Pipe loop”.



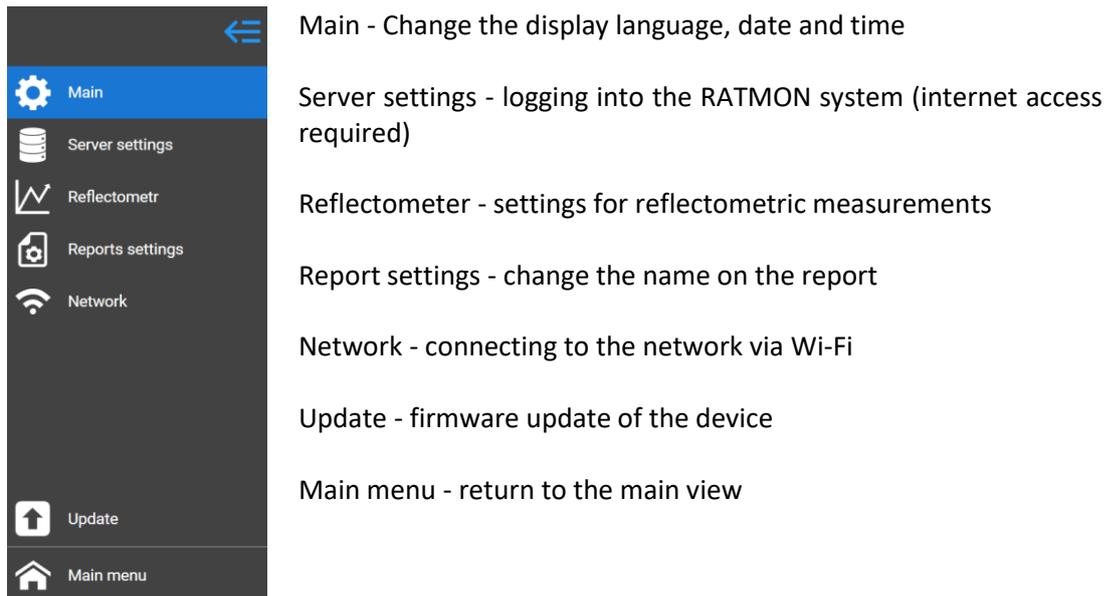
Below window will display and after clicking on „Start” button measurement will be done and automatically analysed. In case of any faults, proper marking will occur on the screen, show place and type of fault.



START - Beginning of the graph analysis (0m we assume the beginning of the graph), here we omit the first meters of the circuit - e.g. connection cables, junction boxes, etc.

11 Main settings

After pressing the "Settings" button, the device will display a window where you can change configuration of all parameters.

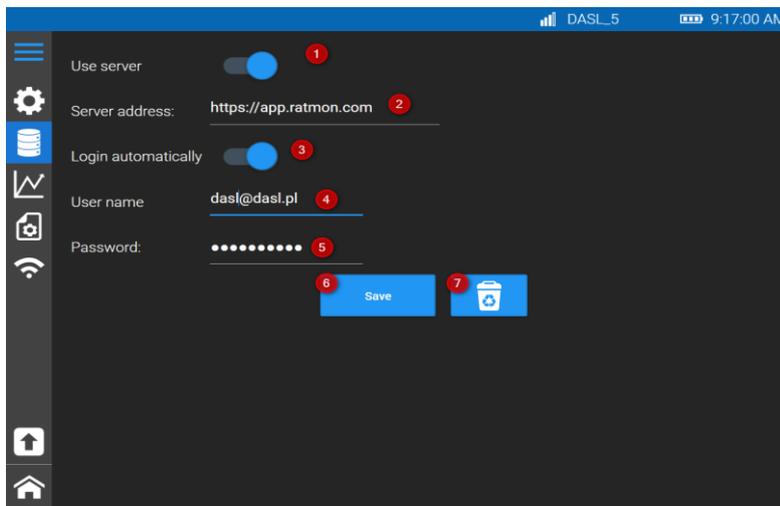


11.1 Main

Here user can change the language. The user can also make changes to the current date and time, which is displayed on the top bar. The set date and time will be taken into account when saving the measurements to the internal memory (offline).

11.2 Server settings

All customers who use RATMON can log in here with their login and password used in the RATMON system. Thanks to this, the user can view the pipe loops and results existing in the RATMON system,



1. Commissioning of communication with server
2. Setting of server address. Default server enabled by DASL <https://app.ratmon.com>
3. Login automatically. When is switched-off, after every restart of device, communication with server is switched-off
4. User name (usually e-mail address)
5. Password

Any change of settings must be proved by „Save” button.

11.3 Reflectometer

In this tab, customer has the option of using additional filters, thanks to which reflectometric graphs are more transparent. These options enable taking measurements and subsequent analysis of TDR curves. However, it should be remembered that this tool filters "noises" but can also flatten out potential faults.



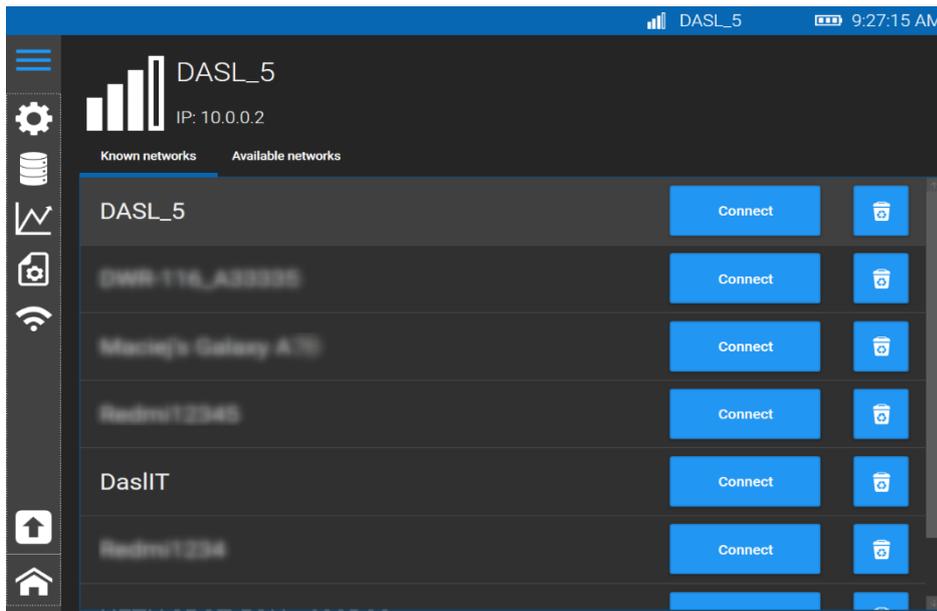
- 1) **Noise reduction** – digital reduction of external noises
- 2) **Bold curves**
- 3) **Point reduction** – display curve with less points
- 4) **Signal normalise**
- 5) **Default type of object** – selection of type of alarm wires (pulse, resistance, sensor cable)

11.4 Network

In order to be able to work with the RATMON system, the device should have an access to the Internet. The Megaloc-1 series device has a built-in Wi-Fi module, thanks to which it is possible to connect to the Internet, e.g. by sharing the Internet, e.g. from a phone.

From the list of available hotspots, select the appropriate one and optionally enter a password. After a successful connection, an proper message will be displayed and the current network range will be indicated on the screen. To connect to a selected Wi-Fi network - select settings / "Network" from the main menu. There are 2 tabs in the main view

- "Known networks" (hotspots that the device has previously connected to.
- Available networks - from the list of available hotspots, press "Connect"



Enter password and click „Ok”

11.5 Device firmware update

In order to update the device firmware, download the update file from the manufacturer's website, then copy it to memory stick and plug it into the Megaloc-1 series device. Go to the tab: Settings / update. After detecting memory stick with the appropriate file, the "update" button will be unlocked. The process will proceed automatically afterwards.

12 Power supply

The Megaloc-1 device can operate on battery power (internal battery) or be connected to the mains via a dedicated 12V DC (5A) power supply.

12.1 Monitoring of power supply

ATTENTION! In order for the indication of the battery charge status to be correct, the battery must be discharged and then fully charged before using the meter. The charge level of the battery is indicated on a current basis by the symbol in the upper right corner of the screen (battery symbol). The extreme discharge of the battery is also signalled by messages on the main screen.

12.2 Battery power supply

The Megaloc-1 devices are powered by a lithium-ion battery that can only be replaced by a authorised service centre. The charger is mounted inside the meter and works only with the manufacturer's rechargeable battery. It is powered by a dedicated 12V DC (5A) power supply

ATTENTION! Do not power the meter from other sources than those mentioned in this manual.

12.3 Battery charging process

Charging begins after connecting the power adapter plug to the device, regardless of whether the meter is turned off or not. The appearance of the plug symbol on the screen and the flashing green diode indicates the charging process. The battery is charged in accordance with the "quick charge" algorithm - this process allows to shorten the charging time. The end of the charging process is signalled by the battery symbol and the continuous light of the green LED.

Signalling LED

Signalling	State
Red (continuous)	Battery charging process
Red (blinking)	Temporary blinking after an attempt to turn on the meter when the battery is extremely discharged.
Green	Battery fully charged
Blue	Failure of charging (contact with service)

12.4 General rules of use of lithium-ion (li-ion) batteries

- Store batteries 50% charged in a plastic container in a dry, cool and well-ventilated place and protect them from direct sunlight. A battery stored completely discharged may be damaged. The ambient temperature for long-term storage should be kept within 5 ° C... 25 ° C.
- Charge the batteries in a cool, ventilated place at a temperature of 10 ° C... 28 ° C. Modern fast chargers detect both too low and too high temperature of the batteries and react appropriately to these situations. Too low temperature should prevent the start of the charging process, which could irreversibly damage the battery. A rise in battery temperature may cause electrolyte leakage and even cause the battery to ignite or explode.
- Do not exceed the charging current, otherwise the battery may ignite or "swell". "Swollen" batteries must not be used.

- Do not charge or use batteries in extreme temperatures. Extreme temperatures reduce the lifetime of the batteries. The rated operating temperature must be strictly adhered to. Do not throw batteries into fire.
- Li-Ion cells are sensitive to mechanical damage. Such damage may contribute to its permanent damage, and thus - ignition or explosion. Any interference in the structure of the Li-Ion battery may lead to its damage. It may ignite or explode as a result. If the + and - poles of the battery are short-circuited, it may be permanently damaged and may even ignite or explode. → Do not immerse the Li-Ion battery in liquids or store it in high humidity.
- If the electrolyte contained in the Li-Ion battery comes into contact with the eyes or skin, immediately rinse the area with plenty of water and consult a doctor. Protect the battery from bystanders and children.
- If you notice any changes in the Li-Ion battery (e.g. colour, swelling, too high temperature), stop using the battery. Li-Ion batteries that are mechanically damaged, overcharged or excessively discharged are not suitable for use.
- Using the battery inconsistently with its intended purpose may cause its permanent damage. This may cause it to ignite. The seller and the manufacturer are not responsible for any damage resulting from improper handling of the Li-Ion battery.

13 Cleaning and maintenance

ATTENTION! Use only the maintenance methods specified by the manufacturer in this manual. The casing of the meter may be cleaned with a soft, damp cloth using all-purpose detergents. Do not use any solvents or cleaning agents that could scratch the casing (powders, pastes, etc.). Crocodile clips and wires can be washed with water and wiped dry. The electronic system of the meter does not require maintenance.

14 Storage

When storing the instrument, observe the following recommendations:

- disconnect all leads from the meter,
- thoroughly clean the meter and all accessories,
- Wind the long test leads on the spools,
- to avoid complete discharge of the batteries during long storage, they should be recharged from time to time.

15 Utilization

Worn-out electric and electronic equipment should be collected selectively, i.e. it must not be placed with other types of waste. Worn-out electronic equipment should be sent to a collection point in accordance with the law on used electrical and electronic equipment. Do not disassemble any parts of the equipment by yourself before handing it over to a collection point. Observe the local regulations regarding disposal of packages, used batteries and accumulators.

16 Technical data

- a) Type of insulation.....double, acc. EN 61010-1 and IEC 61557
- b) Measurement category IV 300 V (III 600 V) acc. EN 61010-1
- c) Protection class PN-EN 60529 (by closed cover)..... IP65
- d) Power supply.....li-ion battery 7,2V 10Ah
- e) Charger parameters.....100 V...240 V, 50 Hz...60 Hz
- f) Dimensions.....320 mm x 270 mm x 170 mm
- g) Weight with battery..... ok. 2,5 kg
- h) Storage temperature.....-20 °C...+70 °C
- i) Working temperature.....0 °C...+50 °C
- j) Charging temperature.....+10 °C...+40 °C
- k) Working humidity..... 20 %...90 %
- l) Display.....7" touch screen
- m) Data transfer..... Wi-Fi or USB
- n) Device conform requirements of EN 61010-1:2011, EN 61326-1:2013-06, PN-EN 14419:2020-01