

MEA-IT-System

USER MANUAL

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WELCOME TO THE MEA2100-SYSTEM

WELCOME TO THE MEA-IT-SYSTEM



Three versions of impedance testing devices MEA-IT are provided: MEA-IT60, MEA-IT120 and MEA-IT256 for microelectrode arrays with 60-, 120- and 256-electrodes allow an easy measuring and monitoring of MEA electrode impedances. The measurement process is controlled by the software MEA-IT. On a virtual MEA layout, the impedance of each electrode is displayed in an intuitive color code.

It is possible to save the data after each measurement to a database file and to export the data in ASCII format. This way you can monitor the development of each single electrode's impedance over the entire life span of each microelectrode array.

Based on this information the user can, for example, decide whether a MEA chip can be put to further use or should be discarded, or if a specific surface treatment or coating has any relevant influence on the electrode impedance.

IMPORTANT SAFETY ADVICE

IMPORTANT SAFETY ADVICE



Warning: Make sure to read the following advice prior to installation or use of the device and the software. If you do not fulfill all requirements stated below, this may lead to malfunctions or breakage of connected hardware, or even fatal injuries.



Warning: Always obey the rules of local regulations and laws. Only qualified personnel should be allowed to perform laboratory work. Work according to good laboratory practice to obtain best results and to minimize risks.

The product has been built to the state of the art and in accordance with recognized safety engineering rules. The device may only

- be used for its intended purpose;
- be used when in a perfect condition.

Improper use could lead to serious, even fatal injuries to the user or third parties and damage to the device itself or other material damage.



Warning: The device and the software are not intended for medical uses and must not be used on humans. MCS assumes no responsibility in any case of contravention.

Malfunctions which could impair safety should be rectified immediately.

High Voltage

Electrical cords must be properly laid and installed. The length and quality of the cords must be in accordance with local provisions.

Only qualified technicians may work on the electrical system. It is essential that the accident prevention regulations and those of the employers' liability associations are observed.

- Each time before starting up, make sure that the power supply agrees with the specifications of the product.
- Check the power cord for damage each time the site is changed. Damaged power cords should be replaced immediately and may never be reused.
- Check the leads for damage. Damaged leads should be replaced immediately and may never be reused.
- Do not try to insert anything sharp or metallic into the vents or the case.
- Liquids may cause short circuits or other damage. Always keep the device and the power cords dry. Do not handle it with wet hands.

Requirements for the Installation

Make sure that the device is not exposed to direct sunlight. Do not place anything on top of the device, and do not place it on top of another heat producing device, so that the air can circulate freely.

Grounding

This product is grounded through the grounding conductor on the power cord. To avoid electric shock, the grounding conductor must be connected to earth.

Orient the Equipment Properly

Do not orient the equipment so that it is difficult to manage the disconnection device.

IMPORTANT SAFETY ADVICE

High Voltage

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Requirements for the Installation Make sure that the device is not exposed to direct sunlight. Do not place anything on top of the device, and do not place it on top of another heat producing device, so that the air can circulate freely.

Explanation of the Symbols used



Caution / Warning



DC, direct current

Guarantee and Liability

The General conditions of sale and delivery of Multi Channel Systems MCS GmbH always apply. The operator will receive these no later than on conclusion of the contract.

Multi Channel Systems MCS GmbH makes no guarantee as to the accuracy of any and all tests and data generated by the use of the device or the software. It is up to the user to use good laboratory practice to establish the validity of his / her findings.

Guarantee and liability claims in the event of injury or material damage are excluded when they are the result of one of the following.

- Improper use of the device.
- Improper installation, commissioning, operation or maintenance of the device.
- Operating the device when the safety and protective devices are defective and/or inoperable.
- Non-observance of the instructions in the manual with regard to transport, storage, installation, commissioning, operation or maintenance of the device.
- Unauthorized structural alterations to the device.
- Unauthorized modifications to the system settings.
- Inadequate monitoring of device components subject to wear.
- Improperly executed and unauthorized repairs.
- Unauthorized opening of the device or its components.
- Catastrophic events due to the effect of foreign bodies or acts of God.

IMPORTANT SAFETY ADVICE

Operator's Obligations

The operator is obliged to allow only persons to work on the device, who

- are familiar with the safety at work and accident prevention regulations and have been instructed how to use the device;
- are professionally qualified or have specialist knowledge and training and have received instruction in the use of the device;
- have read and understood the chapter on safety and the warning instructions in this manual and confirmed this with their signature.
- It must be monitored at regular intervals that the operating personnel are working safely.

Personnel still undergoing training may only work on the device under the supervision of an experienced person.

Terms of Use for the Program

You are free to use the program for its intended purpose. You agree that you will not decompile, reverse engineer, or otherwise attempt to discover the source code of the software.

Limitation of Liability

Multi Channel Systems MCS GmbH makes no guarantee as to the accuracy of any and all tests and data generated by the use the software. It is up to the user to use good laboratory practice to establish the validity of his findings.

To the maximum extent permitted by applicable law, in no event shall Multi Channel Systems MCS GmbH or its suppliers be liable for any special, incidental, indirect, or consequential damages whatsoever (including, without limitation, injuries, damages for data loss, loss of business profits, business interruption, loss of business information, or any other pecuniary loss) arising out of the use of or inability to use the program or the provision of or failure to provide support services, even if Multi Channel Systems MCS GmbH has been advised of the possibility of such damages.

Requirements for the Installation

Make sure that the device is not exposed to direct sunlight. Do not place anything on top of the device, and do not place it on top of another heat producing device. Never cover the vents, not even partially, so that the air can circulate freely. Otherwise, the device may overheat.

Recommended BIOS settings

Recommended operating system settings

The following automatic services of the Windows operating system interfere with the data storage on the hard disk and can lead to severe performance limits in the data acquisition software. These routines were designed for use on office computers but are not very useful for a data acquisition computer.

- Turn off Screen Saver.
- Turn off Manual management of automatic Windows Update.
- Power Options: Power scheme: Never turn on system standby.
- It is also not recommended to run any applications in the background when using the data acquisition software.
- Be careful when using a Virus Scanner. These programs are known to disturb the software and even data loss may occur.

When using a MEA-IT-System it is recommended to connect a high performance computer with a separate hard disk for program files and data storage. The provided possibility to use up to 256 channels with up to 50 kHz needs high memory capacity. Please remove data and defragment the hard disk regularly to ensure optimal performance.

HARDWARE

HARDWARE



The MEA-IT is a very compact and portable device for measuring electrode impedances on microelectrode arrays (MEA) with MEA-IT software.

The measurements are transmitted to the connected computer via universal serial bus (USB 2.0 Full Speed). Thus, it is possible to use any computer as a data acquisition computer, also a laptop.

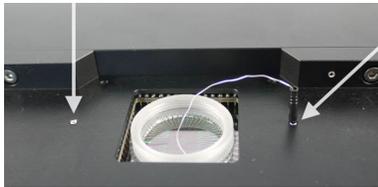


The device does not need an own power supply. Just connect it to an USB port of the data acquisition computer and the blue LED on the right side of the front panel lights up. The USB connector is located on the side panel.



The two triangular front edges of the device can be moved outwards and inwards to open and close the MEA-IT device, respectively.

Two identical sockets are provided to connect an Ag/AgCl ground electrode.

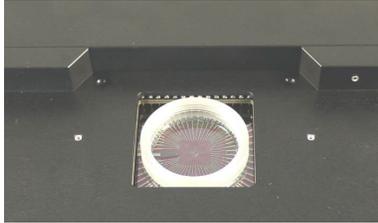


Important: Please wait approximately fifteen minutes after filling the MEA dish with conducting solution before measuring the electrodes!

Important: You always have to connect an Ag/AgCl silver wire even though you like to measure a MEA with internal reference electrode. Otherwise, the impedances are too high.

Mounting the MEA

Open the upperpart of the device by moving the triangular edges of the lid outwards. The lid swings open. Before inserting the MEA note its layout and the individual serial number. Please see chapter "Compatible Microelectrode Arrays". Insert the MEA carefully into the provided area. Make sure that the MEA is correct orientated. Close the device by pressing down the lid and moving the triangular edges of the lid inwards.



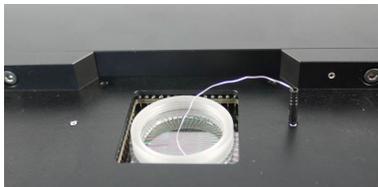
Fill the MEA dish with a conducting solution, usually PBS (phosphate buffered saline) or with ACSF (artificial cerebral spinal fluid for rats and mice). The impedance of an electrode also depends on the hydrophilic properties of the electrode. If an electrode is hydrophobic, the measured impedance will be too high. Treatment with a plasma cleaner will make the MEA hydrophilic.

Grounding the MEA

Ground the MEA with the included Ag/AgCl pellet. There are two identical sockets provided to connect the ground electrode. An external ground electrode is also necessary for MEAs with internal reference electrode.

Important: Please wait approximately fifteen minutes after filling the MEA dish with conducting solution before measuring the electrodes!

Important: You always have to connect an Ag/AgCl silver wire even though you measure a MEA with internal reference electrode. Otherwise, the impedances will be out of range.



The reference electrode of a MEA with internal reference is connected to pin 15, the ground pin in MEA-Systems but not in MEA-IT. In MEA-IT-Systems the electrode connected to pin 15 will be measured just as all others. That is why you always need the silver wire as an external reference point for grounding the MEA-IT-System during measurements.

Compatible Microelectrode Arrays

The MEA-IT is available for MEAs with 60 electrodes, 120 electrodes and 256 electrodes. The contacting units are different in dependence of the number of electrodes. Please contact Multi Channel Systems MCS GmbH for detailed information.

Each MEA is classified by its type and its individual serial number, which is engraved on the back side of the MEA.

The name of the specific MEA mirrors its parameters: 60MEA100/10iR-Ti, for example.

The total number of electrodes on the MEA is the first part of the name, before the term "MEA". The number behind "MEA" gives the distance between the electrodes in the layout grid. The number after the slash is the diameter of the recording electrodes. The character "iR" indicates whether the MEA has an internal reference or not. Ti (titanium nitride) and ITO (Indium tin oxide) are materials for electrodes and / or tracks and / or contact pads.

Positioning the MEA

Important: MEAs are not symmetrical! Therefore, the writing (for example NMI, LEITER, MEA type) on the MEA chip should be on the right side viewed from the front of the MEA-IT device. MEAs with one big internal reference electrode should be placed with reference electrode to the left side in the MEA-IT device. Otherwise, the MEA layout will not match with the pin layout of the MEA-IT device.

When placing a special MEA into the amplifier, for example HighDense MEAs, HexaMEAs, 120MEAs or 256MEAs, please read the data sheets to make sure that the orientation of the MEA is correct, respectively.

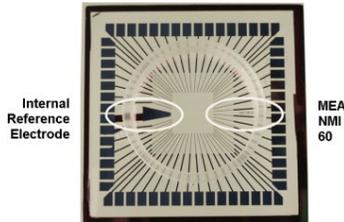
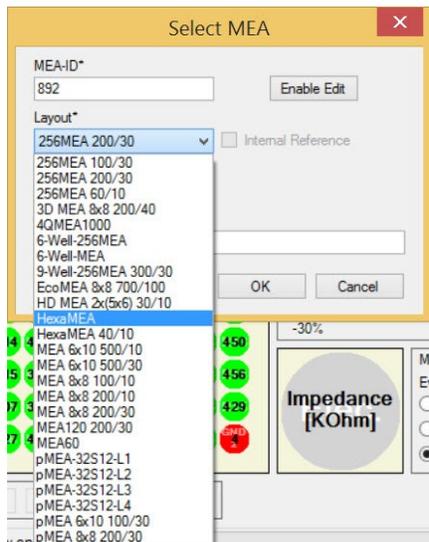


Table of microelectrode arrays with 60-, 120-, or 256-electrodes, currently available for the respective impedance testing device MEA-IT.



Table

<p>60 MEA for MEA2100-HS60-Systems and USB-MEA60-Systems</p> <p>Standard MEA, 8 x 8 layout</p>	<p>60MEA100/10iR-ITO; 60MEA100/10iR-Ti</p> <p>60MEA200/10iR-ITO; 60MEA200/10iR-Ti</p> <p>60MEA200/30iR-ITO; 60MEA200/30iR-Ti</p>
<p>3 Dimensional MEA, 8 x 8 layout</p>	<p>60-3DMEA</p>
<p>6 Well MEA, 6 x (3 x 3) layout</p>	<p>60-6wellMEA200/30iR-Ti</p>
<p>HighDense MEA, 2 x (5 x 6) layout</p>	<p>60HD30/10iR-ITO</p>
<p>Hexa MEA</p>	<p>60HexaMEA-ITO; 60HexaMEA-Ti</p> <p>60HexaMEA40/10iR-ITO;</p>
<p>Thin MEA</p>	<p>60ThinMEA100/10-ITO</p> <p>60ThinMEA200/30iR-ITO</p> <p>60ThinMEA30/10-ITO</p>
<p>MEA, 6 x 10 layout</p>	<p>60MEA500/10iR-Ti</p> <p>60MEA500/30iR-Ti</p>
<p>Economical MEA, 8 x 8 layout</p>	<p>60EcoMEA</p> <p>60EcoMEA-Glass</p>
<p>4 Quadrant MEA</p>	<p>60-4QMEA1000iR-Ti</p>
<p>perforated MEA, 8 x 8 layout</p>	<p>60pMEA200/30iR-Ti</p>
<p>perforated MEA, 6 x 10 layout</p>	<p>60pMEA100/30iR-Ti</p>
<p>MEAs for MEA2100-HS120-Systems</p>	<p>120MEA100/30iR-Ti</p> <p>120MEA200/30iR-Ti</p> <p>120HexaMEA</p>
<p>MEAs for MEA2100-HS256-Systems and for USB-MEA256-Systems</p>	<p>256MEA200/30iR-Ti</p> <p>256MEA100/30iR-Ti</p> <p>256MEA60/10iR-Ti</p> <p>256MEA30/8iR-Ti</p> <p>256ThinMEA60/10iR-Ti</p>
<p>9 Well MEA for MEA-256-Systems</p>	<p>256-9wellMEA300/30iR-Ti</p>
<p>6 Well MEA for MEA-256-Systems</p>	<p>256-6wellMEA200/30iR-Ti</p>

MEA-IT SOFTWARE

Software Installation

System Requirements

Software: One of the following Microsoft Windows® operating systems is required Windows 10, 8.1, (32 bit) with the NT file system, English and German versions supported. Other language versions may lead to software errors.

Hardware: You can operate the MEA-IT device with any computer with an USB 2.0 port.

Important: You need to have installed the latest device driver to operate the device, which is automatically installed with MEA-IT. The installation may be invalid if the device does not respond. Please contact Multi Channel Systems MCS GmbH or your local retailer in this case.

Recommended operating system settings

The following automatic services of the Windows operating system interfere with the data storage on the hard disk and can lead to severe performance limits in MEA-IT. These routines were designed for use on office computers, but are not very useful for a data acquisition computer.

- Windows Indexing Service deselected for all local disks.
- Optimize hard disk when idle (automatic disk fragmentation) turned off.
- It is also not recommended to run any applications in the background when using MEA-IT. Remove all applications from the Autostart folder.
- Be careful when using a Virus Scanner. These programs are known to disturb MEA-IT and even data loss may occur.

Please check the system requirements before you install the software. MCS cannot guarantee that the software works properly if these requirements are not fulfilled.

Important: Please make sure that you have full control over your computer as an administrator for installation the MEA-IT software. Otherwise, it is possible that the installed software does not work properly. For operating the software, it is not necessary to have administrator rights.

Installing the MEA-IT Software

Start the MEA-IT.exe and follow the instructions of the installation wizard.



The software requires the Microsoft NET Framework 4.0. The installer automatically checks if the required components are already installed. If not, they are installed either from the installation media or from the internet.



Warning: The installation of the NET Framework might take a few minutes and might, depending on the operation system, also require a reboot of the computer.

After the NET Framework is installed, the MEA-IT software and the actual driver are installed automatically.

MEA-IT Software Controls

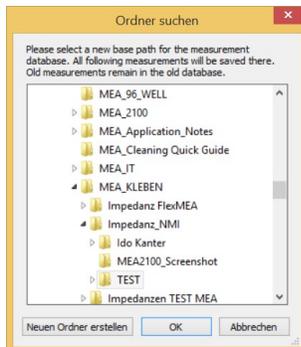
Introduction

The MEA-IT software controls the impedance measurements with the MEA-IT device. Each MEA is identified by its individual serial number on the back side, and all measurements for each MEA are stored in a database file. A current impedance measurement can be compared to any previous one stored in the database in order to identify changes in electrode impedance over time. It is also possible to compare the measured impedances to reference values for any individual electrode type or to highlight outliers. On a virtual MEA layout, the impedance of each electrode is displayed in an intuitive color code. This allows judging the status of a MEA at a single glance.

After installing the MEA-IT software you can start the program with a doubleclick on the program icon.



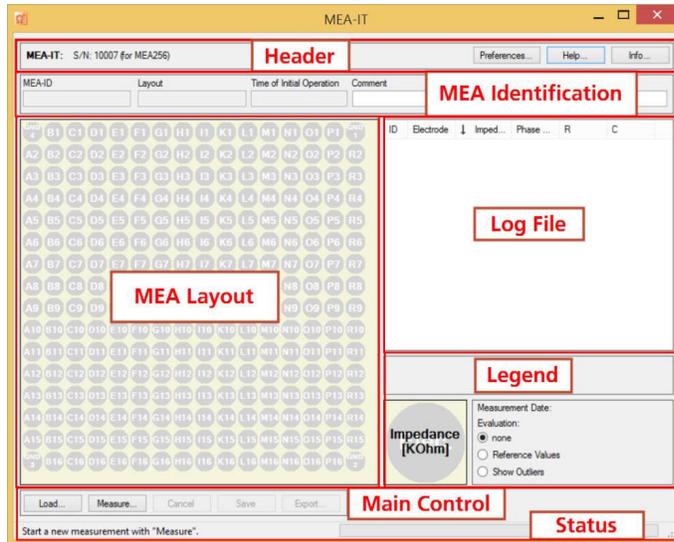
When starting the MEA-IT software for the first time you have to select the path for the database file. The following dialog will come up.



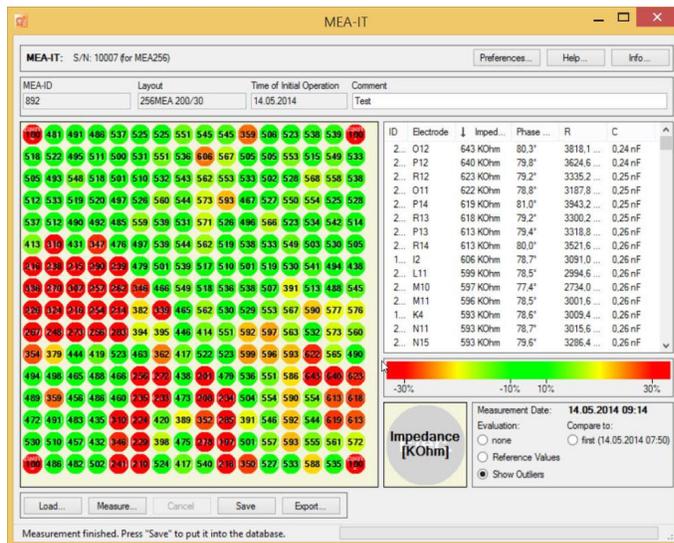
Either accept the default path or select a different folder for the impedance measurement database.

Overview

The MEA-IT main window opens. See below for an overview of the MEA-IT software control. This is the main window for a MEA-IT256 for 256-electrode MEAs.



The main window in MEA-ITs for 60- or 120-electrode MEAs is adapted, respectively.

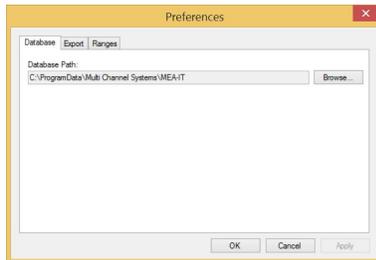


Header

In the header the “serial number S/N” of the MEA-IT device is displayed. You can find the serial number additionally on the rear panel of the device.

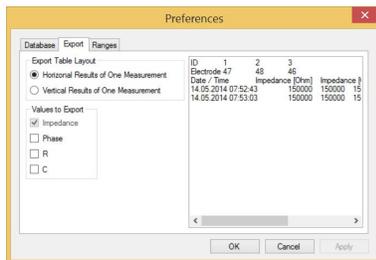


Click the "Preferences" button. The following dialog has three tabs.



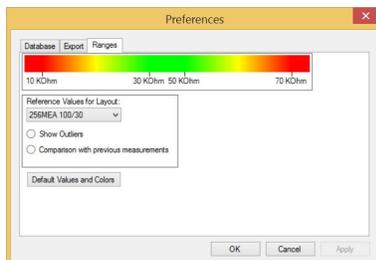
Under "Database" the user can change the selected path for the database file.

Click the "Export" button.



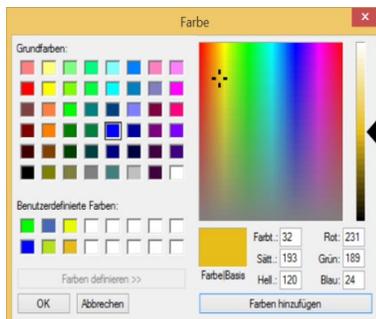
It is possible to select the layout for the ASCII export.

Click the "Ranges" button.



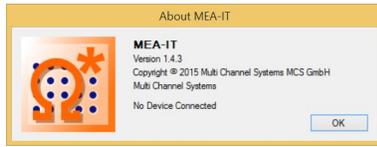
In the "Ranges" tab, the default settings for the evaluation of a MEA can be changed. The MEA-IT software uses default reference values to evaluate whether a measured impedance is all right or out of the acceptable range for the selected electrode type. This evaluation is displayed in an intuitive color code. To change the default reference parameters, select a layout from the drop down menu "Reference Values for Layout" and click on the reference value you want to modify.

Enter the new value in the pop up window. To restore the default values, use the "Default Values and Colors" button. The relative limits for outliers and the comparison with previous measurements can be changed in similar way. It is also possible to change the default colors. Right-click on a color of the color bar and you can select user defined colors.



Click the "Help" button for using the online help.

Click the "Info" button.



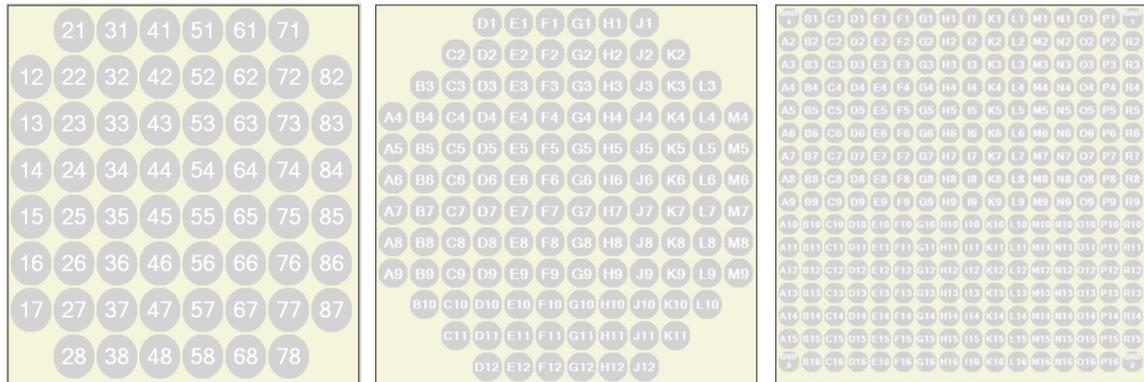
The "About MEA-IT" dialog shows the serial number of the MEA-IT device and the actual MEA-IT software and firmware version.

MEA Identification

MEA-ID	Layout	Time of Initial Operation	Comment
35887	MEA 8x8 100/10	09.01.2020	

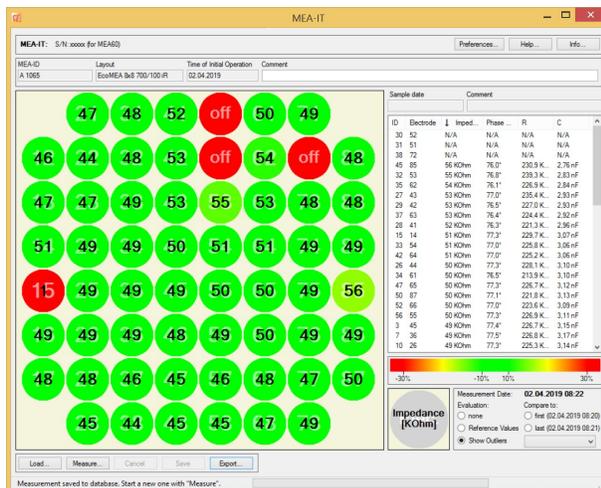
The MEA Identification line shows the layout and the individual "MEA-ID", usually the serial number engraved on the rear side of each MEA. These parameters can be entered in the "Select MEA" dialog at the beginning of each measurement (please see below). The "Time of Initial Operation" is a date that should be entered at the first measurement of each MEA. It will be saved with the MEAs database file and helps the user to keep track on the age of an array. A "Comment" can be added at any time before and during the measurement. The comment will also be saved in the measurement file.

MEA Layout



The virtual MEA layout shows the MEA electrodes in grey color, labeled with their electrode name in the layout grid, selected in the "Select MEA" dialog (please see below). The numbering of the electrodes in the display corresponds with the layout described in the MEA datasheet. Measured impedance values are shown in black letters on each electrode.

Selection of Electrodes in the MEA Layout



In some cases it should be useful to exclude electrodes from the impedance measurement, for example if there are faulty electrodes on a MEA or if one of the pins of the MEA-IT device is not functional.

To exclude an electrode from the measurement, please click onto the electrode with the left mouse. The unwanted electrode is labeled

 "off". In dependency of the initial color code, the color  of the deselected electrode may turn to red. This electrode is excluded from the impedance measuring and the electrode is labeled with "N/A" in the "Log File" list.

A right click onto an electrode generates the following selection menu: "toggle selection", "deselect all", and "deselect none".



Toggle selection: The state of all selected electrodes will be changed into the opposite state, which means, for example, from state "off" to "measurement" state and vice versa.

Deselect all: All electrodes, selected or not, will change to the state "off".

Deselect none: All electrode, selected or not, will change to "measurement" state.

Main Controls



The main control buttons allow to "Load" and old measurement and "Save" the current one to the database. The "Measurement" and "Cancel" buttons start and interrupt the impedance measurement. With the "Export" function, the results of a current or loaded measurement can be exported in ASCII format. The layout of the ASCII file can be selected in the "Preferences" dialog.

Log File

ID	Electrode	↓ Imped...	Phase ...	R	C
50	87	205 KOhm	85,2°	2470,9 ...	0,77 nF
44	84	202 KOhm	84,9°	2248,7 ...	0,79 nF
41	83	200 KOhm	85,2°	2402,3 ...	0,79 nF
51	77	200 KOhm	84,6°	2143,9 ...	0,79 nF
53	78	200 KOhm	84,5°	2100,1 ...	0,79 nF
58	58	200 KOhm	85,0°	2306,3 ...	0,79 nF
55	68	199 KOhm	84,4°	2057,9 ...	0,79 nF
54	67	198 KOhm	85,0°	2281,0 ...	0,80 nF
37	63	196 KOhm	84,6°	2084,1 ...	0,81 nF
40	73	196 KOhm	84,9°	2181,4 ...	0,81 nF
49	76	196 KOhm	84,7°	2109,5 ...	0,81 nF
9	17	195 KOhm	85,1°	2266,9 ...	0,81 nF
46	75	195 KOhm	85,1°	2287,5 ...	0,81 nF
4	38	194 KOhm	84,4°	1994,2 ...	0,82 nF
6	28	194 KOhm	84,5°	2015,9 ...	0,82 nF
12	35	194 KOhm	85,1°	2262,0 ...	0,82 nF
21	22	194 KOhm	77,3°	879,2 K...	0,80 nF
35	62	194 KOhm	84,7°	2077,5 ...	0,82 nF
52	66	194 KOhm	84,7°	2085,6 ...	0,82 nF
57	56	194 KOhm	85,0°	2208,7 ...	0,82 nF
5	37	193 KOhm	84,9°	2153,7 ...	0,82 nF
29	42	193 KOhm	84,2°	1914,7 ...	0,82 nF

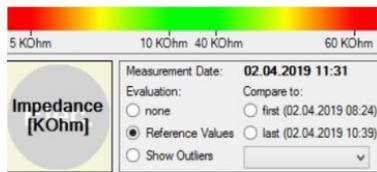
Next to the virtual MEA layout the log file window also displays the impedance measurement values, as well as some additional parameters. There are six columns: ID = Hardware ID, Electrode = electrode name, Impedance, Phase Shift, R = resistance, and C = capacitance.

You can click into the header of each column to sort the values of this column. If the arrow points up, the column starts with the smallest values. You can click on the header again and the arrow and the values will turn around and the column starts with the largest values.

The column "ID" displays the hardware ID of the MEA electrodes in the sequence of measurement. The column "Electrode" displays the electrode name in the layout grid. Depending on the MEA type, the name can consist of either only numbers or letters and numbers.

The "Impedance" is measured in units of kilo Ohm. It's the same value that is displayed in the virtual MEA Layout. The "Phase Shift" is measured in degrees. The values of phase shift and impedance are used to calculate the values of the resistor and the capacitor. The "R" Resistance values are shown in kilo Ohm. The "C" Capacitance values are shown in nano Farad.

Legend



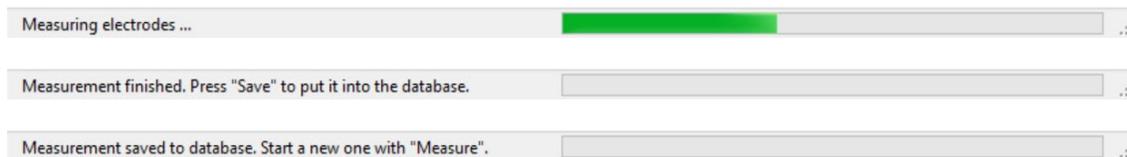
The "Legend" describes what you see in the virtual MEA layout: The color coded MEA electrodes with the value of the measured impedance in black letters in the front, and the electrode names in white letters in the back.

To evaluate a MEA, you can compare the measured impedances to individual reference values for each electrode type. Good and bad electrodes will be color coded according to the limits shown in the legend. It is also possible to highlight outliers. You can change the default limits under Preferences

Alternatively, the user can compare the current measurement to any previous measurement from the same MEA present in the database file. Use the radio buttons or the drop down menu to select the reference measurement. The date of the reference measurement will appear in the upper right corner of the legend.

Status Line

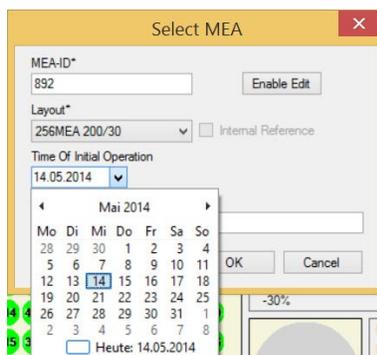
The status line will indicate the actual state of the software and suggest a next step, respectively, for example "Measuring electrodes...." or similar recommendations.



Running a Measurement

Note the serial number and type of the MEA and mount it in the correct orientation in the MEA-IT device, please read also chapter "Mounting the MEA".

Open the MEA-IT software and click the button "Measure" in "Main Controls" to start a measurement. The "Select MEA" dialog appears.



Please type the serial number of the MEA into the "MEA-ID" in the drop down box. The program will save the ID and you can select it from the drop down menu, when measuring the same MEA again.

Please select a MEA "Layout" from the drop down menu. This is important, because the diameter of an electrode has a major influence on its impedance: Smaller electrodes have a higher impedance than bigger electrodes. For example, electrodes with 30 μm have an impedance of about 30 - 100 kOhm and smaller electrodes with a diameter of 10 μm have an impedance of about 250 - 400 kOhm. The impedance of an electrode also depends on the hydrophilic properties of the electrode. If an electrode is hydrophobic, the measured impedance will be too high.

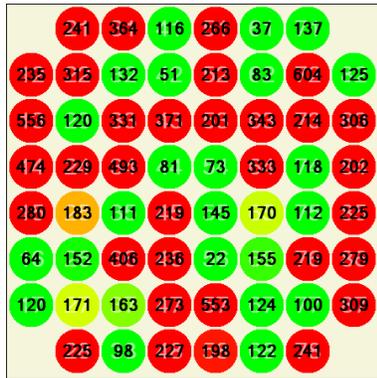
The "Layout" selection also defines the appearance of the virtual MEA layout. If the MEA is already present in the database, the "Layout" and the "Time of Initial Operation" will be set automatically.

When testing a MEA with internal reference (iR), please activate the check box "Internal Reference". The reference electrode is much bigger than the recording electrodes, therefore the impedance should be very low. The MEA-IT software will therefore use different reference values to evaluate the reference electrodes than the regular recording electrodes.

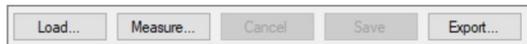
The "Time of Initial Operation" is a date that should be entered at the first measurement of each MEA. It will be saved with the MEAs database file and helps the user to keep track on the age of an array. The content of the "Comment" window will also be saved together with the measurements.

The drop down menus "MEA-ID" and "Layout" are labeled with an asterisk *. They are required to start a measurement.

Click "OK" to start the measurement.



The electrodes are measured one by one and the exact values of the measurements are written in black letters inside the electrodes, and also in the log file in column "Impedance". The color code is activated only when comparing with previous measurements or when the check box "Show Outliers" is enabled. Otherwise, the color of the electrodes remains grey.



Click the "Cancel" button to stop a measurement.

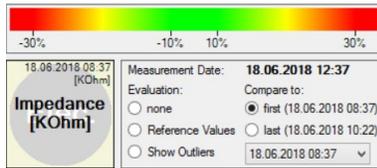
Click the "Save" button to save the measurement file in the data base.

Important: You have to actively save a measurement to archive the file in the database!

With the "Export" function, the results of a current or loaded measurement can be exported in ASCII format. The layout of the ASCII file can be selected in the "Preferences" dialog.

The current measurement can be evaluated or compared to previous measurements of the same MEA. Evaluation results are shown as color code in the virtual MEA display. An impedance measurement can either be compared to reference values for a given electrode type, or outliers in the array can be highlighted please see above).

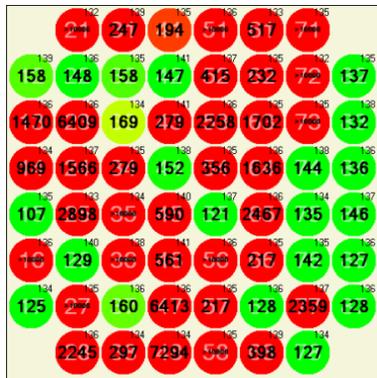
The "Compare to" function allows comparing the current measurement with any previous measurement for that MEA which is present in the database file.



When comparing previous measurements with actual measurements, the impedance of the older measurement is displayed in the upper right corner of each electrode in the "Virtual MEA Layout".

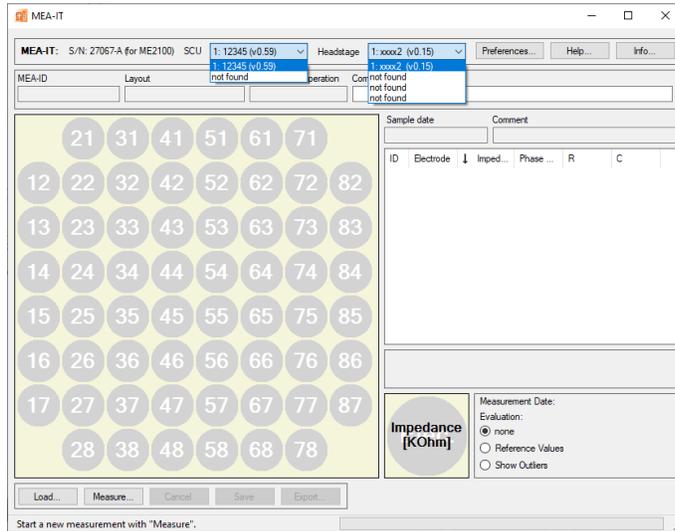
It is possible to switch between the different evaluation and comparison options without running a new measurement.

With all options, a green color indicates no relevant difference to reference values, previous measurements or other electrodes, while yellow or red colors indicate a value out of the acceptable limits. The default limits are suggested by the MEA manufacturer, but they can be modified by the user under "Preferences".



MEA-IT Software for ME2100-System

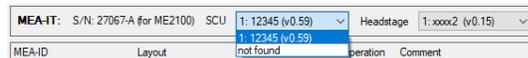
Please read the ME2100-System manual for detailed information.



Connect a ME2100-System with signal collector unit SCU, interface board IFB and headstage to a PC.

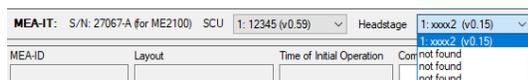
When opening the MEA-IT software, the header of the software includes two additional drop down boxes, “SCU” and “Headstage”. Please use the drop down boxes to define which headstage should be measured.

A ME2100-System includes up to two “Signal Collector Units, SCU”. Please select the SCU in use from the drop down box “SCU”. It is not possible to select both SCUs at once.

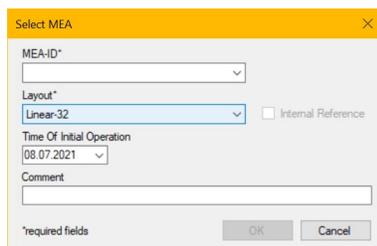


A ME2100-System includes up to eight headstages connected to up to two SCUs. First you have to select the SCU in use, then you have to select the headstage in use from the drop down box “Headstage”.

Up to four headstages can be connected to one SCU. Select one of them, regardless to which connector of the SCU the headstage is connected. Unplugged connectors are indicated with “not found”. It is not possible to measure more than one headstage simultaneously.



Select the type of the MEA in the “Select MEA” dialog: Select “Linear-32” in “Layout”.



TROUBLESHOOTING

Most problems occur seldom and only under specific circumstances. In most cases, it is only a minor problem that can be easily avoided or solved.

If the problem persists, please contact your local retailer. The highly qualified staff will be glad to help you. Please inform your local retailer as well, if other problems that are not mentioned in this documentation occur, even if you have solved the problem on your own. This helps other users, and it helps MCS to optimize the instrument and the documentation.

Please pay attention to the safety and service information in chapter "Important Safety Advice". Multi Channel Systems has put all effort into making the product fully stable and reliable, but like all high-performance products, it has to be handled with care.

Error Messages



If the MEA-IT device and the data acquisition computer are not connected the error message "No Connection" appears in the header of the main window. At the same time the button "Measurement" below the virtual MEA layout turns to "Load".

Possible causes:

? The blue power LED is not lighting. The supply power via computer is not connected or there is a technical problem with the instrument.

Check the power source and the cable connections. If this does not solve the problem, please contact your local retailer for support.

? The power LED is lighting. The USB port might not support USB 2.0 or might not be working. Check the USB port. Only Full Speed USB 2.0 ports can be used. Try another USB 2.0 port.

If the problem is solved, you can click the "Load" button to restart the measurements. The "Select MEA" dialog will appear, you can fill in the required fields and start up again.

Technical Support

Please read the "Troubleshooting" part of the manual or help first. Most problems are caused by minor handling errors. Contact your local retailer immediately if the cause of the trouble remains unclear. Please understand that information on your hardware and software configuration is necessary to analyze and finally solve the problem you encounter.

If you have any question or if any problem occurs that is not mentioned in this documentation, please contact your local retailer. The highly qualified staff will be glad to help you.

Please keep information on the following at hand

Description of the error (the error message text or any other useful information) and of the context in which the error occurred. The more information on the actual situation you can provide, the easier it is to track the problem. The serial number of the device. You will find it on the bottom side of the main unit, and in the header of the main window of MEA-IT Control software.

The software version you are currently using. Click on the "Info" button in the header of the main window of MEA-IT software. The displayed "About" dialog box shows the software version number.

The operating system and service pack number on the connected computer.

The hardware configuration (microprocessor, frequency, main memory, hard disk) of the connected computer. This information is especially important if you have modified the computer or installed new hard- or software recently.

TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS

The **MEA-IT** is a device for impedance testing of microelectrode arrays.



Warning: The device may only be used together with MEA chips from Multi Channel Systems MCS GmbH, and only for the specified purpose. Damage of the device and even fatal injuries can result from improper use. Do not open the headstage or the interface box and do not change hardware configuration as it could lead to improper behavior of the system.

General Characteristics

Operating temperature	10 °C to 50 °C
Storage temperature	0 °C to 50 °C
Relative humidity	10 % to 85 %, non-condensing
Dimensions (W x D x H)	250 mm x 140 mm x 25 mm
Weight	1100 g
Number of channels	60, 120 or 256
Measurement range	5 kOhm to 2 MOhm
Test signal	100 mV, 1 kHz Sinus
Accuracy	5 %
Power supply	USB powered
PC interface	USB 2.0

Software

Operating system	Microsoft Windows [®] 10, 8.1 (32 bit), English and German version supported
MEA-IT program	Version 1.5 and higher

CONTACT INFORMATION

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Local retailer

Please see the list of official MCS distributors on the [MCS web site](#).

Mailing list

If you have subscribed to the [newsletter](#), you will be automatically informed about new software releases, upcoming events, and other news on the product line. You can subscribe to the list on the MCS web site.

www.multichannelsystems.com