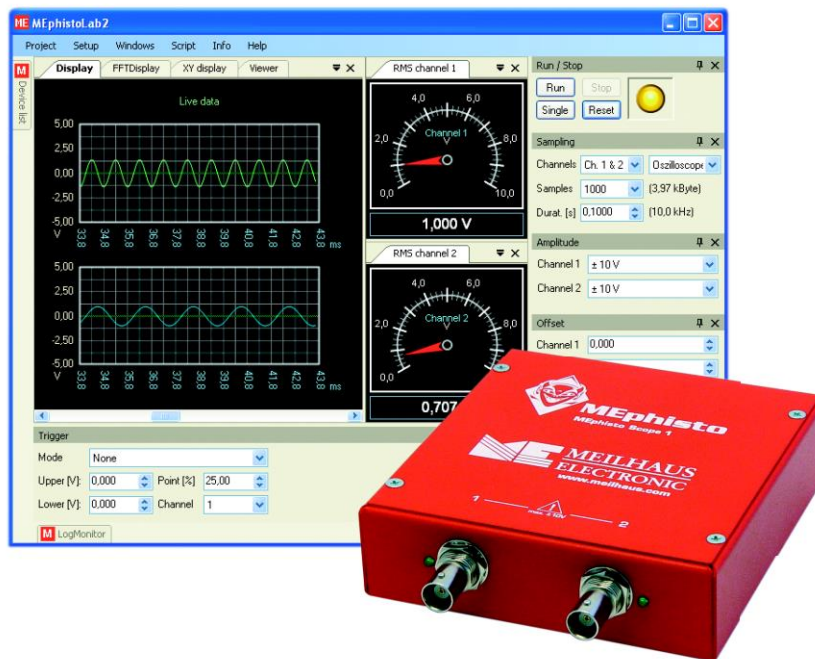


Meilhaus Electronic Manual

MEphisto Scope

(UM202, UM203)



2-Channel USB-Universal-Measuring-Box/
-Instrument with MEphistoLab²-Software

Imprint

Manual MEphisto Scope

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1 Introduction

Valued customer,

Thank you for purchasing this device from Meilhaus Electronic. You have chosen an innovative high-technology product that left our premises in a fully functional and new condition.

Please take the time to carefully examine the contents of the package for any loss or damage that may have occurred during shipping. If there are any items missing or if an item is damaged, please contact us immediately.

Before installing the board in your computer, we recommend you read this manual carefully, especially the chapter describing board installation.

1.1 Important Notes

1.1.1 Use in Accordance with the Requirements

- MEphisto Scope is intended to be used by qualified professionals.
- Use a power supply that conforms to the specifications of the MEphisto Scope.
- Do not use the device without its housing or without its front panel. It is not necessary to open the device in order to run it. There are no control elements inside.
- Only use fuses that conform to the specifications.
- Do not operate the device if you suspect a fault.
- Do not operate the device in damp environments. Keep the device surface dry and clean.
- Ensure sufficient heat dissipation from the housing of the MEphisto Scope.
- The device is not suitable as a children's toy, neither should it be used in the household or under unfavourable environmental conditions (e.g. in the open). Necessary precautions to avoid foreseeable improper operation are to be taken by the user.

1.1.2 Warnings



The MEphisto Scope has a maximum input voltage of ± 10 VDC. Measuring higher voltages may irreversibly damage the device and leads to an invalidation of the warranty.

The MEphisto Scope is not galvanically isolated, i.e. if it is run „online“ the device's mass is directly linked to the computer's mass via the USB cable. If you use a regular desktop PC, the device's mass is earthed via the power cable (by protective contact). However, if you use a laptop, there is no such reference to ground potential. The same is applicable for „offline“-operation. Therefore, it is imperative that the device be earthed by using the earthing-connection on the back side.



The measuring of voltages higher than 42 V, especially power supply voltages, may only be performed by qualified professionals. If doing so, use a high-voltage probe. Note that there is an electrical connection between the shield of the BNC connectors and the device's housing which is lead on to the PC-housing via the USB cable. That means that the housing of the MEphisto Scope may carry 230 V (by accidentally connecting the phase of the Schuko-plug with the mass of your probe, for example). **There is danger to life!**

Please also follow the applicable standards and installation guidelines as well as the VDE-regulations. The Meilhaus Electronic GmbH assumes no liability for any damage that results from incorrect installation, commission or handling during operation.

1.2 Package Contents

We take great care to ensure your delivery is complete. Nonetheless, please check the list enclosed to verify the contents of your delivery. You should find included:

- 1 x USB-Box (metal housing) (UM202, UM203).
- ME-Power-DVD with driver, measurement software „MEphisto-Lab²“ and PDF user manual.
- Software: MEphistoLab² software for the MEphisto Scope, supports all devices: Scope (time, XY, range), voltmeter, analog data logger, logic analyzer, digital data logger, digital-I/O, for Windows. Based on MCD tool monitor, incl. script editor.
Furthermore: MEphisto Scope is also supported by the driver system ME-iDS. iDS is a prerequisite to use the MEphisto Scope.
- 26-pin D-sub female socket.
- USB connection cable (type A - type B).
- UM203 additionally: mains connector.
- **ATTENTION:** SD memory card not included in delivery.

Optional accessories: „ME-probe LF Pair“ and „ME-UB-series“.

1.3 Models MEphisto Scope

Model	Description	Analog Inputs	Digital-I/O	Data Logger	Interface
MEphisto Scope UM202	USB module	2 (Scope/XY/ range, voltmeter, data logger)	up to 24 (digital-I/O data logger, logic analyzer)	with PC/ notebook	USB 2.0 full-speed
MEphisto Scope UM203	USB module	2 (Scope/XY/ range, voltmeter, data logger)	up to 24 (digital-I/O data logger, logic analyzer)	with PC/ notebook or on SD-card	USB 2.0 full-speed
MEphisto Scope UM202-T	package with bag and accessories	2 (Scope/XY/ range, voltmeter, data logger)	up to 24 (digital-I/O data logger, logic analyzer)	with PC/ notebook	USB 2.0 full-speed

MEphisto Scope UM203-T	package with bag and accessories	2 (Scope/XY/ range, voltmeter, data logger)	up to 24 (digital-I/O data logger, logic analyzer)	with PC/ notebook or on SD-card	USB 2.0 full-speed
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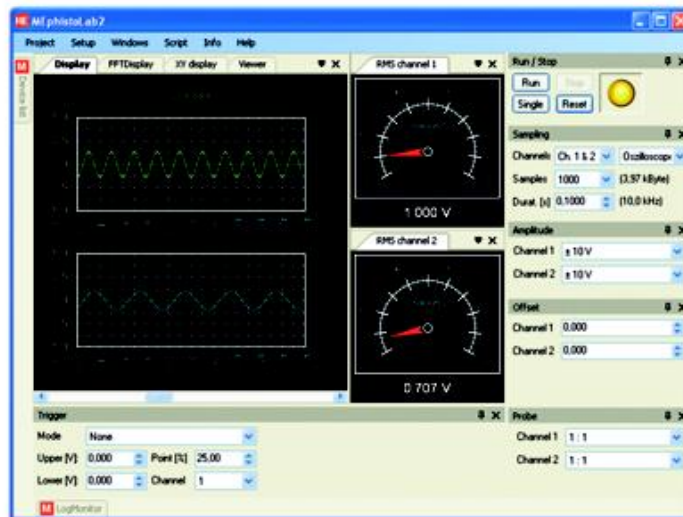
1.4 Short Description

Overview: The following devices are included in the MEphisto Scope:

Instrument	Data
Oscilloscope spectrum analyzer	2 channels, 1 MS/s per channel, 16 bit, up to 500 kHz, range 200 mV...20 V. Time, range and XY-depiction.
Voltmeter	2 channels, input range ± 100 mV, ± 1 V, ± 10 V. 16 bit. Pointer indication (software). DC, AC true RMS value.
Data logger	Analog and digital up to 100 kHz.
Logic analyzer	16 channels, up to 100 kHz, CMOS level.
Digital-I/O	24 TTL lines, programmable for each line as input/output.
Model UM203 stand-alone data logger	Recording of analog and digital data onto SD card. Up to 100 kS/s (depending on card). Start measurement by plugging in the SD card.

The MEphisto Scope is a universal combination-instrument combining a digital storage oscilloscope, a range analyzer/FFT, a voltmeter, a logic analyzer, a data logger and a 24 channel digital-I/O in a compact steel metal housing. Power supply is granted via the PC-USB-interface so that there is no need of an external power supply. The two analog inputs are equipped with BNC-sockets to which standard oscilloscope probes may be connected. Each channel has its own 16-bit A/D-converter so that you may sample up to 1MS/s on two channels simultaneously. The input voltage is within ± 10 V. Depending on the operating mode, there are different trigger modes.

The second generation of the MEphistoLab software provides a virtual instrument panel that offers simply and quick access to all the device's functions.



Picture 1: MEphistoLab² main display based on the MCD electronic tool monitor.

You may choose between the following models (**Tip:** In case you don't have a MEphisto Scope, choose the menu „Extras – Options – Driver“, then go to „Simulation“ and try the software without connected hardware:

- **„Oscilloscope“** 2 channels, max. 1 MS/s per channel, voltage range: ± 10 V (see chapter 1.4.1, p. 12)
- **„Volt meter“** 2 channels (AC_{eff}/AC/DC) with up to 6 virtual pointer instruments (see chapter 1.4.2, p. 12)
- **„Analog data logger“** 2 analog channels, max. 100 kS/s, voltage range: ± 10 V (see chapter 1.4.3, p. 13)
- **„Digital-I/O“** 24 Digital-I/Os, configurable by bit, 5 V CMOS-level (see chapter 1.4.4, p. 14).
- **„Logic analyzer“** 16 channels (DO...15), max. 100 kS/s per channel, 5 V CMOS-level (see chapter 1.4.5, p. 15)
- **„Digital data logger“** 16 channels (DO...15), max. 100 kS/s, 5 V CMOS-level (see chapter 1.4.6, p. 16)
- **„Data viewer“** Analyzes saved data (see chapter 1.4.7, p. 17).
- **„Offline mode“** The model UM203 saves data onto a SD-card (see chapter 1.4.8, p. 17).

- **„Script editor“** Write your own code in C# and make automated measurements (see chapter 1.4.9, p. 18).

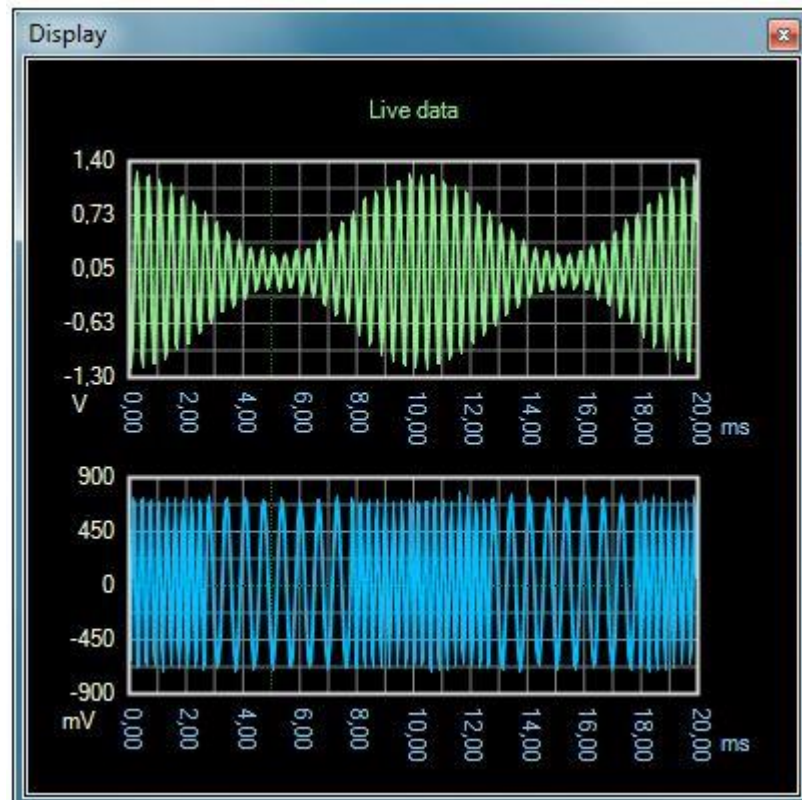
General note: The MEphistoLab² tries to implement setting defaults as accurately as possible. However, the hardware may not implement all values accurately. In such cases, the oscilloscope approximates the setting to the desired value. After that, the MEphistoLab corrects the settings that consequently display the real value.

Please always follow the safety instructions while working.

Tip: You may change the program language if required: choose the menu „Extras – Options – Language“ (reboot is necessary). Find an extensive description of the MEphistoLab²-Software in the online support.

1.4.1 Oscilloscope

The module „Oscilloscope“ has 2 measurement channels. They display frequency signals up to 500 kHz. All frequency signals measured above this limit are non-existent in reality. This should be kept in mind when defining a completely unknown signal. Both channels share a common time basis.

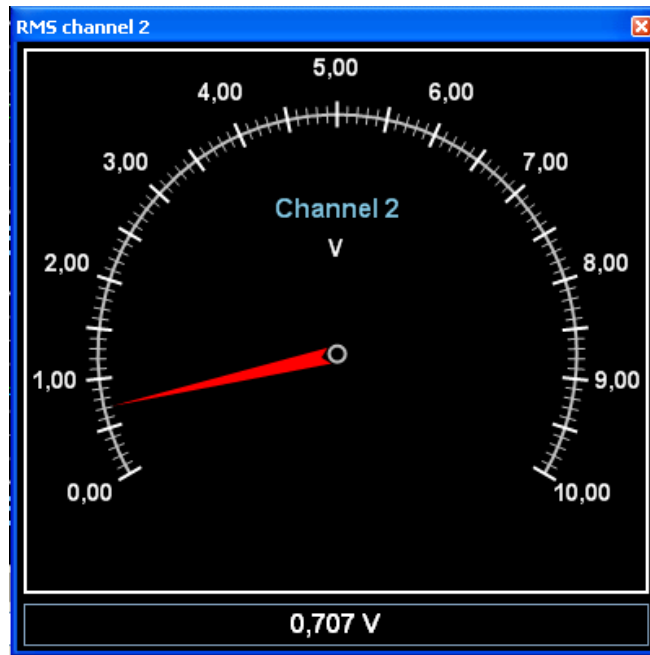


Picture 2: Functions of the oscilloscope.

1.4.2 Voltmeter

With the help of a virtual pointer element, the total RMS value, the DC or AC voltage component of the input signal may be displayed.

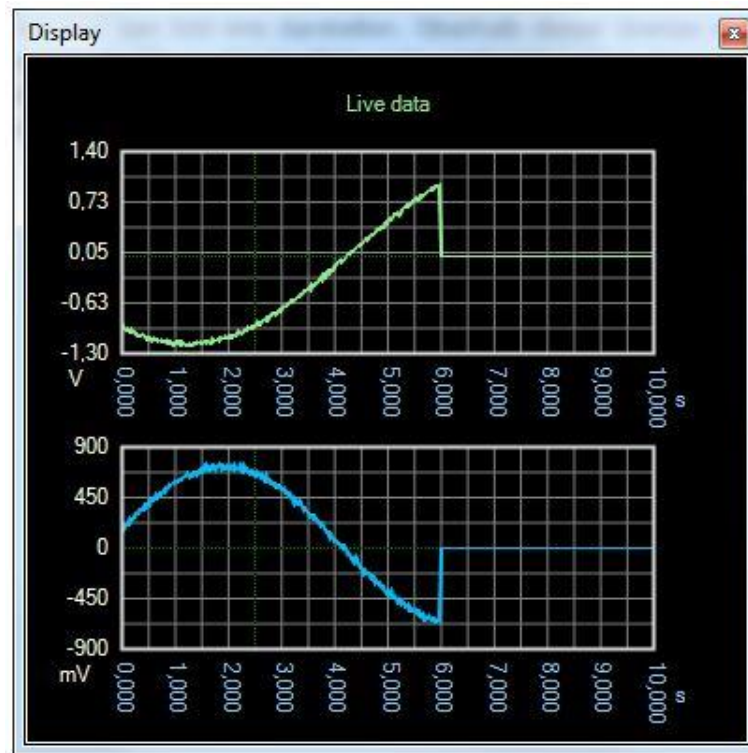
AC voltages may have very high peak voltages even at low RMS values. The high peak voltages must always be within the scale limits. If this is not the case, the measurement result is falsified. If you do not know the measurement signal, you should work with a high division factor. The oscilloscope function allows you to get an image of the wave pattern.



Picture 3: Voltmeter

1.4.3 Analog Data-Logger

The module „Data Logger Analog“ has two measurement channels. They show signals with a signal frequency of up to 50 kHz. Image frequencies measured above this limit do not exist in reality. This should be kept in mind when defining a completely unknown signal. Both channels share a common time basis.



Picture 4: Analog Data-Logger

1.4.4 Digital-Input/Output

The MEphisto Scope has 24 Digital-I/Os. Each channel may be configured independently as input or output.

When you turn on the device, all channels are configured as input.



Picture 5: Digital-Input/Output

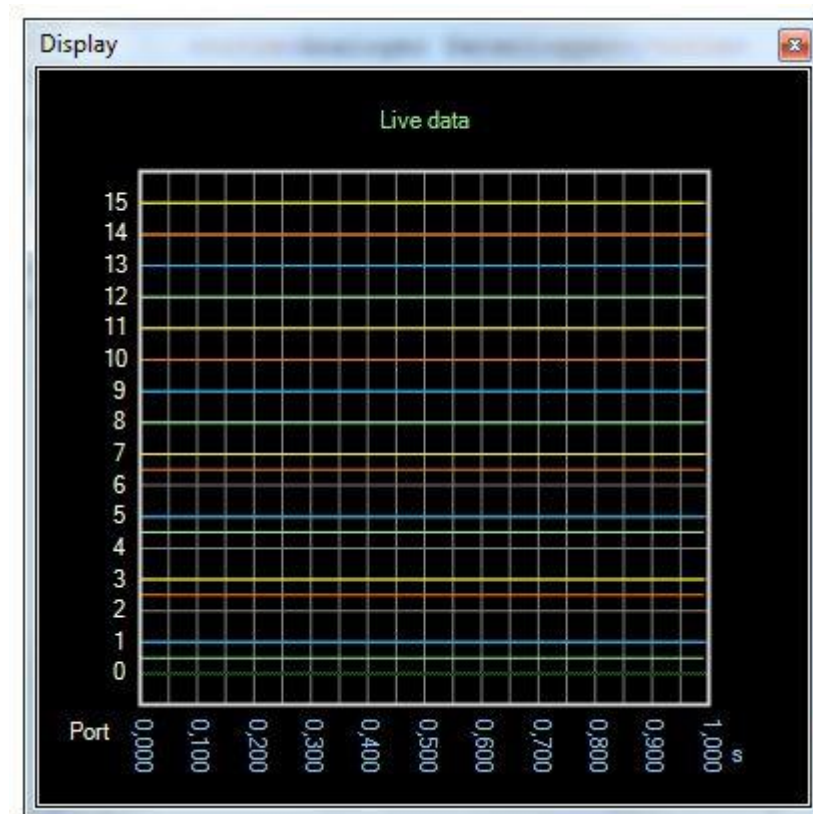
1.4.5 Logic-Analyzer

The module „Logic-Analyzer“ shows 16 digital channels with a frequency of up to 50 kHz. Image frequencies measured above this limit do not exist in reality. This should be kept in mind when defining a completely unknown signal. In case of doubt, an observation through the oscilloscope may shed light but only up to a frequency of 500 kHz.

All digital channels use a common time basis.

In the „Logic-Analyzer“ mode, the channels D16 to D22 are reserved for special functions on the pins 19 to 25. If required, they are configured as output and therefore shouldn't be connected.

The levels of the signals must meet the requirements of the 5 V CMOS. In case they don't, you need to connect a level converter.



Picture 6: Logic-Analyzer

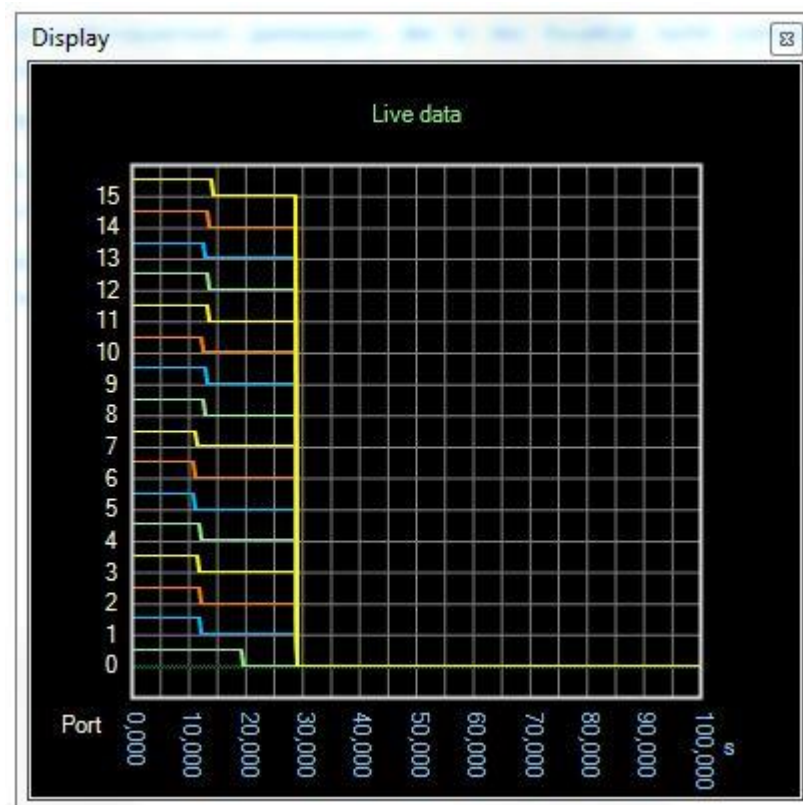
1.4.6 Digital Data-Logger

The module „Digital Data logger“ shows 16 digital measurement channels with a frequency of up to 50 kHz. Image frequencies measured above this limit do not exist in reality. This should be kept in mind when defining a completely unknown signal. In case of doubt, an observation with the oscilloscope may shed light but only up to a frequency of 500 kHz.

All digital channels use a common time base.

In the „Digital Data logger“ mode, the channels D16 to D22 are reserved for special functions on the pins 19 to 25. If required, they are configured as output and therefore shouldn't be connected.

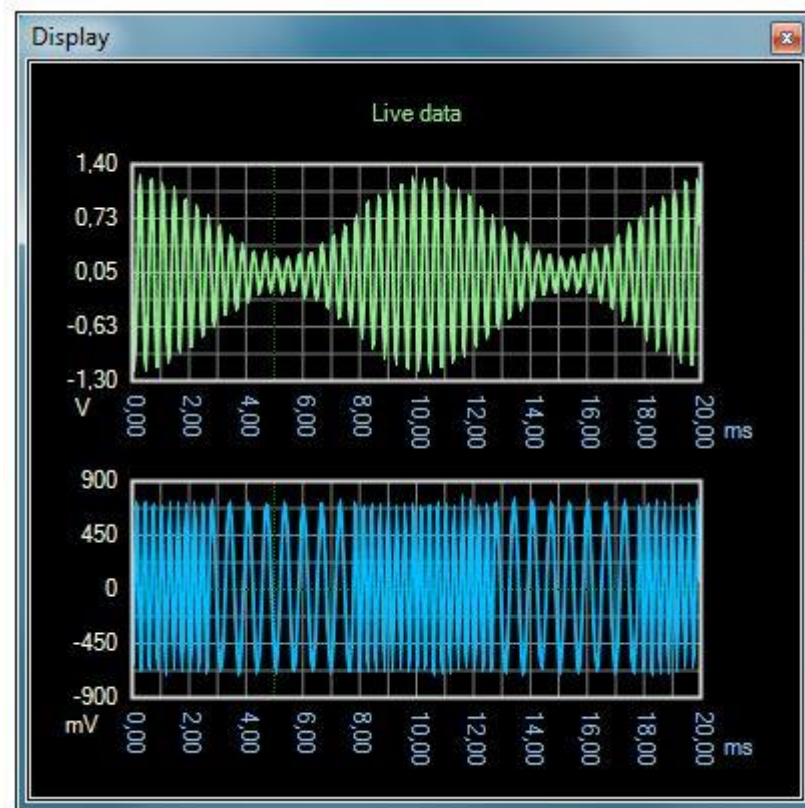
The levels of the signals must meet the requirements of the 5 V CMOS. In case they don't, you need to connect a level converter.



Picture 7: Digital Data Logger

1.4.7 Data-Display

The module „Data-Display“ displays saved data. How this data is displayed depends on the type of data. Analog signals are displayed in a window that resembles the oscilloscope mode. Digital signals are displayed in a window that resembles the Logic Analyzer mode.



Picture 8: Data-Display

1.4.8 Set up Offline Mode

The MEphisto Scope UM203 may save data onto an SD-card that has a capacity of up to 2 GB. After applying the supply voltage, the MEphisto Scope uses the settings that were last made online. Inserting the SD-card starts the measurement process.

Notes: Whether offline or online via PC, the way how the MEphisto Scope (UM203) measures is exactly the same. However, there are some aspects to consider.

The most important difference between online and offline mode is the reference potential. Within the online-mode, the device is connected to the mass of the PC. If it is a Desktop-PC, the device's

mass as well as its housing is partially earthed via the PC-power supply.

This reference does not exist if the device is connected to a laptop or in offline-mode. Please note that external earthing and extra care is absolutely necessary for your safety.

Another difference is the maximum sampling rate. In the logger modes, the maximum rates may – in rare cases – lead to incorrect records. For further recommendations on how to handle SD-cards, please refer to the corresponding chapter.

In offline-mode, the digital data logger has a maximum sampling rate of 2.5 kHz. This isn't reported back to the MEphistoLab² if settings are made. Please make sure to set a valid sampling rate on the SD-card. If necessary, the device will reduce the rate automatically before starting the measurement.

Offline-modes vary depending on the firmware version of the device. From version 3.10 on, all modes may be used in offline-mode.

If a chosen mode is not available, the device signals no availability in offline-mode. Instead, it displays the POST Code 15. It cannot be reset to standby from this condition. Please connect the device to the PC and set an available mode.

In offline-mode, the logger modes only support pre-trigger, i.e. a start via trigger-mode. It is not possible to end the recording.

1.4.9 Script Editor (Script Menu)

Using the Script-Engine, the Mephisto Scope automatically performs measurements and calculates further measurement values.

Scripts may be edited, loaded and saved, as well as started and stopped.

1.5 System Requirements

1.5.1 Supported Hardware

Meilhaus Electronic MEphisto Scope (models UM202 und UM203), firmware-version from 2.10 on.

Both analog inputs are equipped with BNC-sockets for standard oscilloscope probes. Each channel has its own 16-bit A/D-converter that facilitates simultaneous sampling rates of up to 1 MS/s on both channels. The digital port serves as input for the Logic-Analyzer. It can be found on the backside of the 26-pin plug connector.

The device is supplied with power via the USB-port of the PC. In case it is connected to the PC via USB-hub, the hub needs its own voltage supply. The device signals a current consumption of 490mA max. This is required so that operation is safe even with shorts on the digital port.

For the autonomous operation of the model UM203 an external power supply with 5V, 500 mA is required. In this mode, the device may also be supplied with a powered USB hub without connection to the PC.

1.5.2 SD-Cards

1.5.2.1 General Information

The MEphisto Scope accepts SD-cards with a capacity range from 8 MB to 2 GB. A functioning of cards with a capacity of 8 MB or 16 MB cannot be guaranteed for all manufacturers. Capacities of more than 2 GB are not supported.

1.5.2.2 Format

All SD-cards should be formatted prior to using them in the MEphisto Scope. Only if formatted, the cards may use the full range of files or the full capacity for recording. This particularly affects highly fragmented file systems that have often been described with many small files.

The MEphisto Scope accepts the formats FAT16 and FAT32. Some operating systems offer FAT32 as standard for data storing units starting from 32.5 MB. However, FAT16 should generally be preferred. Otherwise, only limited functionality may be available.

For historical reasons, SD-cards with a capacity of 32 MB and less are factory-equipped with the outdated file system FAT12. The MEphisto Scope is unable to read this format und signals a POST Code 6. Please reformat these cards. FAT16 is automatically used by all modern operating systems to format data storing units with a capacity of more than 4 MB.

Some programs allow you to change the file format as well as the management system of a data storing unit. However, many SD-cards work best using the factory-defined structure. The Meilhaus Electronic GmbH strongly advises you to abstain from such changes. There have been occasional malfunctions and defects in relation to wrong formatting. However, it must be stressed that this does not affect the file system (FAT12, FAT16, FAT32 etc.) but only structures like boot sector, partition information etc.

1.5.2.3 Speed

In order to achieve the highest possible data rates, you should use fast-operating cards. However, it is not necessary to use extremely fast-operating cards (attributes „extreme“, „ultra“, etc.). A very high speed may only be reached on certain conditions. The MEphisto Scope does not support these conditions. We recommend to test the measuring condition. Over-speed may produce incorrect values that occur separately or in blocks even though the card does not indicate any error. A typical symptom are short „bursts“ at regular intervals. This does not occur, however, at sampling rates under 20 kHz. The modes Oscilloscope and Logic-Analyzer are not affected. They work full-speed with any type of card.

1.5.2.4 File Attributes

The MEphisto Scope generates a unique file name for each measurement. The name is based on the date and time the file was created. In the logger-modes, the file's first time-stamp is set on the time when the file was created. Therefore, it is approximately the moment you insert the card which is recorded. The second stamp indicates the last time you accessed the file and may be used to define the end of the measurement. All information given by the other modes always refers to the end of the measurement. The time stamps are attributes of the files themselves not of the data. If the file is manipulated, the stamps change, too.

1.5.2.5 Termination of measurement

If you terminate the measurement early by turning off or taking out the card, not all measurement data is saved. In logger-modes, it is

the last 512 bytes. This corresponds to 256 or 128 measuring points, depending on the mode. The modes Oscilloscope and Logic-Analyzer create a file only partially described or with no content at all, in case of early termination. These files do not have time stamps and their content is undefined. They should be deleted prior to the evaluation of other measurement data.

1.6 System Requirements

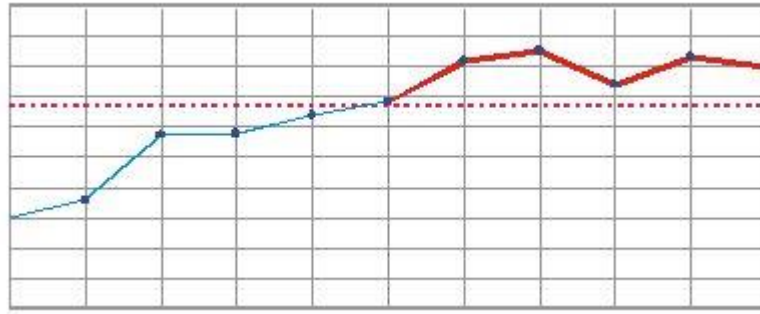
System Requirements for MEphisto Scope UM202/UM203 und MEphistoLab²: Windows 7 through Windows 10 as well as driver software ME-iDS:

Please note the corresponding README-files.

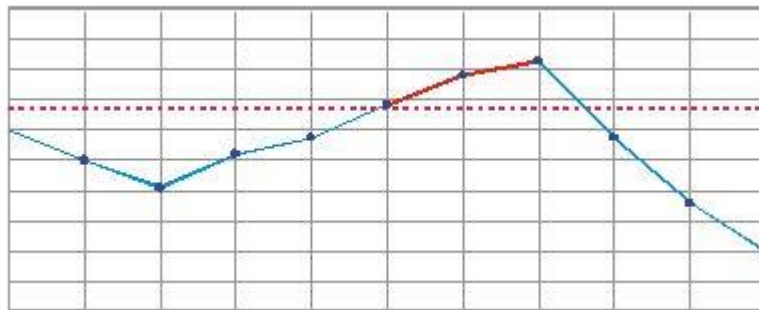
1.7 Trigger Modes

- **Manual (Manual)**
This trigger-mode stands for the freely running measurement. It starts immediately after pressing „Run“ or „Single“.
- **Threshold value** (Level, above / Level, below)
In this mode, the oscilloscope reacts to exceeding or not meeting the indicated threshold. It is not important how the exceeded threshold value was created. This trigger mode is especially suitable for two cases:

- The tracking of a starting-process (Single-Shot-Operation)



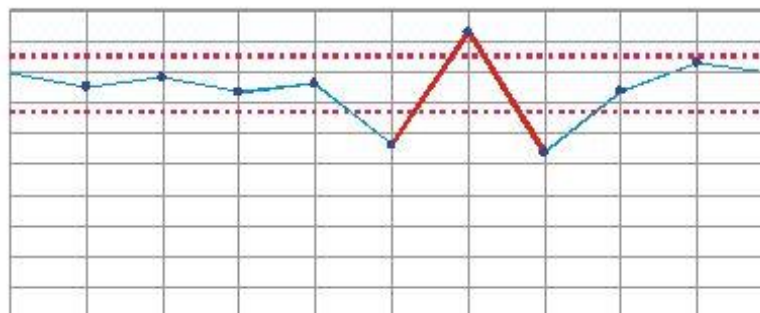
- The detection of a brief exceeding (Single-Shot-/Run-Operation)



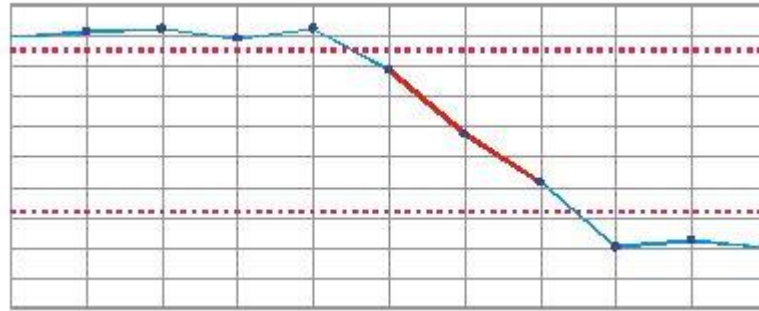
- **Window, inside / Window, outside**

In this mode, a window is defined by means of an upper and a lower threshold. The trigger-event occurs as soon as the signal enters or leaves the window. It is not important, if the signal enters through the upper or the lower threshold. This mode is mainly used to monitor direct voltage.

- Monitoring DC voltage disturbances with „Window, inside“ (Single-Shot/Run-Operation)



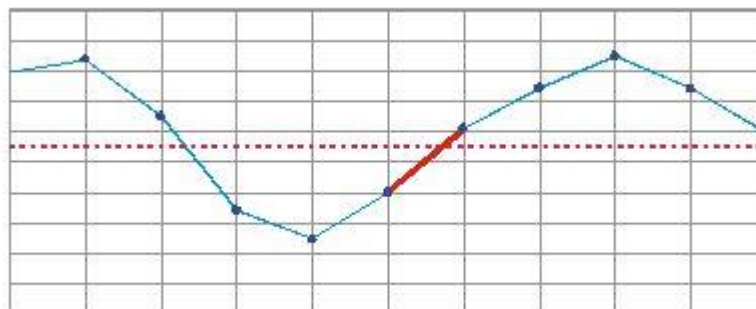
- Detecting a „forbidden area“, e.g. in digital technology (Single-Shot/Run-Operation)



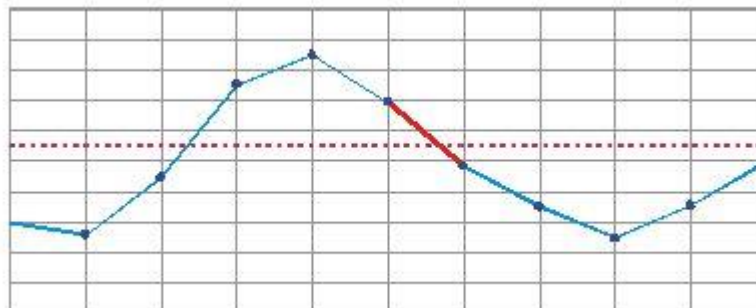
- **Edge, rising / Edge, falling**

If this mode is activated, an exceeding or not meeting the indicated threshold is awaited (similar as in threshold-trigger). However, in the edge-mode the threshold must be crossed. A signal that is statically too high or too low does not activate the trigger. The edge-mode may be used for reiterating AC signals in order to create still images.

- Display of the rising edge (Run-Operation)



- Display of the falling edge (Run-Operation)



- **Slope, positive / Slope, negative**

This trigger-mode is intended for special cases of dynamic signals. It is nearly independent of the actual voltage. Only the changing of the signal is controlled. If the signal rises or falls faster than indicated, the trigger is activated. The slope is indicated as Voltage/SampleTime. The voltage specification is in volt. The sample time is calculated from the quotient Time/Memory Depth.

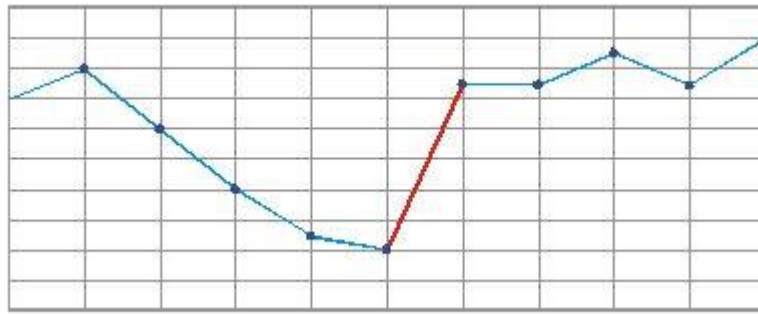
$$dU = U[V]$$

$$\frac{dU}{dt} = \frac{U[V] \cdot \text{Memory [Samples]}}{t_{\text{TimeBase [s]}}} \quad \text{bzw.} \quad U[V] = \frac{dU}{dt} \cdot \frac{t_{\text{TimeBase [s]}}}{\text{Memory [Samples]}}$$

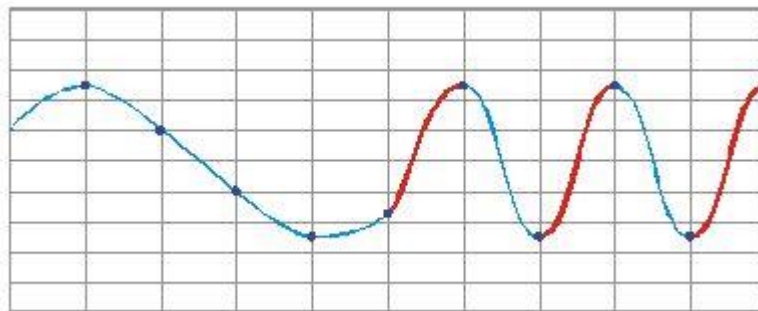
The controlling of the slope is mainly important for two applications. To begin with, there is process control in chemistry, biology etc. Here, large fluctuations are normal, whereas a sudden rising indicates an error. Secondly, this mode is suitable to realize a frequency detection.

The MEphisto Scope has a limited measurement range. In order to prevent uncontrolled fluctuations in the measuring range near the upper or lower edge, the trigger also triggers if the current voltage plus the rise would exceed or fall below the measuring range. When experimentally determining suitable settings, very small values are recommended as a starting point. For example, to detect a very short burst of the same amplitude and a frequency of 1 kHz in a 50 Hz and 10 - 18 V_{pp} signal, a trigger value of 0.15625 V is required. The further away the frequency to be detected is from the fundamental frequency, the safer it can be detected.

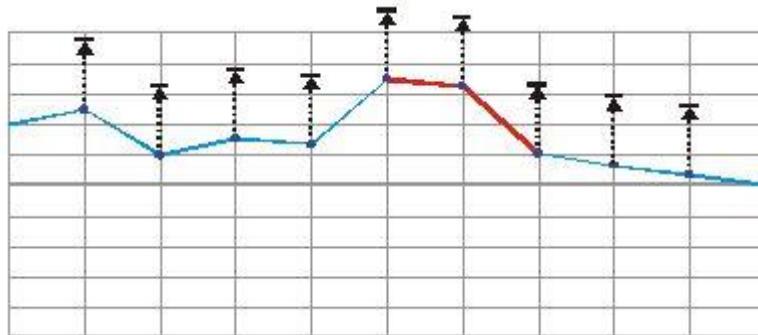
- Recognition of a critical condition (Single-Shot/Run-Operation)



- Detecting a frequency (Run-Operation)

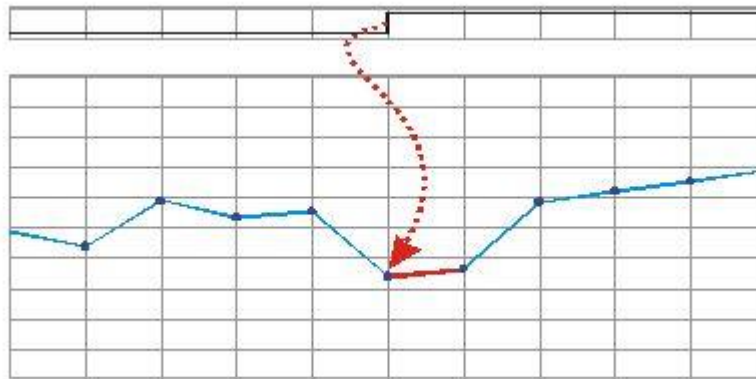


- Potentially exceeding the measuring range at the next measured value (Single-Shot/Run-Operation)



- **External, rising / External, falling**

If this mode is active, as with the edge trigger, a rising or falling edge is awaited. However, the decisive factor in this case is not one of the analog signals, but the digital signal at I / O port D23 (pin 26). As with the analog edge trigger, only a logical edge triggers the trigger. A static signal is ignored. The external trigger is for synchronization with other devices. Please check the compatibility of the trigger source and the MEphisto Scope. Modern signal generators usually generate a 5 V CMOS signal, which you can use as a synchronous pulse.



2 Software Installation

Please read the manual of your computer on how to install additional hardware components.

2.1 Connection

1. Use the USB-cable you found included in your delivery package to connect the MEphisto Scope to a free USB-port of your computer.
⇒ The new USB-device is automatically recognized by the hardware assistant and the message „Found new hardware“ is displayed. The following description is based on Windows 10 but by analogy applies to other versions, too. Depending on the Windows-version, the dialogues may vary.
2. Insert the CD/DVD you found included in your package into the driver of your computer or provide the USB-driver via download:
<http://www.meilhaus.org/downloadserver/mephistoscope.htm>.
3. Go to the hardware-assistant and choose the option „Automatically install software“ (recommended). Click on „Continue“. Possible notifications from Windows pointing out that the driver is not certified my Microsoft, may be ignored.
⇒ The system driver is installed and the MEphisto Scope is registered in the device manager with the device class „Meilhaus DAQ Boards“.
4. Complete the installation of the system driver by clicking on „Complete“ and continue with the installation of the MEphisto-Lab²-Software as follows:
5. Navigate to the installation program of the MEphistoLab²-Software on CD/DVD or got to the directory where you unpacked the driver after download. The standard path on the ME-Power-DVD is: [Drive]:\Software\MEphisto-Scope\MEphistoLab². Start the installation by double-clicking on the file „MEphistoLab2.msi”.
⇒ After completing the installation, you will find the MEphistoLab² as well as the help-file, further documentation and a „Quick Start Video“ in the windows-menu under „Programs - Meilhaus Electronic - MEphistoLab²“.

2.2 User Interface

The user interface of the MEphistoLab² may be set rather freely and adapted to different applications.

All windows may be positioned freely and arranged according to your own requirements.

All functions of the MEphistoLab² may be controlled by other Windows programs via a COM-Server-Interface. Likewise, obtained measurement data may be integrated in most different programs. No special programming skills are required to do this.

2.2.1 Project Management

The project management allows you to save or load current settings. All settings regarding the measurement, the positioning of the windows, scaling, etc. are recorded.

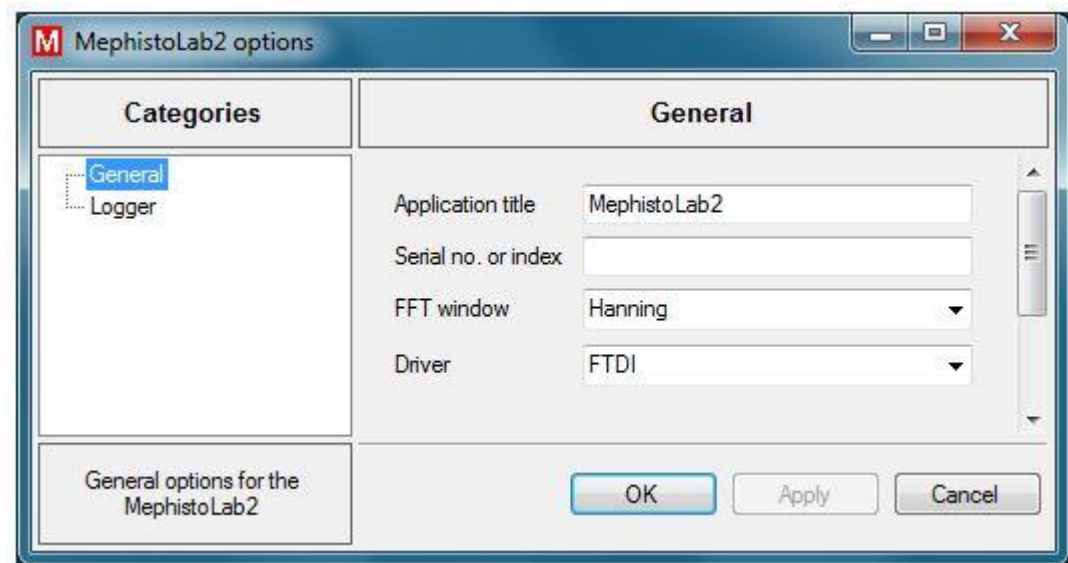
There are predefined settings in regard to the main functions of the MEphistoLab². They are to be found under „Presets“.

Furthermore, all recorded waveforms may be saved and reloaded here.

Finally, this menu item allows you to close all windows or quit the program.

2.2.2 Standard Settings (Setup Menu)

The item „Options“ allows you to apply several standard settings.



The item „General“ allows you to define the following windows' titles.

Furthermore, the device to be used may be selected. This selection is made by entering the serial number or a continuous index. If the field remains empty, the first "found" MEphisto Scope will be used.

Via "FFT-window", the window method to be used in the calculation of the FFT analysis may be defined. The window type "Hanning" is the standard type and should only be changed if you are knowledgeable about the underlying mathematical procedures.

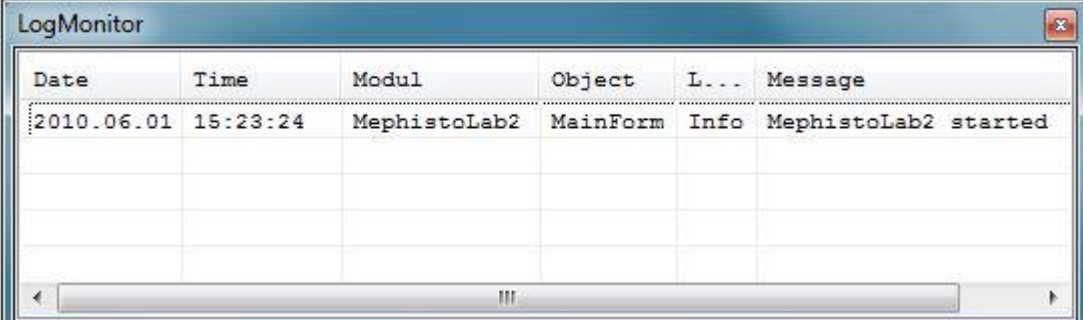
With "Driver", the driver for the MEphisto Scope may be set. The standard driver is FTDI and should only be changed if necessary. If no hardware is available, a simulated input signal may be chosen by selecting "Simulation".

In the logging area, parameters for logging internal events may be defined.

2.2.3 Views

The individual views or subfunctions may be selected via the “Windows” menu.

2.2.3.1 Logger

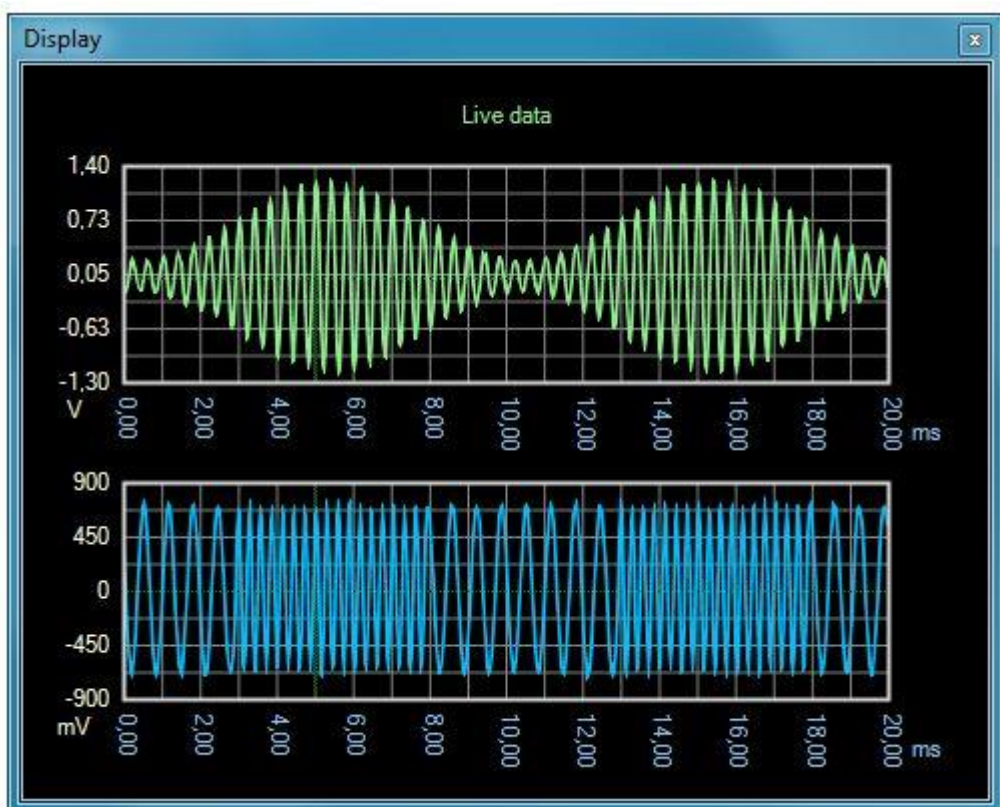


The screenshot shows a window titled "LogMonitor" with a table of log entries. The table has six columns: Date, Time, Modul, Object, L..., and Message. The first entry shows the date 2010.06.01, time 15:23:24, module MephistoLab2, object MainForm, level Info, and message "MephistoLab2 started".

Date	Time	Modul	Object	L...	Message
2010.06.01	15:23:24	MephistoLab2	MainForm	Info	MephistoLab2 started

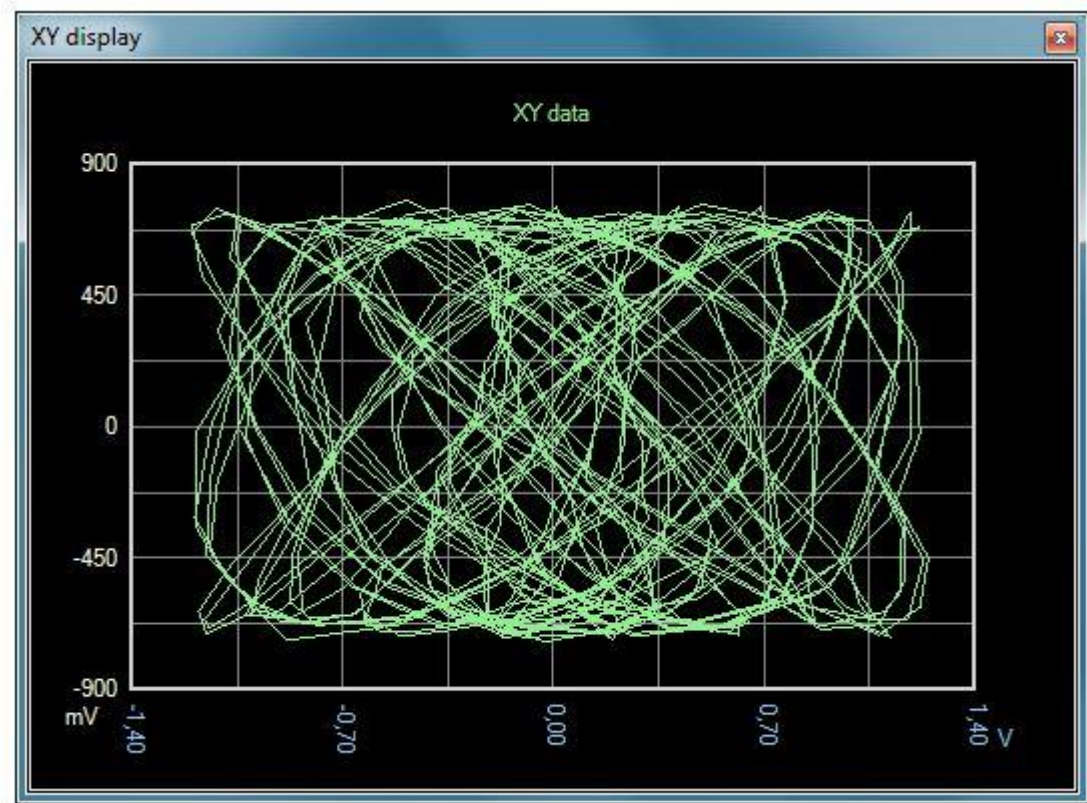
The menu “Logger” displays the logger that records internal events. The configuration in which messages are to be recorded takes place in the basic settings.

2.2.3.2 Display



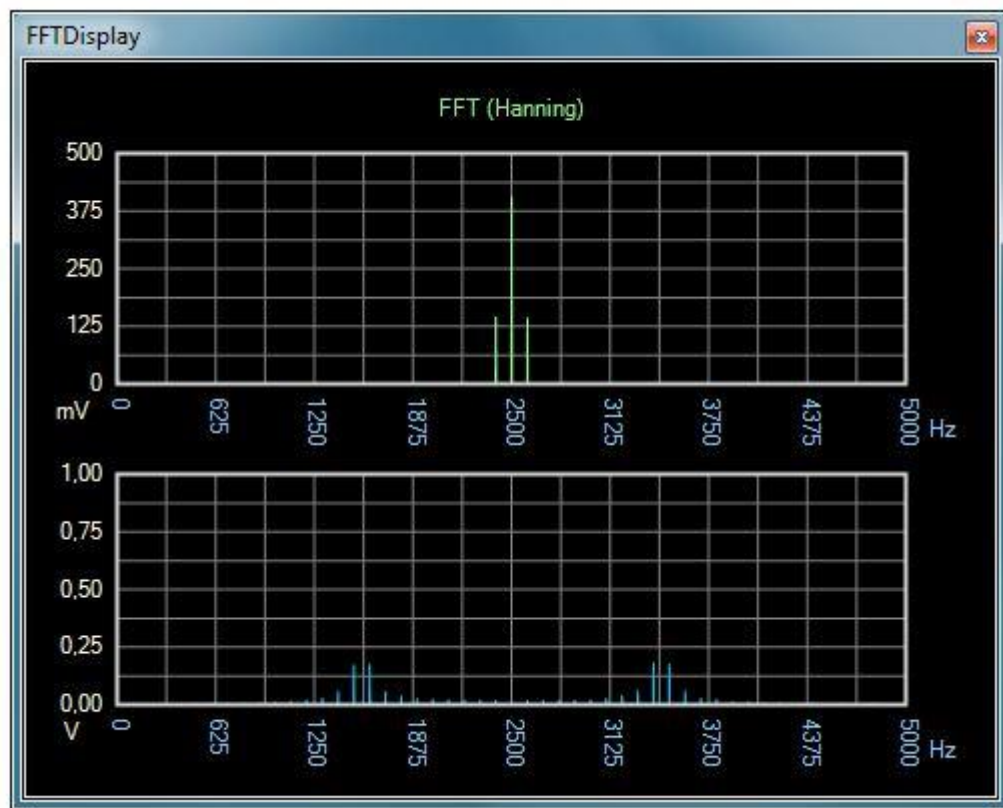
The “Display” menu opens the main window for displaying the measured input signal. The „Context Menu“ allows you to make a wide range of changes on how the signal is displayed.

2.2.3.3 XY-Display



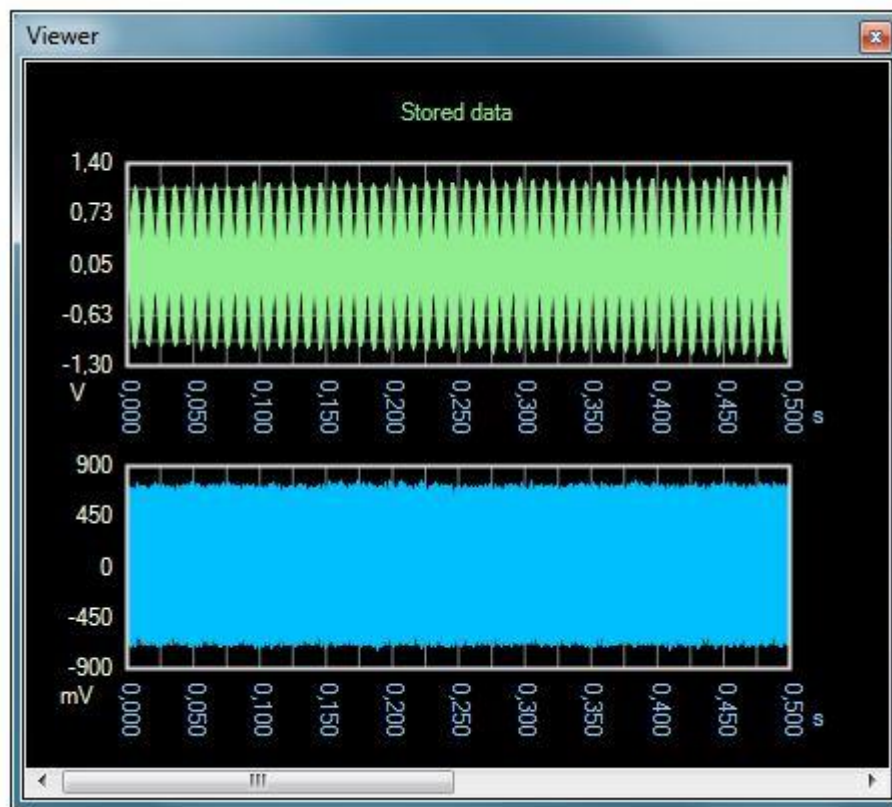
The “XY” menu displays the measured input signal as an XY diagram. Channel 1 is displayed on the X axis and channel 2 on the Y axis. Both channels need to be activated in order to get useful results. The „Context Menu“ allows you to make a wide range of changes on how the signals are displayed.

2.2.3.4 FFT-Display



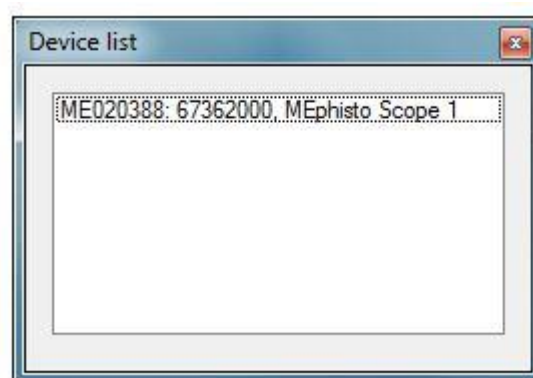
The „FFT“ menu opens the display of the frequency analysis. The „Context Menu“ allows you to make a wide range of changes on how the signals are displayed.

2.2.3.5 Viewer



The internal viewer displays stored measurement curves. The „Context Menu“ allows you to make a wide range of changes on how the signals are displayed.

2.2.3.6 Device List



The menu item „Device List“ displays all connected items that the MEphistoLab² „finds“.

2.2.3.7 Run/Stop



The menu item „Run“ activates a window that starts and stops the measurements.

In this window, you may start a continuous measurement via the button „Run“. The button „Stop“ stops a running measurement. The button „Single“ activates a one-time recording of the input signal. The button „Reset“ resets all MephistoLab² settings to standard.

The status LED shows the status of the measurement. A yellow indicator signals that no measurement is active and a new measurement can be started. A green indicator signals a running measurement. A red indicator signals an error in the communication to the hardware.

2.2.3.8 Sampling



The menu item „Sampling“ opens a window for entering sampling parameters.

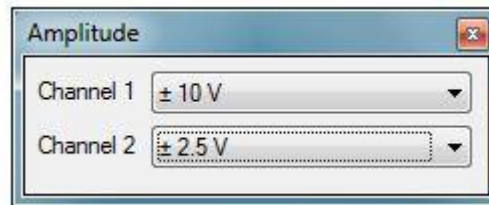
The item "Channels" allows you to select the channels to be recorded. If you activate the digital inputs, the MEphistoLab² switches to the operating mode for digital signal analysis.

Additionally to changing the channels, you may switch the operating mode. In analogue mode, either the oscilloscope or the data logger mode is available. In digital mode, it is possible to switch between the digital logic analyzer and the digital data logger.

„Samples“ is used to set the memory depth for the signal recording. That is, it determines how many samples of the input signal are used for the actual measurement.

„**Duration**“ determines the duration of a measurement. The sampling frequency resulting from "Samples" and "Duration" is displayed.

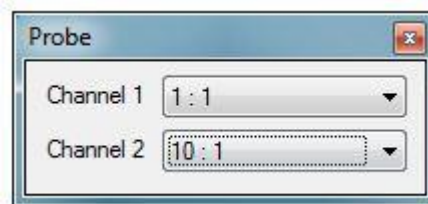
2.2.3.9 Amplitude



The “Amplitude” menu opens a window for entering the measuring range for both channels.

The amplitude can be set between 0.2 V and 20 V in the grid 1-2-5. The selection values adapt to the set division factor of the probe. The default value is 20 V.

2.2.3.10 Probe



The “Probe” menu opens a window for entering voltage dividers for signal conditioning.

If voltages higher than ± 10 V are to be measured, a probe with a division factor of 10 or 100 must be used. This factor should be indicated next to the amplitude. All voltage-related information is based on this factor. Please note that most probes with sub-factors greater than “1x” are not very accurate.

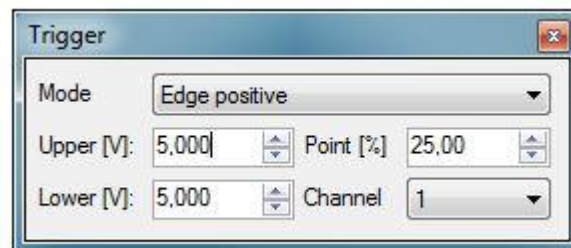
2.2.3.11 Offset



The „Offset“ menu opens a window for entering an offset for both channels.

The center of the measuring range can be determined by means of the value „Off-set“. The value range comprises half the amplitude in the positive or negative direction. The maximum voltage of $\pm 10\text{ V}$ may not be exceeded. The measurement accuracy may decrease slightly at offsets other than 0V as the instrument is calibrated for this voltage only.

2.2.3.12 Trigger



The „Trigger“ menu opens a window that allows you to configure the triggering for the measurement.

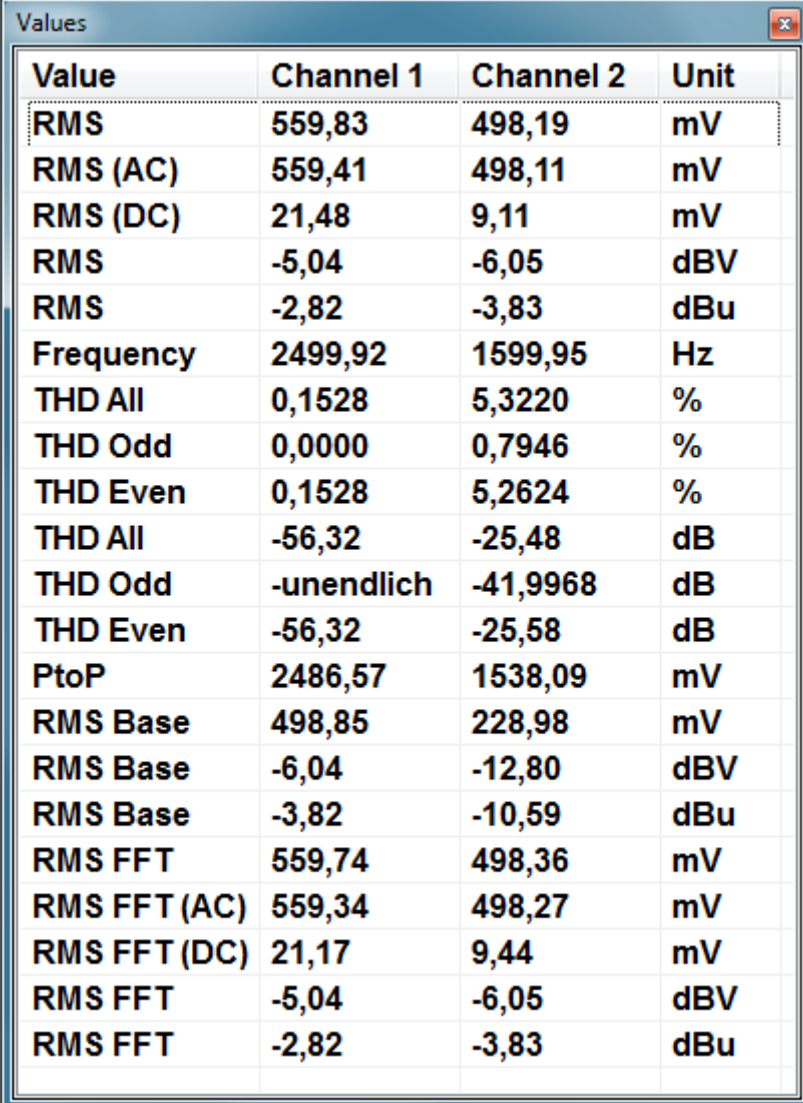
With the two values "Upper" and "Lower" trigger thresholds are set. For most trigger modes, only the Upper Threshold is required. Only in the trigger mode window (Windows) an additional lower threshold must be specified. There are no settable thresholds in the modes "Manual" and "External". The thresholds always refer to the measured data, not to possible mathematical results.

Furthermore, the trigger channel may be specified.

The most important entry in this window is the selection of the trigger type. This information is of decisive importance for a smooth picture with repetitive signals and reliable recognition in the case of one-time events. A detailed description can be found in the section "Trigger Modes".

In addition, setting the trigger point is possible. It is indicated in percent and determines at which point of the screen the trigger event is to be displayed. Given a measurement period of 1 ms and a setting of 10%, the trigger point is at 0.1 ms. Thus, it is mainly the behavior after the trigger event that is displayed. If 99% is specified, the history of the trigger event is displayed.

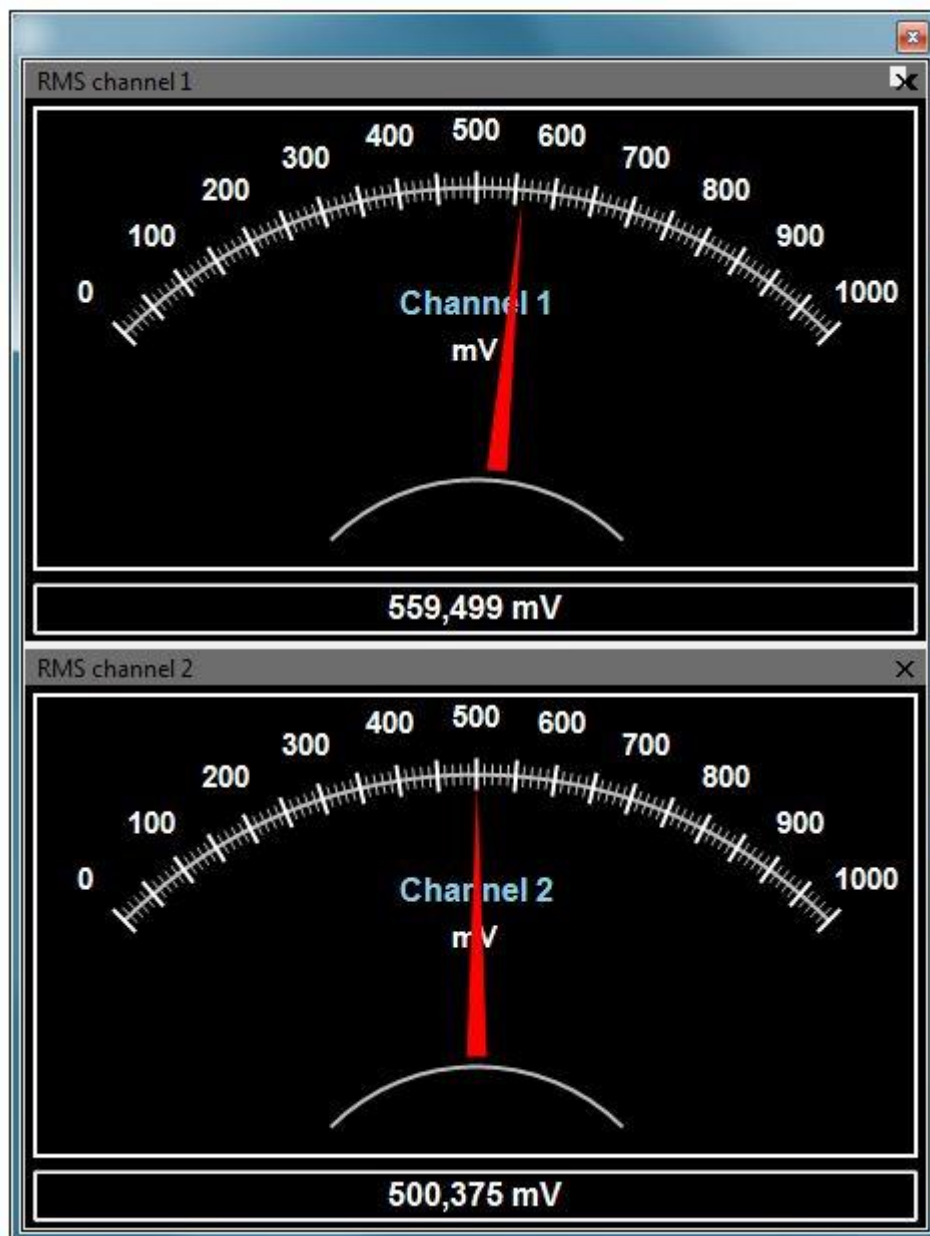
2.2.3.12 Values



Value	Channel 1	Channel 2	Unit
RMS	559,83	498,19	mV
RMS (AC)	559,41	498,11	mV
RMS (DC)	21,48	9,11	mV
RMS	-5,04	-6,05	dBV
RMS	-2,82	-3,83	dBu
Frequency	2499,92	1599,95	Hz
THD All	0,1528	5,3220	%
THD Odd	0,0000	0,7946	%
THD Even	0,1528	5,2624	%
THD All	-56,32	-25,48	dB
THD Odd	-unendlich	-41,9968	dB
THD Even	-56,32	-25,58	dB
PtoP	2486,57	1538,09	mV
RMS Base	498,85	228,98	mV
RMS Base	-6,04	-12,80	dBV
RMS Base	-3,82	-10,59	dBu
RMS FFT	559,74	498,36	mV
RMS FFT (AC)	559,34	498,27	mV
RMS FFT (DC)	21,17	9,44	mV
RMS FFT	-5,04	-6,05	dBV
RMS FFT	-2,82	-3,83	dBu

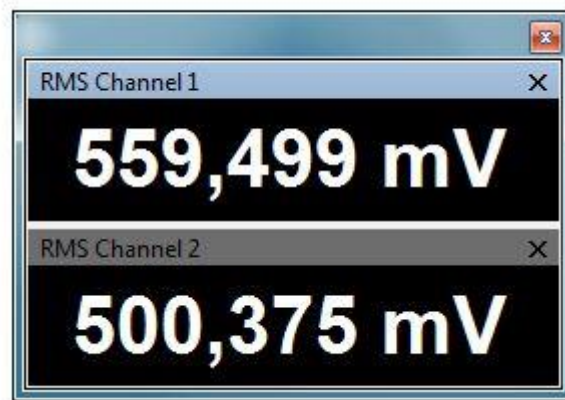
The “Values” menu opens a window in which all measured values derived from the measured signal are displayed in a table.

2.2.3.13 Analog Meter



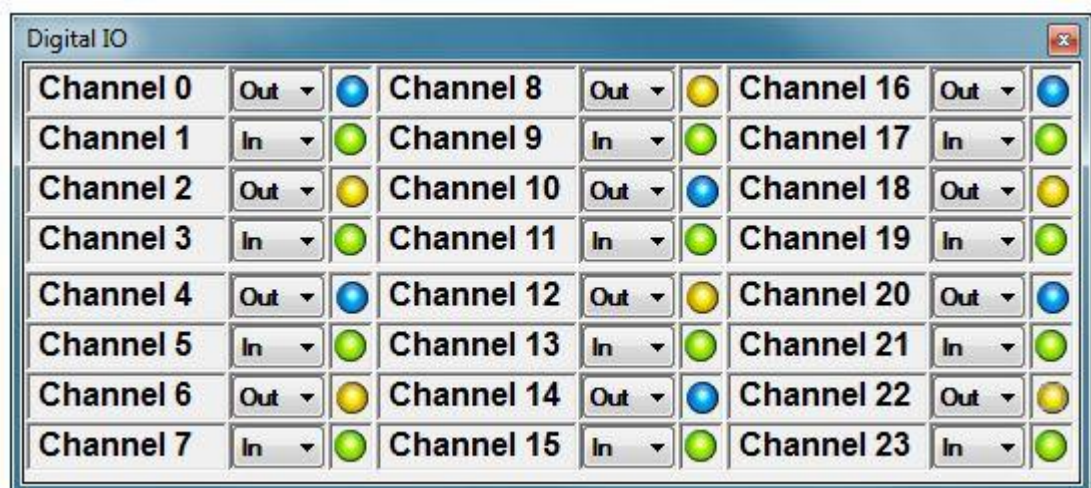
Some selected measurements of the input signal may be displayed in the form of virtual pointer elements. Via a context menu, these pointer elements may be adapted to different measuring ranges.

2.2.3.14 Panels



Some selected readings of the input signal may be displayed in the form of panels.

2.2.3.15 Digital-I/O



The “Digital IO” menu opens a window in which the digital I / O may be set and displayed.

Each channel may be independently configured as input or output. After switch-on, all channels are configured as inputs.

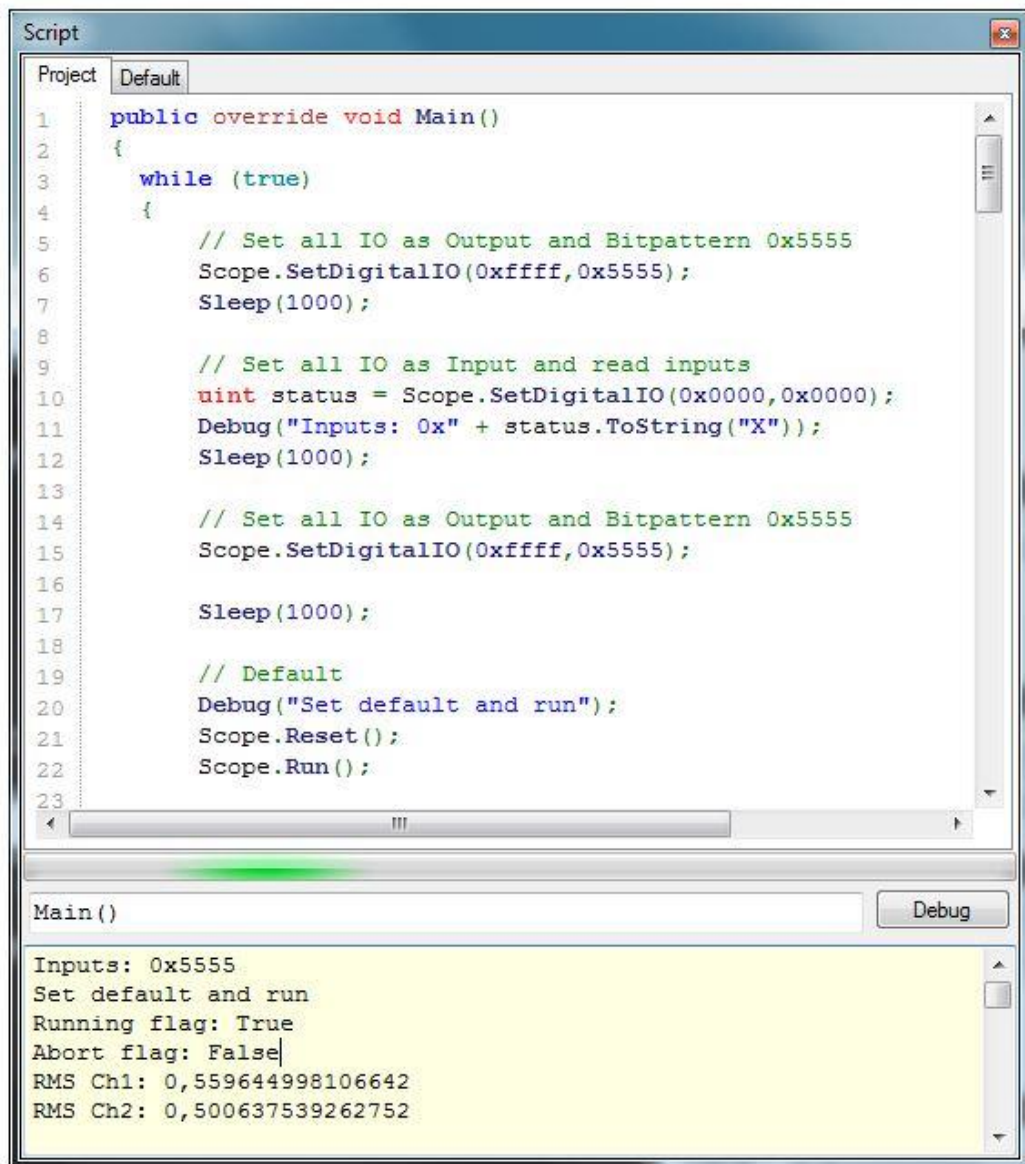
If required, you can use channel D23 (pin 26) as an external trigger input. In this case, the channel is always input and reserved for external trigger operation in conjunction with the Oscilloscope and Logic Analyzer modules as well as the two data logger modes.

In the Logic Analyzer mode and the digital data logger all channels are reserved for this function. Channels D0 to D15 and D23 are always inputs, the remaining channels D16 to D22 are outputs. Their levels depend on the use of external level converters.

Make sure that the voltage levels are maintained and a reference to the PC ground (PC_GND) is established, when connecting the digital inputs / outputs directly.

- „Low“: U_{OL} : max. 0.6 V.
- Output level „High“: U_{OH} : typ. 5 V \pm 10 % (USB supply voltage).
- „Sink“-current: I_{OL} = max. -9 mA @ U_{OL} = 0.6 V.
- „Source“-current: I_{OH} = max. +5 mA @ U_{OH} = 1.4 V.
- Input level „Low“: U_{IL} : max. 1.44 V.
- Input level „High“: U_{IH} : min. 3.36 V.
- Input current: \pm 1 nA.

2.2.3.16 Script Editor



With the help of the script engine, the MEphisto Scope can automatically perform measurements and calculate further measured values.

Scripts may be edited, loaded and saved here, as well as started and stopped.

2.3 Programming interface

2.3.1 General

Using the programming interface (COM / DCOM), the MEphistoLab² can automatically perform measurements, calculate further measured values and remotely control them via any COM / DCOM-compatible Windows program.

Programming within the script engine is done in C #.

2.3.2 Class name

The MEphistoLab² is called via the following COM / DCOM class:

„MEIDS.MephistoScope1.Interface“

2.3.3 Object name

The MEphistoLab² is addressed via the following object:

„Scope“

2.3.4 Main function (entry point)

The ScriptEngine of the MEphistoLab² uses the following function as entry point for the script sequences:

„public override void Main()“

2.3.5 General commands

Command/Feature	Description
Reset()	Puts all settings to predefined values.
Debug(object value)	Output of a value or message in the Debug window.
LoadPreset(string file-Name)	Loads presets.
Sleep(int timeMS)	Stops program execution for a certain time (timeMS in milliseconds).
AutoScaleDisplay()	Scales the displays automatically.

2.3.6 Sampling

Command/Feature	Description
Run()	Starts the continuous measurement.
Single()	Starts a single measurement.
Stop()	Ends a continuous measurement.
IsRunning	Flags indicating whether a measurement is active.
IsAborted Flag	Flags indicating whether a measurement has been aborted due to an error.
ActiveChannels	Sets the active channels (CH1, CH2, CHBOTH, DIGITALIO).
SampleCount	Number of measuring points for a measurement.
SamplingDuration	Duration of a measurement in seconds.
SamplingMode	Operating mode (OSZILLOSCOPE or DATALOGGER)
TriggerMode	Triggertype ('M', 'T', 't', 'W', 'w', 'E', 'e', 'D', 'd', 'X', 'x')
TriggerLowerLimit	Lower trigger threshold in volts.
TriggerUpperLimit	Upper trigger threshold in volts.
TriggerPoint	Trigger position in percent.
TriggerChannel	Trigger channel (CH1, CH2)
AmplitudeCh1	Measuring range channel 1
AmplitudeCh2	Measuring range channel 2

ProbeCh1	Probe channel 1
ProbeCh2	Probe channel 2
OffsetCh1	Offset channel 1
OffsetCh2	Offset channel 2

2.3.7 Measured values

Command/Feature	Description
GetData(int channel)	Returns the last measured curve as a double array in volts.
GetDataRange(int channel, int startIndex, int endIndex)	Returns a range of the last measured curve as a double array in volts.
GetFFT(int channel)	Returns the last calculated FFT as a double array in volts.
GetFFTRange(int channel, int startIndex, int endIndex)	Returns a range of the last calculated FFT as a double array in volts.
RMS[int channel]	Rms value - value for channel 1/2 in volts
AC[int channel]	AC value for channel 1/2 in volts
DC[int channel]	DC value for channel 1/2 in volts
Frequency[int channel]	Frequency for channel 1/2 in hertz
THDAll[int channel]	THD all - value for channel 1/2
THDEven[int channel]	THD even - value for channel 1/2
THDOdd[int channel]	THD odd - value for channel 1/2
PtoP[int channel]	Point to point – value for channel 1/2 in volts
RMSBase[int channel]	Base frequency for channel 1/2 in hertz
RMSFFT[int channel]	RMS value (via FFT) for channel 1/2 in volts
ACFFT[int channel]	AC value (via FFT) for channel 1/2 in volts
DCFFT[int channel]	DC value (via FFT) for channel 1/2 in volts

2.3.8 Synthetic measurement values

Using the script engine, it is possible to change the measured values recorded by the MEphisto Scope before processing. There are two functions to be accessed with the recorded measurement values.

As soon as these functions are provided, the measured signal is "processed" using these functions.

```
public override void Calc(double [,] data, int count)
```

and

```
public override void Calc(ref double channel1, ref double channel2,  
int index).
```

Example:

Below is a code example that includes all the above commands.

```
public override void Main()  
{  
while (true)  
{  
// Load a preset  
Scope.LoadPreset („c:\\Test.xml");  
Sleep(5000);  
// Digital IOs  
Debug („Set and get digital IOs");  
// Set all IO as Output and Bitpattern 0x5555  
Scope.SetDigitalIO(0xffff,0x5555);  
Sleep(1000);  
// Set all IO as Input and read inputs  
uint status = Scope.SetDigitalIO(0x0000,0x0000);  
Debug („Inputs: 0x" + status.ToString („X"));  
Sleep(1000);  
// Set all IO as Output and Bitpattern 0x5555  
Scope.SetDigitalIO(0xffff,0x5555);  
Sleep(1000);  
}}
```

```
// Default
Debug(„Set default and run“);
Scope.Reset();
Scope.Run();
Debug(„Running flag: „ + Scope.IsRunning);
Debug(„Abort flag: „ + Scope.IsAborted);
Sleep(1000);
Scope.AutoScaleDisplay();
Sleep(3000);
// Debug measurement values
Debug(„RMS Ch1: „ + Scope.RMS[0]);
Debug(„RMS Ch2: „ + Scope.RMS[1]);
Debug(„AC Ch1: „ + Scope.AC[0]);
Debug(„AC Ch2: „ + Scope.AC[1]);
Debug(„DC Ch1: „ + Scope.DC[0]);
Debug(„DC Ch2: „ + Scope.DC[1]);
Debug(„Frequency Ch1: „ + Scope.Frequency[0]);
Debug(„Frequency Ch2: „ + Scope.Frequency[1]);
Debug(„THD all Ch1: „ + Scope.THDA11[0]);
Debug(„THD all Ch2: „ + Scope.THDA11[1]);
Debug(„THD even Ch1: „ + Scope.THDEven[0]);
Debug(„THD even Ch2: „ + Scope.THDEven[1]);
Debug(„THD odd Ch1: „ + Scope.THDOdd[0]);
Debug(„THD odd Ch2: „ + Scope.THDOdd[1]);
Debug(„Point to point Ch1: „ + Scope.PtoP[0]);
Debug(„Point to point Ch2: „ + Scope.PtoP[1]);
Debug(„RMS base Ch1: „ + Scope.RMSBase[0]);
Debug(„RMS base Ch2: „ + Scope.RMSBase[1]);
//Get live data
Debug(„Live data (first 10 values“);
double[] data = Scope.GetData(0);
for (int i = 0; i < 10; i++)
{
```

```
Debug(data[i].ToString(„0.000“) + „ V“);
}
//Get FFT
Debug(„FFT (first 10 values“);
double[] fft = Scope.GetFFT(0);
for (int i = 0; i < 10; i++)
{
Debug(fft[i].ToString(„0.000“));
}
Scope.Stop();
// Trigger
Scope.TriggerMode = 'M';
Scope.TriggerLowerLimit = -0.5f;
Scope.TriggerUpperLimit = 0.5f;
Scope.TriggerPoint = 50;
Scope.TriggerChannel = CH1;
// Amplitude
Scope.AmplitudeCh1 = 10;
Scope.AmplitudeCh2 = 10;
// Probe
Scope.ProbeCh1 = 1;
Scope.ProbeCh2 = 1;
// Offset
Scope.OffsetCh1 = 0;
Scope.OffsetCh2 = 0;
// Analog oszilloscope
Debug(„Analog oszilloscope“);
Scope.ActiveChannels = CH1;
Scope.SampleCount = 10000;
Scope.SamplingDuration = 0.1f;
Scope.SamplingMode = OSZILLOSCOPE;
Scope.Single();
Sleep(1000);
```

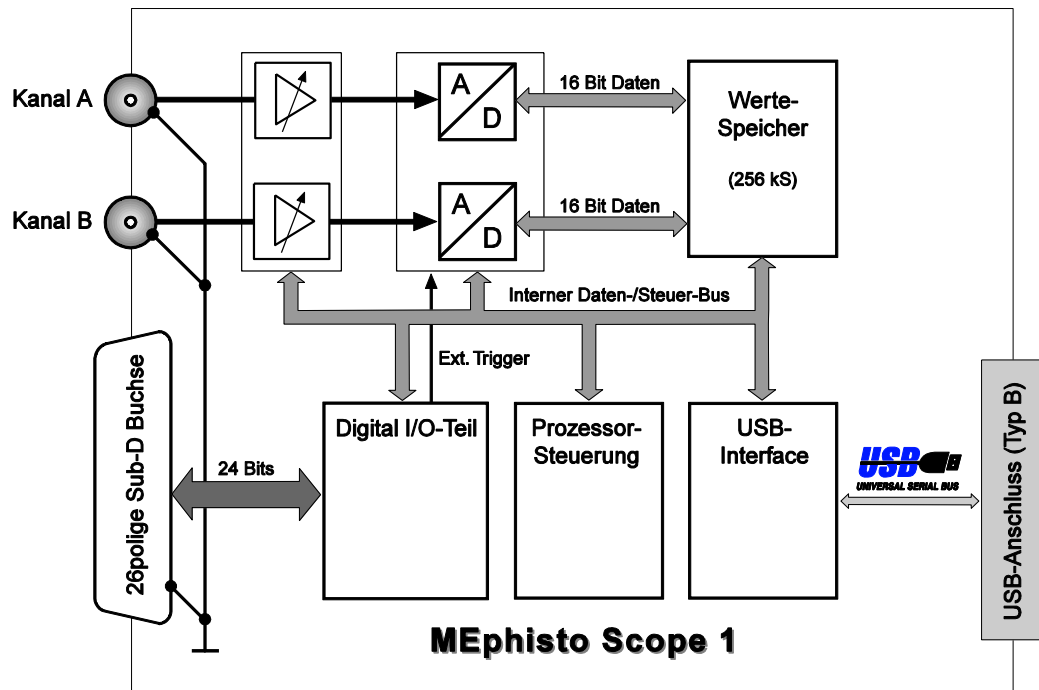
```
Scope.AutoScaleDisplay();
Sleep(3000);
Scope.ActiveChannels = CH2;
Scope.SampleCount = 5000;
Scope.SamplingDuration = 0.1f;
Scope.Single();
Sleep(1000);
Scope.AutoScaleDisplay();
Sleep(3000);
Scope.ActiveChannels = CHBOTH;
Scope.SampleCount = 100000;
Scope.SamplingDuration = 1f;
Scope.Single();
Sleep(1000);
Scope.AutoScaleDisplay();
Sleep(3000);
// analog data logger
Debug(„Analog data logger“);
Scope.ActiveChannels = CH1;
Scope.SampleCount = 100000;
Scope.SamplingDuration = 10.0f;
Scope.SamplingMode = DATALOGGER;
Scope.Single();
Sleep(1000);
Scope.AutoScaleDisplay();
Sleep(11000);
// digital Logic-Analyzer
Debug(„Digital Logic-Analyzer“);
Scope.SamplingMode = OSZILLOSCOPE;
Scope.ActiveChannels = DIGITALIO;
Scope.SampleCount = 1000;
Scope.SamplingDuration = 0.1f;
Scope.Run();
```



```
Sleep(3000);  
Scope.Stop();  
// digital data logger  
Debug(„Digital data logger“);  
Scope.ActiveChannels = DIGITALIO;  
Scope.SampleCount = 100000;  
Scope.SamplingDuration = 10.0f;  
Scope.SamplingMode = DATALOGGER;  
Scope.Single();  
Sleep(11000);  
  
}  
}
```

3 Hardware

3.1 Functional diagram



Picture 9: Functional diagram MEphisto Scope

Features	UM202	UM203
Measuring modes		
Voltmeter, DC	✓	✓
Voltmeter, true RMS value	✓	✓
Analog Oscilloscope	✓	✓
Analog Oscilloscope, self-sufficient	-	✓
Analog Data Logger	✓	✓
Analog Data-Logger, self-sufficient	-	✓
Logic Analyzer	✓	✓
Logic Analyzer, self-sufficient	-	✓
Digital Data Logger	✓	✓
Digital Data-Logger, self-sufficient	-	✓
Mass storage	-	SD-card up to 2 GB
Real timeclock	-	✓

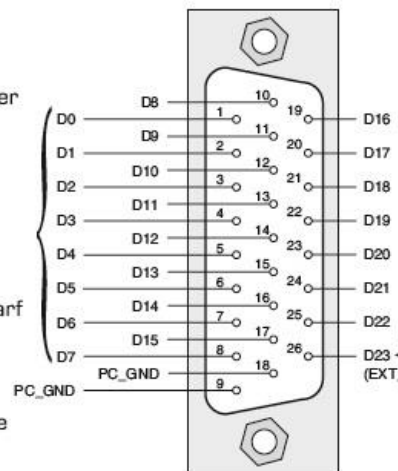
3.2 Digital-I/O

„Digital-I/O“:

D0...23 bitweise als Ein- oder Ausgang konfigurierbar.

„Logik-Analysator“ & „Digital-Daten-Logger“:

D0...15 werden in dieser Betriebsart als Eingangskanäle verwendet. Bei Bedarf kann über D0...7 ein Muster („Pattern“) als Triggerereignis definiert werden (steigende/fallende Flanke, High-/Low-Pegel).



Achtung!

D16...22 sind in den Betriebsarten „Logik-Analysator“ und „Digital-Daten-Logger“ reserviert und dürfen nicht beschaltet werden!

Externer Triggereingang (EXT_TRIG)

... optional in den Betriebsarten:

- „Oszilloskop“
- „Logik-Analysator“,
- „Digital-Daten-Logger“
- „Analog-Daten-Logger“

Picture 10: 26-pin Sub-D connector

4 Appendix

A Specifications

Analog Inputs

Number, resolution	2 x 16 bit
total sampling	2 MS/s (2 channels)
Simultaneous channels	2
Input voltage range	$\pm 100 \text{ mV} \dots \pm 10 \text{ V}$
Analog Bandwidth (-3 dB)	500 kHz
Value memory	256 kS
Trigger modes	Threshold, window, edge, slope (dU / dt), external manual

Digital Channels

Number	24 inputs/outputs
Configuration	programmable as input or output, bit by bit (outputs can be read back)
Output current (25 °C)	Sink current: 10 mA, Source current: 5 mA
Signal level	+5 V (CMOS)

General Information

Supply	+5 V / 0.85 W via USB interface 5V with external power adapter (UM203 only)
Ground reference	PC mass (PC_GND)
Anschlüsse	
analog channels digital channels USB external power supply (UM203 only) SD card (UM203 only)	2 x BNC sockets (front) 26-pin. Sub-D socket (on the back) Type B (on the back) DC plug, 5.5 mm Push-push socket

Additional Information

Sample memory	24
PC-Interface	USB 2.0 (FS), USB1.1 compatible
Power consumption in measurement mode, without load on digital channels	
Connector	
Analog channels Digital channels USB External power supply (only UM203) SD card (UM203 only)	2 * BNC 1 * SUB-D-26 (HD) USB - B DC plug, 5.5 mm Push-push socket
Dimensions	
Housing (WxHxD) everything (WxHxD)	112 x 110 x 32 mm 138 x 110 x 35 mm
Weight	430 g
Operating temperature	0...70 °C
Storage temperature	-20...85 °C

*) In order to guarantee reliable functions even if the digital port is heavily loaded, the device indicates a maximum power consumption of 2.5 W. It is therefore not possible to operate the device on a passive USB hub.

Stand-Alone Data logger (UM203):*Online operation:*

via USB-cable as UM202

Offline- or „Stand-Alone“-operation:

without connection to PC. Recording is started by inserting the SD card into the slot. To read the data from the SD-card, a commercially available SD-card reader is needed.

Recording is started by inserting the SD-card into the slot. To read the data from the SD-card, a commercially available SD-card reader is needed.

Voltmeter Mode

Analog Inputs	2
Resolution	16 bit
Nonlinearity, integral	± 2 LSB
Sampling rate	2 x 1 S/s
Simultaneous channels	2
Input voltage range (in 1-2-5-steps)	± 100 mV to ± 10 V
Analog bandwidth (-3 dB)	
DC	40 kHz
RMS	2,3 kHz
Accuracy (voltage) at 25 °C	0.1 % or 1 mV
Accuracy (time)	100 ppm
Overload protection	± 300 VDC
Noise (typ.)	-94 dB (RMS) -86 dB (P-P)
Input impedance	1 M Ω , 14 pF

Analog Oscilloscope Mode

Analog Inputs	2
Resolution	16 bit
Nonlinearity, integral	± 2 LSB
Sampling rate	2 x 1 MS/s
Measured value memory per channel	100 Samples to 131.000 Samples
Simultaneous channels	2
Input voltage range (in 1-2-5-steps)	± 100 mV to ± 10 V
Analog Bandwidth (-3 dB)	500 kHz
Automatic signal detection tension Frequency Pause ratio, rectangle, 100 Hz, 100 mV _{SS}	automatic signal recognition 500 mV _{SS} – 20 V _{SS} 0,2 Hz – 500 kHz 0,2 % - 99,8 %
Time basis (1 μ s / s to 10ms / s in 1 μ s steps, then 10ms / s steps)	1 μ s to 2,5 s
Accuracy (voltage) bei 25 °C	0,1 % or 1 mV
Accuracy (time)	100 ppm
Overload protection	± 300 VDC
Noise (typ.)	-66 dB (RMS) -48 dB (S-S)
Input impedance	1 M Ω , 14 pF
Trigger Modes	7
Threshold	✓
Window	✓
Flank	✓
dVldt	✓
Manually	✓
Extern	✓
Delay	✓

Logic-Analyzer Mode

Digital Inputs	16
Simultaneous channels	8 + 8
Measured value memory per channel	100 Samples to 262.000 Samples
Simultaneous trigger channels	8
Sampling rate	100 kS/s
Delay between the 8-bit groups	2 μ
Time basis (1 μ s/S to 10 ms/S in 1 μ s steps, then 10 ms/S steps)	10 μ s to 2,5 s
Accuracy (time)	100 ppm
Logic level	5 V CMOS (1,8 V/3,3 V CMOS; 12 V/24 V; with optional converter)
Overload protection	+5,5 VDC/-0,5 VDC
Input impedance	50 M Ω , 8 pF
Trigger Modes	4
Pattern (low / high / edge rising / edge falling / ignore) in any combination simultaneous for 8 bit	✓
Manually	✓
Extern	✓
Delay	✓

Analog Data-Logger-Mode

Analog Input	2
Resolution	16 bit
Nonlinearity, integral	± 2 LSB
Sampling rate	2 x 100 kS/s
Simultaneous channels	2
Input voltage range (in 1-2-5-steps)	± 100 mV to ± 10 V
Analog bandwidth (-3 dB)	500 kHz
Time basis	10 μ s to 2,5 s

(1 μ s/S to 10 ms/S in 1 μ s steps, then 10 ms/S steps)	
Accuracy (voltage) bei 25 °C	0,1 % or 1 mV
Accuracy (time)	100 ppm
Overload protection	± 300 VDC
Noise (typ.)	-66 dB (RMS) -48 dB (S-S)
Input impedance	1 M Ω , 14 pF
Trigger Modes	7
Threshold	✓
Window	✓
Flank	✓
dV/dt	✓
Manually	✓
Extern	✓
Delay	✓

Digital Data-Logger Mode

Digital Inputs	16
Resolution	16 bit
Simultaneous channels	8 + 8
Simultaneous Trigger channels	8
Sampling rate	
USB SD card	100 kS/s 2,5 kS/s
Delay between the 8-bit groups	2 μ s
Time basis	
(10 μ s/S to 10 ms/S in 1 μ s steps, then 10 ms/S steps)	10 μ s to 2,5 s (USB) 400 μ s to 2,5 s (SD)
Accuracy (time)	100 ppm
Logic level	5 V CMOS (1,8 V/3,3 V CMOS; 12 V/24 V; with optional converter

Overload protection	+5,5 VDC/-0,5 VDC
Input impedance	50 MΩ, 8 pF
Trigger Modes	4
Pattern (low / high / edge rising / edge falling / ignore) in any combination simultaneous for 8 bit	✓
Manually	✓
Extern	✓
Delay	✓

GPIO Mode (not usable in Logic Analyzer mode)

Digital channels	24
Resolution	1 bit
Data direction programmable per bit	✓
Readback-ability for outputs	✓
Logic level	5 V CMOS

B Error messages

The MEphisto Scope does a self-test after switching on. When all components have passed the test, the device goes into standby mode. If it is connected to a PC and initialized, then both LEDs are constantly lit in this state.

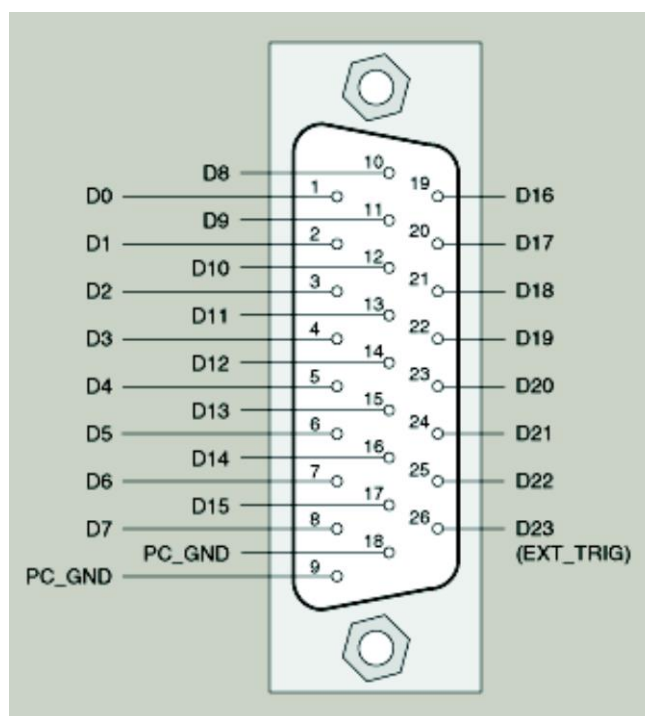
The model UM203 may also be operated without a PC, however an SD card is needed. As long as the device is waiting for a new SD card, both LEDs flash in quick succession and then remain dark for a short time. This is repeated until a card is identified. The card is subjected to some tests that convey their errors through POST codes.

In case of an error, the status LEDs flash as follows: The left LED flashes briefly. The right LED then flashes four times in succession in different durations. The assignment of the blink sequence to the detected error is listed in the table.

Nr.	1	2	3	4	Error	Description
1	•	•	•	-	GPIO-error	The module that processes digital signals is defective. The signals on the 26-pin connector can no longer be processed. Please send the device to Meilhaus Electronic where it will be repaired.
2	•	•	-	•	RAM-error	The module that caches measurement data is defective. Please send the device to Meilhaus Electronic where it will be repaired.
3	•	•	-	-	Hardware-Version could not be determined	The device could not determine its type (version 1.0, version 1.1 or version 1.1 with SD-card option). There might be a fatal error in several components and in the processor. Please send the device to Meilhaus Electronic where it will be repaired.
4	•	-	•	•	RTC not reliable	The configuration memory and the clock do not provide reliable Dates. This may occur during long

						storage without power supply. To be fully charged, the buffer capacitor needs to be connected to a power supply for at least 24 hours (USB or power adapter). Please reconfigure the device and charge the capacitor for a longer period of time.
5	•	-	•	-	Error accessing the SD-card.	The inserted SD-card could not be initialized and is probably defective. Also, an accidental initializing of an MMC-card will result in this error message. Please replace the SD-card.
6	•	-	-	•	Error initializing the file system	If this error occurs, the SD card is not formatted or formatted with a wrong file system. It might be a small card (8-32 MB) with FAT12. Please reformat the card with the file system FAT16. For more information on formatting, please refer to the corresponding chapter.
7	•	-	-	-		
8	-	•	•	•		
9	-	•	•	-		
10	-	•	-	•		
11	-	•	-	-		
12	-	-	•	•		
13	-	-	•	-		
14	-	-	-	•	Wrong trigger mode for offline operation	If this error occurs, the trigger mode is not supported. This might happen if the post-trigger is set to offline-mode. Please use another mode or change the trigger point.
15	-	-	-	-	Wrong mode for offline operation	In firmware version 3.0, the digital data logger is not supported. The voltmeter modes are not supported in any version. Please select another measuring mode.

C Pinouts



Picture 11: Pinouts of the 26-pin (high-density) Sub-D connector

D Accessories

We recommend to use high-quality connector cables with single-shielded lines per channel.

For further accessories please refer to the current Meilhaus Electronic catalog and the internet:

www.meilhaus.de/en/pc-boards/accessories/

E Technical Questions

E1 Hotline

Should you have questions or inquiries concerning your Meilhaus device, please contact us:

Meilhaus Electronic GmbH

Repair & Service
Am Sonnenlicht 2
D-82239 Alling

Sales:

Tel.: (08141) 52 71 – 0
Fax: (08141) 52 71 – 129

eMail: sales@meilhaus.de

Support:

Tel.: (08141) 52 71 – 188
Fax: (08141) 52 71 – 169

eMail: support@meilhaus.de

Download-Server and Driver Update:

To download current driver versions for Meilhaus Electronic devices as well as manuals in PDF format, please go to:

www.meilhaus.org/driver

Service Department with RMA Process:

In case you need to return a board for repair purposes, we strongly ask you attach a detailed description of the error as well as information regarding your computer/system and the software used.

Please register online using our RMA process:

www.meilhaus.de/en/infos/service/rma.htm

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