

INSTRUCTION MANUAL

MONILOG[®] **MicroShockDetector plus**

(Transport data logger)



PRODUCT CERTIFICATION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.**



This equipment has been tested and found to comply with the limits for a **Class B** digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC ID: 2AELT-04MONILOG

This Class [B] digital device complies with Canadian ICES-003.

Cet appareil numérique de la classe [B] est conforme à la norme NMB-003 du Canada.



The product complies at intended use with the essential requirements of the following EC-directives (www.monilog.de)

2014/30/EC (EMC – directive)

2011/65/EC (RoHS directive)

2012/19/EC (WEEE – directive)

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1. INTRODUCTION

1.1 SCOPE OF DELIVERY

Thank you

for having chosen the MONILOG® MicroShockDetector plus.

Scope of delivery¹ (standard):

- MONILOG® MicroShockDetector plus, incl. 1 replaceable lithium cell of type LR06 (AA, Mignon) 3.6 V / 2500 mAh, lithium content ~ 0.7g
- USB stick
 - Configuration software „MONILOG Analyzer“ with integrated software help
 - Driver for USB interface
 - Operating instruction in electronic form (PDF)
 - Application examples, transport monitoring manual
- USB 2.0 interface cable (type A  type Mini AB)

In order to be able to further optimise our products for the respective applications, we are always open to suggestions and change requests on your part.

1) The scope of delivery can deviate from the standard due to special contract agreements!

1.2 BRIEF INSTRUCTIONS FOR THE INSTALLER

Assuming the MONILOG® MicroShockDetector plus is pre-programmed for the application and the battery cell capacity sufficiently, the device only needs to be attached to the cargo and turned on. The mounting is preferably with 2 mounting screws or optionally with magnetic bases (see Section 3.4).

Briefly (<3 sec) press the *CONTROL*-button. If the *STATUS* LED is green, the device is ready for use and you do not have to do anything else. Otherwise, press the *CONTROL*-button for at least 3 seconds to switch on the device until *STATUS* LED light up in green and then release the button.

In all other states, the device can only be operated using the analyzer software MONILOG® (see Section 3.2). If the *STATUS* LED lights up red, there is an error. Follow the instructions in the MONILOG® analyzer or ask your administrator or the manufacturer.

To switch off the device, press the *CONTROL*-button for at least 5 seconds until the *STATUS* LED lights up red.

1.3 FUNCTIONALITY

MONILOG® **MicroShockDetector plus** is a small, universal and cost-effective data logger. Developed for long-term measurement applications, it is perfectly suited for the monitoring of transport goods and critical environments.

The integrated sensor system for the detection of shock events and for the measurement of temperature, humidity, air pressure and light enables a wide range of different measurement applications. Configured alarm thresholds ensure the reliable detection of exceedances of limit values. Shock loads are recorded and evaluated in real time, the temperature, humidity, air pressure and light also in an adjustable interval.



The **compact and network-independent design** enables simple fixing on or in transport goods or transport devices with screws, magnetic feet or adhesive pads.

The case of the device protects against dust and splash water (**degree of protection IP 67**) and thus is also suitable for the exterior use. Thanks to this, the MONILOG® **MicroShockDetector plus** can be universally used as an almost invisible goods companion in the international transport of goods, in storage rooms, at reloading points and during transport by rail, by roads as well as by water and by air.

The **power supply** is realised by customary, exchangeable lithium battery cells. Thanks to very low current consumption and associated very long, maintenance-free operating time, the MONILOG® **MicroShockDetector plus** is perfectly suited for self-sufficient long-term applications. Energy-optimised operating settings render possible a self-sufficient operational time of up to 3 years under rough ambient conditions (depending on settings).

The licence-free configuration software MONILOG® **Analyzer** enables a simple and intuitive configuration of the devices. It offers a comprehensive adjustment of the device functions to your application-specific requirements. Besides the detailed evaluation of the device data in measured value tables and graphs, the programme also provides export functions for external applications (e.g. Microsoft Excel). Communication takes place via a **USB interface**.

With the status report function, an overview of the measurement data, including the division of all impacts into acceleration classes and activities of the device, is created immediately without any necessary settings. The license-free Android app MONILOG® **Connect** enables the device to be conveniently read out via NFC with a smartphone. When reading out, an overview of all relevant measurement data and activities of the device is created immediately in the form of a status report without any necessary settings.

1.4 ENVIRONMENTAL AND SAFETY INSTRUCTIONS

Intended use

The MONILOG® MicroShockDetector plus is intended for the verification of transport and storage conditions and may only be used under the operating conditions mentioned in the Section 2. No safety-relevant functions may be derived from it.

Changes or modifications to the device could void the user's authority to operate the device.

The following information on handling lithium battery cells must be observed.

Environment & disposal



Der MONILOG® MicroShockDetector plus contains, excluding the lithium battery cells, no corrosive or environmentally damaging substances.

Used lithium battery cells must be immediately removed from the device and be disposed of in an environmentally friendly manner, according to the applicable legislation. Lithium battery cells are hazardous waste.

Battery cell operation

The power supply in the MONILOG® MicroShockDetector plus is realized by one exchangeable lithium battery cell (type AA | LR6) 3,6 V 2500 mAh. This can be bought in specialised stores or from equipment suppliers. Due to the lithium cell used, the transport regulation UN3091-PI970 must be observed during transport.

Operation with 1.5 V battery cells is not possible.

ATTENTION!

Risk of explosion if the battery cell is replaced with the wrong type.

Only use battery cells that conform to UN 38.3, IEC 60086-4 and IEC 60079-11 (intrinsically safe).

In case of non-compliance with the national regulations/laws applicable in the handling of lithium battery cells, any liability and warranty claims become void!

ATTENTION!

When transporting several devices or lithium battery cells in one package, this must be marked in accordance with the transport regulation UN3091-PI970.

Decommissioning

In case of decommissioning the devices must be properly switched off and all battery cells must be removed from the cases and be disposed of in an environmentally friendly manner.

2. TECHNICAL PARAMETERS

Shock parameters	200 data records with the highest space vector amplitude, of which the 10 highest values with a curve-plots over 4 s, resolution 2 ms
Acceleration sensor	3D-MEMS, measuring range ± 14 g, 1 mg resolution, accuracy: $\pm(2\%$ measuring range and 5% measurement value) at $13\text{Hz}/20^\circ\text{C}$; $\pm(3\%$ measuring range and 6% measurement value) at $13\text{Hz}/+60^\circ\text{C}$ Registration threshold from 0.25 g Lower limit frequency 1 Hz Upper filter cut-off frequency set up fixed at 25 Hz
Shock classification	Subdivision of shocks according to space vector amplitude into classes, number of shocks not limited; >0,25; >0,5g; >1g; >1,5g; >2g; >3g; >4g; >5g
Temperature measurement	-40°C to $+65^\circ\text{C} \pm 1$ K; 100,000 measurement values
Relative humidity	0 %RH - 100 %RH ± 3 %RH, 100,000 measurement values
Air pressure	260 – 1260 mbar ± 2 mbar, 100,000 measurement values
Light	0 lx – 65000 lx ± 10 %, 100,000 measurement values
Indication	2 LED's, for status and alarm limit-value overshooting
Operating elements	1 button for status indicator, ON/OFF switching with password protection
Connections:	Mini USB 2.0
Interfaces	NFC; Status report can be read out via NFC with a smartphone and the free "Monilog Connect" app; Save and/or send the PDF report via email
Operation and storage conditions:	-40°C to $+65^\circ\text{C}$; max. 98% rel. air humidity
Power supply	1 exchangeable lithium battery cell, 3,6 V type LR06 (AA, Mignon), lithium content $\sim 0,7$ g Duration of up to 3 years in the switch-on period (depending on the device configuration)
Data storage	Receipt of measuring data independent of battery cell status for a minimum of 10 years
Dimensions	106mm x 48mm x 33mm (LxWxH) 126mm x 48mm x 40mm (LxWxH with magnetic feet)
Housing	Plastic housing with stainless steel base
Weight	approx. 172 g, (258g total if mounted on magnetic feet)
Protection type	IP67
Calibration	Manufacturer's calibration valid for 2 years, unless otherwise agreed.

<p>Programmable parameters</p>	<p>X, Y, Z registration thresholds, X, Y, Z alarm thresholds, minimum shock duration, measurement interval for temperature, humidity, air pressure, light Start-Stop time (switch-on time period), password protection by means of license-free Windows software</p>
<p>Data evaluation</p>	<p>Using license-free Windows software, the following can be displayed: Measurement value tables, curve graphics, active periods of the device, export functions, reports, statistical evaluation, battery monitoring Using license-free Android software: Status report can be read out via NFC; save and/or send the PDF report via email</p>
<p>Software update</p>	<p>Updates are provided by the manufacturer for both the Windows and Android software and the firmware of the device.</p>

3. DEVICE DESCRIPTION

3.1 DEVICE SETUP / DEVICE VIEW



- | | |
|--|--------------------------------------|
| 1 CONTROL button | 6 Battery cover |
| 2 STATUS LED, green/red display | 7 Temperature/humidity sensor |
| 3 ALARM LED, red display | 8 Light sensor |
| 4 NFC chip | 9 Name plate |
| 5 USB port with cap | |

3.2 OPERATION OF MONILOG® MicroShockDetector plus

The *CONTROL* button is available for operating the device, which can have different functions depending on the current status and the duration of the button press. The current status is indicated by the 2 LEDs.

Checking the on-state of the device

In order to determine whether the device is switched on or off, **briefly** press (<3 s) the *CONTROL*-button:

STATUS LED does **not** light up → the device is **OFF**

STATUS LED **briefly** lights up → the device is **ON**

Switching on the device

To turn on the device, press the *CONTROL*-button for at least 3 seconds until *STATUS* LED lights up. After that, release the button. Once the **green** *STATUS* LED stops lighting up the device is ready for operation. If the device is provided with an **On/Of password**, it can only be activated via the software. This is indicated by the *STATUS* LED flashing for 60 s. If the software is not activated, the device switches off again after 60 seconds. To activate the device, connect the device to a PC while the LED is flashing and start the MONILOG® Analyzer. When reading out the device, it is recognized that the device is password-protected. At this point you will be asked to enter the device password. Follow the instructions in the software to switch on the device. Explanations on the configuration of the switch on/off password can be found in the chapter 4.3.8 in the section „Configure password“.

If no password is required, the device starts recording data immediately.

Switching off the device

To switch off the MicroShockDetector plus, keep the *CONTROL*-button pressed for at least 2 seconds until the *ALARM* LED flashes red. If you continue to keep it pressed, the *STATUS* LED lights up red for 1 s. Now it can be released. Then the device switches off. This can be verified by briefly pressing the button. If the button is released while flashing, the device remains switched on.

If the device is provided with an **On/Of password**, it can only be deactivated via the software. In order to signal this, the *STATUS* LED starts to flash rapidly red when the button is pressed for a long time (> 3 s). To switch off the device, connect the device to a PC and start the MONILOG® Analyzer. When reading out the device, it is recognized that the device is password-protected. At this point you will be asked to enter the device password. You can now switch off the device using

the "Configuration" tab and the „Turn off device" button. Explanations on the configuration of the switch on/off password can be found in the chapter 4.3.8 in the section „Configure password and access rights"

Display of the functional statuses

Status	Device status	Condition	Auxiliary condition	Subsequent status device	LED status green	LED status red	LED alarm red
A0	Device on	Idle process	Ready for operation	A0	10ms every 2s ¹	Off	Off
A1			System error	A1	Off	10ms every 2s ¹	Off
A2			Critical battery status	A2	Off	10ms every 2s ¹	Off
A3			Exceeding an alarm threshold	A3	Off	Off	10ms every 2s ¹
B1	Device on	Pressing Control button t < 3 s	Measurement active	A0 or A3	1 s	Off	-
B2			Measurement inactive	A0 or A3	100ms every 200ms	Off	-
B3			Alarm event present	A3	-	-	1 s
B4			System error	A1	Off	1 s	-
			Critical battery status	A2	Off	1 s	-
B5		Pressing Control button 3 s ≤ t < 5 s	Without active switch-off protection by password	Ax or B6	Off	Off	100ms every 200ms
B6	Pressing Control button t ≥ 5 s	C0		Off	1 s	Off	
B7	Pressing Control button t ≥ 3 s	With active switch-off protection by password	Ax (switch-off prevention through a password)	Off	Off	Off	
C0	Device off			C0	Off	Off	Off
C1		Pressing Control button t < 3 s		C0	Off	Off	Off
C2		Pressing Control button t ≥ 3 s	Battery cell empty	C0	Off	Off	Off
C3			Without active switch-on protection by password	Ax	2 s	Off	Off
C4			With active switch-on protection by password	Ax after valid PW entry via software in 60s; C0 without PW entry after 60s	1 s every 2 s	Off	Off
C5			Clock not set after changing the battery	A1	Off	2 s	-
C6	Battery cell low	C0	Off	7 x 1 s flash	-		
D0	Device on	Measurement data recording		Ax	On	Off	Off

¹ The cyclic device flashing can be switched on/off via the MONILOG® Analyzer software (see section 4.3.8).

3.3 DEVICE RUNTIME AND BATTERY CELL CHANGE

Device runtime

The device runtime of the MONILOG® MicroShockDetector plus depends on the set measurement parameters, the battery cell type and the conditions of use. The number of impacts above the registration threshold of the device and the cyclical status flashing are decisive. Assuming that the device has been activated 100,000 times by impacts and the cyclical status flashing is active, the typical runtime of a battery cell is around 1 year (see also the trigger counter section 4.3.2). The actually still available battery cell charge is monitored by the device itself and displayed when reading out with the MONILOG® Analyzer software. If the device displays low battery while data is being transferred, insert a new battery cell and reconfigure the time before using the device again (see Setting the device time in section 4.3.8).

Battery cell change

ATTENTION!

Risk of explosion if the battery cell is replaced with the wrong type.

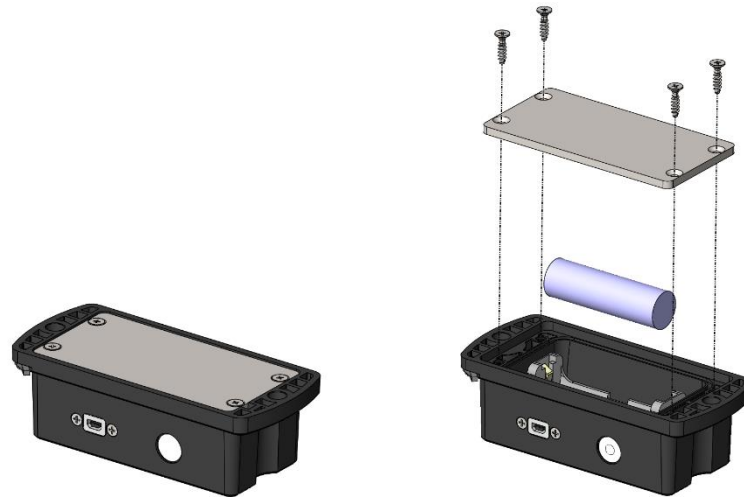
The MONILOG® MicroShockDetector plus may only be operated with lithium battery cells (type AA|LR6) 3,6 V.

Only use battery cells that conform to UN 38.3, IEC 60086-4 and IEC 60079-11 (intrinsically safe).

Before changing the battery cell, MONILOG® MicroShockDetector plus must be switched off properly. Otherwise data loss from the device cannot be excluded.

For the change of the battery cell proceed as follows:

- 1) Remove the battery cover by loosening the fastening screws by means of a screw driver (cross recess, H size 1).
You can then simply remove the battery.
- 2) Now insert the new battery cell according to the specified polarity into the device.
- 3) Screw the battery cover back on. Please take into account the maximum tightening torque of 0.3 Nm and the correct position of the seal.
- 4) Switch on the device and read it out with the MONILOG® Analyzer software.
- 5) Press the "Setup new battery" button in the "Configuration" tab and, if necessary, adjust the capacity of the newly inserted battery cell (see section 4.3.8).



Attention:

Ensure the right polarity when inserting the battery cell!

After changing the battery cell, the *STATUS* LED lights up red and the clock must be reset with the MONILOG® Analyzer (see section 4.3.8)

3.4 MOUNTING INFORMATION

The device can be attached by means of 2 fastening screws (see Figure 1) on the transported goods according to the marked mounting holes. Optionally, the device can also be mounted on magnetic surfaces with the aid of magnetic bases. Lashing strap mounting is also conceivable as long as they do not have a shock-absorbing foam layer.

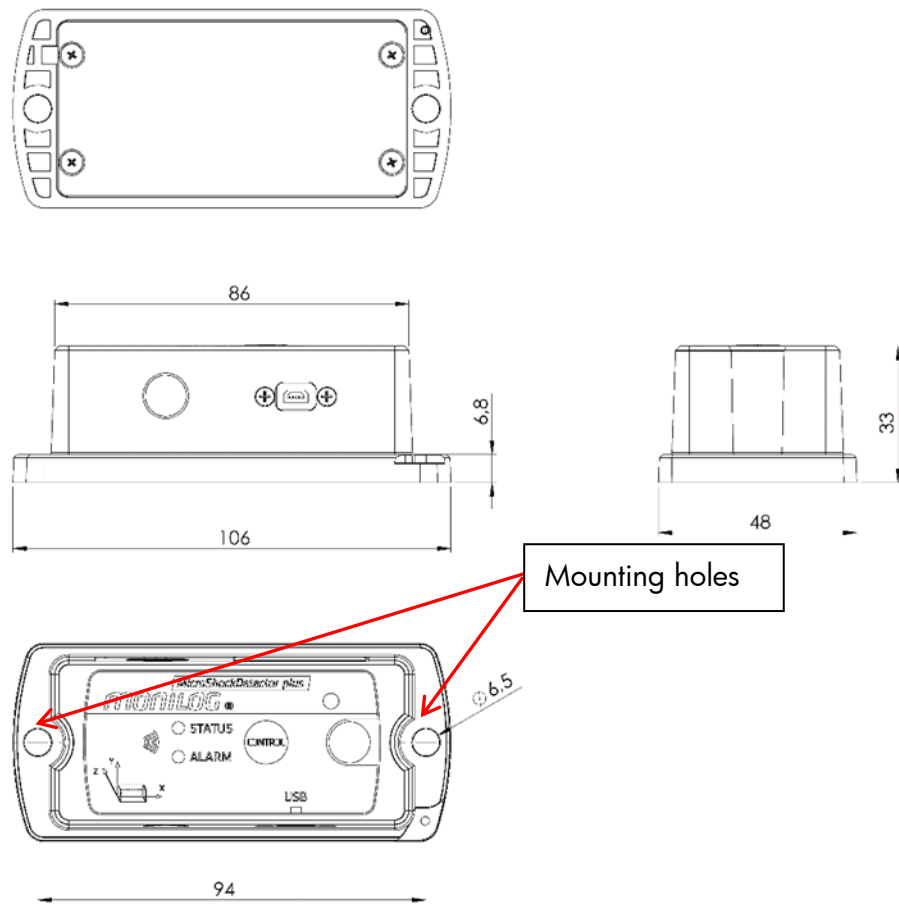


Figure 1: Dimensions and mounting information of the MicroShockDetector plus

4. PC SOFTWARE – MONILOG® ANALYZER

The software MONILOG® Analyzer can be used both for the readout and configuration of the MONILOG® MicroShockDetector plus and other MONILOG® devices. It is intended for the display and analysis of the recorded data in tabular and graphic form. Furthermore, data sets can be saved locally on your PC or loaded from your PC.

4.1 INSTALLATION

4.1.1 General software installation

The supplied USB stick contains the installation of the MONILOG® Analyzer software, the driver for the USB interface and documentation. Please start the installation by double-clicking on the file „setup.exe“, and follow the instructions.

Note:

To install the software and the USB driver you need administrator rights on the PC.

4.1.2 USB driver

When connecting a MONILOG® MicroShockDetector plus for the first time, it may be necessary to install a USB driver on the PC. The “FTDI CDM Driver” is located on the supplied USB stick and is set up with the software installation if it is not already available on the PC.

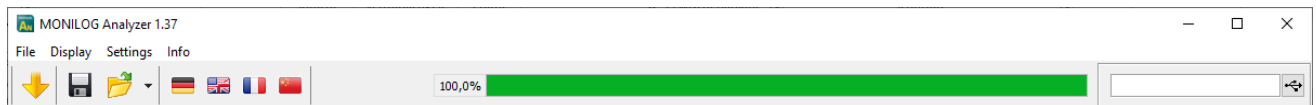
Now connect the MONILOG® MicroShockDetector plus to your PC using the USB cable supplied. When the device is connected, the green *STATUS* LED lights up. After the LED has gone out, USB is ready for operation and you can read out the device with the MONILOG® Analyzer software.

4.2 GENERAL USE OF THE PC SOFTWARE

4.2.1 Establishing the device connection

When the device driver is installed and a device is connected via USB, the connection will be established automatically as a rule upon start of the evaluation software.

If the evaluation programme has already been active before plugging the device or if you want to connect a device to a different COM port, select the device via the USB menu at the top right.



In case of connection problems:

If no connection can be established to the device, select the

Refresh button (blue double arrow) and disconnect the USB cable from the device. Afterwards, reconnect it with the USB cable.

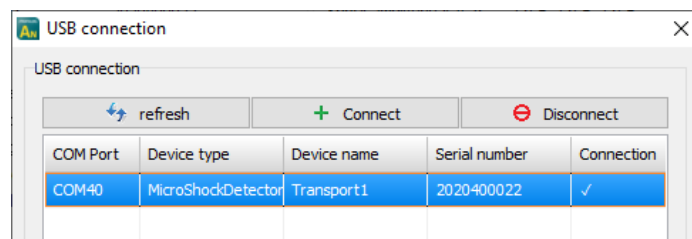


Figure 2: USB connection window: currently connected to COM23

After a successful USB connection, the measurement data is read and then the status data of the connected device is displayed:

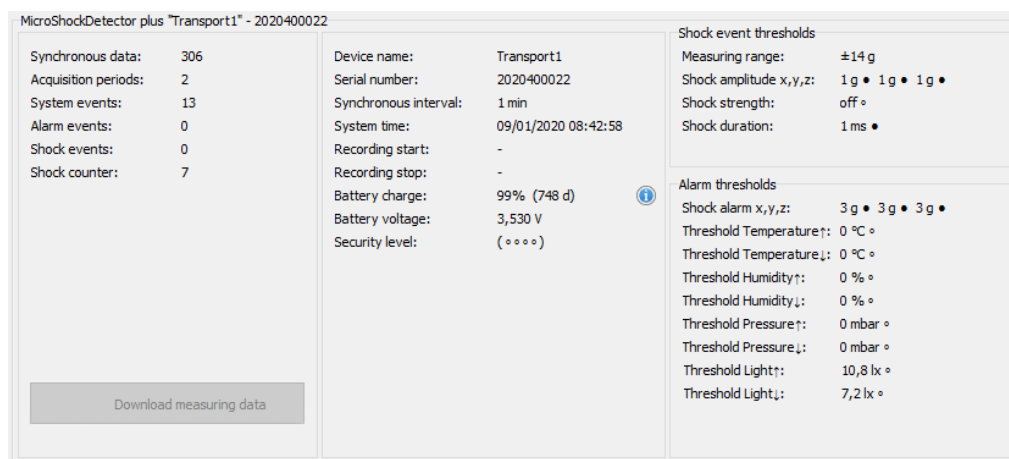




Figure 3 Status view

4.2.2 File area

The data read from the device via USB can be saved on a data carrier using the icon  or “Save file” menu. Please note that the measurement data is only contained in the file if it was previously read out via . Otherwise only the status data are included.

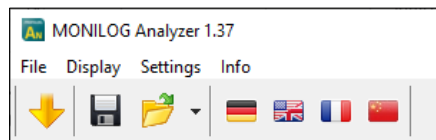



Figure 4: File area

Likewise, saved data can be fed again into the PC programme. The button  “Open file” opens the corresponding dialogue for the selection of the file.

4.2.3 Message window (Log)

The message window, which can be found as a programme tab “Log”, renders possible an overview on the actions performed by means of the programme or the status changes of the device during the established USB connection. Error messages and notes, e.g. for executing configuration commands, connection establishment to devices, saving of data etc. are listed here.

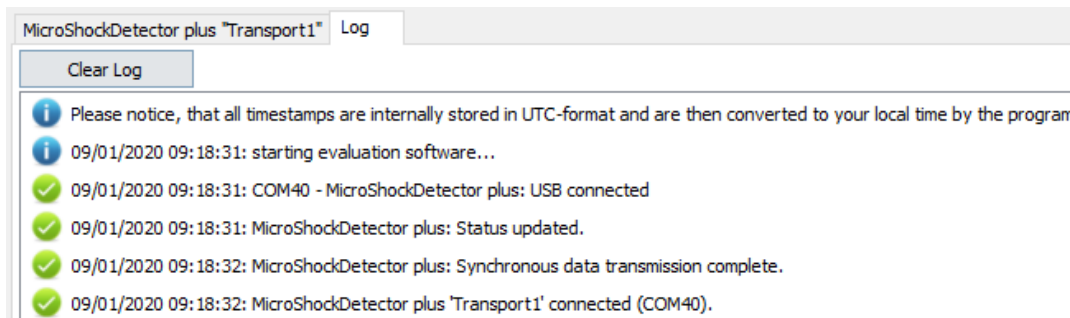




Figure 5: Log-window

4.2.4 View of the measurement data

As described above, the measurement data must either be read out from a connected device or be available in an open file. The data can be displayed as a chart or a table.

Graphs

In a graph it is possible to zoom in. For this purpose, draw up a selection window using the mouse (see Figure 6). The view of linear represented graphs can be shifted using the held right mouse button . By moving the mouse wheel up/down, concentric zooming is carried out. The standard zoom is restored by double-clicking on the graph, or using the button .

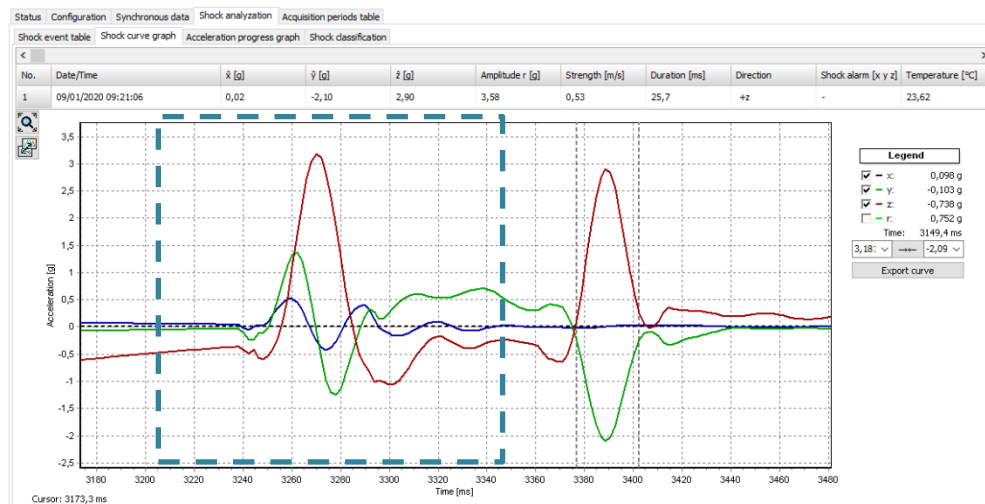


Figure 6: Zoom-selection window

Sorting function in tables

For tables a sorting function is available. This is carried out by clicking on the respective column in the table header. This facilitates the finding of the maximum/minimum values. The sorting is made alternately in ascending and descending order. The data sets remain unchanged by this.

Calculate extremes				
▲ No.	Date/Time	Temperature [°C]	Humidity [%]	Dewpoint [°C]
1	08/26/2020 17:15:28	26,47	37,72	10,89
2	08/26/2020 17:16:28	26,54	37,22	10,76
3	08/26/2020 17:17:28	26,52	37,25	10,75
4	08/26/2020 17:18:28	26,51	37,28	10,75

Figure 7: Sorting the table columns

4.3 MONILOG® MicroShockDetector plus

4.3.1 Reading out status, configuration and measurement data

After the connection to the device is successfully established, the measurement data is automatically read out and shown in Figure 8. This can take up, depending on the number of the data sets, a few seconds to several minutes. A progress bar shows the current readout status. The transmission can be interrupted with the *Cancel* button. According to the available measured values the corresponding programme tabs and graphs open. A detailed description of the programme areas can be found in the following chapters.

Please do not disconnect the USB cable from your PC or MicroShockDetector plus, as long as the data transmission takes place!

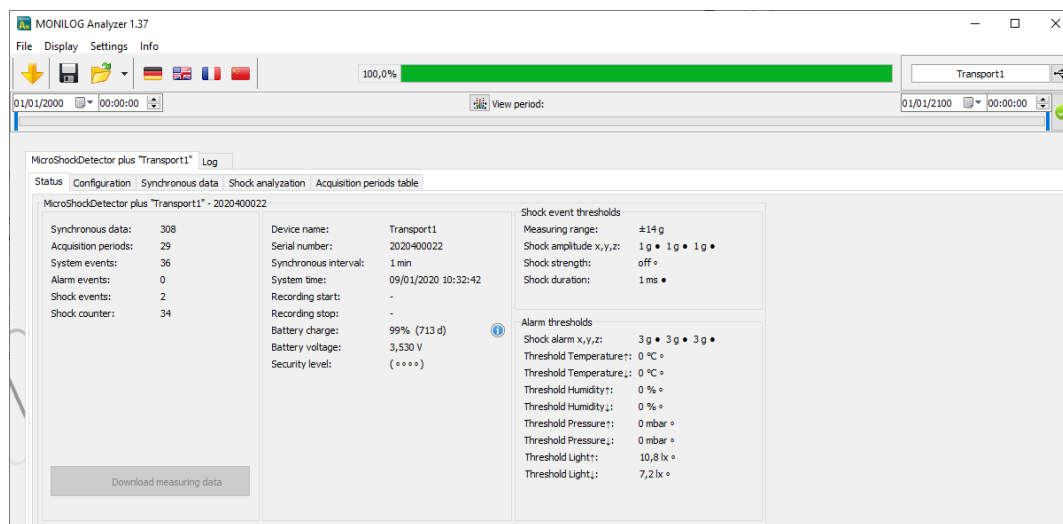


Figure 8: Overview window after reading out the measurement data of MicroShockDetector plus

With the display period, the display of data can be restricted to the desired time range. This simplifies data analysis and the finding of certain events. Enter the desired start and end date in the fields and confirm the entry using the green button to the right of the input fields. The display period can also be adjusted using the slide bar by moving the blue bars with the mouse (see Figure 9).

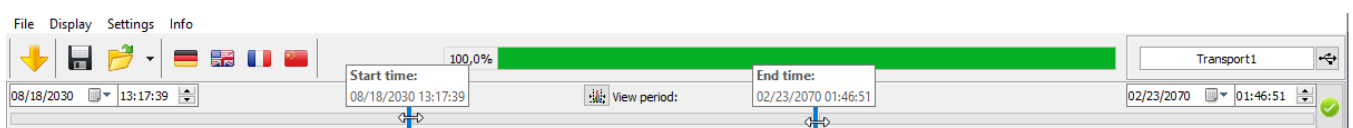


Figure 9: Slide bar for view period

4.3.2 Measurement data, status and thresholds

The parameters shown in Figure 8 have the following meaning:

Measurement data (column 1):

- Synchronous intervals: Number of continuously saved data sets for the activated measuring channels temperature, humidity, pressure, light
- Acquisition periods: Number of periods in which the module was ready to measure
- System events: number of external events (see Section 4.3.3)
- Shock events: number of recorded shock records that exceeded the thresholds
- Shock counter: Total number of the releases when the device's registration threshold is exceeded. Shocks that do not reach the set recording thresholds (shock magnitude, shock strength and shock duration) are rejected again but increase the shock trigger counter. Thus, this value is purely informative and signals that events have been detected by the device.

Status data (column 2):

- Device name: device designation by the user (freely selectable)
- Serial number: serial number of the device (unchangeable)
- Synchronous interval: time interval for the time-synchronous (continuous) recording of temperature, humidity, pressure, light
- System time: internal device time based on the time zone set on the PC
- Start of recording: beginning of the measurement recording by user ("running") or by measurement programme (date & time)
- Stop of recording: end of the measurement recording by user ("infinite") or by measurement programme (date & time)
- Battery charge: current percentage battery reserve (estimated remaining device runtime in days), detailed display by clicking on the info symbol
- Battery voltage: current voltage of the battery cell
- Security level: displays the current password status (see instructions to the mouse pointer)

Shock event thresholds:

- Measurement range: Available acceleration measurement range for each axis

- Shock magn. x, y, z: minimal amplitude of the acceleration (storage criterion) can be set and activated separately for each axis
- Shock strength: minimal “area under the curve of the resulting space vector”, additional storage criterion that can be activated
- Shock duration: minimal duration of the event (storage criterion, for detailed explanation see Principle of the shock recording in section 4.3.6)

Alarm thresholds:

- Shock alarm x, y, z: Acceleration value from which an alarm is displayed; can be set and activated separately for each axis
- Temperature upper/lower: Upon exceedance/falling below, an alarm is created
- Humidity upper/lower: Upon exceedance/falling below, an alarm is created
- Pressure upper/lower: Upon exceedance/falling below, an alarm is created
- Light upper/lower: Upon exceedance/falling below, an alarm is created

4.3.3 System events:

The system events show events that concern the status and the operating behaviour of the device. Possible errors in the hardware are also recorded. The display field for system events is normally hidden and can be shown by activating the option “Extended diagnosis” in the menu „Settings“. The corresponding view then opens in the lower screen area. The events can be scrolled with the bar.

The following system events can occur:

- Turned on/off: The device was turned on or off
- 24H interval: 24 h of operating time of the device are expired
- Device configured: the device had been configured.
- Channels configured: limit values/thresholds were activated/changed
- Time synchronised: the system time of the device had been configured
- USB (dis)connected: the event was caused by activities via the USB interface

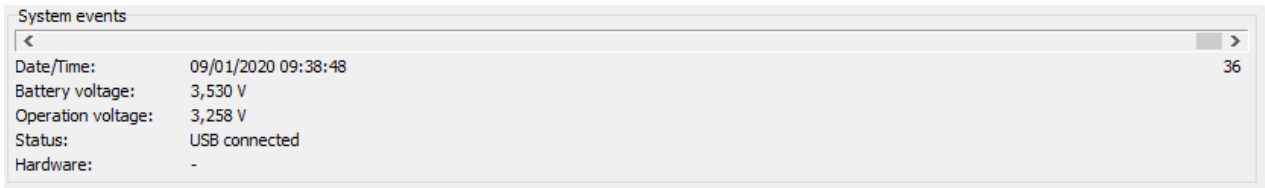


Figure 10: Display of the system events of a MONILOG® MicroShockDetector plus

4.3.4 Acquisition periods

The acquisition periods offer an overview on the individual configuration time segments of the MONILOG® MicroShockDetector plus. In this way, it can be traced back how the device was configured at the respective period of time.

No.	Start time	End time	Δt	Status	Inter	Shoc	Shoc	Shoc	Shoc	Shoc	Shoc	Shoc	Shoc	Shoc	Shoc	Pres	Pres	Light	Light	Temp	Temp	Humi	Humi	Reco	Reco	Mem	Vbat
1	08/26/2020 17:15:28	09/01/2020 08:32:02	5 d 1	USB connected	1 mir	1 g	1 g	1 g	0 m/t	1 ms	250 t	3 g	3 g	3 g	0 mb	0 mb	10,8	2,16	0 °C	0 °C	0 %	0 %	-	-	2%	3,53 V	
2	09/01/2020 08:42:01	09/01/2020 08:42:03	2 s	USB connected	1 mir	1 g	1 g	1 g	0 m/t	1 ms	250 t	3 g	3 g	3 g	0 mb	0 mb	10,8	2,16	0 °C	0 °C	0 %	0 %	-	-	0%	3,53 V	
3	09/01/2020 09:01:41	09/01/2020 09:01:43	2 s	USB connected	1 mir	1 g	1 g	1 g	0 m/t	1 ms	250 t	3 g	3 g	3 g	0 mb	0 mb	10,8	2,16	0 °C	0 °C	0 %	0 %	-	-	0%	3,53 V	

Figure 11: Table with acquisition periods

The start and end time, the active time period and the reason which has led to the completion of the acquisition period are shown. Moreover, all set thresholds and event channels for the period are recorded. A new acquisition period begins, when the device had been switched off or configured.

4.3.5 Synchronous data

Synchronous data are measured values that are continuously recorded synchronously at a fixed interval. The data sets are shown consecutively in a table (see Figure 12). In the program tab “Climate graph”, the synchronous data are shown graphically. The legend on the right-hand side of the diagram shows the measured values at the cursor position. By activating or deactivating the “check mark” in the legend on the right-hand side, the diagrams for such parameters as temperature, humidity, air pressure and light can be switched on or off (see Figure 13). The active alarm thresholds can be displayed with the “Show thresholds” button.

Table of synchronous data

No.	Date/Time	Temperature [°C]	Humidity [%]	Dewpoint [°C]	Pressure [mbar]	Light [lx]
1	08/26/2020 17:15:28	26,47	37,72	10,89	984,1	197,0
2	08/26/2020 17:16:28	26,54	37,22	10,76	984,1	197,0
3	08/26/2020 17:17:28	26,52	37,25	10,75	984,1	197,0

Figure 12: View of synchronous data table

Graph of synchronous data

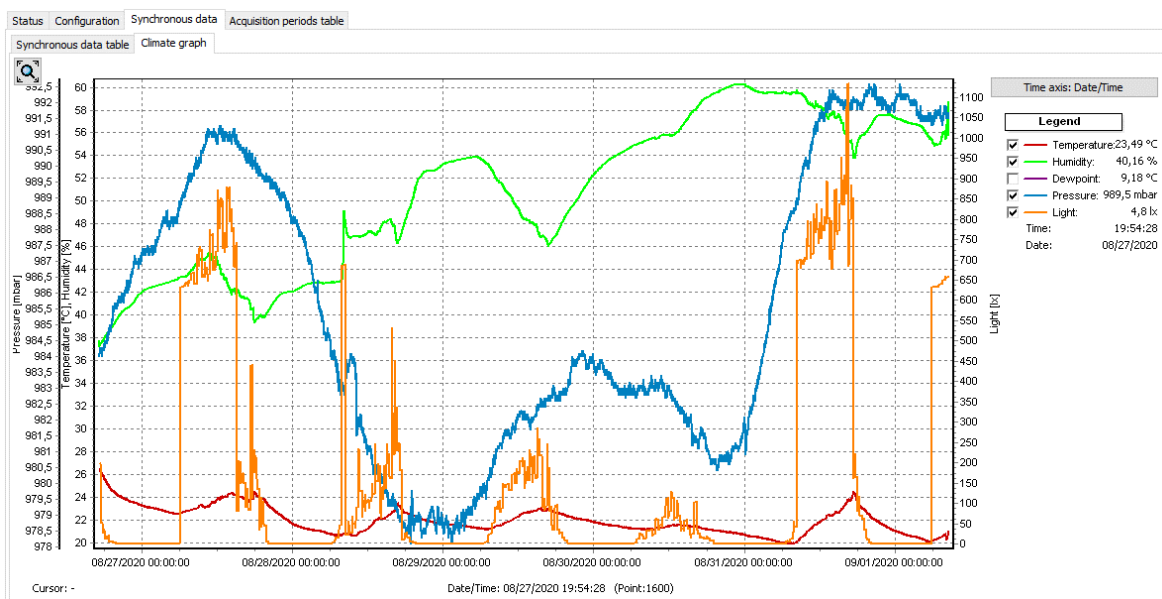


Figure 13: View of synchronous data graph

4.3.6 Alarm events

Alarm events comprise all events created by exceeding/falling below alarm thresholds. Up to 5,000 alarm events can be saved in the MONILOG® MicroShockDetector plus. They are listed in the "Alarm events" program tab as individual tables (light events, pressure events, temperature events, humidity events). The number of the event is also given in brackets in the data table.

No.	Date/Time	Temperature [°C]
1	09/01/2020 10:48:29	24,10

Figure 14: Temperature event table

4.3.7 Evaluation of shock events

A MONILOG® MicroShockDetector plus registers the 200 largest shock events above the set threshold values and of these for the 10 largest impacts the curve progression over 4 seconds each.

All shock events are listed in a table under the “Shock events” tab. In the “Shock alarm” column, the exceeding of an alarm threshold is marked with the corresponding direction. The associated curve can be called up by double-clicking on the table line if the circle symbol • is available in the “Curve” column.

No.	Date/Time	\ddot{x} [g]	\ddot{y} [g]	\ddot{z} [g]	Amplitude r [g]	Strength [m/s]	Duration [ms]	Direction	Shock alarm [x y z]	Temperature [°C]	Curve
1	09/01/2020 09:21:06	0,02	-2,10	2,90	3,58	0,53	25,7	+z	-	23,62	•
2	09/01/2020 09:32:12	0,28	0,21	1,00	1,05	0,13	19,8	+z	-	24,00	•

Figure 15: Shock event table

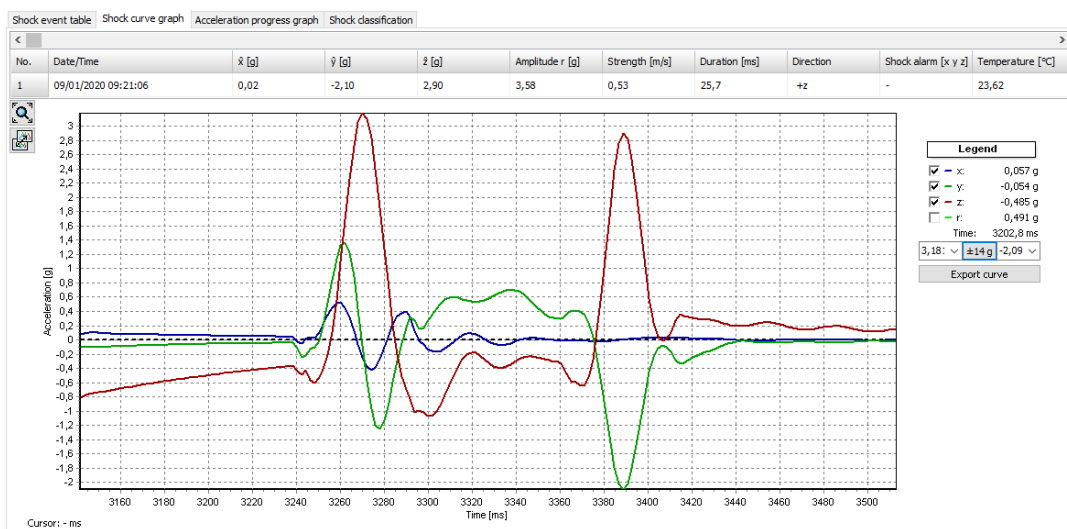


Figure 16: Shock event graph

The shock curves can also be scrolled through using the scroll bar above. By activating or deactivating the “check mark” in the legend on the right-hand side, the x, y, z-channel and the amount curve can be shown or hidden (see Figure 16). The dashed vertical lines mark the pulse selected in the curve period.

With the „→←“ or “± 14 g” button, the vertical diagram axis is switched between the maximum values of the curve and the full measuring range of ± 14 g.

Principle of the shock recording:

The shock recording starts when the value of the acceleration exceeds the internal registration threshold of 0.25 g on at least one measuring channel (approx. 3% of the measuring range).

The measuring points are continuously recorded with 500 Hz per channel and filtered to an upper limit frequency of 25 Hz and a lower limit frequency of 1 Hz. The shock pulses are selected from this curve. A shock impact starts exceeding the registration threshold on at least one measurement channel and ends when the main thrust (channel with the absolute maximum of shock) changes sign (zero crossing) or all 3 channels fall below the registration threshold again. Within a curve duration of 4 s, several shock impacts can occur, for example, by vibration.

The impact with the largest amplitude is evaluated at the end of a curve period and compared with the configured criteria. A shock curve is permanently stored if the registration thresholds met on at least one measurement channel, shock strength and shock duration for this shock impact.

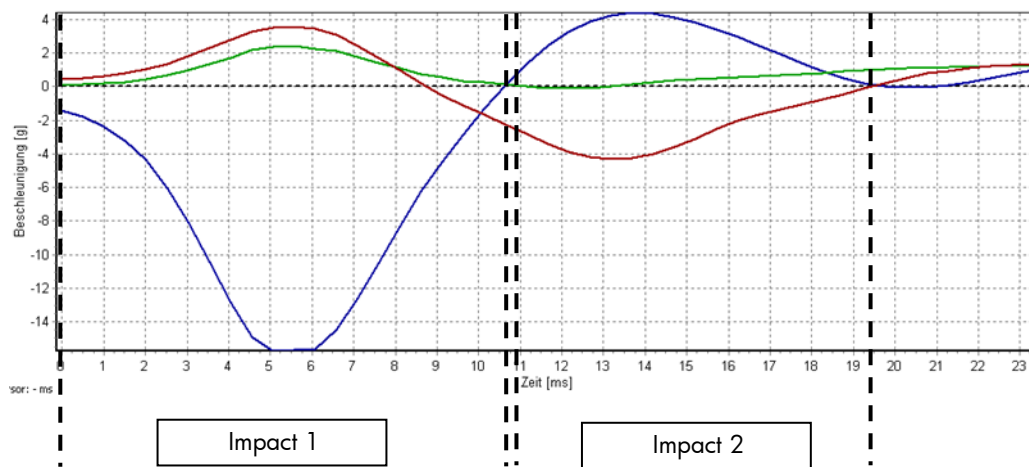


Figure 17: Evaluation of shock events

As a shock event is considered the largest single impact within the sampling time of 4 s, which meets all the set conditions (amount of shock, shock strength, shock duration) (in this example Figure 17 Impact 1). In addition to the measurement of the 3 channels, a value for the space vector and integrated value for the shock strength of this impact are calculated at each measurement point. The shock strength is equivalent to the difference speed.

Space vector: $R = \sqrt{(x^2 + y^2 + z^2)}$

Shock strength: $dv = \sum_0^n R * 2ms$

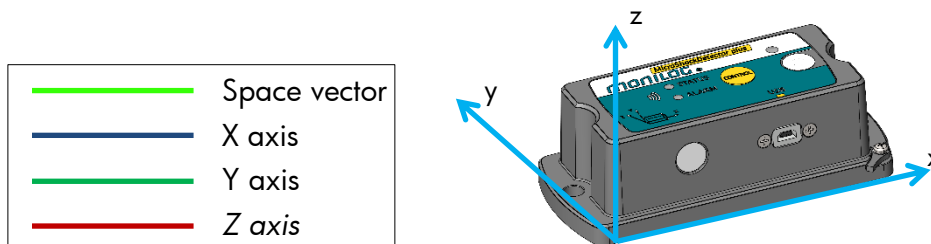


Figure 18: MicroShockDetector plus main axis for acceleration

Shock classification

The MONILOG® MicroShockDetector plus evaluates the acceleration amplitude of all impacts separately according to the shock directions X, Y and Z and also the resulting space vector R. All impacts are counted according to the amplitude in defined limit value classes, regardless of whether they are impact events or impact curves with time stamps and measured values are stored. All impacts recorded in the classification must at least exceed the registration threshold. It is presented as a table and diagram (Figure 19).

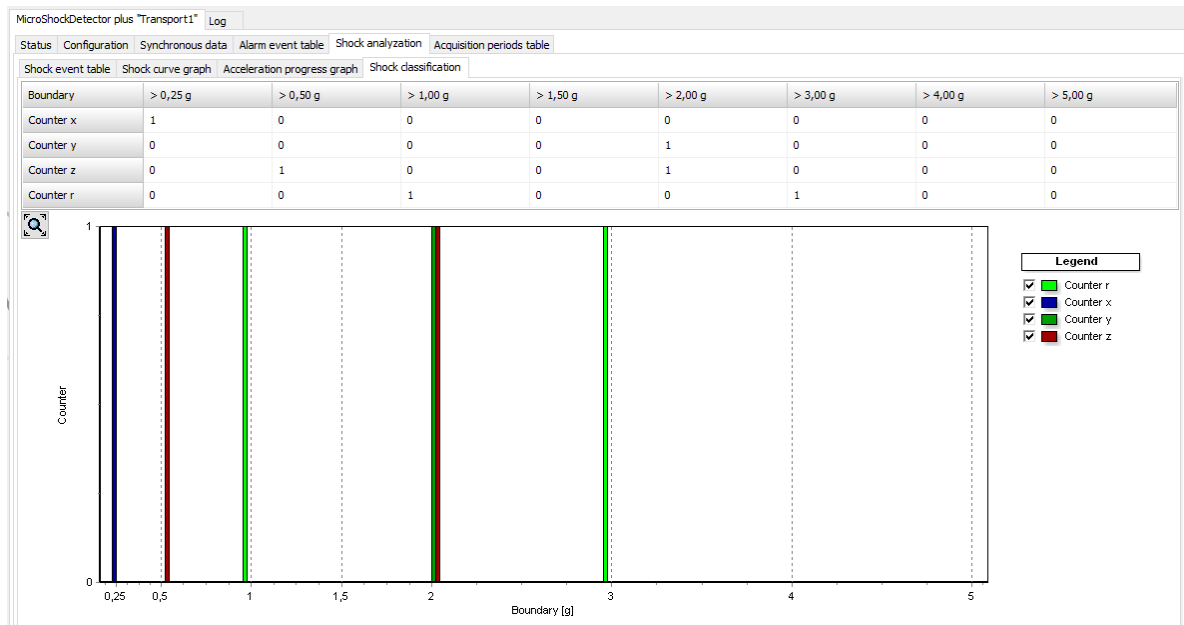


Figure 19: Shock classification

Acceleration progress

Recorded shock events with their maximum acceleration amplitudes are shown in a line graph (Figure 20). It is possible to zoom into the curve shape in. By the button “Calculate average” statistical values of acceleration are calculated on all shock events.



Figure 20: Overview of acceleration progress

4.3.8 Configuration of the MicroShockDetectors plus

To configure a device, use the “Configuration” tab (Figure 21) and adapt the parameters to the upcoming transport. If a device is connected via USB, you can transfer all parameters to the MONILOG® MicroShockDetector plus by clicking the “Send configuration” button.

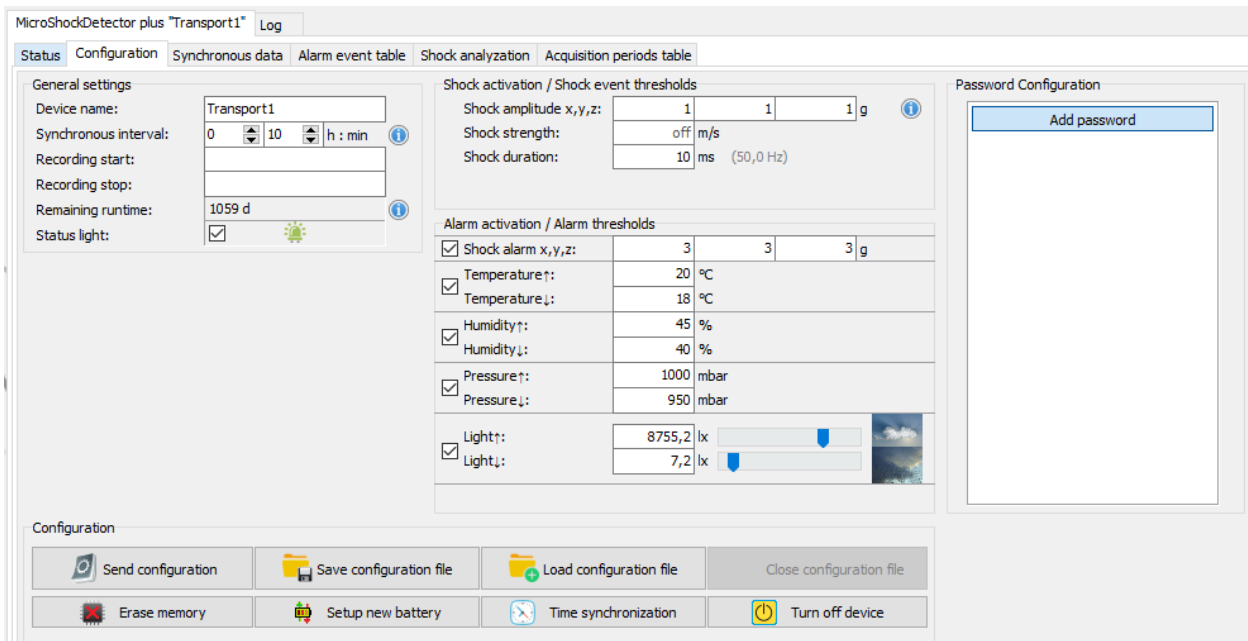


Figure 21: Configuration of a device

The meaning of the available parameters is explained in section 4.3.2. In addition, the status flashing of the device can be activated by ticking the box. When activated, the STATUS LED of the device lights up briefly every 2 seconds and shows the active operating status. Alternatively, instead of the STATUS LED the ALARM LED might light up red briefly ever 2 seconds, if a set alarm threshold has been exceeded. The status flashing affects the remaining device runtime.

The **buttons** have the following function:

- Send configuration: Sends all displayed settings to the device
- Save configuration file: Saves the displayed settings in a file
- Load configuration file: Opens presets from a saved file
- Close configuration file: Closes the open, saved preset file. The parameters of the saved file are no longer displayed in the configuration window.
- Erase memory: Deletes all measurement data in the internal memory of the device
- Setup new battery: Resets the battery usage counter in the device after changing the battery cell. The battery cell type and capacity can be adjusted in the following window if required.
- Time synchronization: Synchronizes the internal device clock with the PC time
- Turn off device: The device is turned off. Both LEDs light up red briefly.

Setting the registration thresholds:

The correct setting of the registration thresholds is fundamental for the storage of shock measurements. An impact must reach the specified shock amount and at the same time the minimum shock duration on at least one axis X, Y or Z. If a value greater than 0 m/s is specified, the shock strength must also be met as a criterion (see also section 4.3.6 Principle of shock recording).

Setting the alarm thresholds:

Using the set threshold values, shock events are marked with the shock direction if the exceeding of the threshold values is detected during the measurement ~~run~~ (see Figure 15 column shock alarm). The alarm threshold of an axis must be at least as high as the associated registration threshold. As soon as the first alarm is detected, the red ALARM LED lights up when the status is queried. The lighting of the ALARM LED when the status is queried can be reset by erasing the device memory.

Changing the synchronous intervals:

The synchronous interval is set using the "Synchronous interval" selection fields in hours and minutes. When set to zero, there is no recording of time-synchronous measured values.

Erase memory:

The function "Erase memory" deletes all data in the device.


Attention!

Make sure that you have completely read out the data before deleting it and saved it as a *.msd file! Deleted data cannot be restored!

Configure password and access rights:

It is possible to protect the device with up to four passwords each exhibiting different access rights. Each password can contain up to 8 characters. A new password can be created by clicking the "Add password" button. The new password setting is saved in the device by clicking on the "Transmit password" button. A password can protect an arbitrary number of different access rights. E.g. if you protect the configuration of your device through a set password, you will be asked to enter the corresponding password at the first configuration attempt during this session. After successfully entering the password, configuration and all additional access rights, protected by this password, are unlocked for the current session. A session persists for as long as the device is connected to the computer and the Software MONILOG® Analyzer is opened.

Note:

To remove a password again, click on . The deletion must be confirmed by successfully entering the password to be deleted. If you have forgotten the password, please follow the instructions in section 4.3.9 Service information on the device to request a reset password.

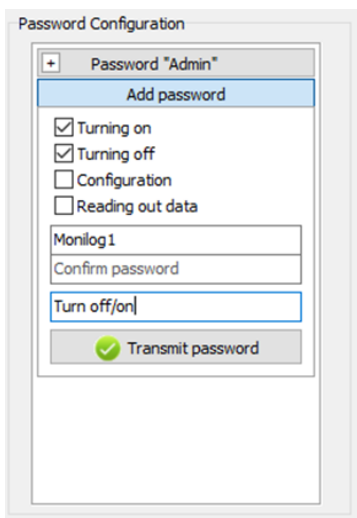


Figure 22: Configure password

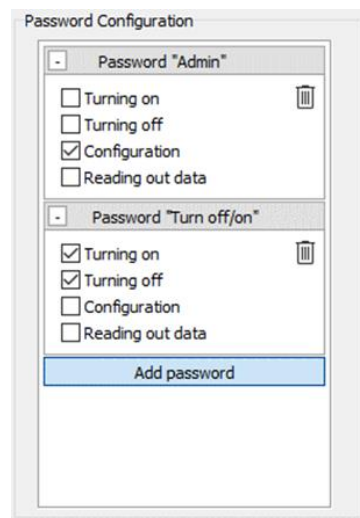
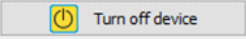


Figure 23: Access protection display & delete password

- **Name:** Specification of a name for the password, e.g. to describe the future group of users
- **New password:** Enter the desired new password
- **Confirm password:** Enter the new password again for confirmation
- **Turning on:** If this field and a password are activated, the MONILOG® Analyzer software is required to turn on the device. To turn on the device, the *CONTROL* button must be pressed for >2s until the *STATUS* LED flashes green. Then make the USB connection within 1 minute and enter the password.
- **Turning off:** If this field and a password are activated, the turn off is only possible by use of the button . Then the password is requested (see Figure 24).
- **Configuration:** If this field and a password are activated, changes in configuration and erase memory are only possible after entering the password (see Figure 24).
- **Reading out data:** If this field and a password are activated, the password is requested when making the USB connection (see Figure 24).

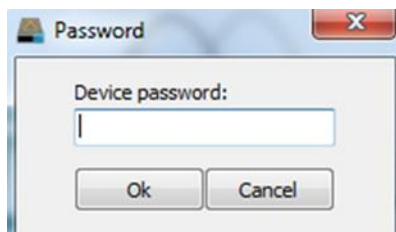


Figure 24: Read out data, unlock configuration or switching on/off

Changing the device name:

The name of the device MONILOG® MicroShockDetectors plus can be changed by the user. Up to 16 characters are available for the device name. By pressing the "Send configuration" button, the name is saved and transferred to the device. The name can be chosen individually. It makes sense to give a name according to the measuring point, measuring task, etc. (e.g. "Transport 1").

Setting the recording period:

The desired recording period for the device can likewise be set by the user. When a recording period is defined, the measured value recording at the start time begins. The measured value recording will be terminated when the stop time is exceeded. If the input fields are not left empty, the measurement recording is running as long as the device is switched on.

The input of start time and stop time is made in local time in the date format:

dd.mm.yyyy hh:mm:ss

(day.month.year hour:minute:second)

Setting the device time

The device time can be set by clicking on the button “Time synchronization” in the programme tab “Configuration”. The synchronisation is made by means of the system time of your PC.

All time specifications are made in the PC programme according to the time zone setting of your PC. Internally, the device works with the Universal Time Coordinated (UTC). Thus, a clear temporal assignment of the events with a point in time is always possible.

Creation and use of ready-made configurations

If similar configuration parameters are to be used on several devices, the MONILOG® Analyzer software offers the option of creating and loading configuration files. A configuration file can be created by clicking the “Save configuration file” button. A configuration file (file extension .cfg) is created from all parameters that are currently displayed in the configuration window. Among other things, the content of the “Note” field and the passwords transferred to the device are stored in the configuration file. The storage location of the file can be freely selected.

To configure several devices with the created configuration file, it can be read in using the “Load configuration file” button. The configuration can be sent to the device with the “Send configuration” button if there is an active USB connection. The configuration file read in remains active in the software until the configuration file or the software is closed. Active means that the parameters read in from the configuration file are always displayed in the configuration window, which is indicated by the addition of the file name in the tab. The actual, current device configuration is still listed in the status window (see section 4.3.1).

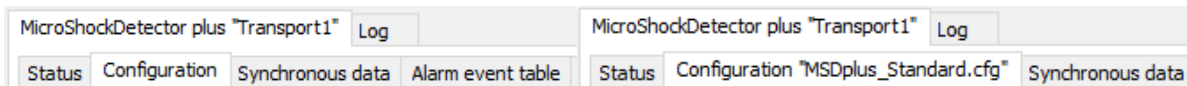


Figure 25: “Configuration” tab without (left) and with loaded (right) configuration file

Changes to the configuration file can be made and transferred to the device. Changes made are only temporary and are reset to the original content of the configuration file after the settings have been successfully transferred.

4.3.9 Service information on the device

Via the menu item “Settings – service menu” you get additional information on the device, which are required for support requests.

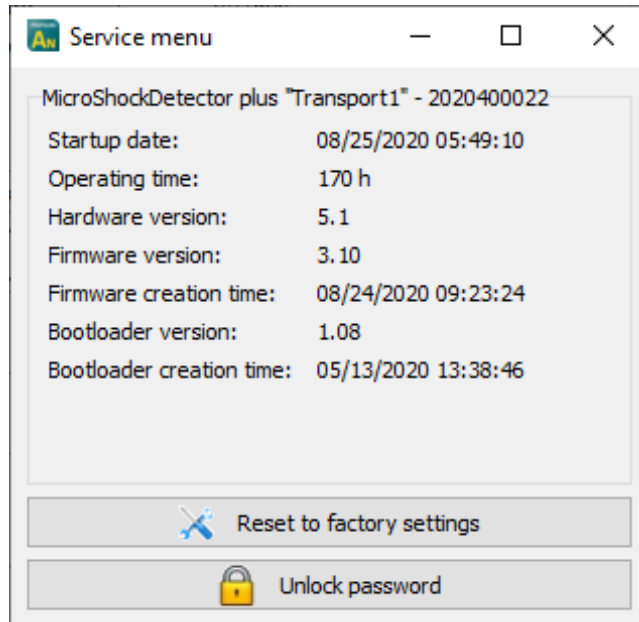


Figure 26: service menu

If you lose the password, click on the button „Unlock password“. This opens your default e-mail program with a prepared email. The email contains a device-specific key which is sent to the address support@monilog.de. After validation of the device-specific key and verification of your authorization by us, you will receive a time-limited reset password. The reset password can be entered at any request to enter a password (e.g. when deleting a password) and resets all passwords assigned in the device. New passwords can then be assigned as described in the previous chapter.

When you click on “Restore to factory settings”, the device is reset to the standard configuration parameters.

5. ANDROID APP – MONILOG® CONNECT

The MONILOG® Connect app can be used to read out the MONILOG® MicroShockDetector plus quickly and easily with a smartphone. It is used to display and analyze the recorded data in tabular form and enables the measurement data to be shared via email or other apps.

5.1 INSTALLATION

The MONILOG® Connect app is available for free for Android smartphones in the Google Play Store and can be found there under the search term “Monilog”.

Note:

The MONILOG® CONNECT application is only designed for Android. Devices with Android 5.0 (Lollipop) or higher are supported.

Note:

NFC is essential for using the app and reading out a MicroShockDetector plus. The app cannot be used on mobile devices without NFC.

5.2 GENERAL USE OF THE APP

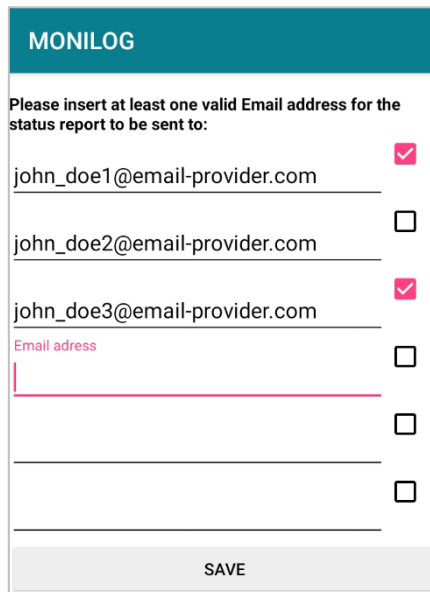
5.2.1 Initial setup

When starting for the first time, the initial setup of the app must be carried out. During the initial setup, a password must be set for the app and an email configuration must be made.

Figure 27: Password assignment during initial setup

The password must have a length of 2 to 8 characters and can consist of numbers, letters and special characters. In principle, the app can be used without password. Should sensitive information such as the stored email addresses be accessed or changed, the app must be opened via the “READ DATA + SETTINGS” button after successfully entering the password.

After setting up the password, the email configuration takes place. Up to 6 email addresses can be stored in the app to which data can be sent directly.



MONILOG

Please insert at least one valid Email address for the status report to be sent to:

john_doe1@email-provider.com

john_doe2@email-provider.com

john_doe3@email-provider.com

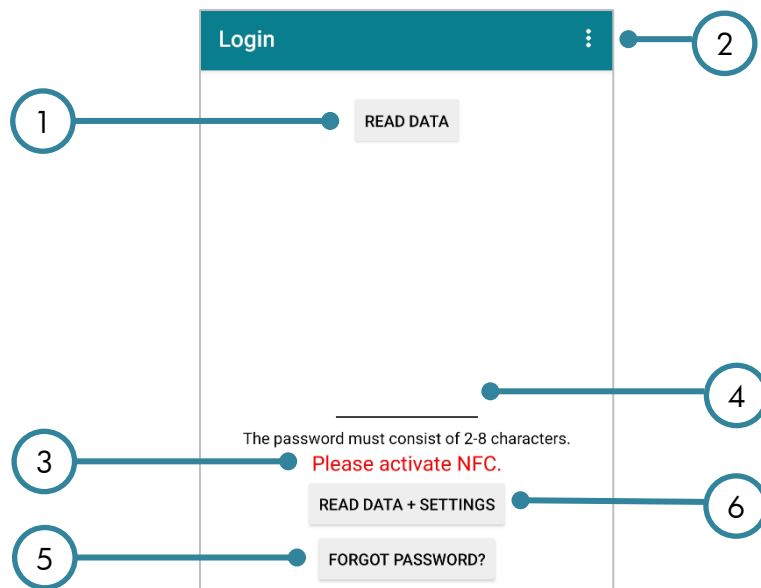
Email address

SAVE

Figure 28: Email configuration during initial setup

The first email address must always be provided. This is required to reset the password. By setting the “check mark” to the right of the email address, you can select whether a read-out device status report should be sent to the associated email address. At least one “check mark” must be set. The configuration is ended with the “SAVE” button and you are automatically forwarded to the start-up menu.

5.2.2 Start-up menu



- | | |
|---------------------------|--|
| 1 Read out device | 4 Password entry field |
| 2 Settings & Info | 5 Reset password |
| 3 Instruction text | 6 Read out device and access to configuration (password required) |

5.2.3 Read device via NFC

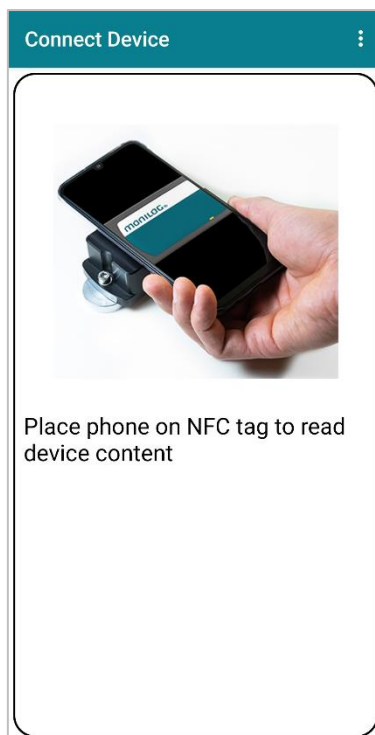


Figure 29: Information screen for reading out device

After logging in successfully, the MicroShockDetector plus can be read out via NFC. To do this, the smartphone must be positioned on the device in accordance with the representation without any gap. The smartphone detects the NFC tag after a short time. The MicroShockDetector plus does not have to be switched on for reading out with the app.

Note:

The NFC position differs from smartphone to smartphone. Identify the NFC position in the device manual or move the smartphone slowly over the MicroShockDetector plus until the device is detected.

If reading out the MicroShockDetector plus is password-protected, you will be asked to enter the password. After a successful readout, the readout screen opens with a brief overview of the data and a status report is generated in PDF format.

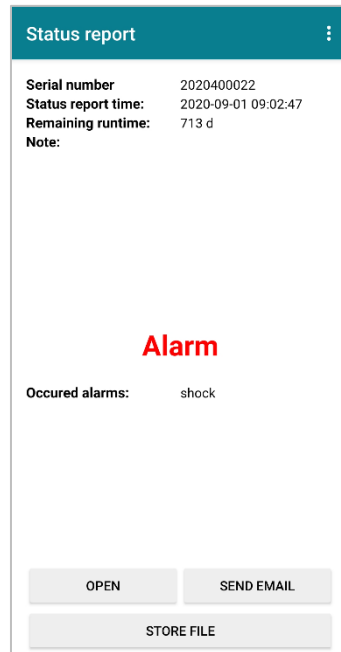



Figure 30: Brief overview after reading out the device

The brief overview shows, among other things, the estimated remaining runtime of the MicroShockDetector plus. It also shows whether and which alarms have occurred.

The buttons on the readout screen offer the following functions:

OPEN

The status report created by the MicroShockDetector plus is displayed. The read out data is shown in table form. For a detailed explanation of all displayed values, see section 4.3.2 Measurement data, status and thresholds. The status report can be shared using the button .

SEND EMAIL

An email is sent to all selected email addresses stored in the app. The email sent contains the status report in PDF format and the read out data as an .msd file. The .msd file can be opened with the MONILOG® Analyzer software (see section 4 PC Software – MONILOG® Analyzer).

STORE FILE

The status report is saved in the download folder of the internal phone memory. The authorization to access the smartphone's memory is required to save the file. If the app does not yet have authorization for this access, the authorization will be queried when you click.

5.3 CONFIGURATION MONILOG® CONNECT

The app settings can be opened using the button .

Note:

The settings menu is only accessible if the app has been opened using the "READ DATA + SETTINGS" button after successfully entering the password.

5.3.1 Password

Allows changing the password. To change the password, the previous password must first be entered. The new password must be 2 to 8 characters long and can consist of numbers, letters and special characters. In general, the app can be used without using the password. Should sensitive information such as the stored email addresses be accessed or changed, the app must be opened via the "READ DATA + SETTINGS" button after successfully entering the password.

5.3.2 Email

Allows changing the email configuration. Email addresses can be added, deleted or changed. Up to six email addresses can be stored in the app. The first email address must always be entered. This is required to reset the configuration password. By setting the "check mark" to the right of the email address, you can select whether a read-out device status report should be sent to the associated email address. At least one "check mark" must be set. The configuration is saved using the "SAVE" button. Valid email addresses must be entered, the app does not validate them.

5.3.3 Further

Allows further configurations of the app. The output language of the status report can be set here. You can choose between German, English and Chinese (simplified). The status report is sent to all selected email addresses stored in the app in the language set here.

6. FIRMWARE UPDATE

6.1 PREPARATION

Through a firmware update, a MONILOG® MicroShockDetector plus receives an updated application program if this update file is provided by the manufacturer.

Prior to the firmware update the following points must be observed:

- The activation of the update mode can only be carried out, if the MONILOG® MicroShockDetector plus is switched off. If your device is still switched on, please switch it off.
- The activation of the update mode can only be carried out, if no password has been configured in the MONILOG® MicroShockDetector plus. Follow the instructions in Section 4.3.8 in the sub-item „Configure password and access rights“ to deactivate the password.
- Have ready the included mini USB cable and plug one end of the cable in a free USB port of your computer for the preparation. Do **not** plug the USB cable into the MONILOG® device yet!
- Ensure that on your computer no MONILOG® Analyzer programmes are executed.

Note:

Back up all measurement, diagnostics and configuration data of your device prior to the firmware update to prevent a possible data loss. The memory is reset to default settings.

In the switched off condition of the device, connect the USB cable and keep the *CONTROL* button pressed (>6 seconds, *STATUS* LED lights up green) until the *STATUS* LED starts flashing red with 1 Hz. The update mode is active now. It only remains active as long as the USB cable is connected. If the *CONTROL* button is released before the detection of the update mode, the device starts the normal operating mode.

Proceed now with the instructions according to chapter 6.2 „CARRYING OUT UPDATE“.

6.2 CARRYING OUT UPDATE

After you have started your MONILOG® device in the update mode, start the PC software. The PC software should automatically detect the MONILOG® device which is in the update mode and open a window to select an „Encrypted Hex File“.

After selecting the update file the update process, which must not be interrupted, starts. The red *STATUS* LED on the device lights up continuously.

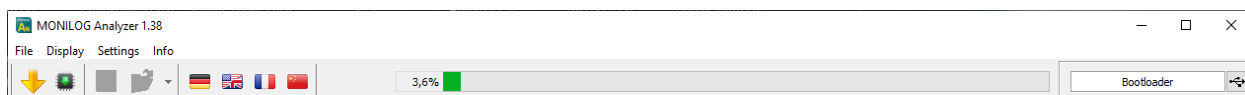


Figure 31: Firmware update

If the progress bar shows 100%, then the message of the successful completion of the update appears.

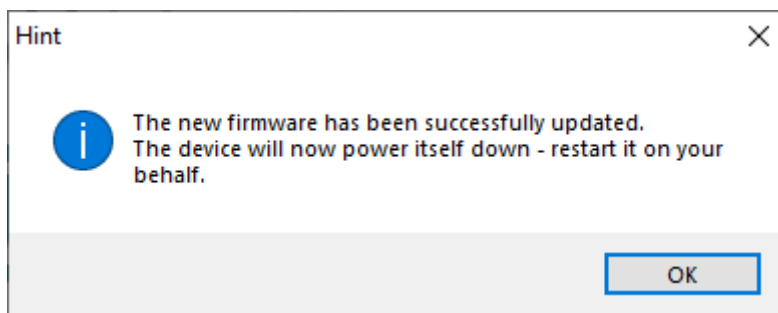


Figure 32: Completion of the update process

The USB connection must now be disconnected. The red *STATUS* LED on the device goes out. The device must be switched on again.

If the update process fails, a corresponding error message is displayed. The MONILOG® device switches off independently. Due to the update interruption the device firmware could not be completely installed. In some circumstances, the device is not switchable any more in the normal operating mode due to this. Please repeat the update process according to the instructions of the entire chapter 6 „Firmware update“.

WARRANTY CERTIFICATE

MONILOG® MicroShockDetector plus

Against submission of this warranty certificate we grant a 12-month warranty from the date of delivery for the above instrument.

In case of defects, we initially have the right to supplementary performance within these 12 months, either removal of defects or subsequent delivery, as we choose. Should the rectification fail, and only then, we will take back the instrument and reimburse the purchase price. Any further warranty claims shall be excluded.

This warranty covers all faults that impair the proper functioning of the instrument due to technical defects of individual components or assemblies.

Battery cells and rechargeable batteries as expendables are not covered by this warranty.

This warranty will only be granted if the instrument has been used properly for its intended purpose.

Any attempts of the warranty or third persons to repair the instruments or to intervene in any other way exclude warranty claims. Any mechanical damage which is the result of undue stress also excludes warranty claims.

We will immediately notify the warrantee of any repair work excluded from warranty coverage.

If the instrument is sent in together with the warranty certificate, this will be considered as a repair order for the elimination of all damage.

The warrantee can exclude partial services.

In case of any malfunctions of the instrument, please state the serial no. You can find it on type label or on the logs when evaluating your data.

SMT ELEKTRONIK GmbH

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01328 Dresden

GERMANY

Telephone: +49 351 266 13 888

Support: support@monilog.de

Email: info@smt-elektronik.de

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