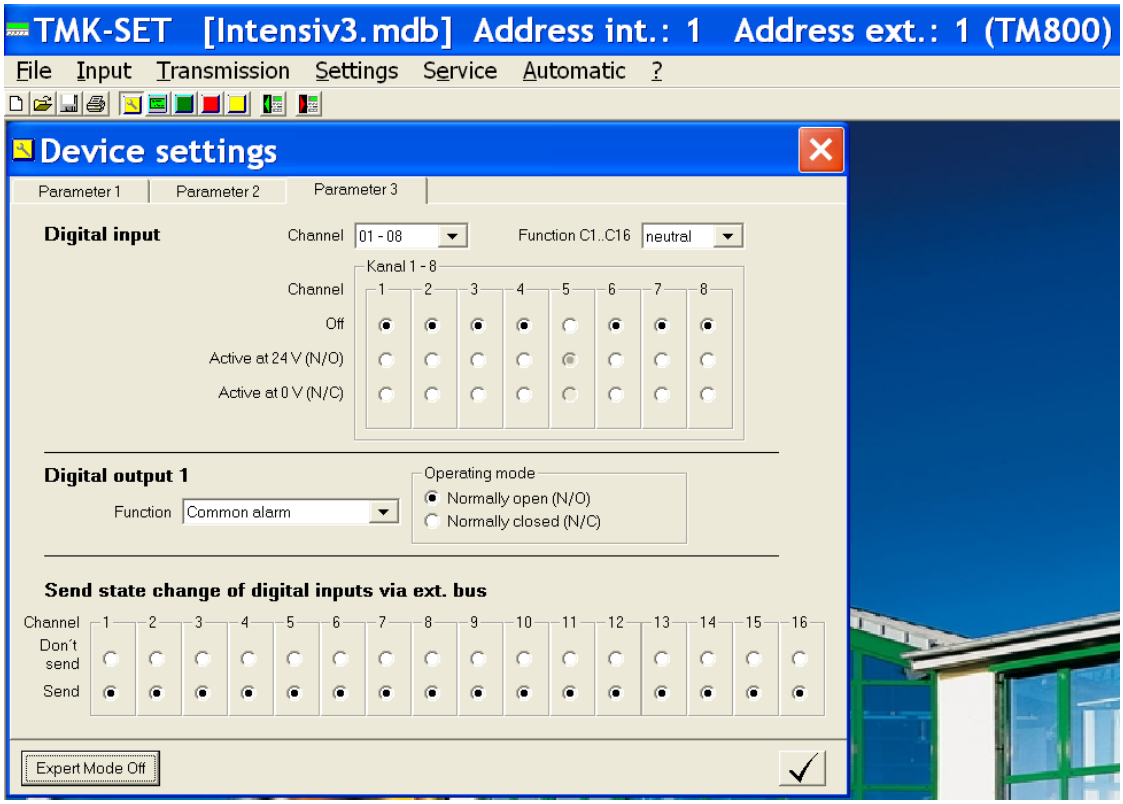
# Operating Manual




# TMK-SET
# TMK-HISTORY

## Software for
## MK800, TM800 and MK2430

## Software version: 3.0

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# Table of Contents

# 1. How to use this operating manual effectively

## 1.1 How to use this manual

This manual describes

- the configuration software TMK-SET, software version 3.0 and
- the software TMK-HISTORY, software version 3.0.

The functions and processes described may vary from those featured in other versions. It is intended for experts in the areas of electronics and electrical engineering but, in particular, for planners, installers and operators of electrical equipment in the medical area.

Please read this operating manual and the supplement entitled "Important safety instructions for BENDER products". Please keep this documentation in an easily accessible location where the software is used.

Should you have any further questions, we would be happy to be of assistance. Please contact our Technical Sales Department.

We are also happy to provide on-site service. Please contact our Service Department for more information, Tel.: +49 6401 807-760.

This manual has been compiled with great care. Nevertheless, errors and omissions cannot be entirely excluded. The BENDER companies do not accept any liability for injuries to persons or material damage resulting from errors or omissions in this manual.

This operating manual is available both in printed and electronic formats. You are advised to visit the download area of our homepage.

## 1.2 Explanations of symbols and notes

The following designations and symbols are used in BENDER documentation for hazards and warnings:


*This symbol indicates an immediate risk to life and limb.*
*Failure to observe the associated instructions and take appropriate precautions will result in death, serious physical injury or substantial damage to property.*


*This symbol indicates a potential risk to life and limb.*
*Failure to observe the associated instructions and take appropriate precautions may result in death, serious physical injury or substantial damage to property.*


*This symbol indicates a potentially dangerous situation.*
*Failure to observe these warnings means that slight bodily injury or damage to property may occur if the corresponding precautions are not taken.*

*This symbol gives important information about the correct use of the product purchased.*
*Failure to observe the associated instructions can result in equipment malfunctioning or cause problems in the environment in which it is being used.*

*This symbol guides you to application tips and particularly useful items of information. This type of information will help you to optimise your use of the product.*

# 2. Safety information

## 2.1 Intended use

The TMK-SET V 3.0 has been designed for the configuration and parameterisation of MK800 and MK2430 as well as for TM800 alarm indicator and operator panels (hereinafter referred to as TM/MK devices). It can be used for individual parameterisation of the TM/MK devices for the purpose of adapting it to the local equipment and operating conditions.

The TMK-HISTORY is used to read out the history memory

- of TM/MK devices (TM800, MK800, MK2430),
- PRC1470 control and indication panels and TM1000 alarm indicator and operator panels

TM/MK panels come into use in:

- healthcare facilities;
- industrial installations and office buildings;
- public buildings

Please note the limits of the area of application indicated in the technical data. Use deviating from or beyond the scope of this is considered non-compliant.
Observance of all instructions in this manual is also part of intended use.

## 2.2 General safety instructions

BENDER equipment is designed and built in accordance with the state of the art and accepted rules in respect of technical safety. However, the use of such devices may introduce risks to the life and limb of the user or third parties and/or result in damage to BENDER equipment or other property.

- Only use BENDER equipment:
  - within the scope of its intended use;
  - in perfect working order;
  - in accordance with the rules and regulations on accident prevention that are applicable for the place of utilisation.
- Any faults which may impair safety must be eliminated immediately.
- Do not make any unauthorised changes and only use replacement parts and optional accessories from or recommended by the manufacturer of the equipment. Failure to observe this requirement can result in fire, electric shock and injury.
- Reference plates must always be clearly legible. Replace damaged or illegible signs immediately.

## 2.3 Safety instructions for users of EDS systems

Instructions for using TM/MK panels in conjunction with EDS... insulation fault location systems

*You must not use TMK-SET to parameterise TM/MK panels while the EDS... is attempting to locate an insulation fault.*

## 2.4 Skilled persons

Only appropriately qualified personnel may work on BENDER devices. Persons who are familiar with the installation, commissioning and operation of the equipment and have undergone appropriate training are considered skilled persons. Such persons must have read this manual and understood all instructions relating to safety.

## 2.5 Delivery conditions, guarantee, warranty and liability

The conditions of sale and delivery set out by BENDER shall apply.

For software products, the "Softwareklausel zur Überlassung von Standard-Software als Teil von Lieferungen, Ergänzung und Änderung der Allgemeinen Lieferbedingungen für Erzeugnisse und Leistungen der Elektroindustrie" (software clause in respect of the licensing of standard software as part of deliveries, modifications and changes to general delivery conditions for products and services in the electrical industry) set out by the ZVEI (Zentralverband Elektrotechnik- und Elektronikindustrie e. V., the German Electrical and Electronic Manufacturers' association) also applies.

Conditions of sale and delivery along with a copy of the software clause can be obtained from BENDER in printed or electronic format.

# 3. System description, installation and connection

## 3.1 TMK-SET features

The TMK-SET V 3.0 has been designed for the configuration and parameterisation of MK800 and MK2430 as well as for TM800 alarm indicator and operator panels.
It supports:

- The modification of device settings
- Standard display configuration
- Alarm message configuration
- The semi-automatic creation of alarm messages
- Test address configuration
- Scanning of the BMS bus
- Setting the system time
- Erasing all history memories
- TM800 only: status message and switching command configuration

The MK device settings can be generated from a new or existing template or even read out from the device and adapted in accordance with project requirements. Project files created with the configuration software MEDI-SET or MK-SET can be read out.

## 3.2 TMK-HISTORY features

The TMK-HISTORY software has been designed for reading out the history memory of TM1000 and TM800 alarm indicator and operator panels and MK800 and MK2430 alarm indicator and test combinations.
It supports:

- in conjunction with TM1000 alarm indicator and operator panels or PRC1470 control and indication panels, the reading of the history memory via the external BMS bus or the RS-232 interface;
- in conjunction with TM800 alarm indicator and operator panels or MK800 alarm indicator and test combinations, the reading of the history memory via the internal and external BMS bus or the USB interface;
- in conjunction with MK2430, the reading of the history memory via the internal BMS bus or the USB interface;
- the display of history data;
- the saving of history data to a file;
- the reading of stored history data from a file;
- attaching of further history data to a file already existing;
- the sorting, filtering and printing of history data.

## 3.3 System requirements

In order to be able to use TMK-SET or TMK-HISTORY, your system must meet the following minimum criteria:

- IBM compatible PC;
- 50 MB of free hard disk space;
- serial RS-232 interface and/or USB interface;
- Microsoft Windows 2000 or Windows XP operating system.

The software can be installed from a CD-ROM or downloaded from the Internet.

For more information about the cables and adapters required to connect your PC to the TM/MK panel, please refer to the ordering information and chapter “Connection options” on page 17.

## 3.4 Ordering information

| Description | BENDER Art. No. |
|---|---|
| MEDICS software:<br>- TMK-SET V 3.0 parameterisation software for MK2430, MK800, TM800<br>- TMK-HISTORY V 3.x for MK2430, MK800, TM800, TM1000 and PRC1470<br>- USB driver software for MK2430, MK800 and TM800<br>- MEDISET V1.x parameterisation software for TM1000 and PRC1470 | B96020087 |
| DI-3-SET, interface converter set consisting of:<br>- DI-2 interface converter RS-485/RS-232<br>- Power supply unit AC 230 V for DI-2<br>- Cable for connecting DI-2 to the BMS bus<br>- RS-232 interface cable for connecting DI-2 to PC | B95012028 |
| DI-2, interface converter RS-485/RS-232 | B95012022 |
| DI-2USB, interface converter RS-485/USB, with USB cable | B95012045 |

## 3.5 Installing TMK-SET

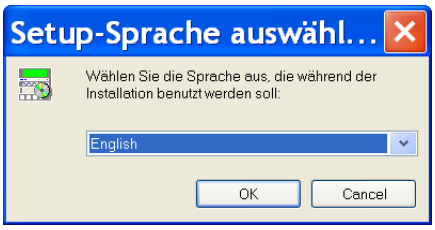
*In order to install this program, you need to be registered as "Administrator" or "Main user" for this PC. For executing this program, the "User" rights are sufficient.*

### 3.5.1 Prior to TMK-SET installation

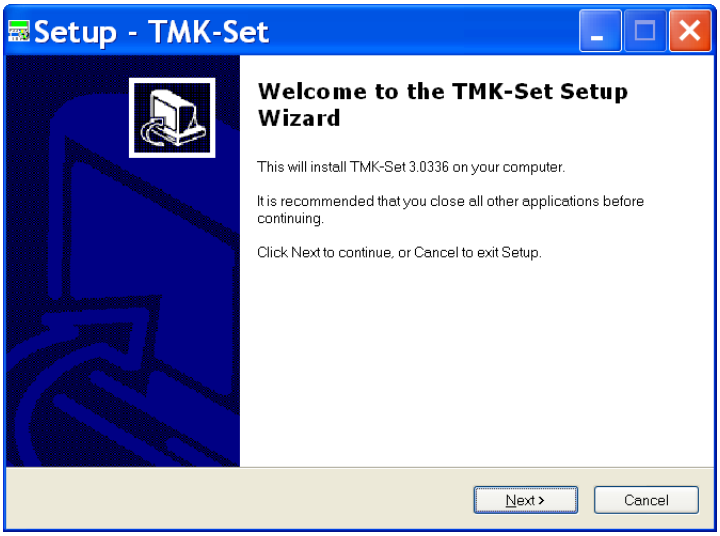
1. Quit all active programs.
2. If the installation file is located on a CD:
   Insert the "MEDICS software" CD into the CD drive. Open directory:"\Software\English".
   The installation file is also available from the "Download" area on our homepage (http://www.bender-de.com). Save the installation file to your computer.

### 3.5.2 The TMK-SET installation process

1. Launch installation file "TMK-SET_setup.exe". Select the language that is to be used during the installation.

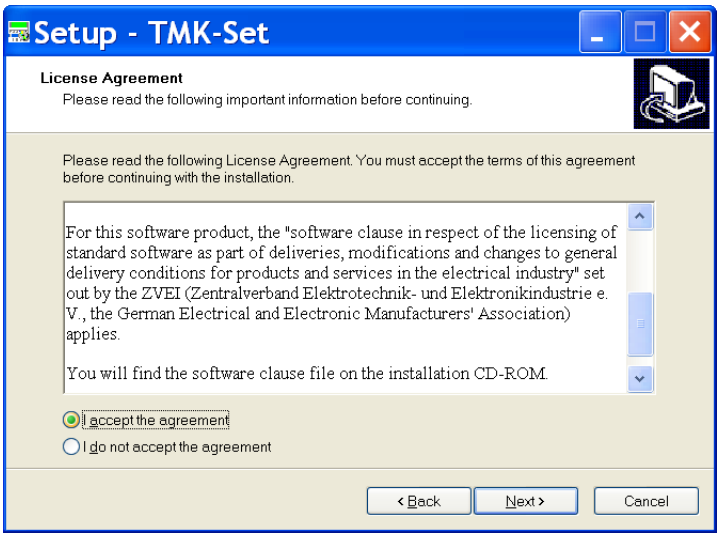



2. The installation process starts up.



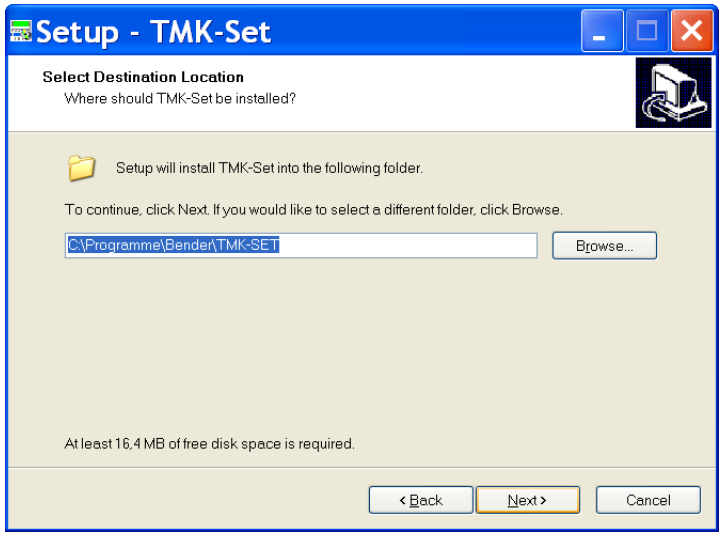

Click on "Next".

3. Read and accept the license agreement.




Read the license agreement. Click on "I accept..." and then "Next".

4. Select the folder for the purpose of installing the files.




   – Click on "Next" to install the files in the suggested default folder.
   – Click on "Browse..." to select an alternative folder for installing the files.

The files will now be installed. A progress bar will inform you about the progress of the installation process. Once the installation is complete, click on "Finish".

## 3.6 Install TMK-HISTORY

*In order to install this program, you need to be registered as "Administrator" or "Main user" for this PC. For executing this program, the "User" rights are sufficient.*

Install the TMK-HISTORY in the same way as TMK-SET.

## 3.7 Install a TMK-SET or TMK-HISTORY update

An up-to-date installation file is also available from the "Download" area on our homepage (http://www.bender-de.com). Proceed as follows:

1. Save the installation file to your PC.
2. If the version is older than 3.30: uninstall this old version (see "chapter 3.8").
3. Launch installation and follow the instructions provided by the installation utility.

## 3.8 Uninstall TMK-SET or TMK-HISTORY

To access the option for uninstalling the TMK-SET or TMK-HISTORY software, go to "Start -> Programs -> Bender -> TMK-SET -> Uninstall TMK-SET" or use the WINDOWS uninstall routine.


Uninstall TMK-HISTORY in the same way as TMK-SET.

## 3.9 Install the USB driver

*In order to install this program, you need to be registered as "Administrator" or "Main user" for this PC. For executing this program, the "User" rights are sufficient.*

Caution

*Make sure that the power supply of TM/MK devices is isolated against PE. If this is not taken into consideration and if a PC is connected to the USB interface, the TM/MK device and the PC may sustain damage.*

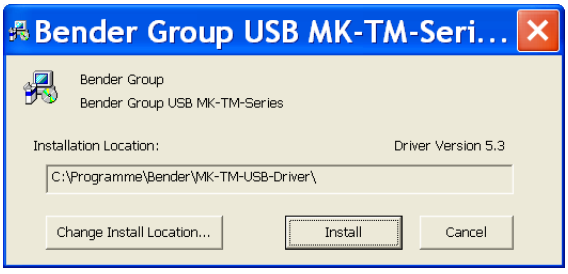
A USB driver is required, if a connection is established between your PC and the device to be programmed via a USB interface.

### 3.9.1 Prior to installation

1. Check, whether older USB drivers for TM/MK devices exist on your PC. Uninstall these drivers.
2. Quit all active programs.
3. If you have received the installation file on CD:
   Insert the "MEDICS software" CD into the CD drive. Open directory:"\Software\English".
   The installation file is also available on the "Download" area on our homepage (http://www.bender-de.com). Save the installation file to your computer.

### 3.9.2 The installation process

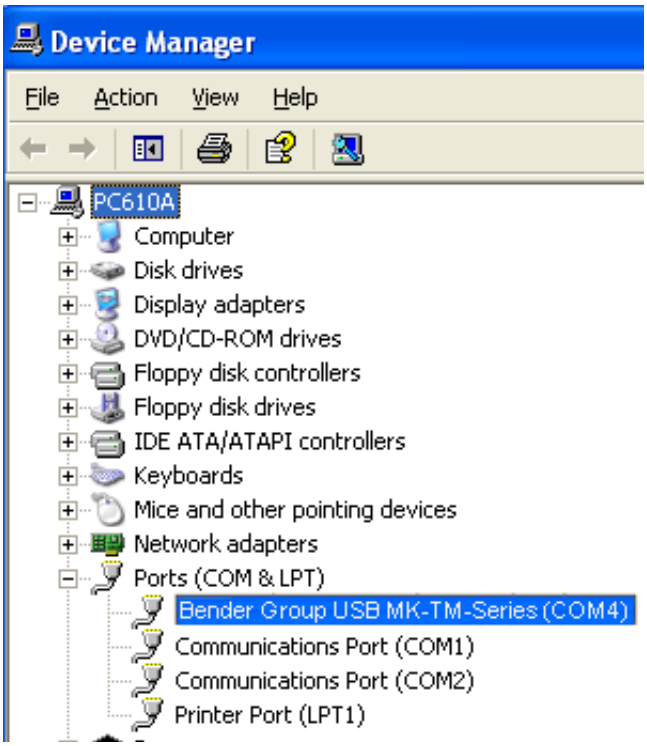
1. Do **not** connect the PC to the TM/MK device via the USB cable at this point!
2. Launch file "Bender-MK-TM-USB-Driver-Setup.exe".




   Click on "Install". - The required files are copied.
3. Connect the TM/MK device to the power supply. Only now, you can connect the PC to the TM/MK device using the USB cable. The PC will detect a new device and start the actual installation process. Follow the on-screen instructions. Note: The driver is located in the directory "C:\Programs\Bender\MK-TM-USB-Driver".
4. Once installation is complete, TMK-SET will possess a new, virtual COM interface (e.g. COM4; allowed range up to COM16) for the USB connection. Make the relevant settings under "Settings-> PC interface". For further information about setting up the PC interface, see “SETTINGS menu” on page 52".
5. Test that data transfer is working properly by reading out the data from the TM/MK device (see “Read out device data” on page 46).

*You must always proceed in the order given below (even after RESET or power failure):*
*- First, connect the TM/MK device to the power supply,*
*- then connect the TM/MK device to the PC using the USB cable.*
*You must observe this order, otherwise it will not be possible to transfer data between TMK-SET and the TM/MK device.*
*Remedy: Repeat the steps in the correct order.*

*The new, virtual COM interface will also appear in the Windows Device Manager under "Ports (COM and LPT)". To access the Windows Device Manager, go to "Start -> System control -> System -> Hardware".*




*If necessary, you can assign a different number to the COM interface. Right-click on "Bender TMK USB Port (COM_)" and select "Properties". Enter the desired COM port number under "Port Settings -> Advanced" (allowed range up to COM16).*

### 3.9.3 Using the USB interface

If you intend to use the TMK-SET resp. TMK-HISTORY via the USB interface, you must always proceed in the order given below (see “The installation process” on page 15):

1. Install the USB driver (if a driver has not been installed before).
2. First, connect the TM/MK to the power supply.
3. Only then connect the TM/MK device to the PC using the USB cable.
4. Set the virtual COM interface in the "Settings" menu of the TMK-SET resp. TMK-HISTORY software.

## 3.10 Connecting your PC to the TM/MK panel

### 3.10.1 Connection options

- For the purpose of programming a TM/MK device, a USB device cable is all you need for the connection between the PC and the relevant TM/MK device. However, you will need to install the USB driver for the TM/MK device on the PC (see “Install the USB driver” on page 15). A BMS bus scan is not possible.
- If, on the other hand, several devices are to be programmed from one location or a BMS bus scan is to be performed, you will need to establish a connection between the PC and the BMS bus. The BMS bus hardware is based on the RS-485 standard. A serial PC interface converter RS-232 (resp. USB) to RS-485 will therefore be required (you may also need the required driver). The converters you use must have either been supplied or approved by BENDER.

For further connection information, please see the TM/MK device manual.

### 3.10.2 Address setting

Successful data exchange depends on the following conditions being met:
The addresses specified in TMK-SET must always match the internal resp. external address set on the TM/MK device.

### 3.10.3 Password

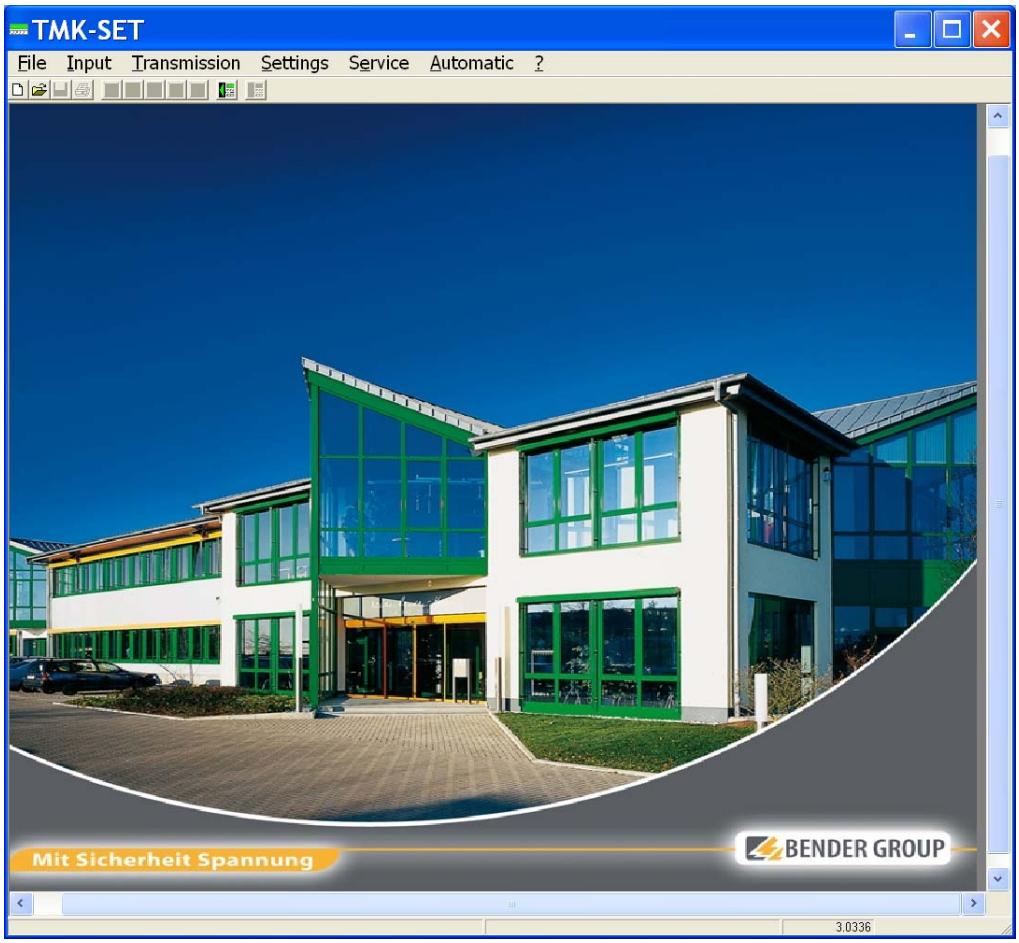
Even if the password prompt function is activated on the TM/MK device, you can read out data from it. However, if you want to transfer data to the TM/MK device, TMK-SET will ask you for the password first.

# 4. Operating and setting TMK-SET

## 4.1 Starting the program

To access the option for starting the TMK-SET software, go to "Start -> Programs -> Bender -> TMK-SET -> TMK-SET".
Click on this option to launch TMK-SET.

You will then be able to call the individual software functions via menus (File, Input etc.) or by clicking on the relevant buttons. If you use the mouse button to hover over a button without clicking on it, a tooltip will appear.



## 4.2 The TM/MK programming steps

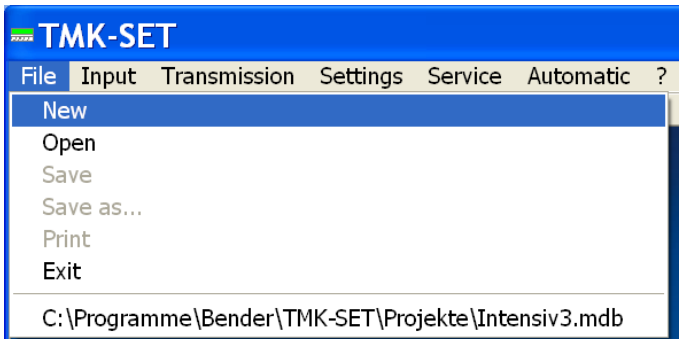
To program a TM/MK device using TMK-SET, proceed as follows:

| | Step | Chapter and page |
|---|---|---|
| 1. | Configure PC interface | "SETTINGS menu" on page 52 |
| 2. | Create new project file | "FILE menu" on page 21 |
| 3. | Make basic settings | "Device settings" on page 24 |
| 4. | Program standard display | "Programming the standard display" on page 31 |
| 5. | Program alarm addresses | "Programming alarm addresses" on page 36 |
| 6. | Set individual alarms semi-automatically | "Alarm messages semi-automatic setup" on page 55 |
| 7. | Program test addresses | "Programming test addresses" on page 42 |
| 8. | TM 800 only: Program status messages and switching commands | "Programming status messages" on page 34 and "Programming switching commands" on page 43 |
| 9. | Save project file | "FILE menu" on page 21 |
| 10. | Send device settings | "Sending device settings" on page 48 |
| 11. | Send messages and alarms to device | "Sending messages and addresses" on page 51 |

*In this manual, the TM800 is used as a programming example. MK2430 and MK800 settings deviating from this programming example will be described additionally.*

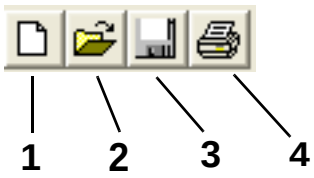
## 4.3 FILE menu

The TM/MK device settings are stored in project files. The "File" menu can be used to manipulate these files.



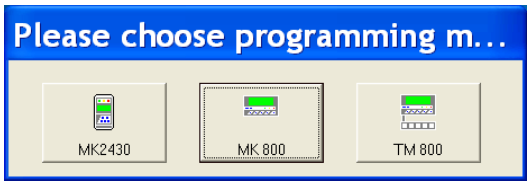

**Buttons**

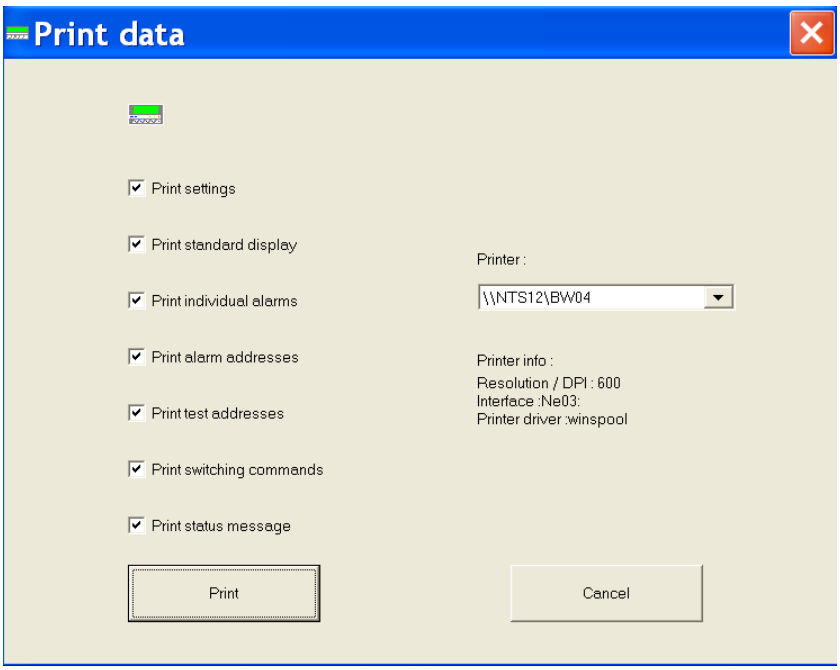
For the purpose of manipulating a project file, the Create, Open, Save, and Print functions are also accessible via the following buttons:



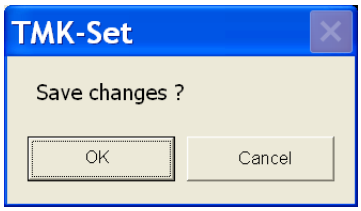

1 New
2 Open
3 Save
4 Print

**In the FILE menu, select:**

| | |
|---|---|
| NEW | To create a new project file (all the data of a TM/MK device). Once you have clicked on this menu item, select the TMK/MK device you wish to program:<br>  <br>The window "Parameter/device setup" will open in which you can enter the text in the standard display of the TM/MK device. Also the message and address settings are to be carried out. These settings are made via the "Input" menu (see page 23). Now save the project under a name of your choice. |
| Open | To open an existing project file. All the project files located in the subdirectory selected under "Settings -> Project path" will be displayed. Use the mouse to select the desired project file and click on the "Open" button to open it. |
| Save | To save a project file that has been edited or modified in some way. If the file you want to save already has a name, it will be saved under this name. If it has not yet been assigned a name, you will be asked to enter one. |
| Save as | To save an existing project file under a different name and location or to different data carrier. |

| | |
|---|---|
| Print | To print out the settings and texts associated with the current project file. You can decide whether you want the device settings, standard display, individual alarms, alarm addresses or test addresses to be printed out. If the TM800 is concerned, you can additionally print out switching commands and status messages. In order for settings to be printed out, the relevant box must be checked. All the boxes are checked by default.<br>  <br>If you have a number of printers installed and registered under your Windows system, you can decide which printer is to be used for outputting the data. |
| Close | To exit TMK-SET. If the current file has changed since you last saved it, before exiting the program, you will be prompted to save the modified project file. |

*In the first instance, TMK-SET will save all the settings to a temporary file. If settings are changed or added, you will get the message:*




*However, if you click "Yes", the changes will only be saved in the temporary file. If you want the changes to be saved in the project file itself, you will need to select "File -> Save".*

*Whenever messages and device settings are sent to the TM/MK device, it is always the settings in the temporary file that are transferred.*

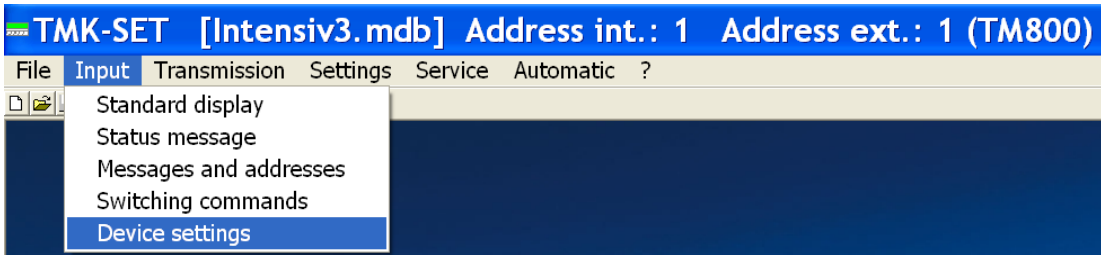
## 4.4 INPUT menu

*As far as settings relating to the BMS bus are concerned, you will need to know how your BMS network is set up and also know the associated device addresses. Incorrect settings can result in malfunctions. For general information about the BMS bus, please refer to "BMS bus" instruction leaflet and the TM/MK device manual.*
*A list of device bus addresses can be created and printed out by selecting "Service -> Bus scan".*

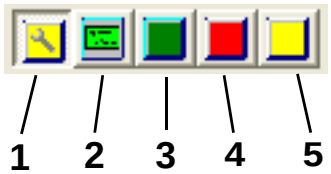
*Always remember to set the language for your message texts **before** you start programming them. This will ensure that any special characters are displayed properly in the relevant language. You can access a table of the special characters used via the "? -> Help" menu. Simply select "Index -> Special characters"*

*Save recent settings: The TMK-SET provides numerous options for programming the TM/MK device. If you are programming on quite a large scale, we recommend that you save your settings every so often. This will protect your settings in the event of an PC operating system crash. Simply select "Save" from the "File" menu.*

You use the "Input" menu to make all the settings for an existing project.




**Buttons for toggling between menus**
In the course of programming a TM/MK device, you may need to switch frequently between the standard display, messages and addresses and the device settings. To facilitate this, buttons for each of these functions are provided in the menu bar. If a TM800 is concerned, in addition switching commands and status messages can be programmed.




| | |
|---|---|
| 1 | Device settings |
| 2 | Standard display |
| 3 | TM800 only: status messages |
| 4 | Messages and addresses |
| 5 | TM800 only: switching commands |

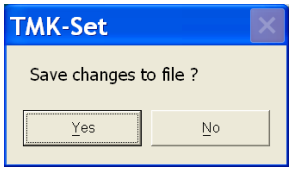
If you use the mouse button to hover over a button without clicking on it, a tooltip will appear. By clicking on the buttons you can switch quickly between the various types of setting.

### 4.4.1 Device settings

Device settings are stored in the project file. You can define new device settings or modify a TM/MK‘s device settings. The default settings proposed by TMK-SET are the same as those supplied with a brand new TM/MK device.

How to modify a TM/MK's settings

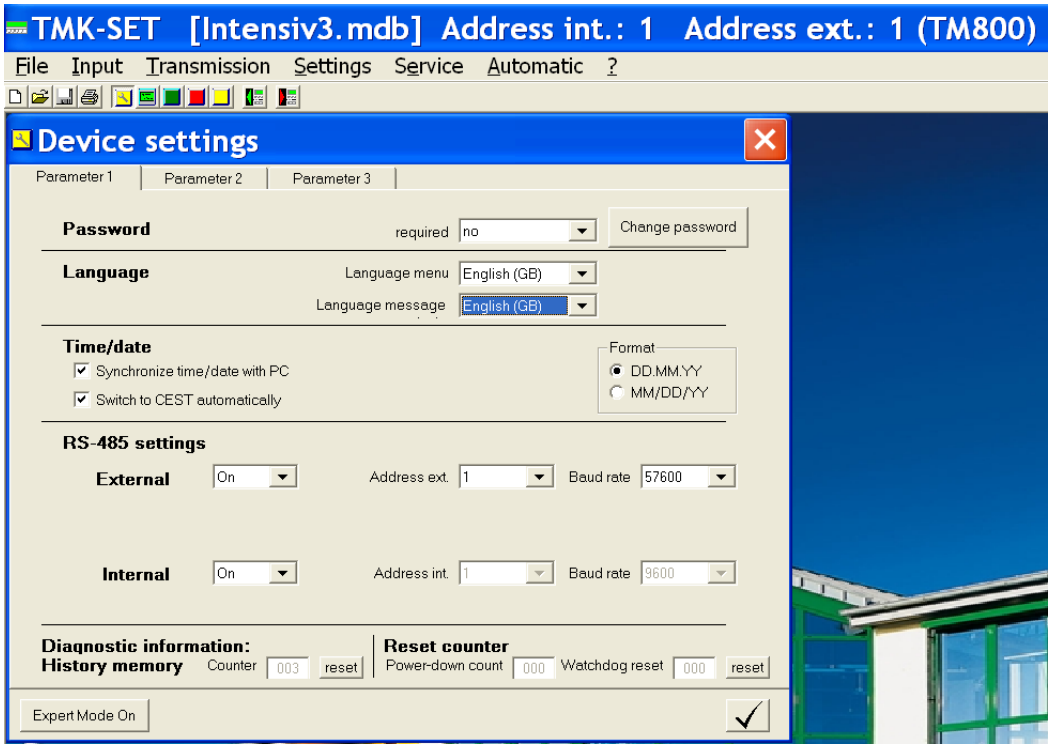
1. Connect your PC to the TM/MK device. Set the PC interface (refer to “SETTINGS menu” on page 52)
2. Read out the TM/MK device using the selected address: "Transmission -> Read data from device".
3. TMK-SET will ask you whether you want to "Save changes to file":




   Click on "Yes" and then enter a name in order to save the project file.
4. Modify the device settings that have been read out: "Input -> device settings".
5. Click on "Transmission -> Send" to transfer new device settings to the device.

If you are creating a new project file, TMK-SET will propose some device settings, which you can modify in accordance with your requirements. A TM/MK's device settings are configured under Parameter 1, Parameter 2 and Parameter 3.

#### 4.4.1.1 Parameter 1

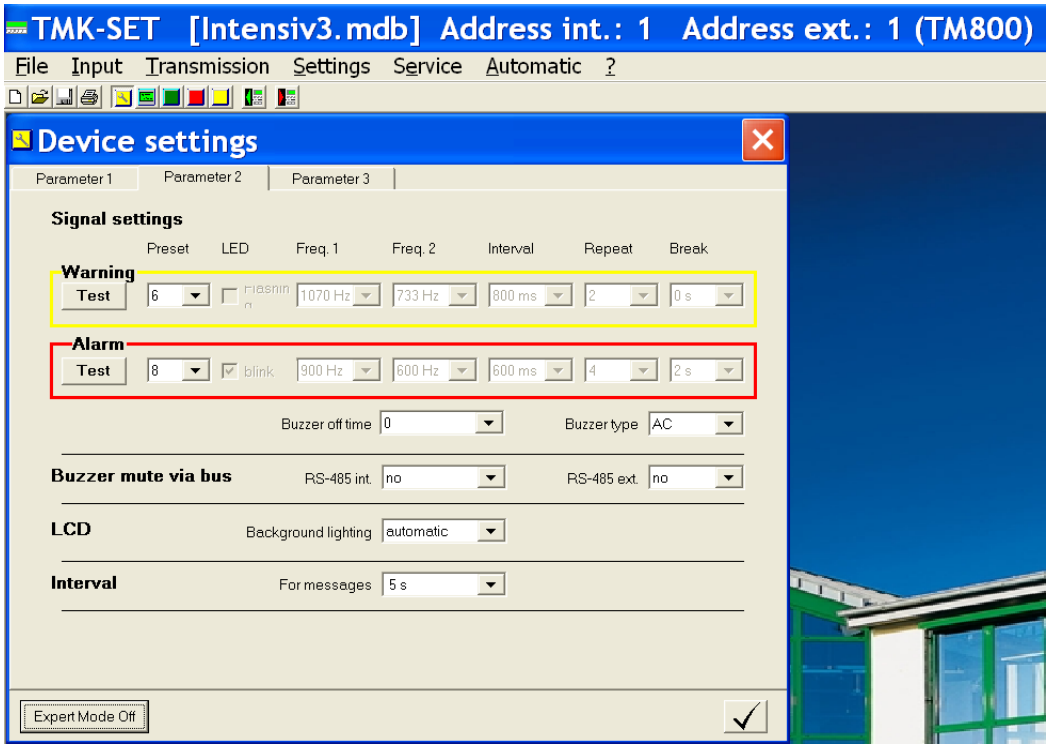



| | |
|---|---|
| Password | **Password required**<br>Setting that determines whether a password needs to be entered before. Default setting "no".<br>Password protection has an effect on the settings directly at the TM/MK device and the settings via PC and interface.<br>**Changing the password**<br>Set and confirm a new password. This setting will only be available if the password prompt is "yes". The default TM/MK device password is factory set to "807". |
| Language | **Language menu**<br>Here you can select the language for using the TM/MK device menus. Only languages marked with the "*" symbol can be selected. The device to be programmed must support the selected language.<br>**Language messages**<br>Here you can select the language for TM/MK device message texts (individual texts, automatic). These standard message texts are available in 20 languages. The associated character set is activated (special characters) for individual message texts. |
| Time/ date | "Synchronise time/date with PC" box.<br>☑ The time and date of the PC will be applied.<br>☐ The boxes for entering the time and date appear.<br>When a TM/MK device is read out, the time and date displayed here will be that of the TM/MK device read out. When the device settings are sent, the time and date entered/stored in these boxes is transferred to the TM/MK device. |

| | |
|---|---|
| ... Time/date | **"Switch to CEST automatically"** box<br>Setting for automatic switchover to central European summer time.<br>☑ Automatic switchover<br>☐ No switchover<br>**Date format**<br>DD.MM.YY European format<br>MM/DD/YY US format |
| RS-485 settings (external bus, MK800 and TM800 only) | **External**<br>Switching the external BMS bus on or off<br>**Address ext.**<br>Address on the external BMS bus.<br>**Baud rate (external)**<br>Set the baud rate of the external BMS bus.<br><br>**Internal**<br>Switch the internal BMS bus on or off.<br>**Address int.**<br>Address on the internal BMS bus (can only be set when the external bus has been switched off before).<br>**Baud rate (internal)**<br>Indication of the baud rate permanently set for the internal BMS bus.<br><br>**Additional settings, with "Expert Mode On"**<br>The factory setting may only be changed in consultation with Bender Service.<br>**Max. Slave Time**<br>Period of time after which a slave on the external bus will take priority.<br>**Timeout**<br>Timeout on the external resp. internal BMS bus.<br>**Max. Fault Count**<br>Maximum number of queries not being answered by a device after which a failure message will be generated.<br>**Max. Address Gap**<br>Maximum permissible address gap after which the scanning cycle will be stopped.<br>**Max. Variation**<br>Required modification of a value in %, so that it can be sent again via the external bus.<br>**ALMI-Idle Time**<br>Set the amount of time between 2 ALMI requests on the internal BMS. |
| Diagnostic information | **History memory**<br>Display the number of entries stored in the history memory (after device data read-out) with reset option.<br>**Reset counter**<br>Display number of resets (after device data read-out) with reset option. |

Press  to save the settings made so far (temporary file).

#### 4.4.1.2 Parameter 2

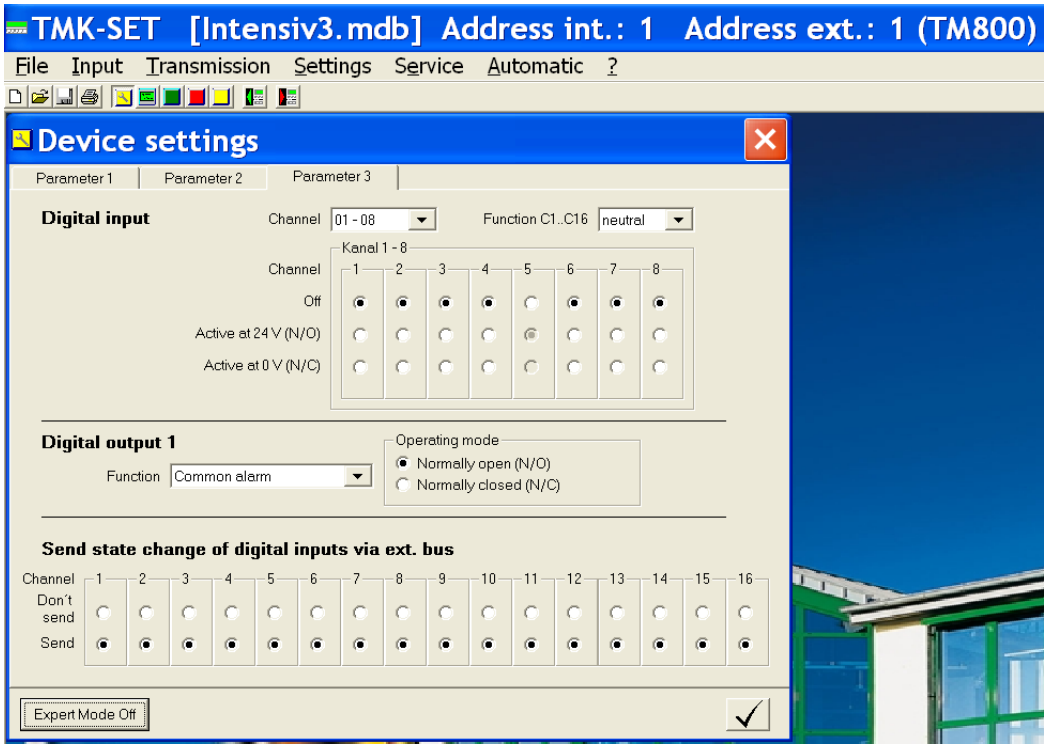



| | |
|---|---|
| Signal settings | In the event of an alarm message, the buzzer sounds and the associated LED lights up. The "Warning" and "Alarm" signals are configurable. When you make the buzzer settings, please ensure that there is no danger of the buzzer tone being confused with that set for other devices.<br>**"Test" button**<br>The configured buzzer tone is simulated using the PC's loudspeaker.<br>**PRESET**<br>1 ... 9 Various default LED and buzzer settings.<br>ind. Individual LED and buzzer setting.<br>**The following settings are only possible if "ind" has been selected.**<br>**"LED flash" button** (setting only possible if break > 0 s):<br>☑ LED flashes in the event of a message.<br>☐ LED lights up in the event of a message.<br>**Freq.1 and Freq. 2:**<br>For specifying the frequency of the two consecutive buzzer tones (1 and 2).<br>**Interval, Repeat and Break**<br>For specifying the frequency rate and break for the buzzer tone.<br><br>**Additional settings, with "Expert Mode On"**<br>The factory setting may only be changed in consultation with Bender Service.<br>**Buzzer off time**<br>Buzzer is deactivated for the preset period of time (e.g. for the time of commissioning).<br>**Buzzer type**<br>Selection of the appropriate buzzer. |

| | |
|---|---|
| Buzzer mute via bus | How this TM/MK device responds to message acknowledgements received via the bus (set buzzer to mute).<br>yes TM/MK device responds to acknowledgement; buzzer muted.<br>no TM/MK device ignores acknowledgement; buzzer not muted. |
| LCD | Setting the **background lighting**<br>always on Backlight remains permanently on.<br>automatic Backlight only comes on when a message is pending. |
| Interval for messages | Time **interval**<br>If several alarm messages occur simultaneously, they will be displayed consecutively. With "Interval" you set how long a message is to be displayed until the next message appears. |

Press  to save the settings made thus far (temporary file).

#### 4.4.1.3 Parameter 3



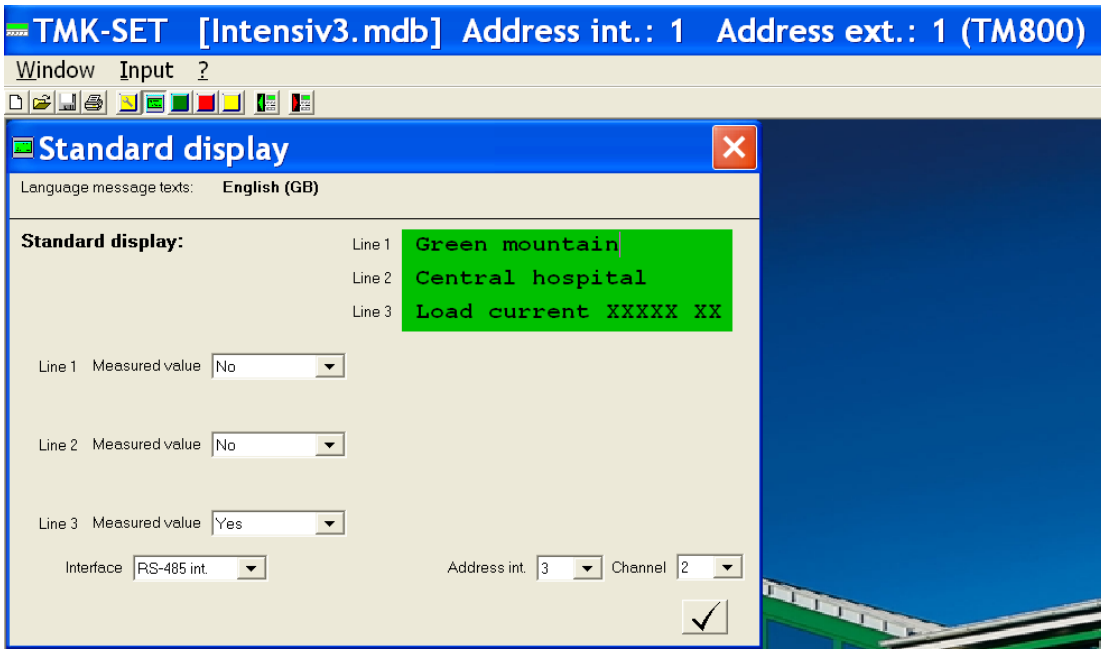

| | |
|---|---|
| Digital input (MK2430-11, MK800-11, TM800 only) | Neutral alarm messages or messages that relate specifically to medical applications can be assigned to the digital inputs (see the TM/MK manual or TMK-SET Help for details). These alarm messages are sent to other TM/MK devices via the BMS bus and are displayed there in plain text format. If freely programmable alarm messages need to be displayed on a different TM/MK device, the same alarm messages must have been programmed in the displaying device.<br>**Channel**<br>Select the group of channels to be set.<br>**Function C1...C16**<br>neutral The alarm, channel and address of the device that is responsible for triggering the alarm are signalled.<br>medical A set function is assigned to each output. Preprogrammed alarm messages are signalled.<br><br>In the event of an alarm, the following is displayed:<br><br>**Input** / **Function neutral** / **Function medical**<br>IN1 / Alarm: Address/channel XXX/01 / Alarm: Oxygen<br>IN2 / Alarm: Address/channel XXX/02 / Alarm: Vacuum<br>IN3 / Alarm: Address/channel XXX/03 / Alarm: Nitrous oxide<br>IN4 / Alarm: Address/channel XXX/04 / Alarm: Compressed air 5 bar<br>IN5 / Alarm: Address/channel XXX/05 / Alarm: Compressed air 8 bar<br>IN6 / Alarm: Address/channel XXX/06 / Alarm: Nitrogen<br>IN7 / Alarm: Address/channel XXX/07 / Alarm: CO2<br>IN8 / Alarm: Address/channel XXX/08 / Alarm: UPS battery operation<br>IN9 / Alarm: Address/channel XXX/09 / Alarm: UPS overload<br>IN10 / Alarm: Address/channel XXX/10 / Alarm: UPS converter failure<br>IN11 / Alarm: Address/channel XXX/11 / Alarm: UPS fault<br>IN12 / Alarm: Address/channel XXX/12 / Alarm: UPS test run |

| | |
|---|---|
| | IN13 Alarm: Address/channel XXX/13 Alarm: UPS mains operation<br>IN14 Alarm: Address/channel XXX/14 Alarm: Failure air conditioning<br>IN15 Alarm: Address/channel XXX/15 Alarm: OP light battery operation<br>IN16 Alarm: Address/channel XXX/16 Alarm: Sat OP light battery operation<br>IN13...IN16: available only at MK800-11 or TM800 |
| Channels 1...8, 09...16 etc.: (MK2430-11, MK800-11, TM800 only) | Select **"Off"** or **"Active at 24 V"** or **"Active at 0 V"**<br>If an individual alarm has already been programmed for a digital input (channel) (see "Programming individual alarms" on page 37), this will take priority. This channel setting is grey-shaded out and cannot be modified here (in the above example, the setting for channel 5).<br>Off* Channel is deactivated<br>Active at 24 V alarm at 24 V<br>Active at 0 V alarm at 0 V<br>* *The option "off" is not available for MK2430.*<br><br>**Default setting for alarm LEDs**<br>In case of messages relating to medical gases, the "ALARM" LED lights up; in the case of UPS messages, the "WARNING" LED lights up. If the "neutral" function is selected, the "WARNING" LED will light up for all messages. You can modify the setting for each individual channel in the "individual alarms" window. |
| Digital output 1 (MK2430-11, MK800-11, TM800 only) | **Function**<br>You can select which events should trigger switching of the alarm relay:<br>- Programmable (TM800 and MK800-11 only (relay output), the behaviour can be set under switching commands)<br>- Device error (active in case of an internal device error)<br>- Common alarm message (active, if any alarm is active)<br>- Device failure (active, when a device failure is signalled)<br>- Test (active, for a short time after pressing the test button to trigger the Isometer test)<br>- Buzzer operation (output active when buzzer active)<br>**Operating mode (of the alarm relay)**<br>Normally open (N/O) During normal operation, relay is deenergized; it is energized in the event of an alarm.<br>Normally closed (N/C) During normal operation, relay is energized; it is deenergized in the event of an alarm.<br><br>**Additional settings, with "Expert Mode On"**<br>The factory setting may only be changed in consultation with Bender Service.<br>**Send state changes of digital inputs via ext. bus**<br>The transfer of messages of the first 16 channels via the external bus can be blocked here. This may be useful in case of "flashing" messages. |

Press  to save the settings made thus far (temporary file).

### 4.4.2 Programming the standard display

Programming of the texts which appear in the lines 1...3 of the LC display on the TM/MK device during normal (fault-free) operation. Depending on the setting of the language for alarm texts, the use of special characters is supported.

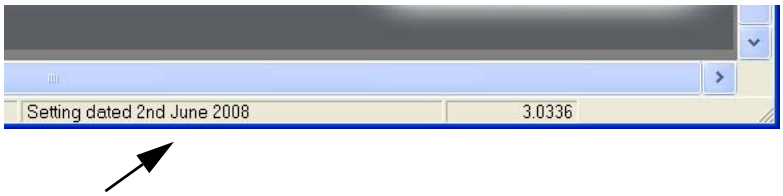



1. Enter the text that is to be displayed on the first three lines of the display during normal, fault-free operation.
2. As well as general text, measured values can also be displayed (e.g. insulation resistance, load current). Simply click "Yes" in the relevant "Value" box and then select the address and channel of the device whose measured value is to be displayed.

**Example: Insulation monitoring device with load and temperature monitoring 107TD47**

| Channel | Information | Note |
|---|---|---|
| 1 | Insulation OK | The insulation resistance is higher than the response value. The current insulation value is transferred in the form of a measured value. |
| 2 | Load current measurement OK | The load current is below the response value. The current utilisation rate of the IT system transformer (in relation to the set rated current) is transferred as a percentage. |

*For documentation purposes, an info text (max. length 256 characters) can be entered in a memo box. This will appear when you position the mouse pointer on the free area in the "Standard display" window and right-click. The info text will continue to be displayed in the status bar (on the left next to the version number) for as long as the "Standard display" window remains open.*




*An info text can be assigned to the "Messages and Addresses" window in exactly the same way.*
*The info texts are only saved to the project file. They will not be transferred to the TM/MK device and therefore are not available once the TM/MK device is read out. If info texts are used, always the stored project file must be used in case of changing the programming of the TMK/MK device.*

### 4.4.3 Buttons in the "Input" menu

The submenus "Status messages", "Messages and addresses" and "Switching commands" feature the following buttons for programming various functions.

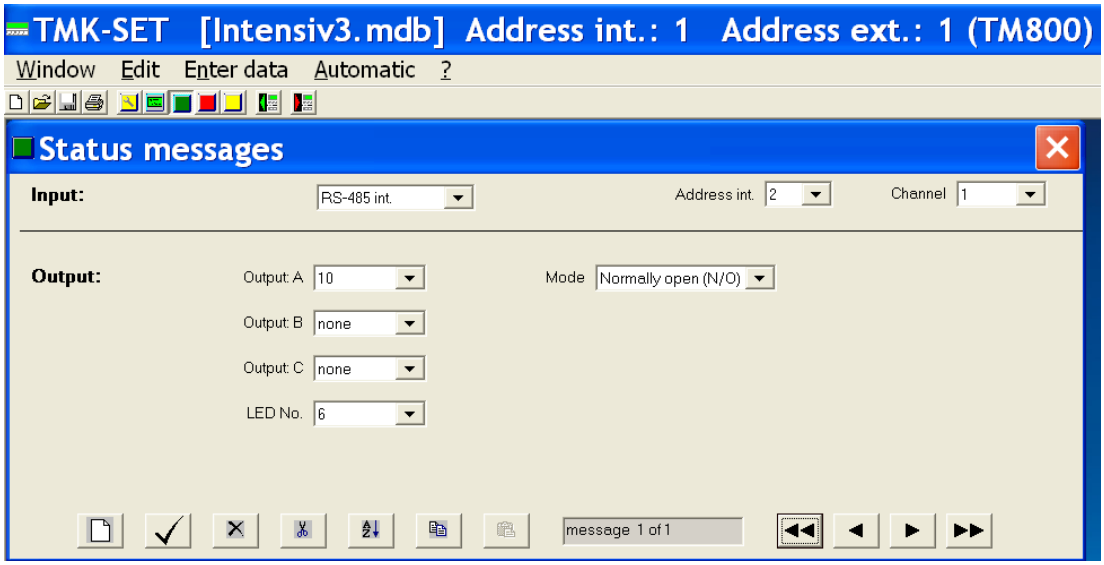
If you move the mouse to a button without clicking on it, a tooltip will appear. The buttons have the following functions:

| | | |
|---|---|---|
|  | New data record | Creates a new data record for programming purposes. |
|  | Save data record | Saves the settings made thus far (temporary file). |
|  | Delete data record | Deletes the data record currently on display. |
|  | Cut data record | Cuts the current data record (i.e. copy it to the clipboard and delete it). |
|  | Sort data records | Sorts all data records that have been programmed thus far for the called function. The main criterion for sorting is the device address. |
|  | Copy data record | Copies the data record currently on display to the clipboard. |

| | | |
|---|---|---|
|  | Paste data record | Pastes a data record that has been copied or cut into the current data record. |
|  | Scroll through data records | Scrolls to the previous or next data record (click and hold the mouse button for rapid scrolling).<br>Use these buttons to jump to the first or last data record. |
|  | Close window | Exits programming for the function called. The settings can be saved. |

### 4.4.4 Programming status messages

Only TM800 and MK800-11 feature the menu "Status messages". Use this menu to set the type of status messages (no warning and alarm messages) to be output, the backlit pushbuttons status messages are to be assigned to, and the output relays that are to be activated in this case. Status messages are always output to the backlit pushbuttons on the TM800; they are not indicated as text on the display.




Press  to create a new data record or use  or  to select an existing data record for editing.

#### Programming an input

Select the "Input" connected to the device whose status message is to be displayed. You may select:

| | |
|---|---|
| RS-485 ext. | External BMS bus. Settings are the same as for RS-485 internal. In addition, in the first box "Address ext.", enter the address of the TM/MK device the signalling device is connected to. |
| RS-485 int. | Internal BMS bus. In the "Address int." box, enter the address of the device whose status message is to be displayed. In the "Channel" box, select the status message channel (see "BMS device channel assignment" instruction leaflet). |
| Digital input | Under "Mode", set the operating mode (Active at 24 V / 0 V) and type of signal (Impulse/Time) and under "No." set the number for the digital input. |

#### Status messages arriving via the BMS bus

**Example 1: Insulation monitoring device with load and temperature monitoring 107TD47**

| Channel | Information | Note |
|---|---|---|
| 1 | Insulation OK | The insulation resistance is higher than the response value. The current insulation resistance is transferred in the form of a measured value. |

| Channel | Information | Note |
|---|---|---|
| 2 | Load current measurement OK | The load current is below the response value. The current utilisation rate of the IT system transformer (in relation to the set rated current) is transferred as a percentage. |

**Example 2: Control and indicating device PRC487**

| Channel | Information | Note |
|---|---|---|
| 1 | Line 1 in operation | Voltage present on Line 1 |
| 2 | Line 2 in operation | Voltage present on Line 2 |
| 3 | K1/Q1 | Switching element for Line 1 ok |
| 4 | K2/Q2 | Switching elements for Line 2 ok |
| 5 | Automatic | Automatic operating mode (only when there is the option of manual operating mode) |
| 6 | Manual mode | Manual operating mode (only when there is the option of manual operating mode) |

These status messages can be assigned to the respective backlit pushbuttons.

**Programming of outputs**

| | |
|---|---|
| TM 800 only:<br>Outputs A, B, C<br><br>MK800-11 only:<br>Output A | Three digital outputs can be assigned to each status message if required.<br>Select the appropriate output number and the operating mode from the three "output" selection boxes. The default setting for status messages is "no" output.<br>The outputs at TM800 are wired on a terminal strip. The output type depends on the module installed (see also “I/O modules” on page 45). |
| TM800 only:<br>LED No. | You can select whether a status message is to be output to a backlit pushbutton and which backlit pushbutton is to be activated.<br>The backlit pushbuttons at the TM800 are numbered from left to right. Example:<br>1 2 3 4 5<br>6 7 8 9 10<br>11 12 13 14 15 |

Press ✓ to save the settings made thus far (temporary file). Click on 🗋 to program more test addresses.

**Deleting status messages**

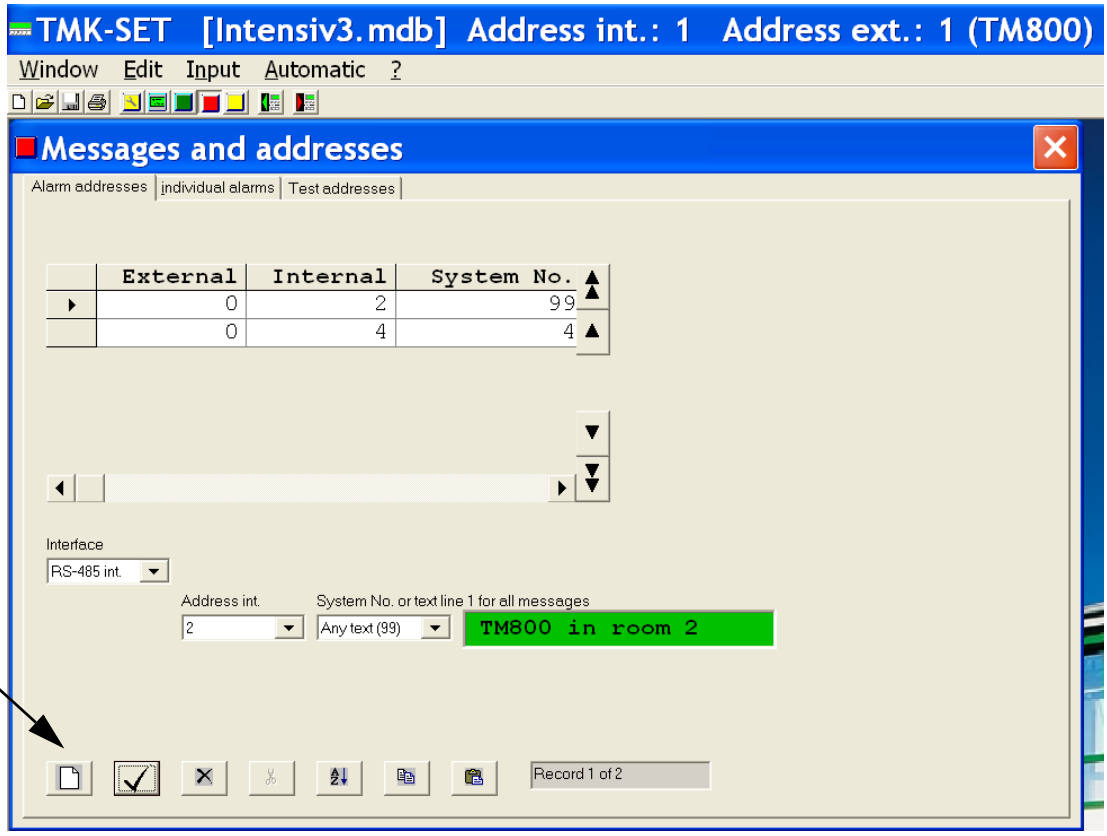
Press ✕ to delete the current data record.

### 4.4.5 Programming messages and addresses

Use this window to set alarm addresses, individual alarms and test addresses.

#### 4.4.5.1 Programming alarm addresses

Setting of bus addresses for devices whose alarm messages are to be displayed as standard texts on the TM/MK device that is to be programmed.
Alarm messages for digital inputs of the TM/MK device to be programmed need not to be programmed. These alarm messages are automatically displayed.
If required, (e.g. when "neutral" is selected) individual alarms can be assigned (see "chapter 4.4.5.2").




1. Press [ ] to create a new data record or use [▲] or [▼] to select an existing data record for editing.
2. Select the address of the device whose alarm messages are to be displayed. Selected addresses are monitored for presence on the BMS bus; if a device cannot be found on the bus, a corresponding message will appear.
3. All alarm messages for the selected device will be indicated on the TM/MK's display. Select the text that you want to appear in the first line of the display. If several systems or areas (e.g. several operating theatres) are connected to the TM/MK device, the numbers 1...4 can be assigned to them. Alternatively, you can enter a text in accordance with your requirements.
4. Press [✓] to save your settings (temporary file).

To program additional alarm addresses, repeat steps 1...4.

**Deleting alarm addresses**

Press [✕] to delete the current data record. If a test address has been programmed for this data record, you will need to delete this address first.

**Save recent settings**

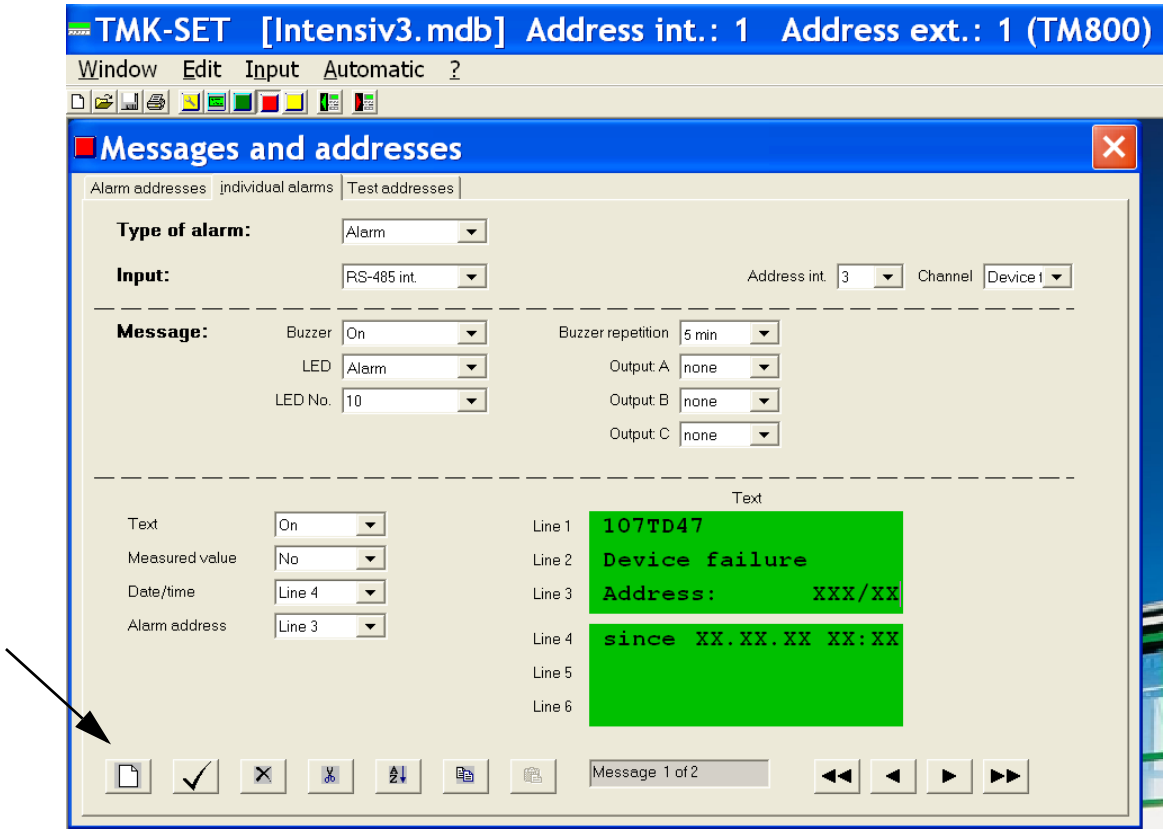
Once all alarm addresses are programmed, click on "Close window". If you have made any recent changes, you will be prompted to save them (temporary file). We also recommend that you save the latest version of the project file ("File -> Save").

### 4.4.5.2 Programming individual alarms

*The settings in the "Individual alarms" window always take priority over those in the "Alarm addresses" window. If an "Individual alarm" has been configured for an address channel, the associated message text will be displayed in its entirety (including blank lines) in the event of an alarm. The settings in the "Alarm addresses" window will be ignored in respect of this channel.*

Here you can configure how and where individual alarms (warnings and alarms) are to be displayed. Individual alarms can:

- trigger a buzzer message,
- be output to an LED (alarm resp. warning),
- be displayed as message text/additional text on the LC display,
- display measured values, time and date and/or the alarm address on this display,
- activate a backlit pushbutton and/or digital output (TM800 only) .



### Creating or selecting a data record

You can create a new data record in the "Individual alarms" window by pressing the button (indicated by an arrow in the above screenshot) or select the data record you wish to edit using .

### Programming the type of alarm

| | |
|---|---|
| Alarm | Set for the majority of applications |
| Prewarning | Possible setting, if prewarnings of the RCMS460/490 are to be displayed. |

### Program type of alarm and input

Select the "Input" to which the device is connected and the status message of which is to be displayed. You may select:

| | |
|---|---|
| RS-485 ext. | External BMS bus. Settings are the same as for RS-485 internal. In addition, in the first box "Address ext.", enter the address of the TM/MK device the signalling device is connected to. |
| RS-485 int. | Internal BMS bus. In the "Address int." box, enter the address of the device whose status message is to be displayed. In the "Channel" box, select the status message channel (see "BMS device channel assignment" instruction leaflet). |
| Digital input | Under "Mode", set the operating mode (alarm at 24 V / 0 V) and type of signal (Impulse/Continuous) and under "No." set the number for the digital input. Settings in the "Individual alarm" window take priority over those in the "Device settings" window (see “Parameter 3” on page 29). |

### Programming a message

A buzzer signal and an LED can be assigned to each individual alarm:

| | |
|---|---|
| Buzzer | Setting whether the buzzer should be activated for this alarm message. You may select:<br>on — Buzzer will sound in the event of this alarm.<br>unchanged — This alarm will not have an effect on the buzzer. If the buzzer was silent before, it will remain silent. |
| LED | Setting whether the "WARNING" or "ALARM" LEDs (or neither of them) should light up when an alarm message occurs. |
| Buzzer repetition | If an alarm message is triggered, the buzzer can be muted by using the "Buzzer off" key at the TM/MK device.<br>However, just in case you forget about the pending message, the buzzer will sound again once the time specified in the "Buzzer repetition" box has elapsed. |
| TM 800 only:<br>Outputs A, B, C<br><br>MK800-11 only:<br>Output A | Three digital outputs (TM800) or one digital output (MK800-11) can be assigned to each individual alarm.<br>Select the appropriate output number and the operating mode from the "Output" selection boxes. The default setting for status messages is "no" output.<br>The outputs at TM800 are wired on a terminal strip. The output type depends on the module installed (see also “I/O modules” on page 45). |

| | |
|---|---|
| TM800 only:<br>LED No. | You can select whether an individual alarm is to be output to a backlit pushbutton and which backlit pushbutton is to be activated.<br>The backlit pushbutton at the TM800 are numbered from left to right. Example:<br>1 2 3 4 5<br>6 7 8 9 10<br>11 12 13 14 15 |

**Alarm messages arriving via the BMS bus**

**Example 1: Insulation monitoring device with load and temperature monitoring 107TD47:**

| Channel | Information | Note |
|---|---|---|
| 0 | Device failure | 107TD47 failure |
| 1 | INSULATION FAULT* | The insulation resistance is lower than the response value. |
| 2 | Overcurrent* | The load current has exceeded the response value. |
| 3 | Overtemperature | The transformer temperature has exceeded the response value. |
| 4 | Connection fault | Test lead wire break. |
| 5 | PE connection fault | PE wire break. |
| 6 | Transformer short-circuit | The transformer connection for measuring the current has been short-circuited. |
| 7 | Connection fault | Transformer connecting cable wire break. |
| 8 | Alarm OP light | Insulation fault in the IT system for the operating theatre lights. The message originates from the NC contact of an external insulation monitoring device. |
| 9 | Device error | Internal 107TD47 error. See documentation relating to the 107TD47. |

* *As far as these messages are concerned, measured values can also be displayed.*

**Example 2: PRC487 control and indicating device:**

| Channel | Information | Note |
|---|---|---|
| 0 | Device failure | PRC487 failure |
| 1 | Failure line 1 | The voltage on line 1 is below the response value. |
| 2 | Failure line 2 | The voltage on line 2 is below the response value. |
| 3 | Failure distribution board | The voltage downstream of the changeover module is below the response value. |
| 4 | Failure N conductor | The line 1 neutral conductor has failed. |
| 5 | Failure K1 | The switching element on the preferred supply has failed (K1 or Q1) |
| 6 | Failure K2 | The switching element on the second supply has failed (K2 or Q2). |
| 7 | Failure K3 | The K3 relay has failed (internal component of the SUE487 voltage monitor). |
| 8 | Device error | Internal PRC487 error |
| 9 | K1/2 manual mode | The contactor control is changed to manual mode. Automatic changeover no longer takes place! |
| 10 | Short-circuit distribution panel | Short-circuit downstream of the changeover module. |

**Example 3: Residual current evaluator RCMS460/490:**

| Channel | Information | Note |
|---|---|---|
| 0 | Device failure | RCMS failure |
| 1...12 | a) Prewarning | when the value drops below or exceeds the prewarning response value |
| | b) Alarm | when the value drops below or exceeds the alarm response value |
| | c) System fault alarm for channel | System fault alarm (cannot be set individually):<br>- CT interruption<br>- CT short-circuit |

### Programming message and additional texts

You can assign alarm texts and additional text to each alarm message which is indicated on the TM/MK's display.

| | |
|---|---|
| Alarm text | on Text message will be output.<br>off Text message will not be output. |
| Measured value | If an alarm message or a measured value is output, it can be indicated on a line of your choice. If no measured value is to be displayed, enter no in this selection box. |
| Date/time | The date and time of an event can be indicated in any line. |
| Alarm address | As an aid to in-house technical personnel, the alarm address of the device triggering this alarm message can be indicated in any line. We recommend that the additional text is used for this purpose in order to avoid burdening medical personnel with this technical information. |
| Message text (lines 1...3) | Click into the relevant text line and enter your text. When an alarm message occurs, this text will appear on the TM/MK's display. |
| Additional text (lines 4...6) | Click into the relevant text line and enter your text. Whenever an alarm message is pending, the associated additional text can be indicated on the TM/MK's display by pressing the "Add. text" button. |

*The settings in the "Individual alarms" window always take priority over those in the "Alarm addresses" window. If an "Individual alarm" has been configured for an address channel, the associated message text will be displayed in its entirety (including blank lines) in the event of an alarm. The settings in the "Alarm addresses" window will be ignored in respect of this channel.*

### Programming more individual alarms

Press ✓ to save the settings made thus far (temporary file). To program additional alarm addresses, repeat the steps described in the chapter “Creating or selecting a data record” on page 38.

### Deleting individual alarms

Press ✕ to delete the current data record. If a test address has been programmed for this data record, you will need to delete this address first.

### Save recent settings

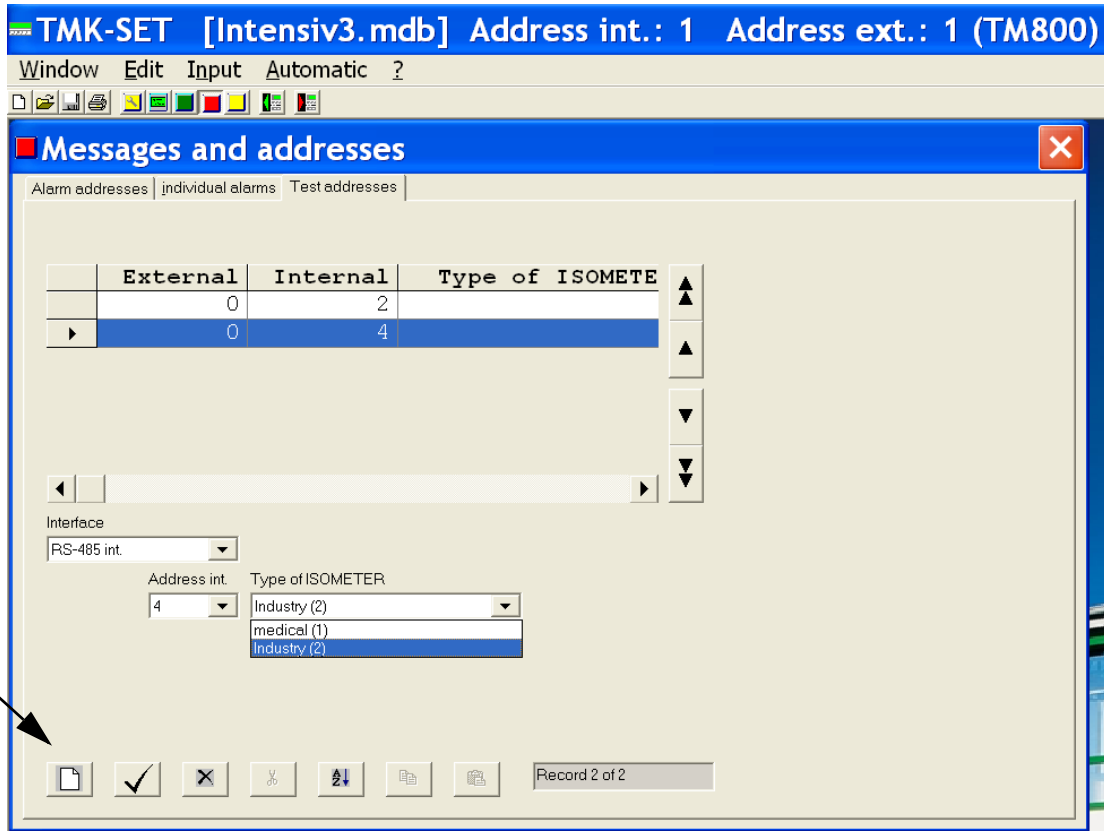
Once you have finished programming all the individual alarms, click on "close window". If you have made any recent changes, you will be prompted to save them (temporary file). We also recommend that you save the latest version of the project file ("File -> Save").

#### 4.4.5.3 Programming test addresses

This is where you specify the BMS bus addresses of the insulation monitoring devices that are to be tested by pressing the "TEST" button on the TM/MK device. You can specify up to 30 addresses (TM800/MK800: 50 addresses). The test is carried out sequentially and evaluated automatically.
The setting can only be made for devices which have also been activated in the "Alarm addresses" window and/or programmed for individual alarm texts.

Individual alarm texts are a minimum requirement for:

- Channel 1...3 (setting "medical (1)")
- Channel 1 (setting "Industrial (2)").




1. Press to create a new data record or use ▲ or ▼ to select an existing data record for editing.
2. Select the address of the device you want to run the test on.
3. Select the type of insulation monitoring device.
4. Press ✓ to save your settings (temporary file).

To program additional test addresses, repeat steps 1...4.

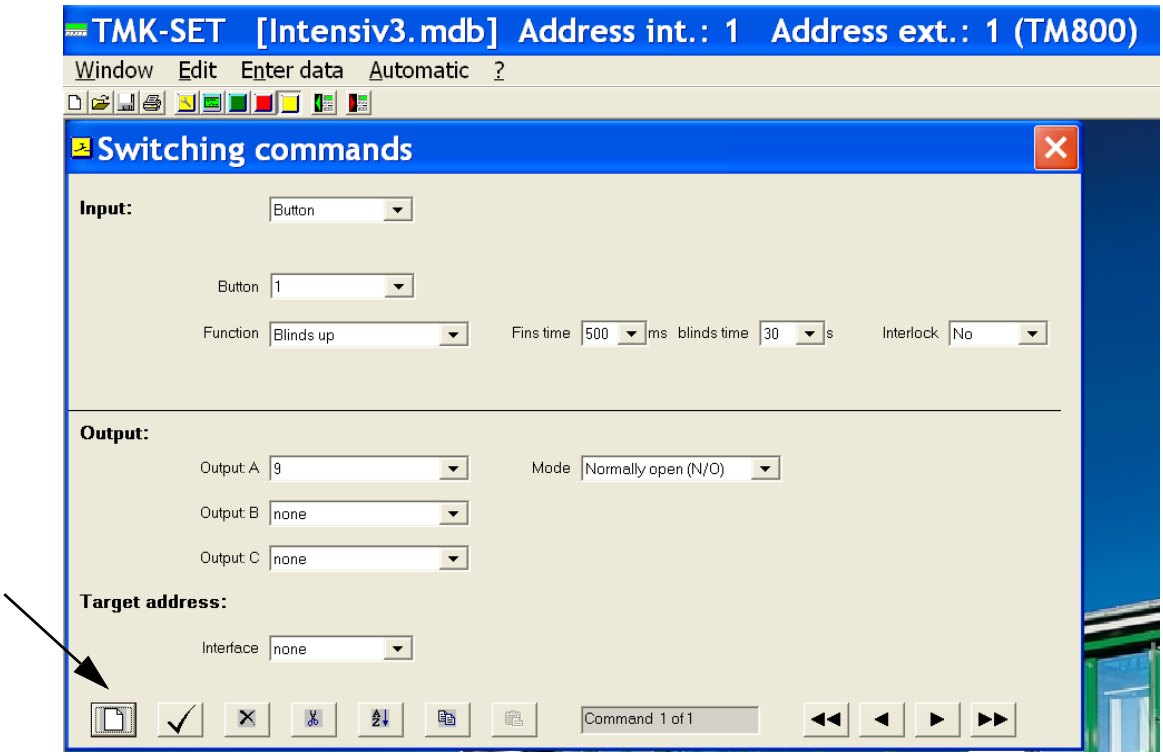
**Save recent settings**

Once you have programmed all test addresses, click on "Close window". If you have made any recent changes, you will be prompted to save them (temporary file). We also recommend that you save the latest version of the project file ("File -> Save").

### 4.4.6 Programming switching commands

Only TM800 features the "Switching commands" menu. One switching command can be assigned to each backlit pushbutton of a TM800. These commands can be necessary for lighting system controls, blinds controls or for the operation of an air conditioning system.

Switching commands can be used in combination with backlit pushbuttons or digital inputs. The backlit pushbutton resp. the digital input and its function have to be defined.




#### Creating or selecting a data record

You can create a new data record in the "Switching commands" window by pressing the button (indicated by an arrow in the above screenshot) or select the data record with .

#### Programming an input

| | | |
|---|---|---|
| TM 800 only:<br>Input | Digital input<br>Button | Switching command is activated by the digital input.<br>Switching command is activated by pressing the backlit pushbutton. |
| Settings for "Button" | Select the backlit pushbutton the switching command of which is to be programmed from the "Button" box. Up to 120 backlit pushbuttons can be controlled via the TM800. The backlit pushbuttons at the TM800 are numbered from left to right. Example:<br>1 2 3 4 5<br>6 7 8 9 10<br>11 12 13 14 15 | |
| Settings for "Digital input" | Set the channel number and operating mode (Active at 24 V/Active at 0 V). | |

| | |
|---|---|
| Function | Select the action that is to be initiated by a switching command:<br><br>Test ISOMETER — Check an individual Isometer via the bus (same function as the test button at the device)<br>Switch — Up to three outputs and one bus address possible<br>Reference value + — Up to three outputs and one bus address possible<br>Reference value - — Up to three outputs and one bus address possible<br>Buzzer mute*) — Deactivates the buzzer activated by an alarm message (internal function)<br>Lamp test*) — Switches all LEDs on the TM800 to check their function (internal function, in addition three outputs possible)<br>EDS start/stop*) — Starts or stops an insulation fault location system connected within a BMS network (internal function)<br>EDS/RCMS reset*) — Reset of all messages of an EDS or RCMS (internal function)<br>Pushbutton — Up to three outputs and one bus address possible; Switch off delay can be set<br>Blinds up — Up to three outputs and one bus address possible. Interlocking with "Blinds down" required; slat blinds and in-motion time can be set<br>Blinds down — Up to three outputs and one bus address possible. Interlocking with "Blinds up" required; slat blinds and in-motion time can be set<br>Button on — Up to three outputs and one bus address possible; On delay can be adjusted<br>Button off — Up to three outputs and one bus address possible; Switch off delay can be set<br>* *This function can be programmed via max. one pushbutton and/or one digital input.* |

**Programming of outputs**

| | |
|---|---|
| Outputs A, B, C | Three digital outputs can be assigned to each switching command, if required. Select the appropriate output number and the operating mode from the three "Output" selection boxes. The default setting is "none".<br>The outputs at TM800 are wired on a terminal strip. The output type depends on the module installed (see also “I/O modules” on page 45). |

*N/C operation (N/C):* *During normal operation the output is active and will be inactive once the switching command is completed.*

*Normally open (N/O):* *During normal operation, the output is inactive and will be active once the switching command is completed.*

### I/O modules

| Type of module | Features |
|---|---|
| BMI8/8 | 8 digital inputs, 8 open collector outputs.<br>The open collector outputs are capable of driving a load of up to 15 W, at an operating voltage of 24 V. They feature flyback diodes for the connection of relays. |
| BMI8/4 | 8 digital inputs, 4 relay outputs.<br>The digital outputs correspond to those of BI8/8 module. The potential-free output relays feature one changeover contact each AC 250 V, 5 A (AC1). |
| BMI0/4 | Expansion for BMI8/4 by 4 relay outputs. The BMI0/4 module can only be used in conjunction with BMI8/4. The potential-free output relays feature one changeover contact each AC 250 V, 5 A (AC1). |

### Programming the target address

If a device on the BMS bus is to be addressed by a switching command (e.g. TM800 on the external BMS bus or SMO481 on the internal bus), select the target address here:

| | |
|---|---|
| Interface | Select the interface where the device to be addressed is connected to. You may select: "None", "RS-485 external" (external BMS bus) or "RS-485 internal" (internal BMS bus). |
| Address | Select the (external and) internal address of the device to be addressed by a switching command. |
| Channel | Select the channel of the device to be addressed by a switching command. |

### Programming additional switching commands

Press  to save the settings made thus far (temporary file). To program additional switching commands, repeat the steps described in chapter “Creating or selecting a data record” on page 43.

### Deleting switching commands

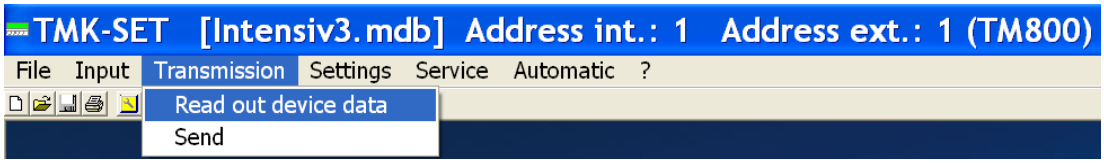
Press  to delete the current data record.

### Save recent settings

Once all switching commands are programmed, click on "Close window". If you have made any recent changes, you will be prompted to save them (temporary file). We also recommend that you save the latest version of the project file ("File -> Save").

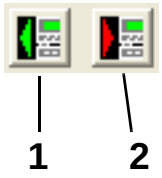
## 4.5 TRANSMISSION menu

Use the "Transmission" menu for data transmission between the PC with TMK-SET and a TM/MK device. Before starting data transmission, set the respective PC interface (see “SETTINGS menu” on page 52).




**Buttons**

As an alternative to the "Transmission" menu, you can also use the following buttons to read out and program the MK2430.

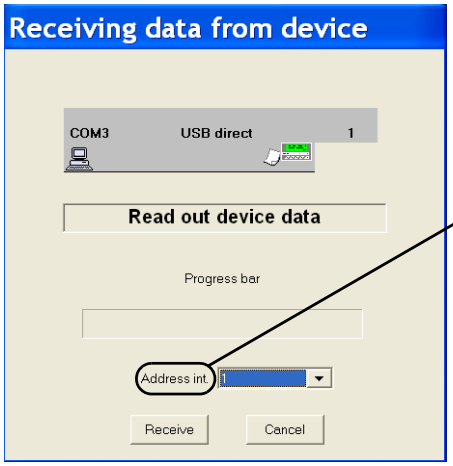



1 Read out data from device
2 Send data to device

### 4.5.1 Read out device data

TMK-SET downloads the settings from a TM/MK device that has already been programmed to your PC and displays all texts and parameters. If required, changes can be entered in TMK-SET or the configuration file can be used to program another TM/MK device with an identical or similar function.

1. Select "Transmission -> Read out device data".




2. Select the address of the TM/MK device the data of which is to be read out (e.g. address 1). If you are using the USB interface, select the address which is set in the TM/MK device for the internal BMS bus.
3. Click on the "Receive" button.

Data transmission from the TM/MK device to the PC is being started. The progress bar will tell you when transmission is complete.

### 4.5.2 Send data to device

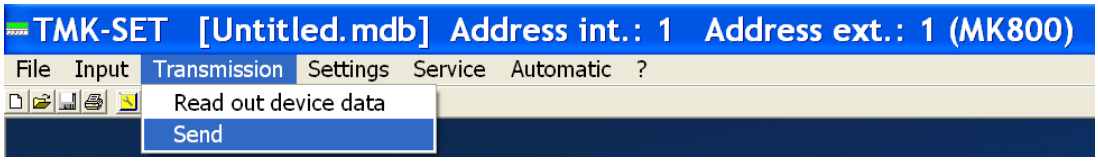
*First, you need to set the BMS bus address at each device correctly (see „BMS bus“ instruction leaflet. Only then connect the devices to the BMS bus system.*

*Make sure that the interface cable remains connected during data transmission, in order to prevent incomplete parameterisation of TM/MK device. If the cable is unplugged, there may also be the risk of a TMK-SET software crash.*

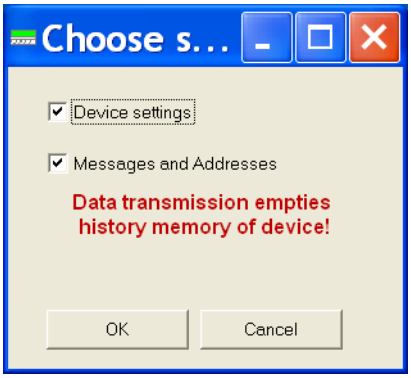
*TMK-SET sends data to the address selected under "Parameter 1". Exception: If individual new devices are to be programmed, a new address can be assigned during sending instead of the factory set address.*

*By sending "Messages and addresses" you will delete messages stored in the history memory of the TM/MK device. Save messages you may require before sending data (e.g. using the TMK-HISTORY).*

1. Select "Transmission > Send data to device".




2. It is always the data from the current temporary file that is transmitted. Select "☑ Device settings" and/or "☑ Messages and Addresses" for transmission to the TM/MK device. If a password query is activated in the TM/MK device, enter a password.



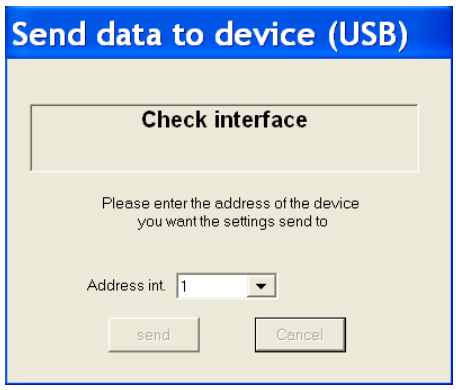


The following pages contain detailed information about sending data.

#### 4.5.2.1 Sending device settings

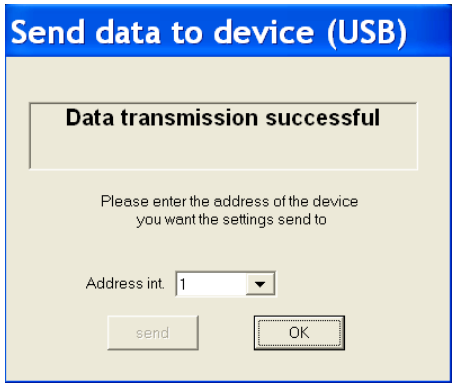
1. Select the current address of the TM/MK device. Click on the "Send" button.


2. TMK-SET will check the interface. If a password is enabled on the TM/MK device, a password query will appear. Enter the password.





3. Data is being sent to the TM/MK device. Once transmission is complete, the TMK-SET will send the message telling you that data transmission was successful. Click on "OK".

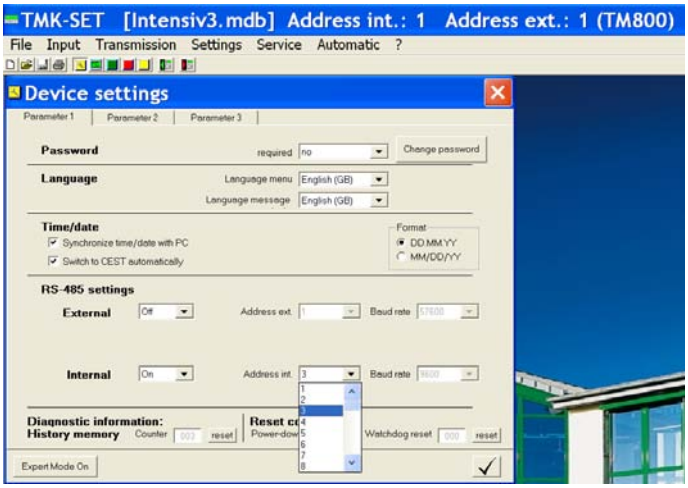



#### 4.5.2.2 Sending device settings to other TM/MK devices

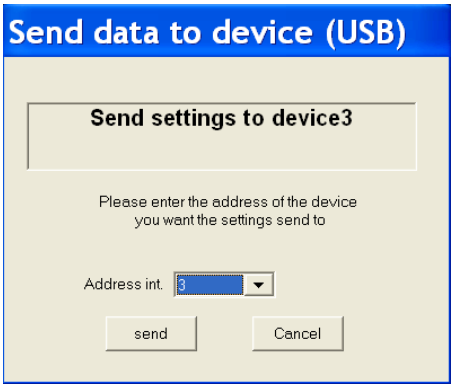
TMK-SET sends the device settings to the address set under "Parameter 1". These device settings can be "copied" to other TM/MK devices.

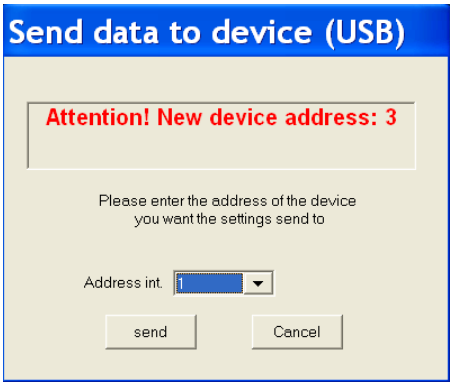
Example: A new TM/MK device is to be programmed with address 3 using the same device settings as used for the TM/MK device with address 1.

1. It is always the data from the current temporary file that is transmitted. Create this temporary file as follows: Read out the TM/MK device with address 1 or open the file containing the stored TM/MK device data.
1. Enter the new address under "Parameter 1".

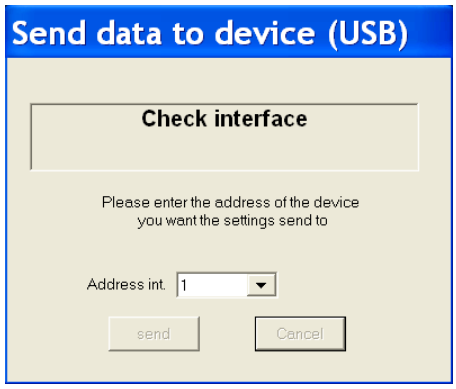



2. Select "Transmission -> Send", then "☑ Device settings". Click on "Send".
3. Select the current address of the device from the window "Send data to device".
   - The new TM/MK device still has address 1 (factory setting). Therefore, select "1" and confirm with "send".
   - TMK-SET recognises that a new address is to be assigned to the device. Click on "Send".



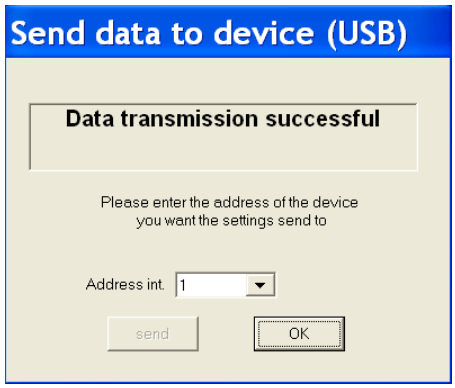



4. TMK-SET will check the interface. If a password is enabled on the TM/MK device, a password query will appear. Enter the password.





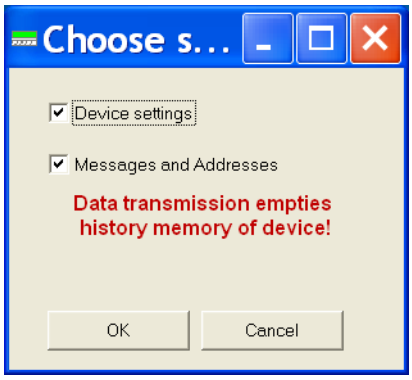
5. Data is being sent to the TM/MK device. Once transmission is complete, the TMK-SET will send the message telling you that data transmission was successful. Click on "OK".


Now the TM/MK device has address 3. All other settings are copied from the TM/MK device with address 1.

#### 4.5.2.3 Sending messages and addresses

1. Select "Transmission > Send", then select "☑ Messages and Addresses". Click on "OK" and "Send" in the next window.

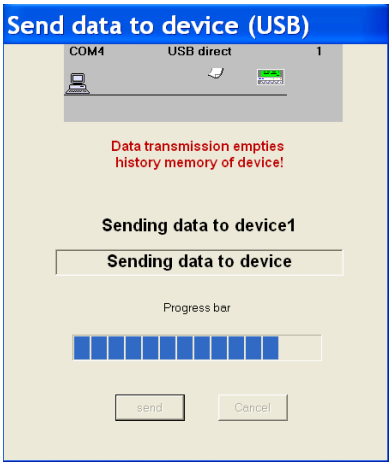


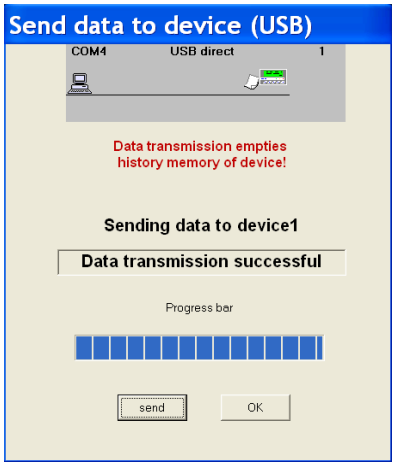


2. TMK-SET will check the interface. If a password is enabled on the TM/MK device, a password query will appear. Enter the password.



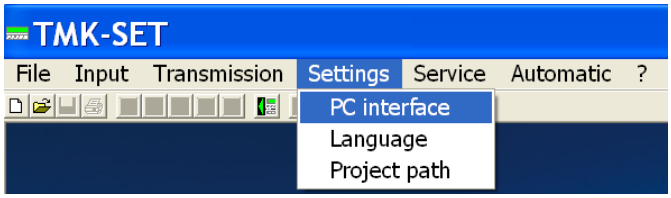
3. Data is being sent to the TM/MK device. Once transmission is complete, the TMK-SET will send the message telling you that data transmission was successful. Click on "OK".

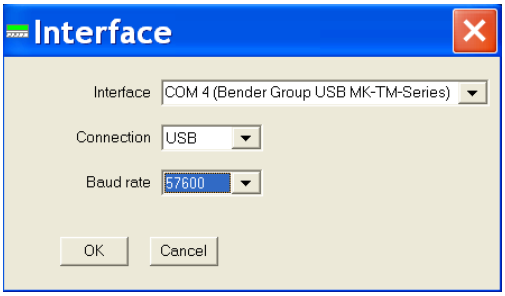
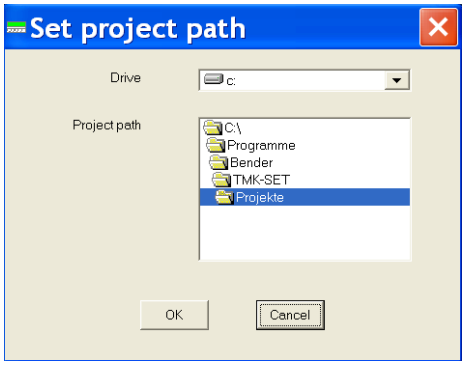


## 4.6 SETTINGS menu

This menu is used to configure the PC interface, to set the language for using the TMK-SET menus and to select the directory for saving the project files.

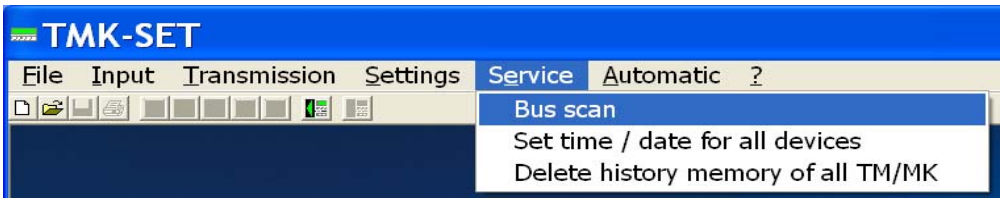



| | |
|---|---|
| PC interface |  <br>**Interface:**<br>Select the serial interface "COM1" ... "COMx" for data transmission to the TM/MK device.<br>Only if you are using a USB interface: The number of an unassigned COM interface will be assigned to the USB interface USB (see “Install the USB driver” on page 15). Select this setting in order to transfer data via a USB interface. Only available **and** free interfaces (not being used by another program) will be displayed.<br>**Baud rate:**<br>For the external BMS bus only: Make sure that the baud rate value set in TMK-SET is identical to that set in the TM/MK-device. Data transmission may fail in case of two different settings. |
| Language | Selection of the operating language for TMK-SET<br>(German, English, French, Polish...). |
| Project path |  <br>Specify under "Drive" and "Project path" (by double-click) where the TM/MK device settings are to be saved. |

## 4.7 SERVICE menu

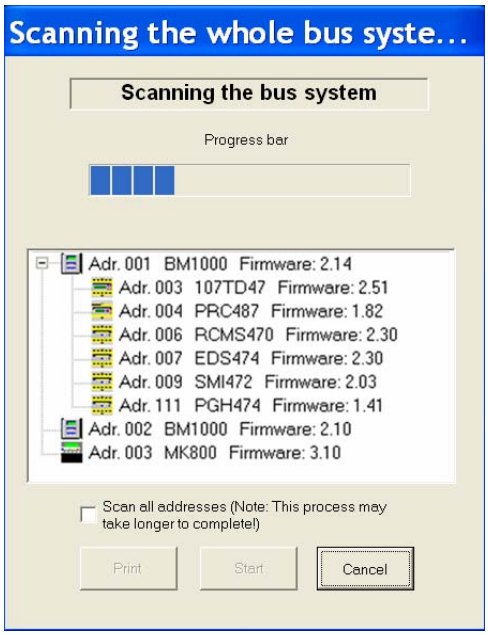
Use this menu for BMS bus scanning, for setting the time for all devices at the BMS bus and for clearing the history memory of all TM/MK devices.

### 4.7.1 Bus scanning




The "Bus scan" function is used to scan the entire BMS network. All detected devices are displayed including their device addresses and version numbers. This overview makes the programming process easy. You can also use this function to check that all devices have been connected correctly and their bus addresses have been set correctly.

*This function will only be available, if TMK-SET is connected to the BMS bus (RS-485 interface). If the direct USB connection is used for the TM/MK device, this function is not available.*

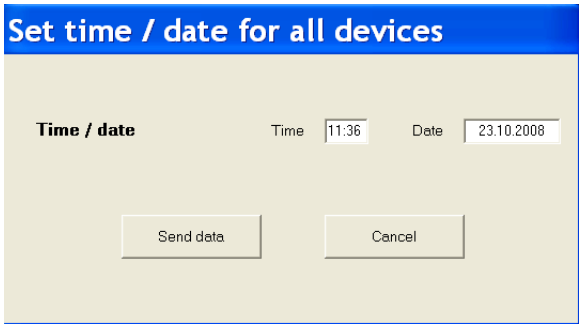



1. The bus scanning process stops as soon as the system detects a series of unassigned consecutive addresses. If you want to scan the entire BMS bus, select "Scan all Addresses".
2. Click on the "Start" button. Bus scanning will now commence. The progress bar will tell you when transmission is complete.
3. At the end of the process, you can view the address, type and firmware version of the devices detected during the scan. Click on the "Print" button if you want to print out the list.

### 4.7.2 Setting time and date for all devices

In a networked system, the TM/MK device with address 1 determines time and date of the entire system. The settings are transmitted to all TM/MK devices. Time and date of the system, however, can be set at any TM/MK device.

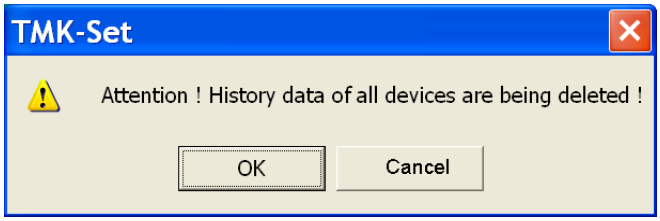
*This function will only be available, if TMK-SET is connected to the BMS bus (RS-485 interface). If the direct USB connection is used for the TM/MK device, this function is not available.*




### 4.7.3 Clearing the history memory of all TM/MK devices

Alarm messages with date and time are automatically stored in the history memory. In this way, detailed information about the accrued alarm messages is available at any time.
Click on "OK" in order to clear the history memory of all TM/MK devices.

*This function will only be available, if TMK-SET is connected to the BMS bus (RS-485 interface). If the direct USB connection is used for the TM/MK device, this function is not available.*



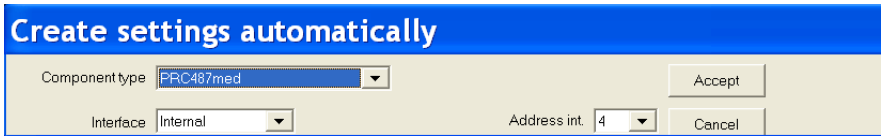
## 4.8 AUTOMATIC menu

The "Automatic" menu allows a semi-automatic programming of the TM/MK device. This menu is only available when a project file is open.


### 4.8.1 Alarm messages semi-automatic setup

This menu item will assist you in programming alarm messages. TMK-SET will make suitable suggestions in respect of device selection and appropriate individual message texts. However, semi-automatic setup is of course no substitute for your knowledge of the BMS network and its bus devices: Such knowledge is a prerequisite for programming!

After you call semi-automatic setup, a window will open in which you can select the first device for the purpose of programming individual messages.

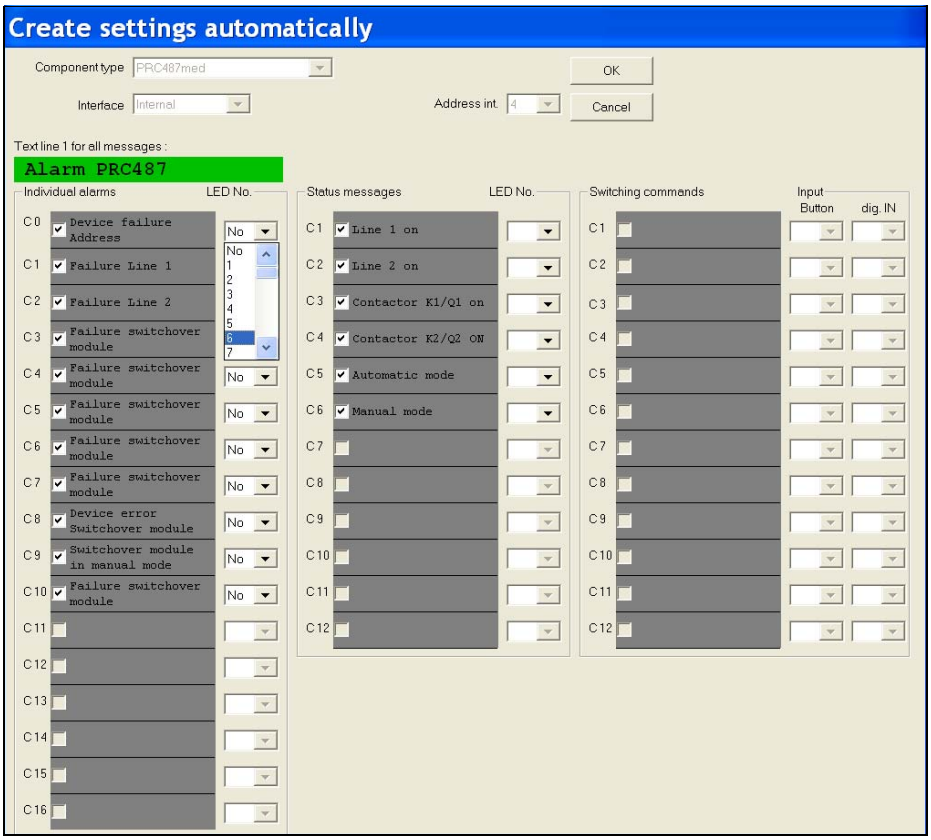



1. Under "Component type", select the device that you want to program first. If the device is saved with the suffix "med", messages relevant for the medical personnel already are preset.
2. The first free device address within the address range (e.g. address 4 for the PRC487 control and indicating device) is suggested. Compare the default settings with your actual BMS network and modify the suggested device address, if necessary.
3. Click on the "Accept" button.

#### 4.8.1.1 Semi-automatic programming of the selected device

The input screen consists of three columns:

| | |
|---|---|
| Individual alarms | All kinds of messages of this device. |
| Status messages | All kinds of messages of this device. |
| Switching commands | A switching command can be defined here, if the selected device (e.g. insulation monitoring device 107TD47, SMO481-12, RCMS4xx) is able to process the switching commands.<br>All other switching commands have to be programmed individually and manually in the "Input > switching commands" menu. |




**Programming individual alarm messages**

1. Enter a message text that is to be displayed for all individual alarm messages in the first line.
2. With the mouse, check the boxes for any individual alarm messages you want to appear on the TM/MK's display.
3. In addition, an alarm LED (backlit pushbutton) can be activated on the occurrence of the respective alarm message. If this is required, the number of the backlit pushbutton has to be selected from the box on the right.
   If several alarm messages have been assigned to a backlit pushbutton at the same time, TMK-SET will indicate this, however it will also accept double assignment. The user is responsible for a reasonable assignment of the messages to the backlit pushbuttons.

**Programming status messages**

1. With the mouse, check the box for the status message that is to be displayed on the backlit pushbutton.
2. Except for the three lines of the standard display, status messages cannot be displayed on the TM800's display; they have to be assigned to a backlit pushbutton. Therefore, it is absolutely necessary to assign a backlit pushbutton to an activated status message. If several alarm messages have been assigned to a backlit pushbutton at the same time, TMK-SET will indicate this, however it will also accept double assignment. The user is responsible for a reasonable assignment of the messages to the backlit pushbuttons. However, an assignment of a status message and an alarm message at the same time will not be accepted!

**Programming switching commands**

- A semi-automatic programming of switching commands can only be defined here, if the selected device (e.g. an insulation monitoring device 107TD47, SMO481-12, RCMS4xx) is able to process switching commands.
  Example: Assignment of the test button function of insulation monitoring devices to backlit pushbuttons. In this way, a test button can be assigned to each insulation monitoring device within a BMS network.
- All other switching commands (e.g. OP lights, air conditioning, ventilation) have to be programmed individually and manually in the "Input > switching commands" menu.

**Confirming your programming settings**

When you have finished all the required settings for this device, click on the "OK" button.

**Programming additional devices**

- Configure each device on the BMS network individually as described above.
- When you have finished configuring all the devices, click on the "Exit" button.

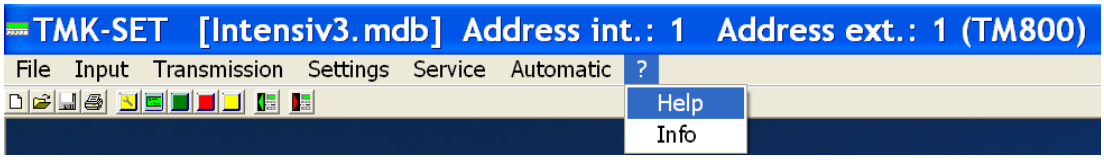
If you need to carry out any fine-tuning or if you need to program switching commands, select the relevant settings from the "Input" menu.

**Saving and sending your settings to the TM/MK device**

- Save the project file to your PC (File -> Save).
- Send your settings to your TM/MK device (Transmission -> Send).

## 4.9 Help menu

You can access the following information via the "?" menu:




| | |
|---|---|
| Help | Online user help |
| Info | Software version |

## 4.10 Example for programming a TM/MK device

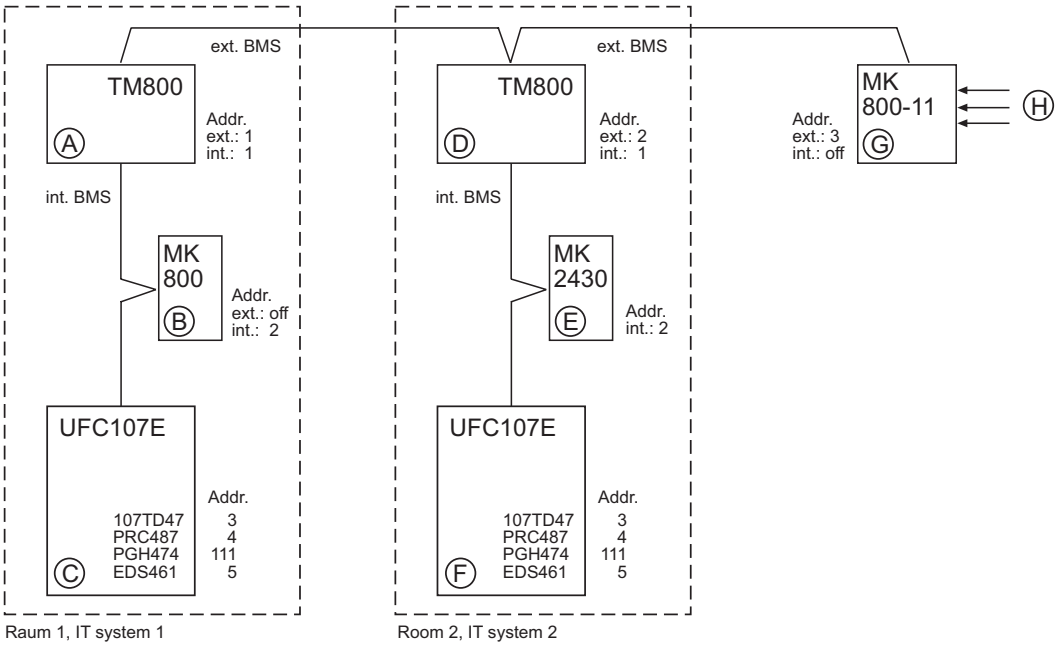
### 4.10.1 Essential information

TMK-SET makes light work of programming TM/MK devices on a BMS network. However, in order to carry out programming, you will still need a sound knowledge of the BMS network and all the its components. You will need to know:

- How the network is structured. Which devices are connected via the internal/external BMS bus.
- The addresses of all the devices on the network. Never assign one address twice.
- Which messages are to be displayed where. Is there a central TM/MK device installed in the central instrumentation and control room which is set up to receive all messages from all devices?
- Is third-party equipment connected to the system via the digital inputs or interface converters?

### 4.10.2 Example

An intensive care unit with two IT systems is supplied via two UFC107E-.. changeover and monitoring modules with an integrated insulation fault location system. As an alternative to the EDS474 insulation fault evaluator, the EDS461 can also be used.




- All messages from the entire BMS bus system are to be displayed on the TM800 Ⓐ, Ⓓ and the MK800-11 Ⓖ .
- All messages from the assigned ⒷUFC107E Ⓒ are to be displayed on MK800.
- All messages from the assigned Ⓔ UFC107E Ⓕ are to be displayed on MK2430.
- All messages concerning medical gases arrived at the digital inputs Ⓖ are to be displayed on ⒽMK800-11.
- The Isometers in the two UFC107E Ⓐ, Ⓓ and Ⓖ are to be tested by the TM/MK devices Ⓒ Ⓕ.
- The UFC107E Ⓑis to be tested Ⓒ by the MK800.
- TheⒺ UFC107E Ⓕ is to be tested by the MK2430.

#### 4.10.2.1 Address settings

| Device | Parameters | External address | Internal address |
|---|---|---|---|
| **UFC107E changeover and monitoring module Ⓒ** | | | |
| **107TD47** | Address | - | 3 |
| **PRC487** | Address | - | 4 |
| **PGH474** | Address | - | 111 |
| **EDS461** | Address | - | 5 |
| **UFC107E changeover and monitoring module Ⓕ** | | | |
| **107TD47** | Address | - | 3 |
| **PRC487** | Address | - | 4 |
| **PGH474** | Address | - | 111 |
| **EDS461** | Address | - | 5 |
| **Alarm indicator and operator panels, alarm and test combinations** | | | |
| **TM800Ⓐ** | Address | 1 | 1 |
| | Test address | 2/3 | 3 |
| | Alarm address | 2/0, 2/2, 2/3, 2/4, 2/5, 2/111, 3/0 | 2, 3, 4, 5, 111 |
| | Individual alarms | 2/5 | 5 |
| **MK800Ⓑ** | Address | Off | 2 |
| | Test address | - | 3 |
| | Alarm address | - | 1, 3, 4, 5, 111 |
| | Individual alarms | - | 5 |
| **TM800Ⓓ** | Address | 2 | 1 |
| | Test address | 1/3 | 3 |
| | Alarm address | 1/0, 1/2, 1/3, 1/4, 1/5, 1/111, 3/0 | 2, 3, 4, 5, 111 |
| | Individual alarms | 1/5 | 5 |
| **MK2430Ⓔ** | Address | not available | 2 |
| | Test address | - | 3 |
| | Alarm address | - | 1, 3, 4, 5, 111 |
| | Individual alarms | - | 5 |
| **MK800-11 Ⓖ** | Address | 3 | Off |
| | Test address | 1/3, 2/3 | - |
| | Alarm address | 1/0, 1/2, 1/3, 1/4, 1/5, 1/111, 2/0, 2/2, 2/3, 2/4, 2/5, 2/111 | - |
| | Individual alarms | 1/5, 2/5 | - |

0 = no internal address; the device is on the external bus.

# 5. Troubleshooting

In order to operate correctly, the TM/MK requires a bus system that has been assembled and configured correctly. Please refer to the corresponding documentation.

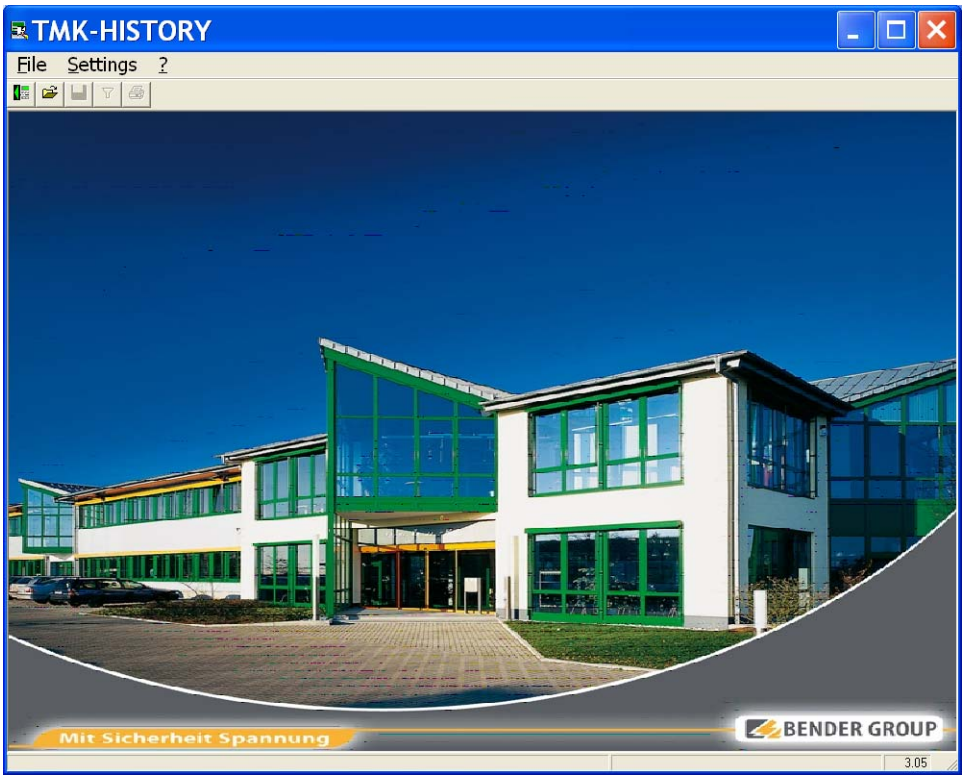
Below please find a selection of errors likely to occur and how to eliminate them.

| Error | Possible cause |
|---|---|
| Error during message transfer or device settings via the USB interface. | a) Incorrect TM/MK device address or baud rate setting (menu);<br>b) TM/MK device address does not match the setting in the TMK-Set configuration software;<br>c) USB cable faulty or assembled incorrectly;<br>d) Incorrect PC interface (COM interface) set in TMK-SET;<br>e) USB driver not installed correctly. |
| Error during message transfer or device settings via the BMS bus. | a) Incorrect TM/MK device address or baud rate setting (menu);<br>b) TM/MK device address does not match the setting in the TMK-Set configuration software;<br>c) Incorrect setting of address of connected BMS bus devices;<br>d) Project file created using an incompatible version of TMK-SET;<br>e) Interface cables A/B mixed up;<br>f) BMS bus terminated incorrectly or not at all;<br>g) Incorrect PC interface set in TMK-SET.<br>h) Function not supported by BMS master firmware version. |
| The bus scan is not picking up some devices even though the addresses, bus cable and termination are correct. | The device addresses have not been assigned in consecutive order.<br>Addresses have not been assigned uniquely. |
| Malfunction of the digital inputs. | a) Digital inputs not programmed correctly with TMK-SET (check "OFF" position).<br>b) Connection fault. |
| Error during data transmission via USB interface (e.g. Read data from device). | The correct sequence has not been observed: "First, connect the TM/MK to the power supply, then connect the USB cable". |
| Bus scan not working. "Error during data transmission to master". | a) Function not supported by BMS master firmware version.<br>b) PC not connected via RS-485. |

# 6. Operating and setting TMK-HISTORY

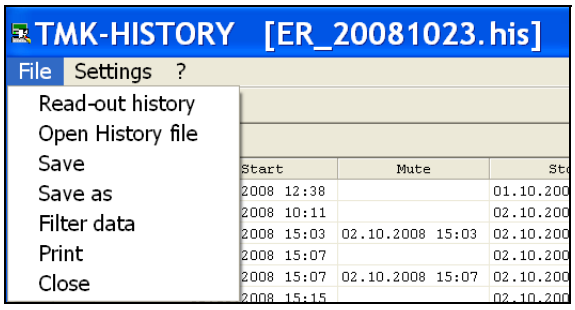
## 6.1 Starting the program

Once installation is complete, a link to TMK-HISTORY appears on the display of your PC. Double-click this link to launch TMK-HISTORY. You will then be able to call up the individual software functions (File, Settings, ...).



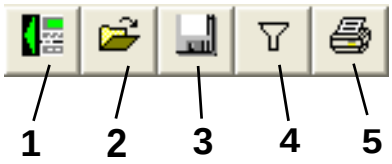

## 6.2 FILE menu

The "File" menu is used to read out, save, filter and print the data of a TM/MK history memory.



### 6.2.1 Button functions

The "File" menu functions are also accessible via buttons.




| | |
|---|---|
| 1 | Read out history memory |
| 2 | Open history file |
| 3 | Save file |
| 4 | Filter data |
| 5 | Print |

If you use the mouse button to hover over a button without clicking on it, a tooltip will appear. By clicking on the buttons you can call up the respective function.

### 6.2.2 Read out history memory

The history memory data of a connected TM/MK device can be read out. The data can be saved, filtered and printed.

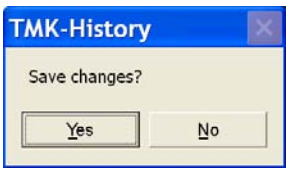
1. Select "File -> Read out history".


2. Select the address of the TM/MK device the data of which is to be read out (e.g. address 1). If you are using the USB interface, select the address which is set in the TM/MK device for the internal BMS bus.
3. Click on the "Receive" button. - The progress of data transmission will be indicated.

4. The progress of data transmission is also indicated by the TM/MK device:

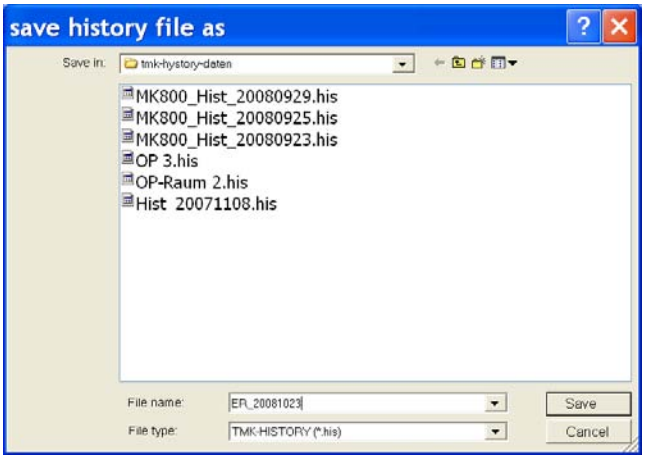
   **History memory**
   **is being transmitted!**
   **Status: Connect. OK**
   **Data record No.: 187**

5. After successful data transmission, click on the "OK" button.
6. Now, TMK-HISTORY will ask you whether you want to save the data.



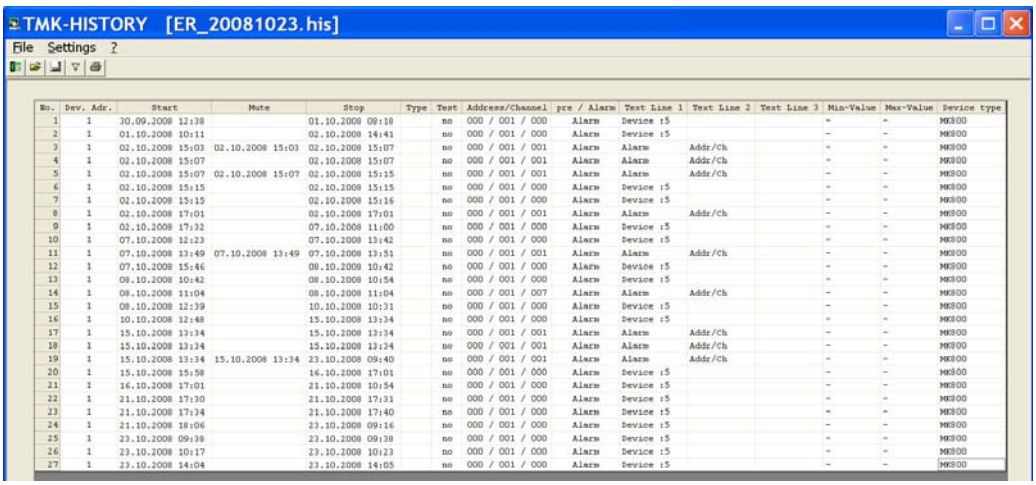

   Click on the "Yes" button to save the data.

7. Enter where and under which name the file is to be saved.




   Then click on the "Save" button.

8. Now the contents of the history memory will be represented in tabular form. Each column of the table can be used as a condition for data filtering.

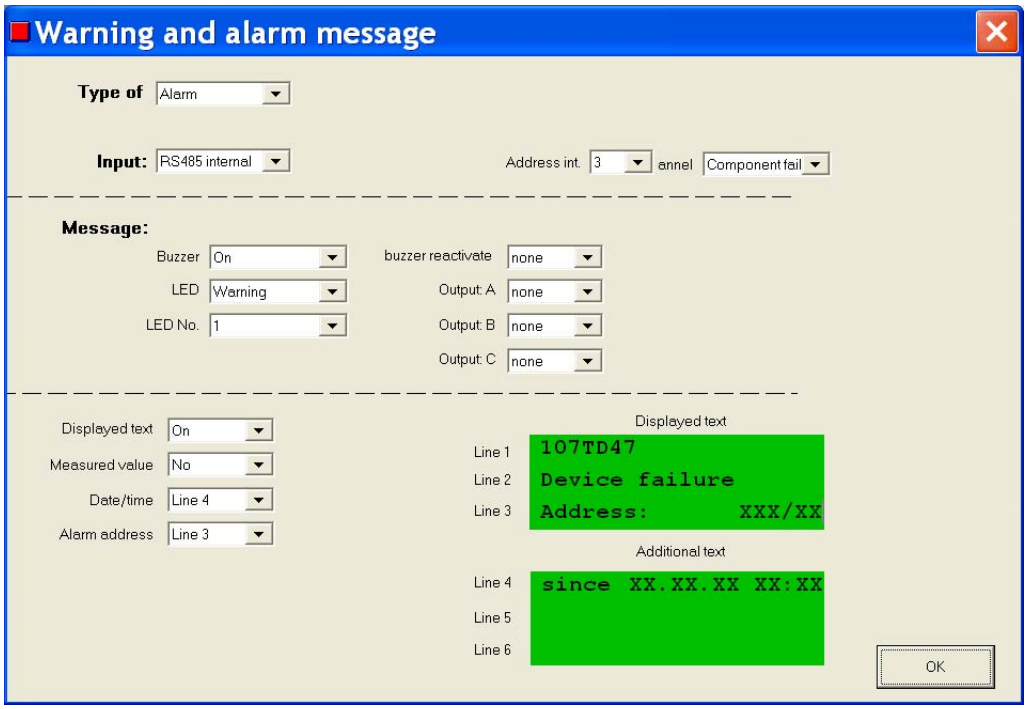


#### 6.2.2.1 Sorting by columns

The data of the history memory can be sorted by the selected columns. Double-click on the selected column's header to sort data in ascending or descending order.

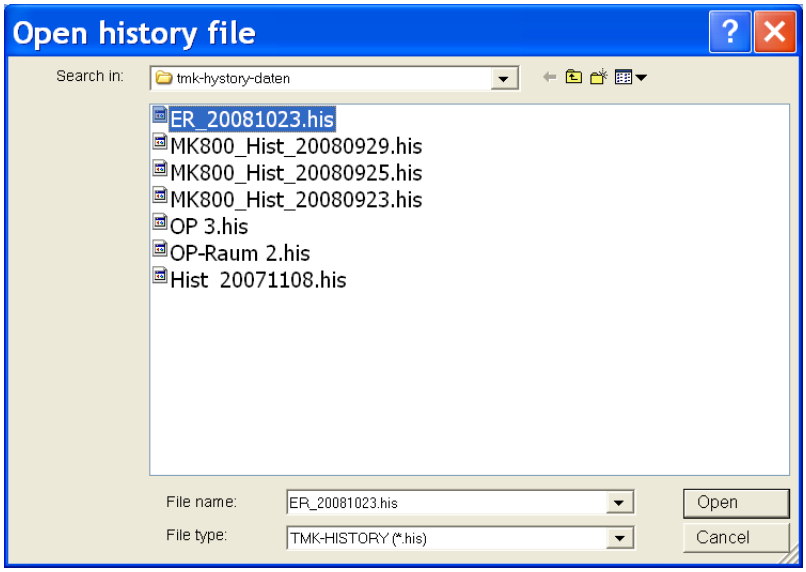
#### 6.2.2.2 Display programming

Whilst the history file is open, you can display the programming relating to a message. To do this, click anywhere in the selected line.



### 6.2.3 Open history file

The history memory data of a TM/MK device saved by means of a PC are called up again.



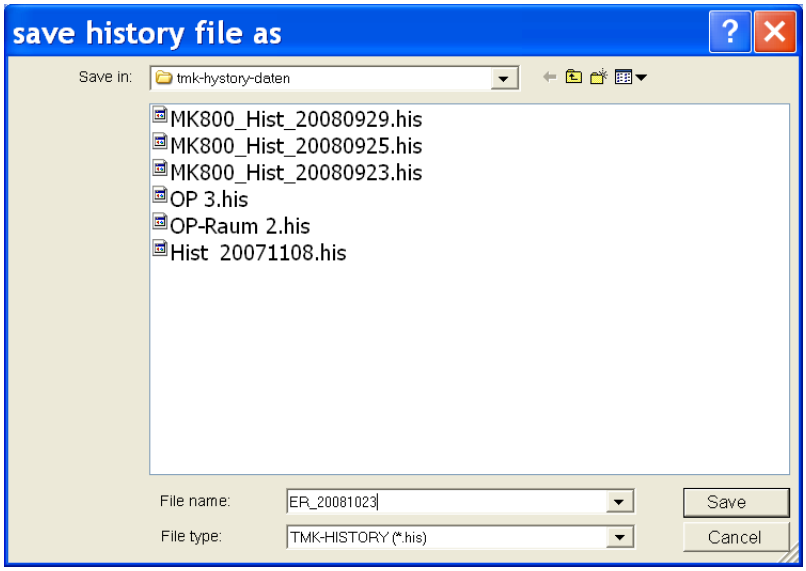

Select the respective file and click on the "Open" button.

### 6.2.4 Save (history file)

For saving the TM/MK's history memory data. If a name already exists for the file to be saved, you can use this one. If no name has yet been assigned, you will be asked to enter one.

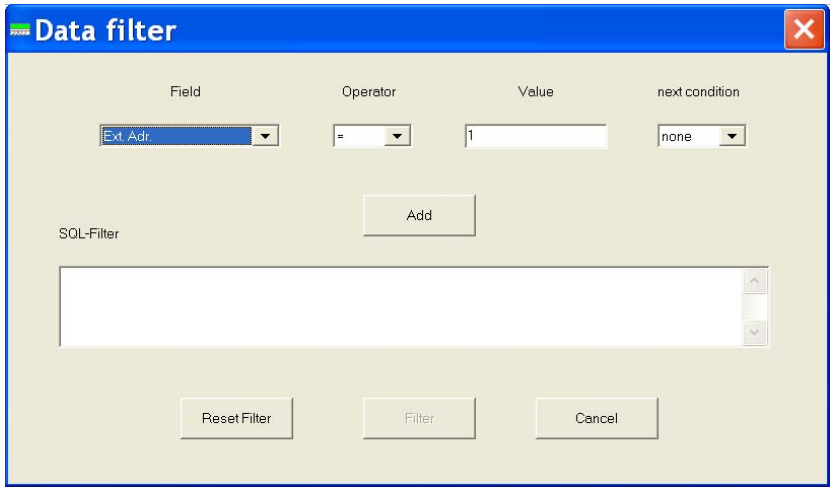
### 6.2.5 Save under (history file)

For saving the TM/MK's history memory data under a different name, a different place, or on a different data carrier.



### 6.2.6 Filter data

The data filter makes it possible to view data using the created filter conditions (e.g. only data of a defined period of time). This function is available only when the history file is open.




1. Select a filter condition under "Field".

| | |
|---|---|
| Ext. Adr. | Address of the TM/MK device |
| Start Date | Date of event |
| Start Time | Event start (time) |
| Mute Date | Date of message acknowledgement (buzzer mute) |
| Mute Time | Time of message acknowledgement (buzzer mute) |
| Stop Date | End of event (date) |
| Stop Time | End of event (time) |
| Type | Type of message (e.g. "WARNING" or "ALARM") |
| Test | Yes = Message has been triggered by a test<br>No = Message has been triggered by an event |
| ext. Address | External address of the device sending the message |
| int. Address | Internal address of the device sending the message |
| Channel | Channel for sending the message |
| Digital input | Digital input the message has been received from |
| EIB-Channel | EIB channel the message has been received from |
| Text Line 1...3 | Text for the arriving message that is to be displayed in the respective line of the TM/MK device. |

2. Select an operator:

| | |
|---|---|
| < | less than |
| > | greater than |
| = | equal to |
| <> | not equal |

3. Enter filter condition details in the "Value" box. TMK-HISTORY will suggest a value corresponding to the selected filter condition (e.g. when "Start-up date" was selected, the current date).
4. Several conditions can logically be linked with each other. Use the box "next condition" to specify the logical link between the current condition and the second condition.

| | |
|---|---|
| none | Do not add other conditions. |
| and | Both criteria must be fulfilled. |
| or | One of two conditions must be fulfilled. |

5. Click on the "Add" button. The current condition will be added to the "SQL-Filter" window.
6. If you want to add other conditions, repeat the steps 1...5.
7. Click on "Filter" to apply the conditions.

TMK-HISTORY only displays data that fulfil the filter conditions. The same applies for printing.

#### 6.2.6.1 Reset the filter

This is how you delete the selected filter conditions:

1. Call up the filter
2. Click on the "Reset Filter" box.

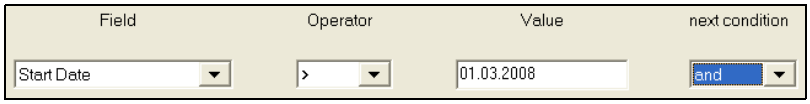
TMK-HISTORY will then display all data of the history memory.

The filter will also be reset when the TMK-HISTORY is exited.

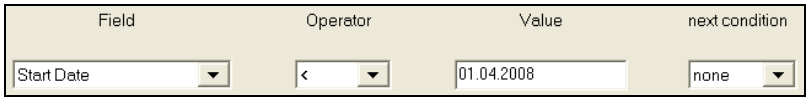
#### 6.2.6.2 Example for the application of a filter

You want to view only messages which arrived between the 14.3.2005 and 17.3.2005 (For testing purposes, select the period of time specified in your history file).

1. Set the first condition as follows:




2. Set the second condition as follows:



Now, you can view your settings in the "SQL filter" box:

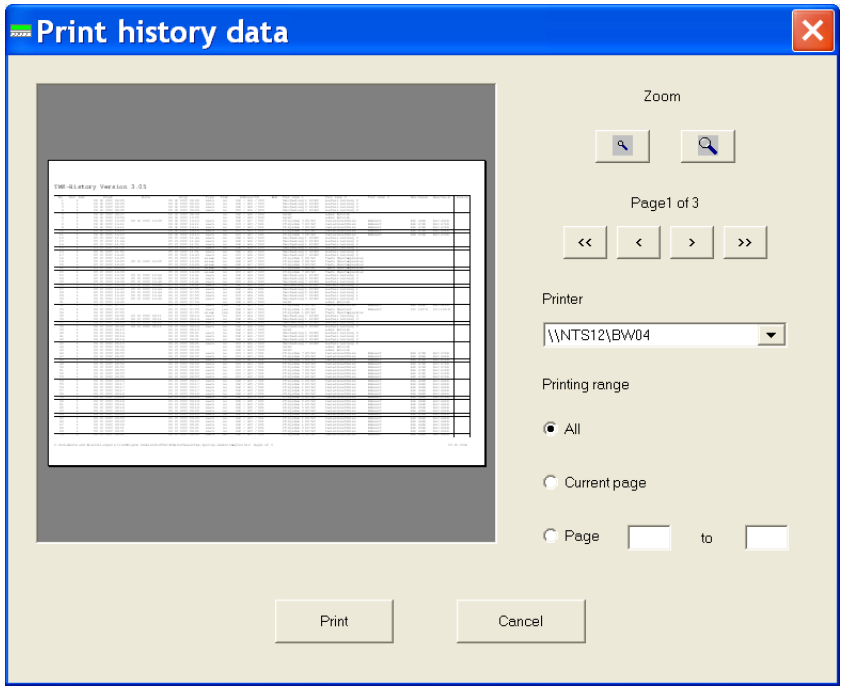
```
Start_Datum_Filter<#3/1/2008# and Start_Datum_Filter<#4/1/2008#
```

3. Click on "Filter" to apply the condition.

TMK-HISTORY only displays data that fulfil the filter conditions.

### 6.2.7 Print

Prints out the current representation of the history file on a printer. If a filter is used, only those data will be printed that fulfil the filter conditions.




- By selecting the zoom step, you can determine the size of the representation in the preview window.
- Use the arrow keys to select a page.
- Select a printer.
- Under "Print area" select whether you want to print all pages or only special ones.
- Start printing by clicking on "Print".

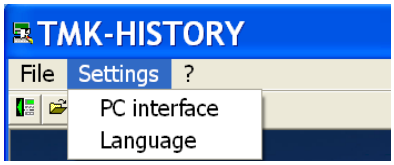
### 6.2.8 Exit

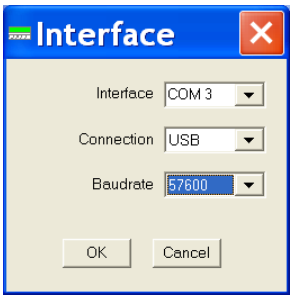
To exit TMK-HISTORY.

- If the current file has been changed since you last saved it, you will be prompted to save the modified history file before exiting the program.
- All filter conditions will be deleted.

## 6.3 SETTINGS menu

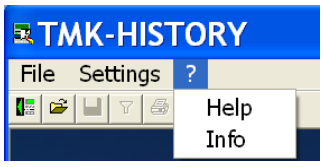
Use this menu to set the PC interface and the language for using TMK-HISTORY menu.




| | |
|---|---|
| PC interface |  <br>**Interface:**<br>Select the serial interface "COM1" ... "COMx" for data transmission to the TM/MK device.<br>Only if you are using a USB interface: The number of an unassigned COM interface will be assigned to the USB interface (see “Install the USB driver” on page 15). Select this setting for data transmission via USB interface. Only available **and** free interfaces (not being used by another program) will be displayed.<br>**Baud rate:**<br>For the external BMS bus only: Make sure that the baud rate set in the TMK-HISTORY is identical to that set in the TM/MK device. In case of different settings, data transmission cannot be carried out. |
| Language | Select whether you want to run TMK-HISTORY in English or German. |

## 6.4 Help menu

You can access the following information via the "?" menu:




| | |
|---|---|
| Help | Online user help |
| Info | Software version |

# INDEX

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BENDER

# Channels of BMS devices

BMS slaves make available alarm- and operating messages as measuring values and/or operating states. Over which channel the BMS master can request this data?

### 107TD47
### Insulation Monitoring Device with transformer monitoring

Alarm messages:

| Channel | Meaning |
|---|---|
| 1 | Insulation resistance below the response value 1, $R_F < R_{an1}$ |
| 2 | Load current above response value (indicating in %) |
| 3 | Transformer temperature below the response value |
| 4 | Connection fault system ($U_n$) |
| 5 | Connection fault PE |
| 6 | Short circuit CT input |
| 7 | Connection fault CT |
| 8 | Insulation fault operating theatre lamp, from N.C. contact of an external insulation monitoring device |
| 9 | Internal device error |

Operating messages:

| Channel | Meaning |
|---|---|
| 1 | Current value of insulation resistance $R_F$ |
| 2 | Current value of load current in % |

### EDS470-12, EDS470E-12, EDS470E2-12, EDS473-12, EDS474-12
### Insulation fault location system

Alarm messages:

| Channel | Meaning |
|---|---|
| 1 | Insulation fault with residual current .... on channel 1 |
| 2 | „ 2 |
| 3 | „ 3 |
| 4 | „ 4 |
| 5 | „ 5 |
| 6 | „ 6 |
| 7 | „ 7 |
| 8 | „ 8 |
| 9 | „ 9 |
| 10 | „ 10 |
| 11 | „ 11 |
| 12 | „ 12 |

Operating messages:

| |
|---|
| none |

### IRDH375B/275/575
### Insulation Monitoring Device

Alarm messages:

| Channel | Meaning |
|---|---|
| 1 | Insulation resistance below the response value 1, $R_{F1} < R_{an1}$ |
| 2 | Insulation resistance below the response value 2, $R_{F2} < R_{an2}$ |
| 3 | Connection fault system ($U_n$) |
| 4 | Connection fault PE |
| 5 | Internal device error |
| 6 | Standby |
| 7 | Starting EDS system in continous operation with 5 minutes pause (IRDH575 only) |
| 8 | Starting EDS system for one cycle (IRDH575 only) |
| 9 | Starting EDS system in continous operation without pause (IRDH575 only) |

Operating messages:

| Channel | Meaning |
|---|---|
| 1 | Current value of insulation resistance $R_{F1}$ |
| 2 | Current value of insulation resistance $R_{F2}$ |
| 3 | Current value of leakage capacitance $C_e$ |

### FTC470XDP
### Protocol converter PROFIBUS DP <===> BMS

Alarm messages:

| Channel | Meaning |
|---|---|
| 1 | Free programmable alarm message by PROFIBUS DP-Master |
| 2 | „ |
| 3 | „ |
| 4 | „ |
| 5 | „ |
| 6 | „ |
| 7 | „ |
| 8 | „ |
| 9 | „ |
| 10 | „ |
| 11 | „ |
| 12 | „ |

Operating messages:

| Channel | Meaning |
|---|---|
| 1 | Free programmable operating message by PROFIBUS DP-Master |
| 2 | " |
| 3 | " |
| 4 | " |
| 5 | " |
| 6 | " |
| 7 | " |
| 8 | " |
| 9 | " |
| 10 | " |
| 11 | " |
| 12 | " |

## FTC470XMB
## Protocol converter Modbus RTU <===> BMS

Alarm messages:

| Channel | Meaning |
|---|---|
| 1 | Free programmable alarm message by Modbus RTU-Master |
| 2 | " |
| 3 | " |
| 4 | " |
| 5 | " |
| 6 | " |
| 7 | " |
| 8 | " |
| 9 | " |
| 10 | " |
| 11 | " |
| 12 | " |

Operating messages:

| Channel | Meaning |
|---|---|
| 1 | Free programmable operating message by Modbus RTU-Master |
| 2 | " |
| 3 | " |
| 4 | " |
| 5 | " |
| 6 | " |
| 7 | " |
| 8 | " |
| 9 | " |
| 10 | " |
| 11 | " |
| 12 | " |

## IMS480
## Scanning system for LIM2000-1NL

Alarm messages:

| Channel | Meaning |
|---|---|
| 1 | Insulation fault in the IT system of channel 1 |
| 2 | „ channel 2 |
| 3 | „ channel 3 |
| 4 | „ channel 4 |
| 5 | „ channel 5 |
| 6 | „ channel 6 |

Operating messages:

| Channel | Meaning |
|---|---|
| 1 | None insulation fault in the IT system of channel 1 |
| 2 | „ channel 2 |
| 3 | „ channel 3 |
| 4 | „ channel 4 |
| 5 | „ channel 5 |
| 6 | „ channel 6 |

## MK2418C
## Remote indicator and control panel

Alarm messages:

| Channel | Meaning |
|---|---|
| 1 | Alarm on digital input 1 |
| 2 | „ 2 |
| 3 | „ 3 |
| 4 | „ 4 |
| 5 | „ 5 |
| 6 | „ 6 |
| 7 | „ 7 |
| 8 | „ 8 |

Operating messages:

| None |
|---|

## PGH47x
## Insulation fault test device

Alarm messages:

| Channel | Meaning |
|---|---|
| 1 | When input IN1 is set: Start of insulation fault location until IN1 is reset |
| 2 | When input IN2 is set: Start of insulation fault location for 1 cycle (approx. 5 Minutes) |
| 3 | Operation of the device switched down (rejection) |
| 4 | Start/stop insulation fault location via push button |
| 5 | Internal device error |

Operating messages:

| |
|---|
| None |

## PRC487
## Control device for switchover modules

Alarm messages:

| Channel | Meaning |
|---|---|
| 1 | Failure Line 1 |
| 2 | Failure Line 2 |
| 3 | Failure distribution board |
| 4 | Failure N conductor Line 1 |
| 5 | Failure switching element Line 1 |
| 6 | Failure switching element Line 2 |
| 7 | Failure contactor relay K3 |
| 8 | Internal device error |
| 9 | Manual mode |
| 10 | Short circuit behind the switchover device |

Operating messages:

| Channel | Meaning |
|---|---|
| 1 | Line 1 ready for operation |
| 2 | Line 2 ready for operation |
| 3 | Switching element Line 1 is switched on |
| 4 | Switching element Line 2 is switched on |
| 5 | Automatic mode |
| 6 | Manual mode |

## RCMS470-12, RCMS470E-12
## Residual current evaluator

Alarm messages:

| Channel | Meaning |
|---|---|
| 1 | Residual-, over-, undercurrent fault with measuring value ... on channel 1 |
| 2 | „ 2 |
| 3 | „ 3 |
| 4 | „ 4 |
| 5 | „ 5 |
| 6 | „ 6 |
| 7 | „ 7 |
| 8 | „ 8 |
| 9 | „ 9 |
| 10 | „ 10 |
| 11 | „ 11 |
| 12 | „ 12 |

Operating messages:

| Channel | Meaning |
|---|---|
| 1 | Measuring value: Residual-, over-, undercurrent on channel 1 |
| 2 | „ 2 |
| 3 | „ 3 |
| 4 | „ 4 |
| 5 | „ 5 |
| 6 | „ 6 |
| 7 | „ 7 |
| 8 | „ 8 |
| 9 | „ 9 |
| 10 | „ 10 |
| 11 | „ 11 |
| 12 | „ 12 |

## SMI471-12
## Converter for digital inputs ==> BMS

Alarm messages:

| Channel | Meaning |
|---|---|
| 1 | Alarm on digital input 1 |
| 2 | „ 2 |
| 3 | „ 3 |
| 4 | „ 4 |
| 5 | „ 5 |
| 6 | „ 6 |
| 7 | „ 7 |
| 8 | „ 8 |

Operating messages:

| Channel | Meaning |
|---|---|
| 1 | Digital input 9 is set |
| 2 | „ 10 „ |
| 3 | „ 11 „ |
| 4 | „ 12 „ |

## SMI472-12
## Converter, digital inputs ==> BMS

Alarm messages 0...12,
Quantity dependend of the preset ratio of alarm messages / operating messages.
In the following example the ratio has been set to 12 alarm messages and 0 operating messages:

| Channel | Meaning |
|---|---|
| 1 | Alarm on digital input 1 |
| 2 | „ 2 |
| 3 | „ 3 |
| 4 | „ 4 |
| 5 | „ 5 |
| 6 | „ 6 |
| 7 | „ 7 |
| 8 | „ 8 |
| 9 | „ 9 |
| 10 | „ 10 |
| 11 | „ 11 |
| 12 | „ 12 |

Operating messages 0...12,
Quantity dependend of the preset ratio of alarm messages / operating messages.
In the following example the ratio has been set to 0 alarm messages and 12 operating messages:

| Channel | Meaning |
|---|---|
| 1 | Digital input 1 is set |
| 2 | „ 2 „ |
| 3 | „ 3 „ |
| 4 | „ 4 „ |
| 5 | „ 5 „ |
| 6 | „ 6 „ |
| 7 | „ 7 „ |
| 8 | „ 8 „ |
| 9 | „ 9 „ |
| 10 | „ 10 „ |
| 11 | „ 11 „ |
| 12 | „ 12 „ |

## SMO480-12
## Converter, BMS ==> digital outputs

Alarm messages:

| |
|---|
| None |

Operating messages:

| Channel | Meaning |
|---|---|
| 1 | Relay 1 has switched (binary 1) or has not switched (binary 0) |
| 2 | „ 2 „ |
| 3 | „ 3 „ |
| 4 | „ 4 „ |
| 5 | „ 5 „ |
| 6 | „ 6 „ |
| 7 | „ 7 „ |
| 8 | „ 8 „ |
| 9 | „ 9 „ |
| 10 | „ 10 „ |
| 11 | „ 11 „ |
| 12 | „ 12 „ |

## SMO481-12
## Converter, BMS ==> digital outputs

Alarm messages:

| |
|---|
| None |

Operating messages:

| Channel | Meaning |
|---|---|
| 1 | Relay 1 has switched (binary 1) or has not switched (binary 0) |
| 2 | „ 2 „ |
| 3 | „ 3 „ |
| 4 | „ 4 „ |
| 5 | „ 5 „ |
| 6 | „ 6 „ |
| 7 | „ 7 „ |
| 8 | „ 8 „ |
| 9 | „ 9 „ |
| 10 | „ 10 „ |
| 11 | „ 11 „ |
| 12 | „ 12 „ |

## SMO482-12
## Converter, BMS ==> digital outputs

Alarm messages:

| |
|---|
| None |

Operating messages:

| Channel | Meaning |
|---|---|
| 1 | Relay 1 has switched (binary 1) or has not switched (binary 0) |
| 2 | „ 2 „ |
| 3 | „ 3 „ |
| 4 | „ 4 „ |
| 5 | „ 5 „ |
| 6 | „ 6 „ |
| 7 | „ 7 „ |
| 8 | „ 8 „ |
| 9 | „ 9 „ |
| 10 | „ 10 „ |
| 11 | „ 11 „ |
| 12 | „ 12 „ |

**Alarm messages**

depending on the device occur when the measured value falls below or exceeds the response value or when status changes to alarm. Alarm messages are provided by BMS devices and are requested by the BMS Master.

**Operating messages**

are measuring values and/or information which is constantly provided by BMS devices and that are requested from the BMS Master via the bus. Some BMS devices (EDS47x) do not provide operating messages, they only provide alarm messages.



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