Operating manual

TM....

Indicator and operator panel

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1. How to use this operating manual effectively

1.1 Notes on how to use this manual

This operating manual describes TM... alarm indicator and operator panels (in this manual designated as TM panels). 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.

Before using the equipment, please take the time to read this operating manual, the supplement "Important safety notes for esb products" and the instruction leaflet that comes with the individual system components. Please keep this documentation close at hand near the equipment.

Should you have any further questions, we would be happy to be of assistance. Please contact our technical sales team. We also offer a wide range of on-site services. Contact our Service Department for further details.

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 damage to equipment resulting from errors or omissions in this manual.

1.2 Explanation of symbols and warnings

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

This symbol means an immediate threat of danger to human life and health. Failure to observe these warnings means that death, severe bodily injury or substantial damage to property will occur if the corresponding precautions are not taken.

This symbol means a possible threat of danger to human life and health. Failure to observe these warnings means that death, severe bodily injury or substantial damage to property may occur if the corresponding precautions are not taken.

This symbol means a possibly hazardous 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 handling of the equipment.
Failure to comply with this information can result in faults on the TM panel or in its environment.

This symbol guides you to application tips and particularly useful items of information. This will help you to make optimal use of all the functions on the TM panel.

1.3 Chapters at a glance

Chapter 1: How to use this operating manual effectively
... provides tips and useful information on how to use this manual.

Chapter 2: Safety instructions
... describes the dangers during installation and when operating the device.

Chapter 3: Description of the system
... informs about the system's properties, functions and components.

Chapter 4: Installation and connection
... informs about mounting and electrical connection.

Chapter 5: Commissioning and testing
... describes what needs to be tested prior to the first use.

Chapter 6: Trouble shooting
... describes how to identify the cause of any fault that may occur.

Chapter 7: Operation and setting
... describes the operation and setting of the menus.

Chapter 8: Options
... informs about optional components and interface converters.

Chapter 9: Technical data
... informs about technical data and dimensions.

Instruction leaflet
... the accompanying instruction leaflet describes the BMS bus.

2. Safety instructions

2.1 Intended use

Alarm indicator and operator panels of the TM... series provide operating, warning and alarm messages on an illuminated LC text display. In addition, brightly lit LEDs inform about the importance of the message. All messages are stored in the memory. Other technical equipment and systems can be integrated. Flexible illuminated pushbutton modules clearly arranged allow easy operation of different technical equipment and systems, e.g. medical gas supply.

In any case, individual parameterization is necessary to adapt the TM... alarm panel to the existing conditions of use, at the place of utilization.

TM... panels come into use in:

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

Please take note of the limits for the application area specified in the technical data. Any other use, or use which goes beyond the foregoing, is deemed to be use other than for the intended purpose.

Use for the intended purpose also includes:

- system-specific settings;
- compliance with all information in this operating manual and
- compliance with test intervals.

2.2 Qualified personnel

Only appropriately qualified staff may work on esb devices. Qualified means familiar with the installation, commissioning and operation of the device and with training appropriate to the work. Personnel must have read and understood the safety section and warning information in this operating manual.

2.3 General safety information

esb devices are built according to the state-of-the-art and recognized technical safety rules. Nevertheless, when it is being used, hazards may occur to the life and limb of the user or third parties or there may be adverse effects on the esb device or on other valuable property.

- esb devices must only be used:
  - for the purpose for which it is intended;
  - when it is in perfect condition as far as safety is concerned;
  - in accordance with the rules and regulations on accident prevention that are applicable for the place of utilization.
- Any faults which may impair safety must be eliminated immediately.
- Impermissible modifications and the use of spare parts and additional devices which are not sold or recommended by the manufacturer of the devices may cause fires, electric shocks and injuries.
- Warning signs must always be easily legible. Damaged or illegible signs must be replaced immediately.
- Make sure that the dimensioning of the UPS (special safety power supply source), the generator system and the whole wiring is adequate. The applicable national and international standards must be observed here. Only in this way selective operation of safety devices can be achieved and a high degree of safety in case of overload and short circuit can be ensured.

2.4 Warranty and liability

Warranty and liability claims in the event of injury to persons or damage to property are excluded if they can be attributed to one or more of the following causes:

- Use of the TM...panel other than for the intended purpose.
- Improper installation, commissioning, operation and maintenance.
- Operation of devices with defective safety devices or improperly installed or non-functional safety or protective devices.
- Failure to take note of the information in this operating manual and the supplement "Important safety notes for esb products" concerning transport, storage and installation, commissioning, operation and maintenance.
- Unauthorized structural modifications.
- Failure to take note of the technical data.
- Improperly performed repairs and the use of spare parts or accessories which have not been recommended by the manufacturer.
- Cases of disaster and force majeure.

2.5 Guarantee

esb guarantees the TM... panel and all its components to be free of faults in manufacturing and material quality under normal storage or operating conditions for a period of 24 months from the date of delivery.

This guarantee does not extend to maintenance work of any kind. The warranty is only valid for the initial purchaser and does not extend to products or individual parts thereof which have not been correctly used, or which have undergone modifications Any warranty shall

lapse if the device is used other than for the intended purpose or under abnormal conditions. The warranty obligation is limited to the repair or the exchange of a product which has been sent to esb within the warranty period. The qualifying conditions are that esb shall recognize the product as being faulty, and that the fault cannot be attributed to improper handling or modifications to the device, to the utilization of the device outside the scope of intended use or to abnormal operating conditions.

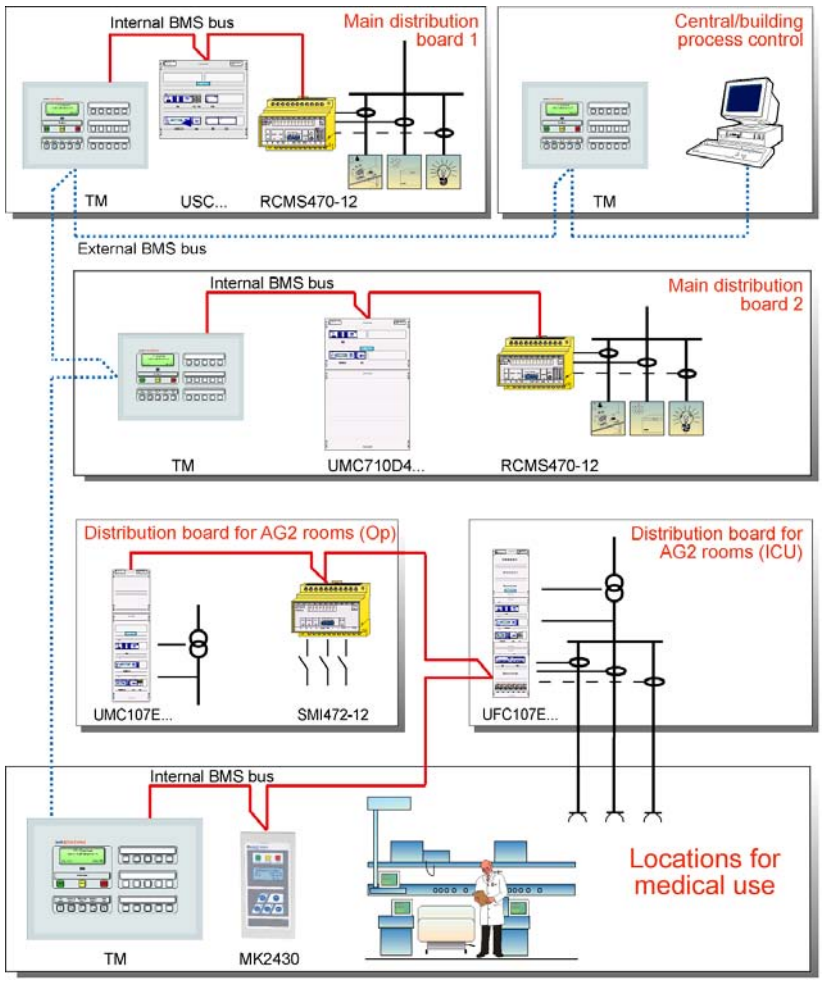
Any warranty obligation shall lapse if repairs and modifications are carried out on the devices by persons not authorized by esb. The foregoing warranty conditions apply exclusively and in the place of all other contractual or legal warranty obligations including, but not limited to, the legal warranty of marketability, suitability for use and expediency for a specified purpose of use. esb shall not assume any liability for any direct and indirect concomitant or consequent damage, regardless of whether these may be attributable to legal, illegal or other actions.

3. System description

3.1 MEDICS®

The TM panel is a part of the MEDICS® system. MEDICS® is an intelligent system that guarantees safe power supply in medical locations.

Example of a hospital section including a MEDICS® system



Legend to example

MK....	Alarm indicator and test combination MK2418 resp. MK2430
RCMS470	Residual current monitoring system for TN-S systems
SMI472	Signal converter for other technical equipment and systems (e. g. med. gases, UPS)
TM	Alarm indicator and operator panel
UFC107E...	Switchover and monitoring module for IT systems including an EDS474 insulation fault location system
UMC107E...	Switchover and monitoring module for IT systems
UMC710D...	Switchover module for main distribution boards
USC710D...	Control module for switchover modules (especially in main distribution boards)

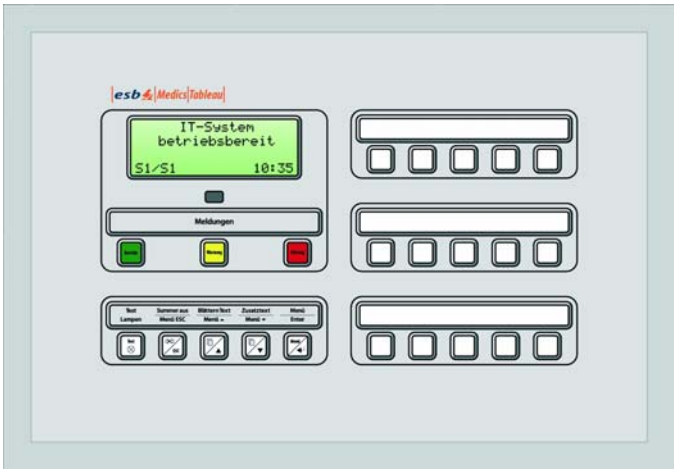
MEDICS® includes:

- Display and operating units such as TM panels or alarm indicator and test combinations.
- Single or three-phase monitoring modules. A MEDICS® system, for example, can include LTIC..., UMC..., USC..., UFC... as well as EDS474 insulation fault location systems.
- Communication between these components via BMS bus (two-wire connection).
- Connection to other technical equipment or systems via protocol converters (gateways), EIB interface or via digital inputs and relay outputs.

The special strength of MEDICS® lies in the communication between all the components involved and the information for the user resulting from this.The functionality of the equipment is continuously monitored. The current operating state, irregularities, faults and device failures are displayed. This provides high functional security for the user.

3.2 TM panel features

TM panels play a major role at the interface of man and technique. They are designed to convert information from the system into clear and concise operating instructions and the actions to be taken. This in particular is the case when critical operating conditions are likely to occur. Flexible TM operator panels provide solutions that meet the requirements of modern medical facilities and other buildings and fit into the user's concept. Appropriate programming of the clear text display and a user-configurable additional text display provide exactly that information the medical and technical staff needs in the particular situation. In this way, personnel is supported in making the right decision and is not unnecessarily distracted by technical matter. The technician is assisted in maintenance planning which means considerably reduced maintenance time and lower maintenance costs.



Features:

- Clear LC text display with indication of alarm stages for fast recording of operating, warning and alarm messages.
- Clear, unambigous information for technical and medical staff.
- Five function keys for additional text, lamp test, acknowledgement of acoustic messages and for panel parameterization.
- Variable illuminated pushbutton modules with freely definable function.
- Text and colours of indicator pushbuttons can be individually made.
- Easy connection to other technical equipment or systems via digital inputs, relay outputs and

EIB interface.

- Parameterization via external BMS bus or RS-232 interface and PC software.
- History to save the entire accrued warning and alarm messages with date and time.
- Non-reflecting, multicoloured foils.
- Smooth surfaces without openings for easy cleaning.
- Other technical equipment and systems are simply to integrate behind a sealed front foil.

3.3 TM panel function

3.3.1 LC display for the indication of different alarm stages

The text display of the TM panel consists of an illuminated LC display, 4 lines of 20 characters 8 mm high. The first three lines are intended for alarm text messages and the fourth line to display status messages such as date, time, number of messages of the existing alarm and warning messages.The three-line display for alarm text messages provides a further three lines for additional text. This additional text can be displayed by pressing a key. Below the text display, three alarm LEDs in different colours are arranged to differentiate between operating, warning and alarm messages.

3.3.2 Illuminated pushbutton modules

Each pushbutton module consists of five pushbuttons. Depending on the type of operator panel, a different number of pushbutton modules is available. An individual function can be assigned to each pushbutton (switch, pushbutton, LED audible alarm), by using the PC software Medi-Set. The link between the pushbutton and the appropriate input, output or interface is also carried out via Medi-Set. In case of subsequent modifications of the functions, the hardware need not to be changed.

3.3.3 History

Warning and alarm messages with date and time stamp are automatically stored in the memory. In this way, detailed information about the accrued warning and alarm messages is available at any time. Up to 650 messages can be stored. Each subsequent message overwrites the oldest message (message 651 overwrites message 1).
Readout and printout of the history is carried out via PC software or the function keys at the TM panel.

3.3.4 Interfaces

TM panels provide different interfaces for communication with other technical equipment or systems and/or other MEDICS components:

- Internal BMS bus
- External BMS bus
- RS-232 interface
- EIB bus (optional)

BMS bus
The BMS bus system (BENDER Measuring Device Interface) guarantees high operational reliability:

- based on the tried and tested industrial standard RS-485;
- a self contained system - not influenced by other technical equipment or systems;
- redundant master function and data transmission (internal and external bus);
- interactive device monitoring;
- open, thanks to defined interfaces, e.g. OPC server.

Internal BMS bus:
The internal BMS bus is intended for communication with local MEDICS components,

- e.g. modules like UMC..., UFC..., LFC...
- or devices like RCMS..., EDS..., SMI..., SMO...

Up to 30 devices can be connected to each internal bus line (in combination with the DI-1 repeater more devices can be connected). One unique address is assigned to each device connected to the BMS bus. Address 1 is assigned to the TM panel which represents the Master on the internal bus.

External BMS bus:
The external BMS bus allows communication with other TM panels, SMI472-12 or BMS-OPC servers. The Master function is cyclically transferred to the external bus. The TM panel with address 1, however, takes over some special tasks:

- as „Master clock“ it synchronizes the time of all TM panels;
- it provides the required supply voltage on the external BMS bus.

Messages can be displayed at any TM operator panel connected to the bus. The PC software Medi-Set is used to assign the messages accordingly.

A PC is recommended to be connected to the TM panel via the external bus. Information of all TM panels connected to the external bus can be displayed and set at a central point. If the PC is not equipped with an RS-485 interface, an RS-232/RS-485 protocol converter is required.

RS-232 interface:
A personal computer can also be connected to the TM panel via RS-232 interface by using a null-modem cable. The 9-pole Sub-D plug of the interface can only be accessed after opening the front plate of the TM panel.

Only the TM panel that is connected to the system can be displayed and set via the RS-232 interface.

Optional software:

- You can change and display the settings of the TM panel using the PC software Medi-Set.
- The history of the TM panel can be read-out using the PC software Medi-History.

3.3.5 Digital inputs

The TM panel provides 16 digital inputs for connection to other technical equipment and systems and BENDER devices without BMS bus.

All digital inputs are galvanically separated from each other. The input voltage is AC/DC 10...30 V / 3...5 mA (HIGH=10...30 V; LOW=0...5 V). In practice, the messages received are voltage-free contacts. The voltage for the 5 V input is supplied by the built-in power supply unit.

Text messages, LEDs and switching commands are assigned to each digital input using the PC software Medi-Set.

The performance of the alarm contact at the digital input (normally open contact or normally closed contact) can also be set via this PC software. That means that subsequent modifications of the contact performance do not require hardware modifications at the TM panel.

3.3.6 Outputs

TM panels provide the following outputs for messages:

Visual common alarms (3 LEDs)

These are three LEDs, one to signal fault-free operation "Normal" (green), one to signal prewarning "Warning" (yellow) and one to signal faults "Alarm" (red). The LEDs are integrated in the BM1000 module, below the LC display.
Assignment of the messages to the LEDs is carried out using the PC software Medi-Set.

Audible common alarm (buzzer)

The PC software Medi-Set allows assignment of the buzzer signal to any prewarning and alarm messages. The frequency of the buzzer signal can be set via the menu of the TM panel. The reactivation of the silenced buzzer can be set via Medi-Set.

Relay outputs

The control of the 8 freely-configurable relay outputs (voltage-free contacts) is carried out via

- illuminated pushbutton modules or
- programmed messages (e.g. common alarms).

Numbers between 1 and 8 are allocated to the potential-free output relays. Relay 1 and 2 provide one changeover contact each, the relays 3...8 one normally open contact each.
Relay data K1 and K2: 250 V AV, 8 A.
Relay data K3 .. K8: 250 V AV, 5 A.
The pushbutton/relay output assignment, the text messages assignment and the operating mode of the relays are set via PC software Medi-Set.

System fault relay

The TM panel provides a system fault relay(watchdog relay, WD) to signal failures or faults. The maximum load for this relay, in N/C operation, is 8 A at AC 250 V.

TM panels provide safe separation according to IEC 60664 between the relay contacts and the electronics, interface outputs, digital inputs and among each other.

Options
The plug-on module BMI100-16/8 with additional 16 digital inputs is available as an option. Any message from external technical equipment or systems can be converted to messages and indications via digital inputs. In addition, the BMI100-16/8 plug-on module includes eight potential-free relays with one normally open contact each (also refer to “Expansion board BMI100-16/8 (option)” on page 65).

3.3.7 EIB bus
Optional interface to connect other technical equipment or systems to the EIB bus (see “Expansion board EIB1000 (option)” on page 68.).

3.4 Mechanical design

3.4.1 Modular design
TM panels are of modular design. Generally, the TM panels consist of the following modules:

- BM1000 central processing unit for TM panels;
- BM500 central processing unit, but without LC display;
- BI70... module consisting of five illuminated pushbuttons.

BM1000
Central processing unit for TM panels with LC display. BM1000 includes:

- LC display
- one operating, warning and alarm LED each as common alarm indication
- 5 function keys
- interfaces
- 16 digital inputs (with plug-on module BMI100-16/8 expandable by additional 16 inputs)
- 8 user-programmable relay outputs (with plug-on module BMI100-16/8 expandable by 8)
- one watchdog relay
- buzzer

The front plate is not covered with a foil.

BM500
BM500 is a central processing unit like BM1000, but does not include an LC display. Used in combination with illuminated 5-pushbutton modules allows to set up a TM panel. Apart from the missing LC display, the BM500 units provide all features of a modern panel.

Illuminated 5-pushbutton modules BI70..., BI71, BI72
The BM1000/BM500 central processing units can be supplemented with 5-push-button modules. 16 modules of 5 illuminated pushbuttons per BM1000/BM500 (a total of 80 single illuminated pushbuttons) can be controlled via the I^2C bus.

Illuminated pushbutton modules are available in different versions:

BI70 — Activation via I²C bus +BM1000. Potential-free pushbutton contacts are available by opening the soldering jumper, as an option, (additional terminal board suitable for surface soldering).In this case scanning commands cannot be sent via the I²C bus, only the built-in LEDs can be activated via the I²C bus.

BI70-0/7	Illuminated 5-pushbutton module for the address range 0 to 7.
BI70-8/15	Illuminated 5-pushbutton module for the address range 8 to 15.
BI70R-0/7	Illuminated 5-pushbutton module for the address range 0 to 7 with additional alarm relay with one normally open contact.

BI71 — No connection via I²C bus. Potential-free changeover contacts max. AC 250 V/8 A. Example: Direct activation of remote-control switches for interior lighting. Each LED can individually be activated with 24 V. Diode-decoupling for LED testing.

If inductive loads and the TM panel are supplied by the same voltage source, free wheeling diodes must be connected directly at the inductive load.

BI72 — No connection via I²C bus. Potential-free changeover contacts max. AC 24 V / 0.9 A. Example: Direct activation of remote-control switches for interior lighting. Each LED can individually be activated with 24 V. LED testing by switching all poles to internal supply voltage via changeover relays .

The appropriate illuminated pushbutton module is selected by esb so that you are not unnecessarily burdened with planning details.

3.4.2 Individual components to be built in

In addition to the operating functions activated via pushbuttons, often complete operating units of other technical equipment and systems are integrated into the alarm and operator panel. Typical examples are of operating table controls or intercommunication systems. These modules are integrated into the panel by *elektro systembau bender* in order to provide an aesthetically attractive functional solution. All available connections are wired to terminals. In this way, the technician is assisted and connection can be carried out with a minimum of time and effort.

The modular concept of the TM panel series allows customized TM panels. Please discuss your wishes with the technical experts of esb.

3.5 Firmware versions

The TM panel is controlled by an internal software (firmware). The present firmware version is 2.xx. The following characteristics distinguishes this version from the previous version:

- The baud rate of the external BMS bus can be set between 19200 and 57600 baud. The standard baud rate is 57600 baud (the baud rate in version 1.xx was 9600 baud).
- New messages are signalled via the external bus with a maximum time delay of one second.
- A maximum of 99 panels can be connected to the external bus.
- The reset mode (deleting of existing alarm messages of devices on the bus) can be set according to the interface:
  - only internal OR internal and external interface
- The time is sent and received in seconds at the external interface (adjustment of the time to an accuracy of seconds- e.g. possible by using the OPC server -)
- Fast stopping of insulation fault location provided that no starting conditions exist (insulation faults).
- When insulation fault location is completed (precondition: fault memory in EDS deactivated), the alarm messages will be deleted.
- PGH... insulation fault test devices not only provide "automatic mode" but also the starting condition "continuous operation". The TM panel is adapted to this function.
- The response value of RCMS47x can be set in the range of 5 mA...10 A.
- The PC software Medi-Set version 1.14 or higher can be used for parameterization.

All TM panels connected to a common external BMS bus must utilize a uniform software version (either all panels with version 1.xx or all panels with version 2.xx).
The baud rate setting of all devices must be the same.

4. Installation and connection

4.1 Installation

4.1.1 Enclosure variations at a glance

The mechanical design of the alarm indicator and operator panels is oriented toward longevity and particularly suited for the high hygienic requirements in medical locations.

Enclosure for flush-mounting with bezel frame (UPB)

A gap of up to 12 mm between the flush-mounting enclosure and the wall can be concealed by a bezel frame made of anodized aluminium. This version, for example, is recommended to be used for wallpapered walls or walls with non-standard tiles.

Flush-mounting enclosure with mounting frame (UPE)

The mounting frame permits accurate and close wall mounting and is made of anodized aluminium. This type of mounting frame is used where the enclosure has to be adjusted accurately to the tile pattern.

Surface-mounting enclosure (AP)

The anodized surface-mounting enclosure is suitable for both pure surface-mounting or for partially recessed mounting. The enclosures can be supplied in depths of 90, 150 and 210 mm.

The support frame inside the flush-mounting or surface-mounting case is provided with a permanently elastic sealing in order to avoid the ingress of cleaning agents into the panel. Depending on the size, the front plate is connected to the flush-mounting or surface-mounting enclosure by two or more stable hinges. That guarantees easy installation of the panel.

All necessary PCB boards and indicating elements are permanently fixed to the front plate using threaded bolts or mounting frames. The front plate is connected with the mounting plate via a flexible spiral hose that is fixed on both sides with cable clips. The technical equipment and systems are connected to a terminal board that is fixed on a mounting plate. The power supply unit for the alarm indicator and operator panel is also located on this mounting plate.The mounting plate can easily be dismantled. In this way, it is possible to install the flush-mounting or surface-mounting enclosure before the final assembly without loosening the cable connections between the front plate and the terminal board.

Since except for the mounting plate no other components are fixed to the baseplate of the flush-mounting/surface-mounting enclosure, the technician has sufficient room for installation.

4.1.2 Unpacking

Unpack all the parts of the delivered system. Avoid sharp-edged tools that may damage the contents of the packaging.

Check each item by comparing your order list to the delivery note and ensure that all items are present. The article numbers printed on the nameplates simplifies the identification of the devices.

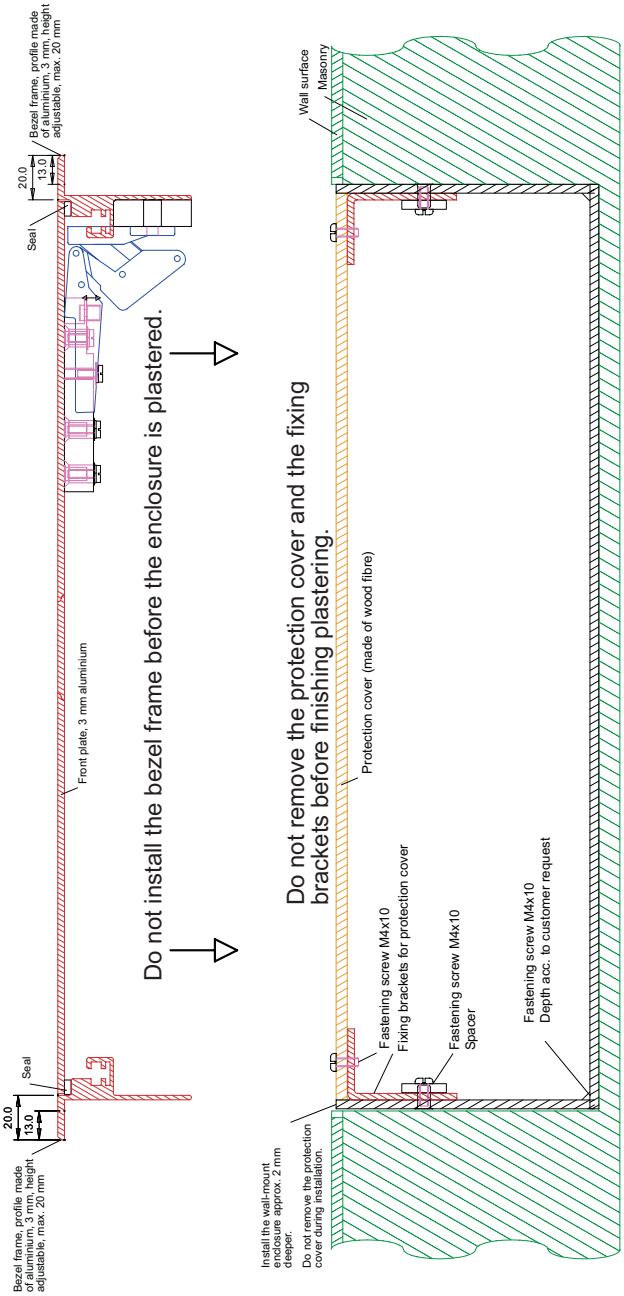
Check all parts delivered for evidence of shipping damage. Be sure that you are satisfied with the contents of your order and the condition of your equipment before installing the equipment. If you find any discrepancies, note them and call esb for further instructions. The contact person is listed on the delivery notes.

When storing the devices in cold environment as it is in winter, the following is to be considered: Leave the device in a location *at room temperature for 3 to 4 hours without connecting them to power supply . When changing from cold to warm environment humidity is being absorbed by all devices.*Starting damp devices may damage electrical components and touching them may result in an electric shock.

4.1.3 Installing a flush-mounting enclosure with bezel frame (UPB)

Note: Do not remove the protection cover and the fixing brackets of the enclosure during installation and not before finishing plastering!

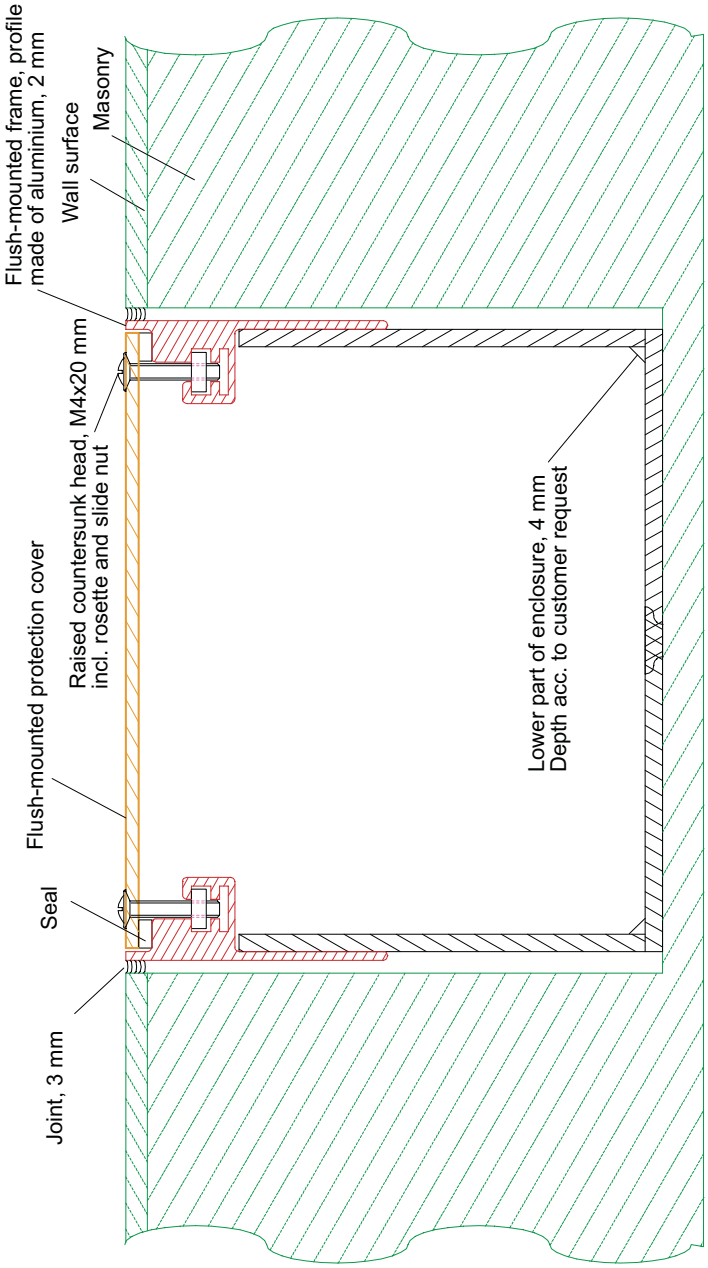
1. Before inserting the cables remove the knockouts. Lead the power supply cables into the enclosure.
2. Install the flush-mounting enclosure in a way that the enclosure (and thus the protection cover) are approximately 2 mm below the finished surface of the wall.
3. After installing the enclosure securely remove the protection cover and the fixing brackets. Then install the bezel frame into the flush-mounting enclosure.



4.1.4 Installing the flush-mounting enclosure with bezel frame

Note: Do not remove the protection cover and the fixing brackets of the flush-mounting enclosure during installation and before finishing plastering!

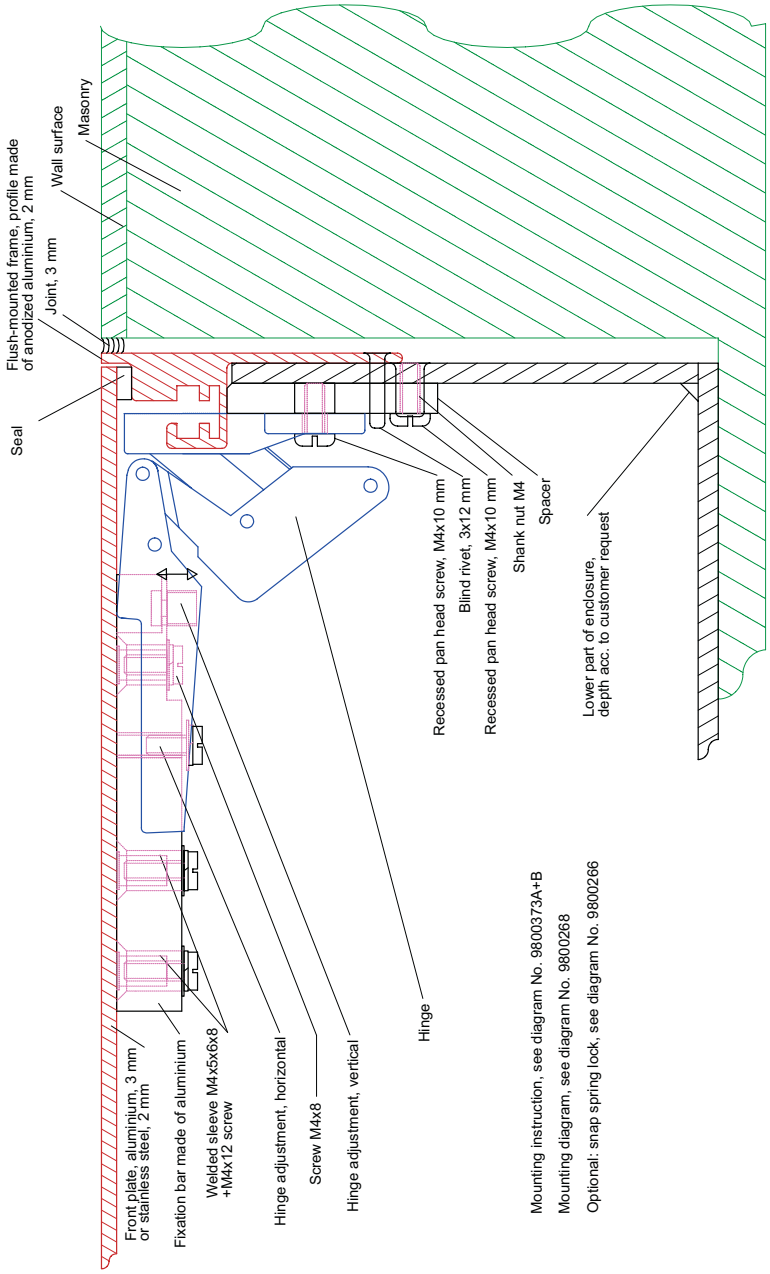
1. Before inserting the cables remove the knockouts. Lead the power supply cables into the enclosure.
2. Install the flush-mounting enclosure in a way that the enclosure (and thus the protection cover) is flush with the finished surface of the wall. Make sure to leave an even joint around of approximately 3 mm to the adjacent surface of the wall.
3. After installing the device securely and after filling the joint the protection cover can be removed.



4.1.5 Mounting the front plate

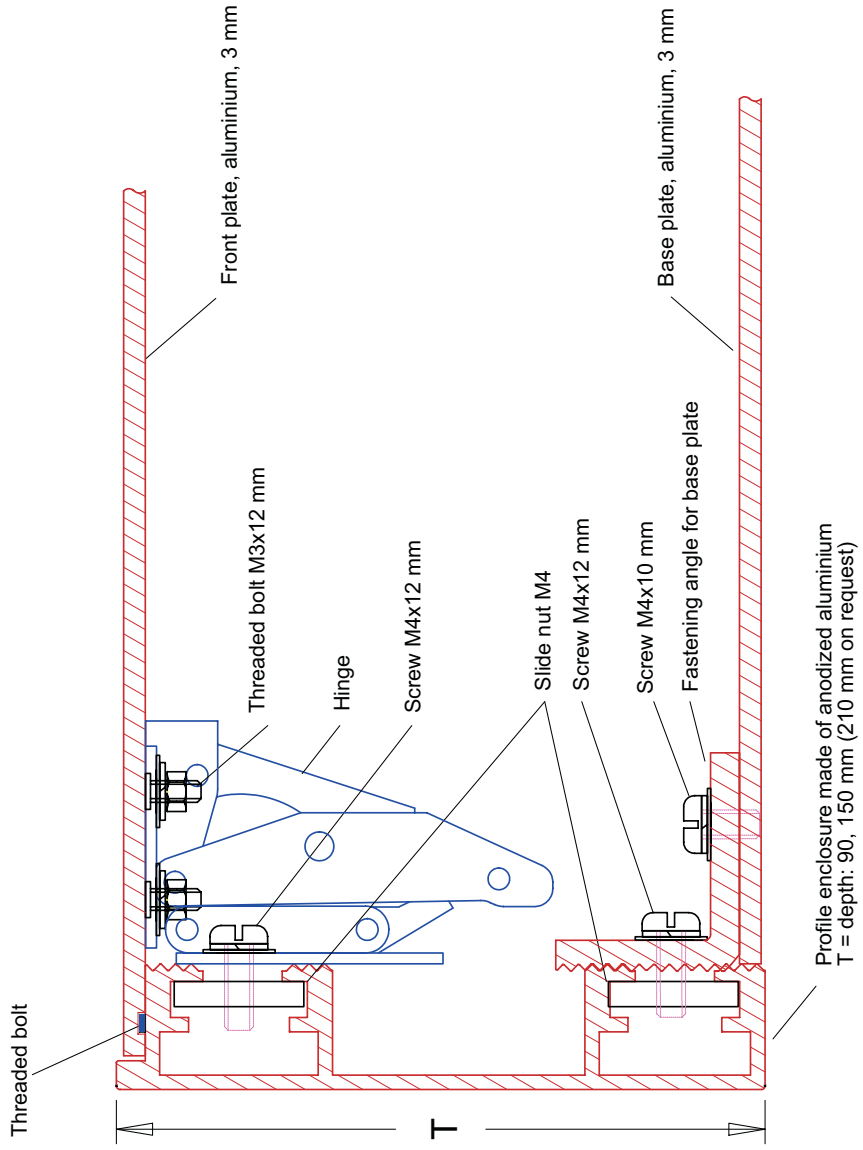
The front plates are fitted into the flush-mounting enclosure and provided with a number (e.g. room number) identical to the number of the enclosure. Before mounting the front plate, ensure that the number of the front plate and the number of the enclosure are identical!

Install the hinges of the front plate as described in the drawing below. Installation example of a flush-mounting enclosure with bezel frame (UPE):



4.1.6 Installation of a surface-mounting enclosure

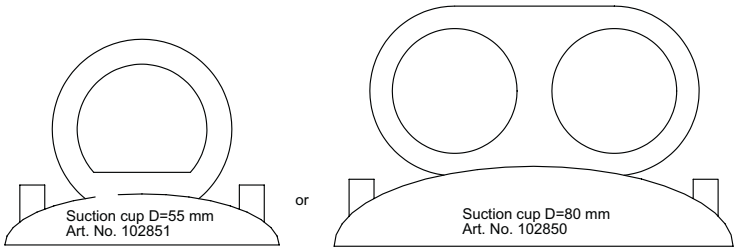
1. Open the front plate as described in chapter "4.1.7 Opening the front plate".
2. Prepare the enclosure with holes for wall mounting and for the cable entries. There are no holes provided so that you are able to select them considering the local conditions. Nevertheless, take care that the cable routing leaves sufficient space for the PCB boards when the front plate is being closed.
3. Fix the enclosure to the wall using stainless steel screws.
4. Lead the power supply cables into the enclosure.



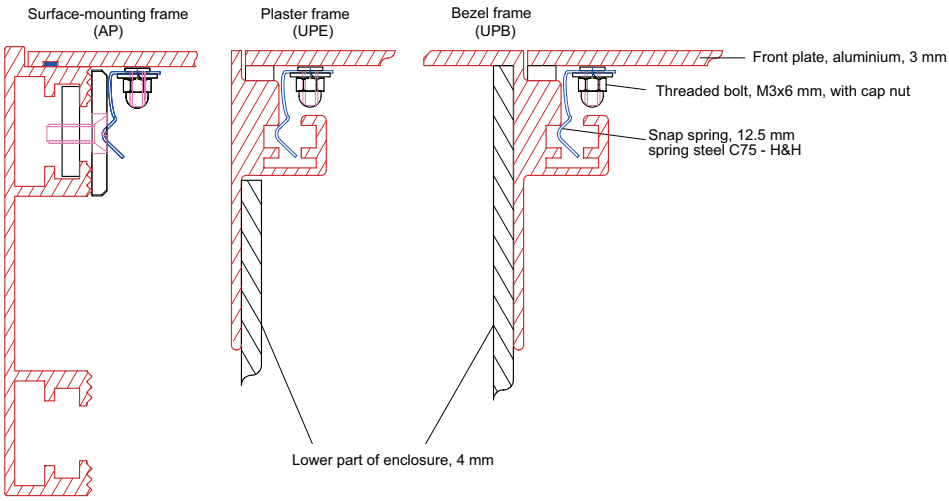
4.1.7 Opening the front plate

According to the requirements of the standards below, the enclosure may only be opened by the use of a tool for example with a suction cup, screw driver etc.

- VDE 0660, part 500, chapter 7.4.2.2.3. a)
- EN 60439-1, chapter 7.4.2.2.3. a)
- IEC 60439-1, chapter 7.4.2.2.3. a)



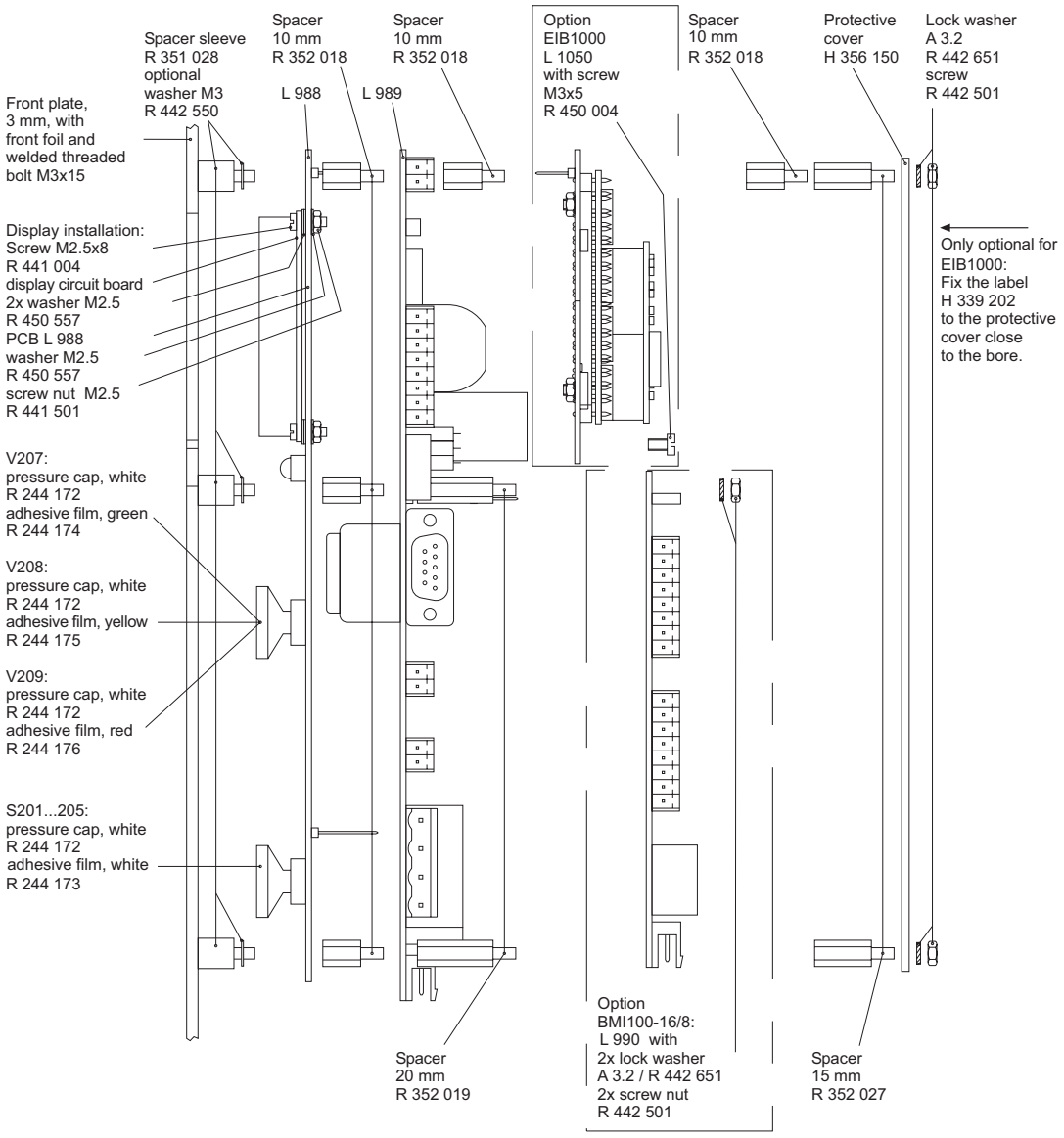
For the following enclosure types:



In order to prevent unintentional opening of the front panel by protruding components *(such as socket-outlets, remote operating theatre table controls)* providing the possibility of holding on to them, the front panel is secured by means of a screw located in the middle of the side opposite to the hinges:
raised countersunk head screw, M4x20
in case of a front panel with foil, M4x25
with rosette and sliding nut

4.1.8 BM1000 set-up with EIB1000 and BMI100 as options

The set-up drawing is intended to be used as a guidance on installation and connection.



4.2 Connection

Prior to installation and before work activities are carried out on the connecting cables, make sure that the mains power is disconnected.
Failure to comply with this safety information may cause electric shock to personnel. Furthermore, substantial damage to the electrical installation and destruction of the device may occur.

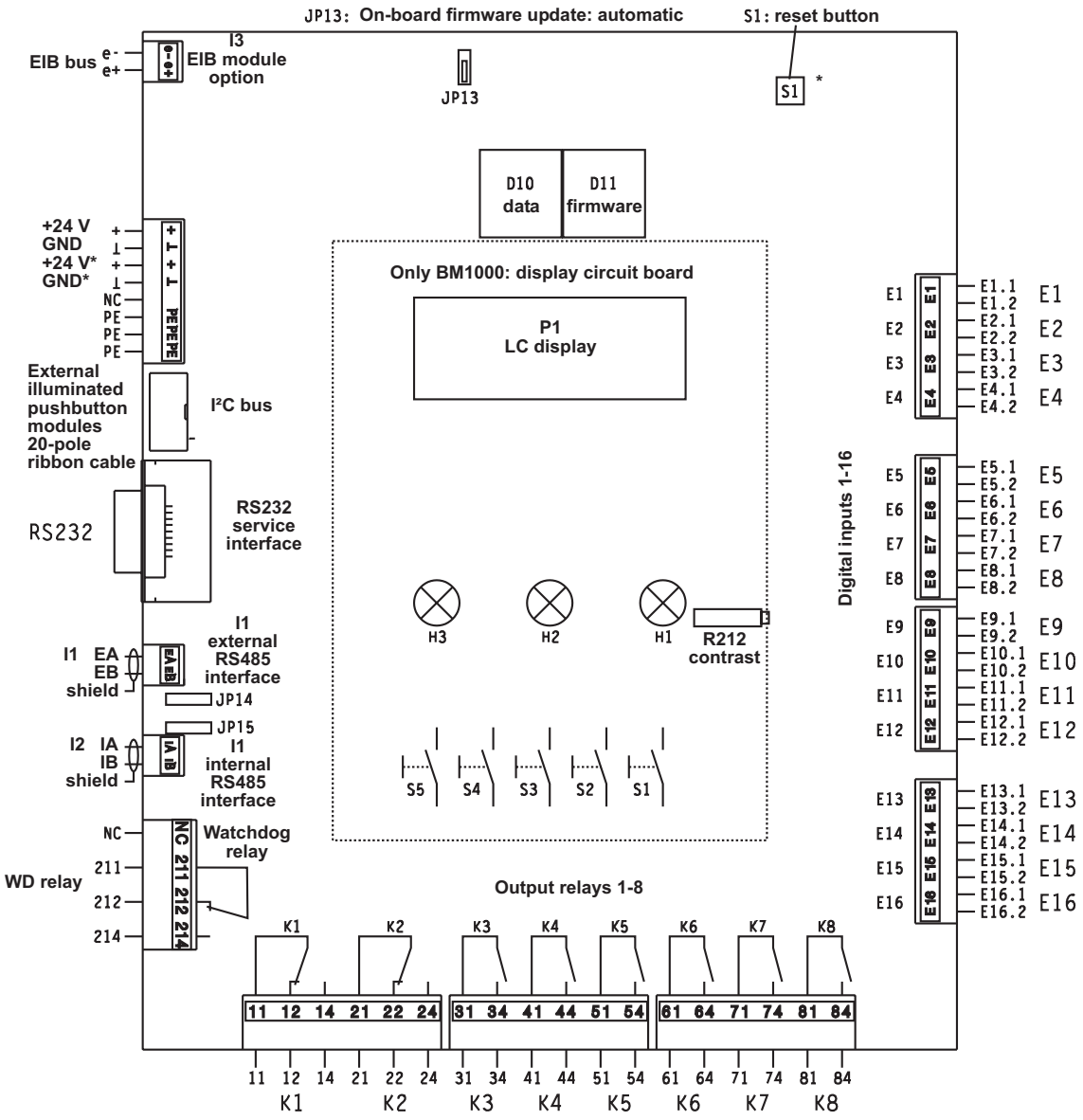
Connect the TM panel only according to the wiring diagram supplied with the TM panel itself. Do not change the internal wiring. Wiring not conforming to the accompanying diagram or unauthorized modifications may entail serious malfunctions or may result in a complete failure of the TM panel.

Connect the TM panels according to the individual wiring diagrams only.

4.2.1 Notes on connection

- Connect the TM operator panel to the supply voltage.
  - The standard supply voltage is AC 230 V.
  - If the TM operator panel is supplied with DC 24 V: When using long supply cables consider the voltage drop in the cable.
- Use cables with a cable cross section of 0.75 mm^2 for the connection of digital inputs and relay outputs. The cable length per connection shall not exceed 500 m.
- Use the terminals IA/IB to connect the device to the internal bus. Use the terminals EA/EB to connect the device to the external bus. Connect the BMS bus considering the details in the chapter "4.2.3 Connection BMS bus" and in the instruction leflet "BMS bus". Use a shielded cable for interface connection, min. 2xJY(ST)Y 0.6. Connect the shield on one side to PE only.

4.2.2 Connection of the central unit BM1000 resp. BM500



Legend to wiring diagram BM500 and BM1000

	Connection	Description
P1		LC display, 4 lines x 20 characters (8 mm character height)
R212		Contrast adjustment of the LC display
H1		LED, green (Normal)
H2		LED, yellow (warning)
H3		LED, red (alarm)

	Connection	Description
S1		"TEST" button (LED testing)
S2		"Buzzer mute" button resp. "ESC" (menu mode)
S3		"Scroll text" resp. ▲ (menu mode)
S4		"Add. text" resp. ▼ (menu mode)
S5		"Menu" resp. "ENTER" key
I3 (EIB)	e-	Connection e- for EIB bus (13) (option)
I3 (EIB)	e+	Connection e+ for EIB bus (I3) (option)
+24 V	+	Voltage supply +24 V DC
GND	⊥	Voltage supply GND
+24 V*	+	Voltage supply +24 V DC for additional loads
GND*	⊥	Voltage supply GND for additional loads
PE	PE	PE connection (protective earth)
I²C bus		Connection for external illuminated pushbutton modules
RS232	RS232	Service interface RS-232, 9-pole D-Sub
JP14		DIP switch for the terminating resistor of the external BMS bus
I1	EA	Connection A of the external BMS bus
I1	EB	Connection B of the external BMS bus
I2	IA	Connection A of the internal BMS bus
I2	IB	Connection B of the internal BMS bus
JP15		DIP switch for the terminating resistor of the internal BMS bus
WD	211	Terminal 211 of the watchdog relay output
WD	212	Terminal 212 of the watchdog relay output
WD	214	Terminal 214 of the watchdog relay output
E1	E1.1	Terminal 1 of digital input E1
E1	E1.2	Terminal 2 of digital input E1
E2	E2.1	Terminal 1 of digital input E2
E2	E2.2	Terminal 2 of digital input E2
...	...	.....
E16	E16.1	Terminal 1 of digital input E16
E16	E16.2	Terminal 2 of digital input E16

	Connection	Description
K1	11	Terminal 11 of relay output K1 (changeover contact)
K1	12	Terminal 12 of relay output K1 (changeover contact)
K1	14	Terminal 14 of relay output K1 (changeover contact)
K2	21	Terminal 21 of relay output K2 (changeover contact)
K2	22	Terminal 22 of relay output K2 (changeover contact)
K2	24	Terminal 24 of relay output K2 (changeover contact)
K3	31	Terminal 31 of relay output K3 (normally open contact)
K3	34	Terminal 34 of relay output K3 (normally open contact)
K4	41	Terminal 41 of relay output K4 (normally open contact)
K4	44	Terminal 44 of relay output K4 (normally open contact)
...	...	.....
K8	81	Terminal 81 of relay output K8 (normally open contact)
K8	84	Terminal 84 of relay output K8 (normally open contact)

4.2.3 Connection BMS bus

Communication between the TM panel and other system components takes place via two serial interfaces (internal and external BMS bus). These interfaces cables are of two-wire design.
The number of devices on the bus is limited to 30. By installing a DI-1 intermediate amplifier, the number of devices can be increased. A DI-1 also is required when the maximum length of 1200 m of a BMS bus segment is exceeded.

See Annex (instruction leaflet "BMS bus") for more details about the BMS bus.

Terminating resistor

The consequence of missing or improperly installed terminating resistors (e.g. in the middle of the bus) will be an unstable bus. See also the instruction leaflet "BMS bus" for more details.

The BMS bus must be terminated at both ends with terminating resistors of 120 Ω (0.4 W). One terminating resistor both for the internal and the external bus is installed in the TM operator panel. The terminating resistors can be switched on or off with the DIP switch (see chapter "4.2.2 Connection of the central unit BM1000 resp. BM500"). The DIP switches are located on the main PCB of the TM... panel adjacent to the interface terminals. Use the DIP switch to select "on" or "off" position.

If several TM panels are connected via the BMS bus, the terminating resistors of the operator panels not located at the end of the bus have to be switched off. The same applies to all other

devices and modules that are not located at the end of the bus.

BMS bus addresses
Be sure that the addresses of all devices connected to the bus are correctly assigned. Never assign one address twice. Assign the addresses consecutively without any gaps. Bear in mind that each bus requires one Master. A device becomes a MASTER by assigning address 1 to it.

Internal BMS bus
With address 1, the TM panel always is the MASTER on the internal bus. This address is permanently set and cannot be changed.

The connection of another TM panel for parallel indication is carried out via the external bus.

External BMS bus
On the external BMS bus, the addresses for the TM operator panel must be selected between 1 and 99 (see chapter "3.5 Firmware versions"). Address assignment can be carried out via the menu of the TM panel or via the basic settings in the Medi-Set software.

The external bus is primarily used for the connection of several TM panels. But PRC1470 control and indication panels and SMI472-12 signal converters can also be connected. Up to 99 devices can be connected.

The following rules apply for external bus:

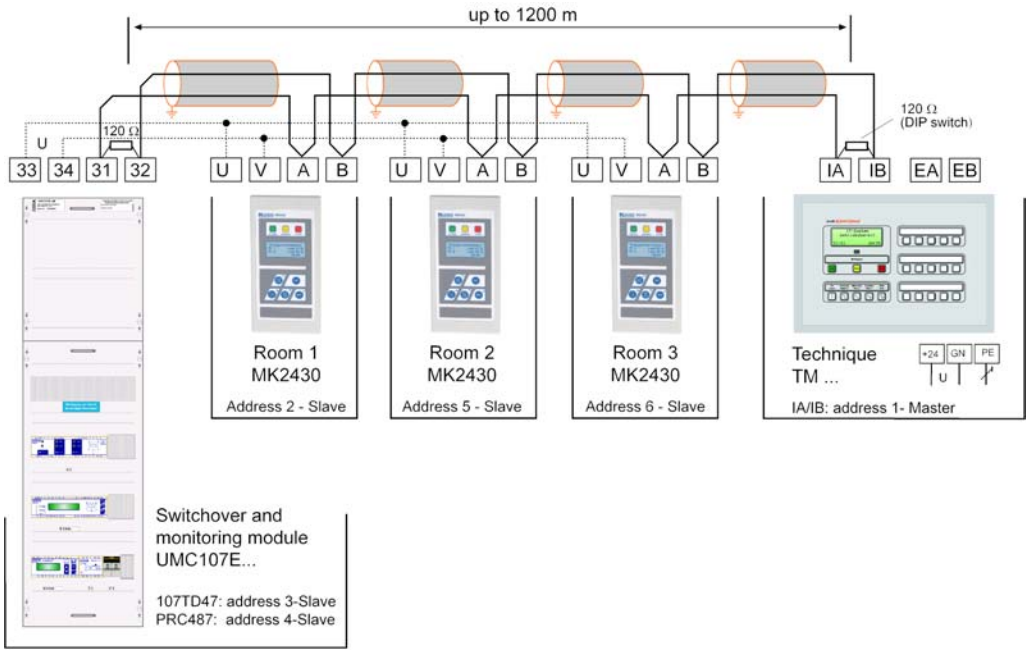
- When the TM panel is the only control device in the system, address 1 is assigned to it (Master).
- On the external bus, the Master function can be cyclically passed from one address to the next higher one.


Caution

- Additional TM panels consecutively get address 2, 3 etc. Only when there are no gaps between the addresses, reliable function can be ensured.
- All TM panels connected to a common external BMS bus must be equipped with a uniform software version (either all panels with version 1.xx or all panels with version 2.xx).
- The baud rate setting of all devices must be the same.

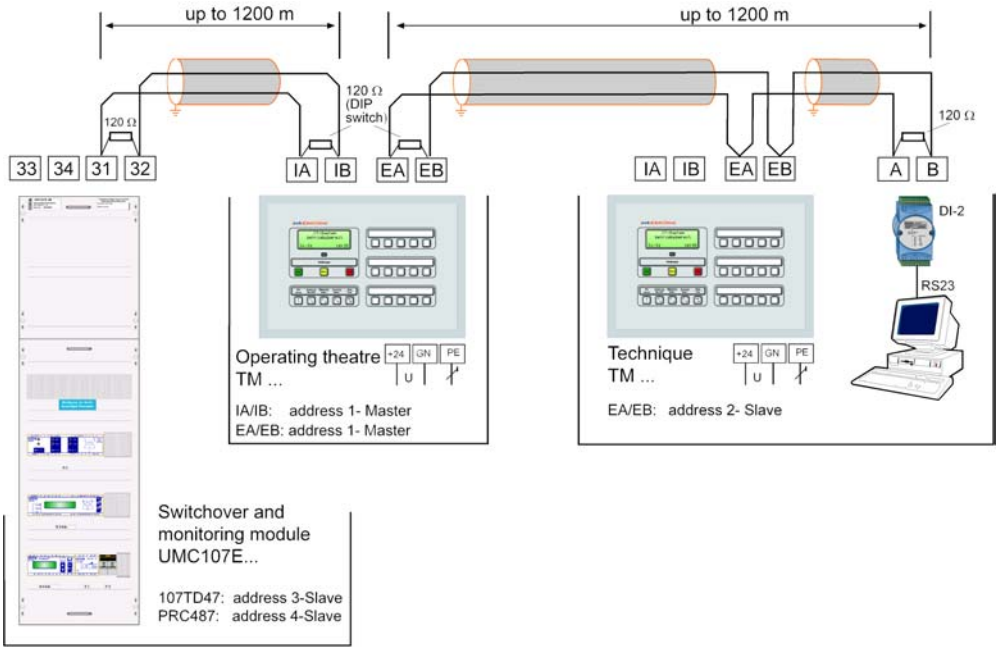
4.3 Examples for connection and addressing

Beispiel 1: Devices connected to the internal bus



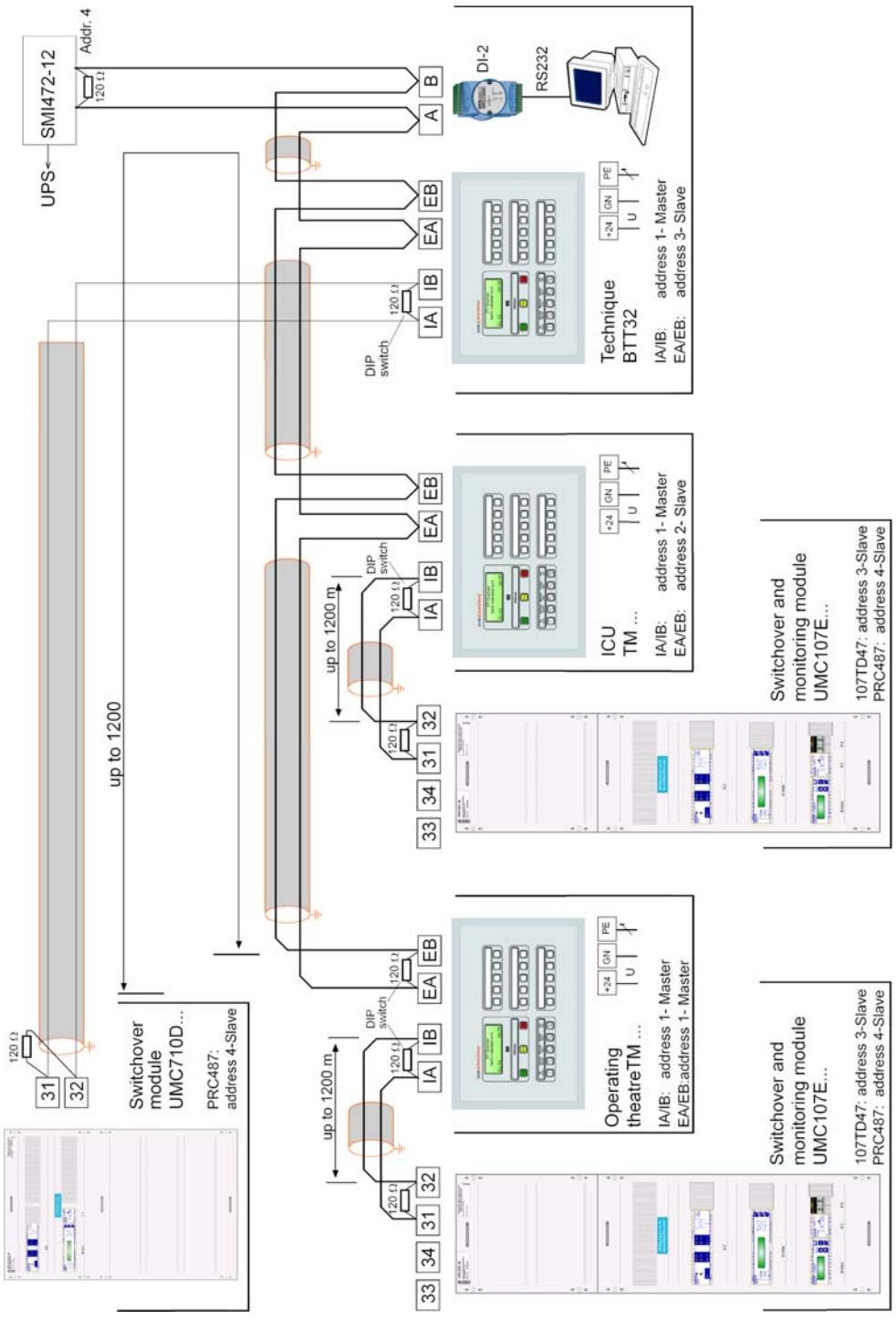
UMC107E-... switchover and monitoring module with TM panel and 3 MK2430-12 remote alarm indicator and operator panels. All components are connected to the TM panel via the internal RS-485 interface.

Example 2: Parallel operator panel



UMC107E-... switchover and monitoring module with one TM panel in the operating theatre, one central TM panel in the control room and a personal computer for evaluation of the panel's history. The personal computer requires a DI-2 interface converter to convert the RS-232 interface to RS-485.

Example 3: Central devices connected to the BMS bus



A three or four-pole UMC710D-.. switchover and monitoring device with two downstream UMC107E switchover and monitoring modules as well as a UPS system. Each *UMC107E is connected with "its" TM panel via the internal BMS bus. The TM panels are connected with each other and to a central TM panel in the control and monitoring room, to the SMI472-12 converter module and a personal computer for evaluation of the history via the external BMS bus. A DI-2 interface converter is required for PC connection.*

5. Commissioning and testing

5.1 Before switching on

1. Check all connections between the TM panel and the complete system
   - Is the system voltage identical with the voltage indicated on the nameplate of the TM panel or on the power supply unit?
   - Are the power supply cable and the PE of the TM panel properly connected?
   - Are the interface cables (internal/external bus) properly connected?
   - Are the terminating resistors of the BMS bus properly connected resp. installed?
   - Do the digital inputs have the right potential?
   - Are the relay outputs properly connected?
   - If there are EIB interface connections, are they properly connected and parameterized?
2. Check the readiness for operation of the other system components
   - Are other devices properly connected?
   - Are the digital inputs properly connected?
   - Are all addresses of other devices connected to the BMS bus properly assigned (no address double assigned)? Does the address asssignment correspond to the planning concept (bus overview).
   - Make sure that the TM panels are connected with each other only via the external bus.
   - Are all the rules specified in the "BMS bus" instruction leaflet followed?
   - If older devices exist in the system: Are all devices updated with the latest software version (firmware version)?

5.2 After switching on

1. Measure the supply voltage of the TM panel (terminals⊥, +)
2. Close the front plate of the TM operator panel
3. Does the green LED "NORMAL" light on the TM panel?
4. What kind of text is displayed on the TM panel? Connected devices with settings not adapted to the system can result in fault messages. Take a note of these messages.
5. Once more check the addresses and the firmware versions of the connected devices. Connect a personal computer with the accompanying Medi-Set PC software to the external bus of the TM panel. Call up the function "bus scanning“.
6. Carry out all the settings as described in chapter "7. Operation and setting" and write them down into the table.
7. Check the settings of all external devices in menu "9. System control" using the function "4. test mode".
8. Use the Medi-Set PC software to program the text of the fault messages for the TM panel.
9. Check whether fault messages are properly displayed on the TM panel. For that purpose simulate single faults such as device failure or insulation fault.
10. Check the circuit at the digital inputs. Are the medical gases in operation at the digital inputs (N/C operation)?

5.3 Periodic verification and service

IEC 60364-7-710:2002-11, clause 710.62 requires initial and periodic verification. It is the responsibility of the manufacturer to call attention to the test intervals of periodic verification.

Test intervals according to IEC 60364-7-710:2002-11	
Functional testing of the insulation monitoring system	every 6 months
Functional testing of the switchover equipment	every 6 months
Tests of the settings of the protective devices	annually

BENDER recommends:	
Testing of the MEDICS® components	annually
Functional testing of the insulation monitoring system (by pressing the test button on the MK.... or TM panel).	daily

Acceptance reports issued by BENDER service personnel prove that the system conforms to the standard.

We can also offer you on-site service for commissioning and periodic verification.

Please contact our service department:

Service-Hotline:
0700-BenderHelp (phone and Fax)

Carl-Benz-Straße 10 • 35305 Grünberg • Germany
Tel: +49(0)64 01-807 760 • Fax: +49(0)64 01- 807 629
E-Mail: info@bender-service.com • www.bender-de.com

or our local representative.

6. Trouble shooting

The following errors are recognized and displayed by the BM1000 module. In addition the system fault relay deenergizes and the buzzer issues a beep code at intervals of 10 seconds which corresponds to the error number.

No.	Display	Description	Actions
1	DISPLAY ERROR	Display defective	Replace the display PCB
2	I^2C BUS ERROR	Fault I^2C bus	Replace the CPU PCB or the cable
3	RTC ERROR	Clock module defective	Replace the CPU PCB
4	FLASH ERROR	Memory module D10 defective	Replace the memory module D10
5	Adress ERROR (XXX)	Address of the panel on the external interface is already occupied (XXX=current address)	Change the address in the menu
6	Overflow ERROR (XX)	Overflow of an alarm array (XX=array number)	Contact Bender Service
7	Checksum ERROR	Program memory defective	Replace memory module D11

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

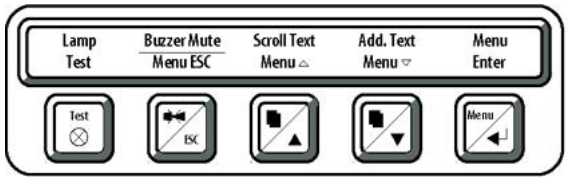
Error	Possible cause and steps to be taken
No indication on the display of the TM operator panel.	Check the voltage supply DC 24 V; Check the fuse of the power supply unit.
No characters on the display, although the display is illuminated.	Adjust the contrast of the trimmer R212 of the display PCB; the wrong jumper 202/203 type for the display set or not set at all; Use the latest firmware.
Function keys do not operate.	Pushbutton defective or defect at the printed conductor.
Common alarm LEDs do not function.	LED incorrectly inserted (polarity reversed).
Character matrix can be seen on the display, but firmware does not start.	Jumpers J1...J4 are not set; EPROM including firmware defective or not implemented.
Time will get lost in case of voltage failure.	Capacitor C30, C37 (gold-electrolyte) defective.

Error	Possible cause and steps to be taken
Error during the execution of a switching command (No. and address of an illuminated pushbutton module has not been found).	Interface of the internal I^2C-bus defective; ribbon cable or plug defective; Address of the illuminated pushbutton section not properly set or double assigned.
Error during transmission of assignments or basic settings via RS-232 interface.	Address of the panel not properly set (menu); Address of the panel does not comply with the setting specified in the configuration software Medi-Set; Null-modem cable defective or improperly prepared; wrong serial interface (com port) set in the Medi-Set software.
Error during transmission of assignments or basic settings via RS-485 interface.	Address or baud rate of the panel improperly set (menu); Address of the panel does not comply with the setting specified in the configuration software Medi-Set; Address of externally connected devices improperly set; incorrect parameterization with Medi-Set; Interface cables A/B interchanged; RS-485 bus improperly terminated or not terminated at all; wrong serial interface set in Medi-Set.
Error at the internal RS-485 interface.	Device addresses improperly set on the internal bus; Interface cables A/B interchanged; RS-485 bus improperly terminated or not terminated at all; incorrect parameterization with Medi-Set;
Malfunction of the output relays.	Incorrect programming of the switching commands with Medi-Set; Relay defective.
Malfunction of the digital inputs.	Incorrect programming of the digital inputs with Medi-Set.

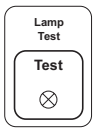
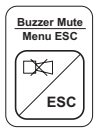
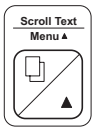
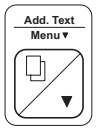
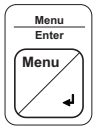
7. Operation and setting

7.1 Pushbutton section of the TM operator panel

The TM operator panel is operated via five illuminated pushbuttons.



The pushbuttons provide the following functions:

	In the operating mode	In the menu mode
	Test of all LEDs integrated in the TM panel (LED "buzzer mute" is not tested)	Test of all LEDs integrated in the TM panel (LED "buzzer mute" is not tested)
	To mute the buzzer after alarm indication	ESC key To exit the menu
	To scroll through the warning and alarm messages listed on the display	UP key to scroll up in the menu
	Alternate indication between normal text and additional text.	DOWN key to scroll downwards the menu
	Starts the menu mode to set the TM operator panel.	ENTER key To confirm the selected sub-menu

Note: If messages exist and the key "scroll text" or "add. text" is pressed, the current message appears on the display. If no further key is pressed, this indication will be displayed for 15 seconds.

7.2 Settings

When the TM operator panel is supplied with mains voltage, the following information appears for about 3 seconds. Address and firmware version are indicated.

```
***MEDICS-SYSTEM***
**BM1000 /Adr.:001**
*Ver.2.10 #27/01/05*
```

The next information always appears when no messages exist (standard display). The clock starts running.

```
  Bender TM-Tableau
    Control panel
for EDS&RCMS systems
               09:50
```

The standard display and the alarm text messages can be changed using the Medi-Set software.

Press the "Menu" key to change the settings.The main menu appears. The last line shows which keys are currently activated:

```
1.Exit
2.Password (Y/N)
3.Time/messages
  | ESC |    |↓|    |↲|
```

ESC	To exit the menu
↓	to select the menu item
↲	to confirm the selected menu item

Now you have opened the main menu. Use the up and down keys to select the respective submenu; then confirm with the ENTER key (↲).

7.3 Menu mode

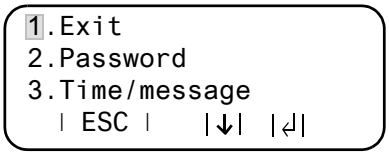
The following submenus are available:

1. Exit	To leave the menu mode.
2. Password	To switch the password query on or off. The password is required for the transmission of the configuration between the TM panel and the personal computer as well as to change some basic settings.
3. Time/message	To set the time interval for the display of warning and alarm messages to several text messages alternately.
4. Buzzer	To set the frequency of the buzzer signal.
5. Common reset	To enable (ON) or disable (OFF) the acoustic alarm of this TM operator panel by an external reset button. This setting has to be selected for the internal and external bus separately.
6. Date/time	To set the time and date of the real-time clock of this TM operator panel. Every hour all other TM operator panels are synchronized by the TM operator panel with address 1.
7. RS485 external	To set the address and transmission rate (baud rate) of the external BMS bus.
8. External devices	Settings at the connected evaluators. (e.g. EDS47x and RCMS47x).
9. System control	This menu offers different possibilities for controlling the entire system.
10. History	Messages and acknowledgements with time and date stored in the memory are listed.
11. Change password	To change the password.
12. Language/Sprache	To choose a language for TM panel operation (German or English).
13. Info	Information about the device type, firmware version and the last transfer of assignments.

The menu mode is automatically quitted when in one of the submenus no key is pressed for longer than two minutes (exception: "Position mode" in menu "9. System control").
The alarm text messages are factory-set via PC software Medi-Set.

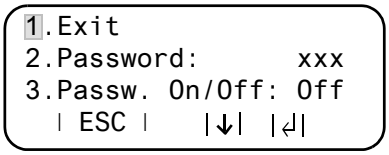
7.3.1 Exit

The menu mode is quitted



7.3.2 Menu 2: Password

Modifications of settings, as for example "External devices" in menu 8. can be protected with a password.

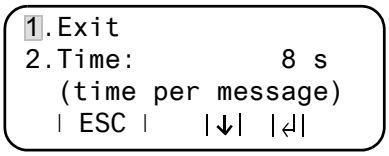


First of all, activate the password query with "ON" and then enter the password.

1. Exit	To return to the main menu
2. Password	Enter three numbers as a password. Choose submenu 2 with the arrow key and confirm with ↲. Choose the first number of the password using the arrow keys, then jump to the next number with the ↲ key to choose the second number, and proceed in the same way with the third number. If the password is entered properly, it is valid until the menu is left and two minutes after. **The password is factory-set to 807.**
3. Passw. On/Off	To enable the password query (ON) or to disable the password query (OFF). Factory setting: ON. Select the submenu 3 with the arrow keys and confirm with ↲. Then choose ON or OFF and confirm with the ↲ key.

7.3.3 Submenu 3: Time/message

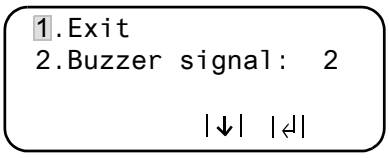
If there are several warning and alarm messages that are to be displayed, these messages will be displayed alternately. The time/message submenu is used to set how long a message is to be displayed until the next message appears. Setting range: 3...8 seconds.
Factory setting: 5 seconds.



1.Exit	To return to the main menu.
2.Time interval	To set the time interval: Select the submenu 2 with the arrow keys and confirm with ↲. Now set the time interval using the arrow keys and confirm with the ↲ key.

7.3.4 Submenu 4: Buzzer

Setting the interval frequency for the buzzer signal that is to be issued in case of an alarm or a warning message.

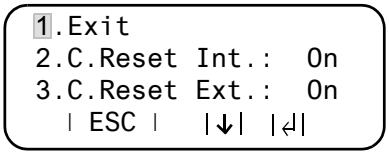


1.Exit	To return to the main menu.
2.Buzzer signal	Adjustable between 1 and 5. 1 = permanent signal 5 = long breaks between the buzzer signals During the setting, the button "buzzer" lights up and the pre-selected buzzer signal sounds. Buzzer signal sounds.

7.3.5 Submenu 5: Common reset

Setting On or Off for this TM panel to allow a common reset with the button "buzzer mute" of another indicating device.

If common reset (On) has been activated, for example, the alarm (buzzer signal) of a TM operator panel in an adjacent building can be reset by a centrally arranged TM operator panel. The alarm message itself is displayed until the fault is eliminated.



1.Exit	To return to the main menu.
2.Comm.res.int.:	To select common reset for the internal bus. Factory setting: On. That allows external buzzer mute.
3.Comm.res.ext.:	To select common reset for the external bus. Factory setting: On. That allows external buzzer mute.

7.3.6 Menu 6: Date/time

Enter the password before setting time and date (see “Menu 2: Password” on page 44.).
The settings remain stored for another 5 days in case of power interruption.
The clock automatically changes from standard to daylight saving time. This automatic change is based on the Central European Time (MESZ). If the time does not correspond to your local time after automatic change, you have to set the time again. Automatic change can be switched off (see “A choice of settings” on page 60.).

```
1. Exit
2. Time    17:45
3. Date    21.07.03
   | ESC |  |↓|  |↲|
```

1.Exit	To return to the main menu.
2.Time	Time setting (hours and minutes).
3.Date	Date setting (TT.MM.JJ)

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

7.3.7 Menu 7: RS485 External

Setting of the device address and the baud rate of the external BMS bus.

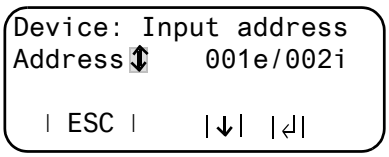
```
1. Exit
2. Addr. RS485E:  001
3. Baud RS485E:  57600
   | ESC |  |↓|  |↲|
```

1.Exit	To return to the main menu.
2.Address	Device address setting. An address must be selected within the range of 1...99. Factory setting is address 1.
3. Baud	Setting the baud rate) of the external BMS bus. Factory setting:version 1.xx : 9600, version 2.xx : 57600

Change the device address if several TM panels are connected to one external BMS bus. One TM panel must have address 1 (Master). All the other TM panels are consecutively set to: 2, 3, 4... The system can only function reliably when there are no gaps between the address numbers.
It is recommended not to change the baud rate. Data exchange can only take place among devices having the same baud rate.

7.3.8 Menu 8: External devices

BMS bus setting for the connection of external devices, such as. EDS47x-12 or RCMS47x-12.



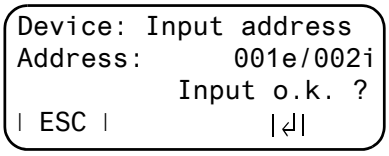
xxxe	Address setting of the device on the external bus that is intended to address the external device. In this case, the TM panel suggests its own address. It is also possible to set addresses of other devices.
xxxi	Address setting of the device connected to the internal bus.

Example:

001e/002i	A device with address 2 (e.g. an EDS470-12) is addressed via its own TM panel with address 1 on the internal BMS bus.
001e/003i	A device with address 3 (e.g.an RCMS470) is addressed via its own TM panel with address 1 on the internal BMS bus.

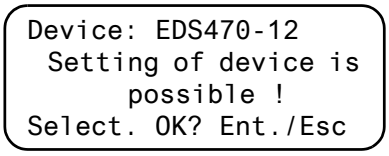
1. Use the Up/Down keys to set the external address of the TM panel and confirm with the ↲ key.
2. Use the Up/Down keys to set the internal address of the external device and confirm with the ↲ key.

Are all settings properly entered ?



ESC	Return to address input
↲	Accept address setting

When the device has been recognized, the TM panel reads the current settings of the connected device. The device type is displayed in the first line.



For changing the device settings press:

ESC	To return to address input.
Ent.	To start parameterization of EDS47x-12 or RCMS47x-12. The EDS or RCM menu offer various possibilities on how to set the devices. For detailed information refer to the technical manuals of the respective systems.

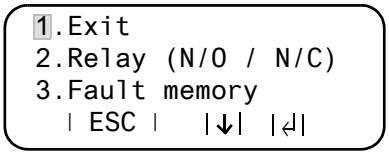
7.4 EDS menu

The insulation fault evaluator EDS47x-12 can be set in Menu "8.external devices" of the TM panel. The following submenus are available:

1. Exit EDS menu	To leave the EDS menu
2. Relay (N/O / N/C)	Setting the operating principle of the alarm relay to N/O operation or N/C operation.
3. Fault memory	To switch the fault memory on or off.
4. CT type	To set the CT type for each channel: standard CT, split-core CT or no CT connected.
5. CT monitoring	Monitors whether a CT is connected, whether its connection is interrupted or short-circuited or if the CT monitoring is switched off.
6. Meas. time (peak)	Guarantees effective insulation fault location. To set how often each CT is to repeat the measurement in case of a fault.

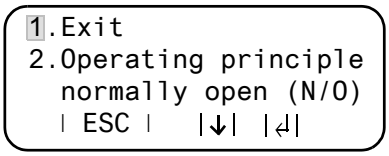
7.4.1 Exit EDS menu

To leave the EDS menu, return to the main menu of the TM panel.



7.4.2 Relay (N/O or N/C)

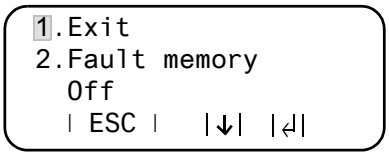
Setting the operating principle of the alarm relay to N/O or N/C operation.



Select:
- N/O operation (N/O)
  or
- N/C operation (N/C)

7.4.3 Fault memory

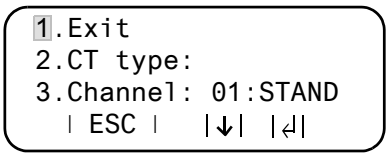
Setting the fault memory.



Select:
- Off
  or
- On

7.4.4 CT type

Setting the CT type for each channel.

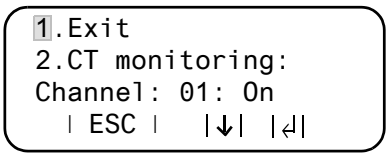


1. Choose one of the channels between 01 and 12.
2. Select the appropriate type for the connected CT:
   - off no CT
   - STAND standard CT
   - SPLIT split-core CT

Repeat the steps 1 and 2 for all the channels to be set.

7.4.5 CT monitoring

Monitors whether a CT is connected, or CT connection is interrupted or short-circuited.



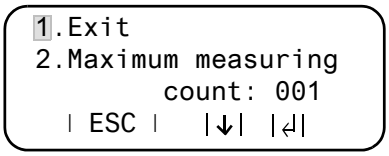
1. Choose one of the channels between 01 and 12.
2. Select
   - Off

   or
   - On

Repeat the steps 1 and 2 for all the channels to be set.

7.4.6 Measuring time (peak)

This function guarantees effective insulation fault location. Set how often the measurement is to be repeated in case of a fault.



Set how often the measurement is to be repeated by a CT (0...255 times).

Enter the settings on the tables beginning on page 60.

7.5 RCMS menu

The residual current evaluator RCMS47x-12 can be set in Menu „8. External devices“ of the TM operator panel. The following submenus are available:

1. Exit RMCS menu	To leave the RMCS menu.
2. Response values	To set the response values and prewarning.
3. Relay (N/O / N/C)	To set the operating principle of the alarm relay to N/O or N/C operation.
4. Fault memory	To switch the fault memory on or off.
5. Factor	Setting the factor to adapt the RCMS47x-12 to the CT connected.
6. CT monitoring	Monitors whether a CT is connected, its connection is interrupted or short-circuited or whether the CT monitoring is switched off.
7. Function	To set the channel monitoring to undercurrent or overcurrent or to switch the channel off.

7.5.1 Exit RCMS menu

To leave the RCMS menu; to return to the main menu of the TM panel.

```
1.Exit RCMS menu
2.Response values
3.Relay (N/O / N/C)
  | ESC |   |↓|  |↲|
```

7.5.2 Response values

To set the reponse values and prewarning as a percentage of the set response value.

```
1.Exit
2.Set response value:
Channel: 01  0050mA
  | ESC |   |↓|  |↲|
```

First of all, set the factor for each channel in menu 5 !

Not all response values are appropriate. If a value is unsuitable, the TM panel suggests the next smaller suitable response value.

Setting the response values:

1. Select

   Channel: xx to set the response value for a channel selected between 1 and 12.

2. Select the response value:

Response range	Step width	
1 mA...9 mA	1 mA	Measuring range extension by using the factor /1.../10.
10...19 mA	1 mA	Measuring range of RCM470-12 with the factor *1 (10 mA...10A).
20...490 mA	10 mA	
500...950 mA	50 mA	
1...9.9 A	0.1 A	
10 ...19 A	1 A	Measuring range extension by using the factor *1...* 225
20...190 A	10 A	
200...2250 A	50 A	

Repeat the steps 1 and 2 for all the channels to be set.

Setting of the prewarning:

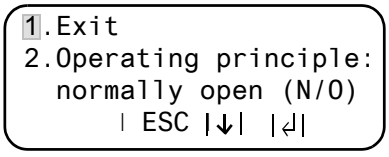
1. Select

   Channel: 1...12 to set the prewarning (only after selecting overcurrent function (Id > Y) as a percentage of the set response value for **all** channels between 1 and 12.

2. Choose the percentage of the respective response value at which a prewarning is to be issued. Setting possibilities: 010 %, 020 %, ... up to 100 %.

7.5.3 Relay (N/O / N/C)

Setting the operating principle of the alarm relay to N/O or N/C operation.

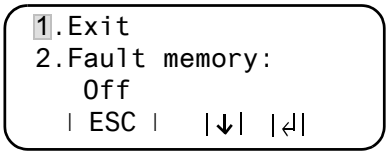


Select:

- normally open (N/O) or
- normally closed (N/C)

7.5.4 Fault memory

Setting of the fault memory (alarm LED and relay).

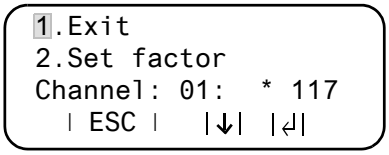


Select:

- Off or
- On

7.5.5 Factor

Setting a factor to adapt the RCMS47x-12 to the connected CTs.



1. Choose one of the channels between 01 and 12.
2. Choose the factor. The following factor setting ranges are available depending on the CT type and the application.

Choose:

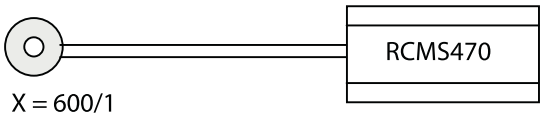
*001	- for BENDER measuring current transformers with a transformation ratio of 600/1 (standard);
*001 ... *225	- for measuring current transformers having a different transformation ratio: - for measuring current transformers with an external shunt (shunt load resistor); - when external CTs are connected via a BENDER measuring current transformer
/002 ... /010	- when the wire to be measured is "pin-wound" several times through the CT in order to amplify the signal.

Repeat the steps 1 and 2 for all the channels to be set.

Examples for the factor determination

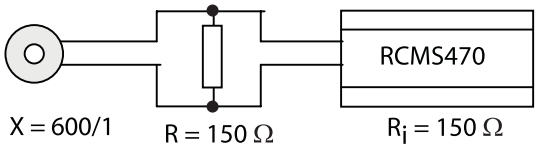
X = transformation ratio, N = number of turns through the measuring current transformer (wire up)

Beispiel 1: Bender measuring current transformers with a transformation ratio of 600/1



X = 600/1
Factory setting:
Factor:F = *001
CT monitoring: On

Example 2: Bender measuring current transformers with an external shunt R = 150 Ω



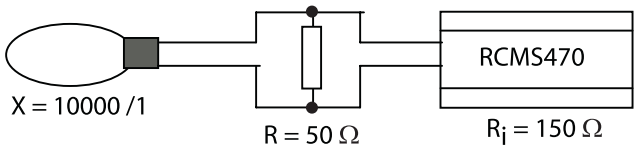
$$F = \frac{R_i}{R} + 1 = \frac{150\,\Omega}{150\,\Omega} + 1 = 2$$

Setting:

Factor:	F = *002
CT monitoring:	Off

Since the internal resistance of a channel of the RCMS47x-12 also is 150 Ohm, half of the current flows via the RCMS47x-12. Hence, the factor must be *002 in order to display the full value.

Example 3: Flexible Bender-wrap-around CTs W500 ... W1000 S with external shunt R = 50 Ω

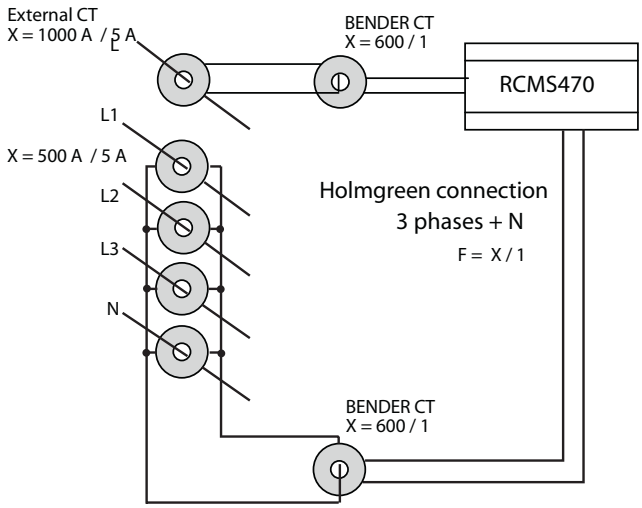


$$F = \frac{10000}{600} * \left(\frac{150\,\Omega}{50\,\Omega} + 1\right)$$

Settings:

Factor:	F = *066
CT monitoring:	Off
Response range:	1 A...12A !!!

Example 4: Connection of external BENDER measuring current transformers



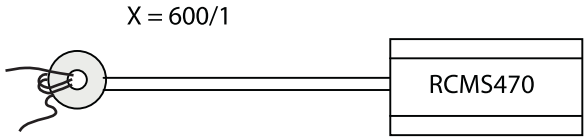
Settings for individual CTs:

Factor	F = (X / N) = 200 / 1 = *200
CT monitoring:	On

Settings for Holmgreen connection:

Factor:	F = (X / N) = * 100
CT monitoring:	On

Example 5: The wire to be measured is "pin-wound" several times through the BENDER current transformer in order to amplify the signal.

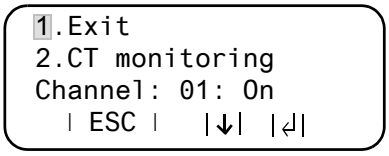


$$F = \frac{1}{N} = /003$$

Setting:
Factor: F = /003
CT monitoring: On

7.5.6 CT monitoring

Monitors whether a CT is connected, whether its connection is interrupted or short-circuited or if the CT monitoring is switched off.

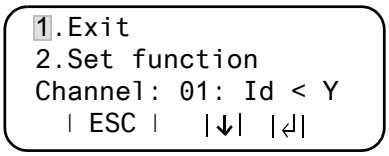


1. Choose one of the channels between 01 and 12.
2. Select
   - Off or
   - On

Repeat the steps 1 and 2 for all the channels to be set.

7.5.7 Function

To set the channel monitoring to undercurrent or overcurrent or to switch the channel off.



1. Choose one of the channels between 01 and 12.
2. Select the appropriate function:

Id>Y	overcurrent function
Id<Y	undercurrent function
off	no CT connected

Repeat the steps 1 and 2 for all the channels to be set.

Enter the settings on the tables on page 60.

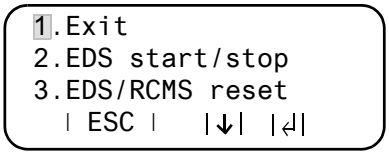
7.6 Menu 9: System control

This menu provides several possibilities:

1. Exit	To leave the menu.
2. EDS Start/Stop	Manual start and stop of the measuring sequence of the EDS system.
3. EDS/RCMS reset	To reset all alarm messages of the connected EDS47x-12 and RCMS47x-12.
4. Test mode	Provides information about the connected devices (address, software version, device type)
5. Position mode	To display continuously the measured value of a channel of a connected evaluator.
6. Setup reset mode	To select internal reset or internal and external reset.

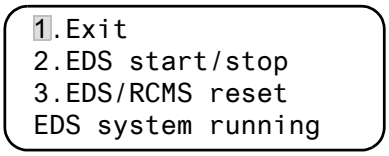
7.6.1 Exit

To leave the menu



7.6.2 EDS Start/Stop

Manual start and stop of the measuring sequence of the EDS system ↵.



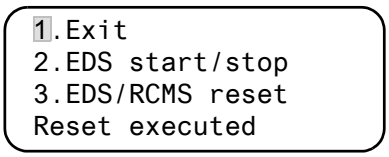
EDS system running	After starting insulation fault location, EDS47x-12 and PGH47x keep running continuously. If the menu is quitted, the message „EDSp“ appears in the last line of the standard display to indicate permanent sequence*.
EDS system stop	The permanent measuring sequence of EDS47x-12 and PGH47x is stopped. If the menu is quitted, the message „EDS“ appears in the last line of the standard display until the current measuring sequence is finished.

*Other abbreviations that can be displayed in the last line:

EDSa	Automatic mode: Insulation fault location has been started at the PGH471 by the Isometer.
EDSs	Single mode: A single pass has been started via IN2 at the PGH471.

7.6.3 EDS/RCMS reset

To reset all alarm messages of EDS47x-12 and RCMS47x-12.



7.6.4 Test mode

Provides information about the connected EDS47x-12 and RCMS47x-12 devices.

```
Device: Input address
Address:  001e/ 003i

                |↲|
```

xxxe — Select the address of the TM panel on the external BMS bus that is intended to address the external device. In this case, the TM panel suggests its own address.But it is also possible to set addresses of other TM panels.

xxxi — Address setting of the device connected to the internal bus.

Example:

001e/003i — A device with address 3 (e.g.an RCMS470-12) is addressed via its own TM panel with address 1 on the internal BMS bus.
Set the external address of the TM panel and the internal and the internal address of the external device and confirm with the ↲ key.

Are all settings properly entered ?

```
Device: Input address
Address:   001e/ 003i
Input o.k. ?
  | ESC |       |↲|
```

ESC — To return to address input

↲ — To accept address setting

If the device has been recognized, the device type is displayed in the first line.

```
Device: RCMS470-12
   Test running!

   Please wait!
```

After finishing the test, information about the connected device is given under the respective address:

Display	Meaning	Example
1. Exit	Leaving the test mode	
Gerät / Device	Device designation	RCMS470
Var. / Type	Device type	-12
SW-Version	Internal software version	2.01
Kanal / Ch. xx	The following information can be displayed for the channels 1...12: ok — CT ok off — channel is not being measured short — CT short-circuited open — no CT connected	1: ok 12: off 2: short ...

Display	Meaning	Example
Relay mode	Operating principle n.open N/O operation n.closed N/C operation	n.open
Speich./ Mem.	Fault memory behaviour: on switched on off switched off	off

7.6.5 Position mode

Continuous indication of the measured value of a channel of a connected EDS47x-12, RCMS47x-12 or Isometer with BMS protocol.

```
Device: input address
Address:   001e/003i
Channel: 01:
      | ESC |    |↲|
```

xxxe Select the address of the TM panel on the external BMS bus that is intended to address the external device. In this case, the TM panel suggests its own address. But it is also possible to set addresses of other TM panels.

xxxi Address setting of the device connected to the TM panel on the internal BMS bus.

Channel: xx: Selection of the measuring channel 01...12

Set the address of the TM panel, of the external device and select the appropriate channel and confirm with ↲ .

Example: 002e/003i, channel 05

```
Device: RCMS470
Address:     002e/ 003i
Channel: 05:  13 mA
  | ESC |        |↲|
```

A device with address 3 (e.g. an RCMS470-12) connected to the internal BMS bus is addressed by another TM panel with address 2 connected via an external BMS bus. Now, the measured value of channel 5 is displayed continuously.

Press ESC to abort the continuous display and return to Menu "9. System control".

The EDS47x provides no function to address internal device addresses of other TM panels.

7.6.6 Setup reset mode mode

To select internal reset or internal and external reset

```
Device: input address
Address:   001e/003i
Channel: 01:
      | ESC |    |↲|
```

7.7 Other main menu functions

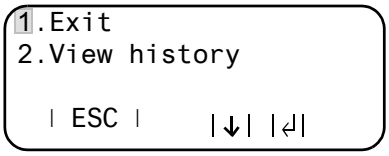
7.7.1 Menu 10: History

The TM panel stores up to 650 messages with date and time in the memory (ring buffer). When more than 650 messages are recorded by TM panels, the 651th message overwrites message 1.

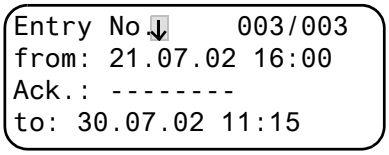
This menu provides information about messages and acknowledgements and their date and time. It also indicates whether an alarm still exists or the time the alarm was reset. The complete contents of the memory with additional text and the address of the device sending the message can be viewed on a personal computer and printed out by means of an appropriate software.

1. Choose:

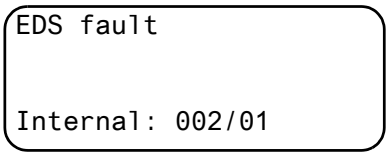
Exit	to leave the menu or
view history	to display the history.



2. Choose the desired entry using the Up/Down keys.
   First of all, the last entry is displayed. Older entries can be selected with the Up/Down keys.



3. Press the ↵ key to display the alarm text of the selected entry.The last line shows the path of the message to the TM panel (in this case: Internal BMS bus, address 002, channel 01).



4. Press the ↵ key again to return to the entry selection.

Repeat the steps 2 and 4 for all messages you want to display. Press ESC to leave the menu.

7.7.2 Menu 11: Change password

The password (numerical code) can only be changed when it has been entered before in the password enable menu (see page 44).

```
1.Exit
2.Change PW: xxx

  | ESC |     |↓| |↲|
```

1. Choose "change PW", then press the ↲ key.
2. Change the first number and press the ↲ key.
3. Also change the second and third number.

After confirming the last number with ↲ your password is set. But it will only be effective when it is switched on in the "2. password enable" menu.

7.7.3 Menu 12: Language/Sprache

Determine the language for the TM panel menus (German or English).
Choose the appropriate language and press the ↲ key.

```
1.Exit
2.German
3.English
  | ESC |     |↓| |↲|
```

From now the menu text will appear in the selected language.

The user-defined alarm text messages, however, remain unchanged.

7.7.4 Menu 13: Info

```
***MEDICS-SYSTEM***
**BM1000 /Adr.:001**
*Ver.2.10 #27/01/05*
   | ESC |    |↑|  |↲|
```

Information about device type, firmware version, and the last assignment transfer. Assignments are settings carried out via a PC software (e.g. Medi-Set). Text messages and functions are assigned to lamps, pushbuttons, digital inputs and relay outputs of TM panels.

Choose:

ESC	To leave the menu mode
↑	To display the date of the last assignment transfer
↲	return to 1. in the menu mode

7.8 Table of TM panel settings

7.8.1 A choice of settings

The TM panel can be set in different ways. The table shows where the individual parameters are set.

Parameters				Settings via				
Designation	**Range**	Factory setting	Individual setting	**TM** Menu No.	**TM** Designations used in the service menu	**Medi-Set** Basic setting/ panel setup	**Medi-Set** Service-menu	**Note**
History buffer	--	--	--	--	History clear	--	History buffer Reset	Delete all data records from the history buffer
Reset counter	--	--	--	--	Reset counter	--	Reset counter Reset	Display and reset of Power-Down and Watchdog counter
Interface RS485 intern RS485 extern	 On/Off On/Off	 on on		--	RS485 int. / RS485 ext.	--	Interface RS485 int. / RS485 ext.	Switch off the unused interface Parallel panel: faster external communication Single panel: faster internal communication:
Time-Out int. Time-Out ext.		42 ms 10 ms		--	Timeout int. Timeout ext.	--	Timeout RS485 int. / RS485 ext.	Timeout at int./ext. BMS. Only to be changed for testing purposes !
MaxSlaveTime	500..3000 ms	2000 ms		--	Timing 3	--	MaxSlaveTime RS485 ext.	When the threshold is exceeded, the external interface will be processed preferably.
ALMI Idle-Time	1..2 s	2 s		--	--	--	ALMI Idle-Time RS485 int.	Time interval between two ALMI requests at the internal BMS.
Backlight	auto / on	auto		--	Backlight	--	LCD Backlight	Display backlight automatically switched on in case of operation or alarm or permanent backlight.
S/W-Time	auto / off	auto		--	S/W-time	--	--	Automatic daylight saving time/standard time
Lamptest-Relay No.	00..16	00		--	Lamptest-> Relay No. xx	--	--	In case of LED testing, the preselected relay will be activated. (00: no relay)
Max.Adress Gap	1..9	3		--	AddrGap ext	--	Max.Adress Gap RS485 ext.	Max. admissible address gap at the external BMS
Max.Fault Count	0..3	2		--	Max fault count	--	Max.Fault Count Device failure alarm	Max. admissible number of missing replies until failure alarm is generated.
Buzzer	On/Off for 1..9 h	On	--	--	Buzzer On/Off	--	--	e.g. during commissioning, the buzzer can be switched off for 1...9 hours.
DigInput Setting Extern	0/1	0		--	DigIn setting ext	--	--	The transfer of operating messages from the digital inputs 1-16 to the external bus can be switched off (for flashing LEDs).
MaxVariation	0..50 %	25 %		--	Value resend cond	--	MaxVariation Resend status and alarm messages	Max. variation from analogue values of the internal BMS. When the values are exceeded, the messages will be resent via the external BMS.
AddrRange 31-60 (SMO... only)	y/n	n		--	AddrRange 31-60	--	--	The request of devices with addresses 31...60 can be switched off ((it appears reasonable when there are only SMO in this area))
Password query	y/n	y		M2	--	Password enable	--	Activation/deactivation of the password query.
Password	nnn	807		M11	--	Changing the password	--	Entering/changing the password
Language	German/ English			M12	--	Language	--	Setting the menu language

Parameters				Settings via				
Designation	**Range**	Factory setting	Individual setting	**TM** Menu No.	**TM** Designations used in the service menu	**Medi-Set** Basic setting/ panel setup	**Medi-Set** Service-menu	**Note**
Time interval for messages	3..8 s	5 s		M3	-- --	Time interval	--	Time interval for displaying messages alternately, if several messages are present simultaneously.
Buzzer settings	Duration/ Interval 1..5	2		M4	--	Buzzer interval	--	Setting the buzzer interval
Common internal acknowledgement	y/n	y		M5		Common int. acknowledgement RS485.	--	Setting whether the buzzer at the internal BMS is to be muted in case of alarm acknowledgements at other devices.
Common external acknowledgement	y/n	y		M5	--	Common external acknowledgement RS485 ext.	--	Setting whether the buzzer at the external BMS is to be muted in case of alarm acknowledgements at other devices.
Reset mode	int. / int.+ext.	int.			--	RS485 int. / RS485 ext.	--	Determination of the RESET command via BMS.
Time Date				M6		Time Date	--	Setting the time and date.
RS485 setting ext. address baud rate	 1..99 19800.. 57600	 1 57600		 M7 M7	 -- --	RS485 settings panel address baud rate	--	Setting of the ext. BMS-bus interface.

7.8.2 Setting of external devices RCMS menu

Please use the following table as a master copy to document the settings of your TM panel.

BMS address	Mounting position / Function												
Submenu	Channels	1	2	3	4	5	6	7	8	9	10	11	12
8. External devices RCMS mode	**Settings for all channels**												
8.2 Response values													
8.3 Relay		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
8.4 Memory		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
8.5 Factor	----------												
8.6 CT monitoring	----------												
8.7 Function	----------												

7.8.3 Settings of external devices EDS menu

Please use the following table as a master copy to document the settings of your TM panel.

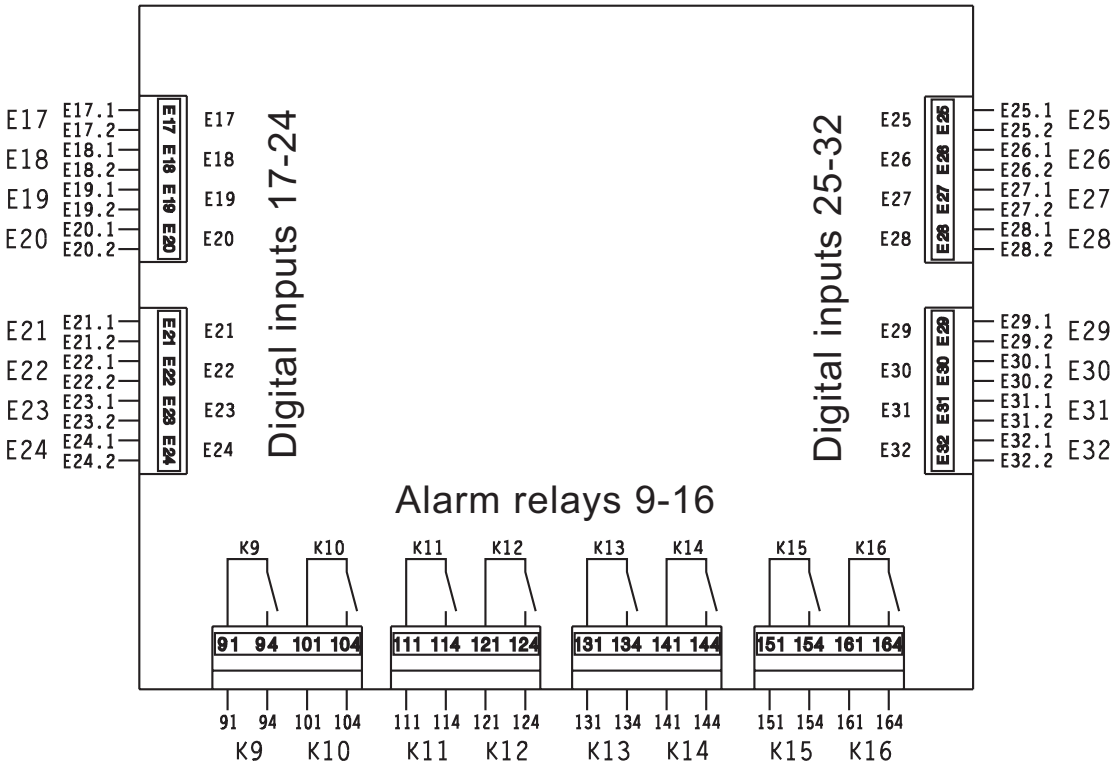
BMS address	Mounting position / Function												
Submenu	Channels	1	2	3	4	5	6	7	8	9	10	11	12
8. External devices EDS mode	**Settings for all channels**												
8.2 Relay		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
8.3 Memory		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
8.4 CT type	----------												
8.5 CT monitoring	----------												
8.6 Measuring time (peak)		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

8. Options

8.1 Expansion board BMI100-16/8 (option)

Expansion board with 16 digital inputs (electrically isolated) and 8 additional relay outputs (normally open contact 250 V / 5 A). The BMI100-16/8 can be installed at factory into the enclosure of the TM panel.

8.1.1 Terminal diagram



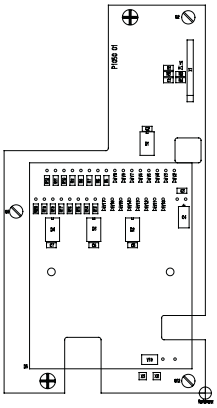
8.1.2 Legend to terminal diagram

	Connection	Description
E17	E17.1	Terminal 1 of digital input E17
E17	E17.2	Terminal 2 of digital input E17
E18	E18.1	Terminal 1 of digital input E18
E18	E18.2	Terminal 2 of digital input E18
E19	E19.1	Terminal 1 of digital input E19
E19	E19.2	Terminal 2 of digital input E19
E20	E20.1	Terminal 1 of digital input E20
E20	E20.2	Terminal 2 of digital input E20
E21	E21.1	Terminal 1 of digital input E21
E21	E21.2	Terminal 2 of digital input E21
E22	E22.1	Terminal 1 of digital input E22
E22	E22.2	Terminal 2 of digital input E22
E23	E23.1	Terminal 1 of digital input E23
E23	E23.2	Terminal 2 of digital input E23
E24	E24.1	Terminal 1 of digital input E24
E24	E24.2	Terminal 2 of digital input E24
E25	E25.1	Terminal 1 of digital input E25
E25	E25.1	Terminal 2 of digital input E25
E26	E26.1	Terminal 1 of digital input E26
E26	E26.2	Terminal 2 of digital input E26
E27	E27.1	Terminal 1 of digital input E27
E27	E27.2	Terminal 2 of digital input E27
E28	E28.1	Terminal 1 of digital input E28
E28	E28.2	Terminal 2 of digital input E28
E29	E29.1	Terminal 1 of digital input E29
E29	E29.2	Terminal 2 of digital input E29
E30	E30.1	Terminal 1 of digital input E30
E30	E30.2	Terminal 2 of digital input E30
E31	E31.1	Terminal 1 of digital input E31
E31	E31.2	Terminal 2 of digital input E31

	Connection	Description
E32	E32.1	Terminal 1 of digital input E32
E32	E32.2	Terminal 2 of digital input E32
K9	91	Terminal 91 of relay output K9 (normally open contact)
K9	94	Terminal 94 of relay output K9 (normally open contact)
K10	101	Terminal 101 of relay output K10 (normally open contact)
K10	104	Terminal 104 of relay output K10 (normally open contact)
K11	111	Terminal 111 of relay output K11 (normally open contact)
K11	114	Terminal 114 of relay output K11 (normally open contact)
K12	121	Terminal 121 of relay output K12 (normally open contact)
K12	124	Terminal 124 of relay output K12 (normally open contact)
K13	131	Terminal 131 of relay output K13 (normally open contact)
K13	134	Terminal 134 of relay output K13 (normally open contact)
K14	141	Terminal 141 of relay output K14 (normally open contact)
K14	144	Terminal 144 of relay output K14 (normally open contact)
K15	151	Terminal 151 of relay output K15 (normally open contact)
K15	154	Terminal 154 of relay output K15 (normally open contact)
K16	161	Terminal 161 of relay output K16 (normally open contact)
K16	164	Terminal 164 of relay output K16 (normally open contact)

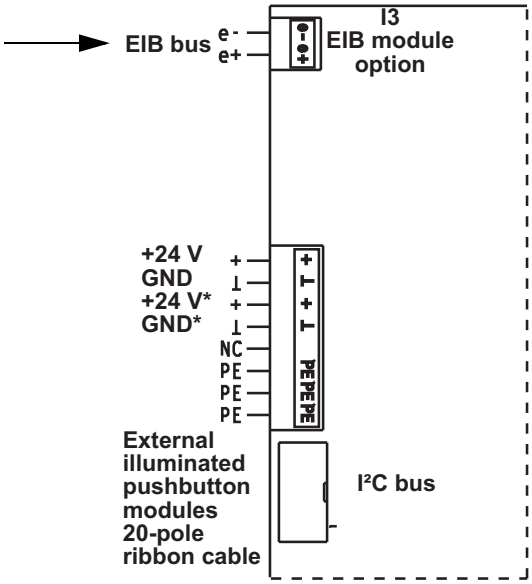
8.2 Expansion board EIB1000 (option)

The EIB1000 expansion board provides 16 EIB inputs and 16 EIB outputs.
It allows to address EIB devices via the TM panel or to display messsages from EIB devices at the TM panel. The EIB1000 is based on the EIB module from ABB (ABB i-bus EIB). Each EIB1000 includes the required device database that has to be imported using the ETS2 (EIB Tool Software). Program the module so that it suits your EIB system.



8.2.1 Preconditions for use

The TM panel must be equipped with firmware version 1.5 or higher. For configuration, the software Medi-Set, version 1.10 or higher is required. As an option, the EIB1000 can be installed into the existing enclosure of the TM panel.
The EIB bus connection is located on the main board of the TM panel (see the connection diagram below or the diagram on page 30; plug X1, contacts e+ and e-). Use only cables that are suitable for the EIB-bus connection.



8.2.2 Addressing

Set the EIB bus address and the EIB group addresses, if required. Use the PC-software ETS2 for this purpose.

8.2.3 Inputs and outputs

The EIB1000 expansion board provides 16 input channels (channel 1...16, setting: display driver) for the display of operating, warning and alarm messages of EIB devices: 16 output channels are provided to send commands to EIB devices (channel 17...32, setting: switching sensor). The outputs can be activated via switching commands using the pushbutton modules of the TM panel. The EIB1000 is supplied with DC 24 V from the TM panel. The ETS2 software is required to program the EIB1000. Please note: ETS2 is not included in the scope of delivery of EIB1000. Contact EIBA (http://www.eiba.org) to order the software.

The file EIB1000.PR1, a programming template, is required to enable the communication between the ETS2 software and the EIB1000 expansion board. This programming template is available as a data medium and is included in the scope of delivery of each EIB1000 respectively each TM panel including an EIB module. Import this file to the ETS2 software.

The software ETS2 is used to program inputs and outputs. Outputs can obtain the functions SWITCHING, DIMMING, SUN SHADE CONTROL, or VALUE. Inputs can control illuminated pushbutton modules or LEDs.

The pushbutton/LED can be configured to indicate On or Off status or to flash in one or three selectable frequencies.

8.2.4 Channels of the EIB bus

The EIB1000 provides 16 input and 16 output channels, which are numbered in the same way (1...16) in the PC software Medi-Set. However, in the EIB programming software ETS2, the inputs and outputs are consecutively numbered between 1 and 32. The different types of channel numbering are displayed in the tables below.
The terms input and output are to be seen from the panel's point of view:

Input Message from the EIB module to the panel
Output Switching command rep. message from the panel via the EIB1000 to external devices.

Signal direction	Channels within the Medi-Set	Channels within the ETS2
Inputs	1	1
	2	2
	3	3
	4	4
	5	5
	6	6
	7	7
	8	8
	9	9
	10	10
	11	11
	12	12
	13	13
	14	14
	15	15
	16	16

Signal direction	Channels within the Medi-Set	Channels within the ETS2
Outputs	1	17
	2	18
	3	19
	4	20
	5	21
	6	22
	7	23
	8	24
	9	25
	10	26
	11	27
	12	28
	13	29
	14	30
	15	31
	16	32

8.2.5 Supply voltage monitoring

If the FUNCTION parameter of channel 32 is set to "none", this channel will be used for supply voltage monitoring. In case of supply voltage failure, the object "telegram supply voltage disturbed" sends a telegram with value 1. As a result of this, all input channels are locked. Approximately 1 second after the restoration of the supply voltage, the object "telegram supply voltage disturbed" will be reset to 0 and all inputs are enabled again. If the input channel 16 is also used as an input, the supply voltage is not monitored. However it is recommended to monitor the supply voltage via channel 32.

8.2.6 File EIB1000.PR1

Importing the file EIB1000.PR1 presets the basic function of the channel. These basic functions may not be changed! Even if it is possible to make a change using ETS2, the function of the channels 1...16 as display driver and the channels 17...31 as switching sensor (switching/dimming sensor, sun shade sensor, value) must remain unchanged and the function of channel 32 must remain "none".

9. Technical data

9.1 Technical data basic module BM1000

Insulation coordination acc. to IEC 60664-1

Rated voltage ..... AC 250 V
Rated impulse voltage/pollution degree 4 kV/3

Supply voltage

Supply voltage U_S ..... DC 24 V
Operating range of U_S ..... 0.85...1.1 x U_S
Power consumption ..... ≤ 5 VA

Displays and LEDs

Display, characters ..... four-line display; 4 x 20 characters
Text messages, programmable 750
Alarm history (messages) 600
Standard text messages ..... 3 x 20 characters
Additional text message (can be displayed via a key) ..... 3 x 20 characters
Alarm LEDs ..... green (normal), yellow (warning), red (alarm)
Menu text ..... German / English
Buttons ..... 5 (Isometer test, buzzer mute, additional text, scroll, menu) + additional customer-specific keys

Buzzer

Buzzer alarm ..... with buzzer mute function, with new value operation
Buzzer interval ..... adjustable
Buzzer repeat factor ..... adjustable

Inputs

Digital inputs ..... 16 (extendable to 32)
Inputs ..... galvanically isolated
Activation of the digital inputs ..... via potential-free contacts / extraneous voltage
Operating principle ..... N/O or N/C operation, selectable for each input
Factory setting ..... N/O operation
Voltage range (high) ..... AC / DC 15...30 V
Voltage range (low) ..... AC / DC 0...2 V

Interface

Interface / protocol ..... 1 x RS-485/BMS internal, 1 x RS-485/BMS external
Baud rate ..... 9.6 kBit/s internal, 19200...57600 kBit/s external
Cable length ..... ≤ 1200 m
Recommended cable (shielded, shield on one side connected to PE) ..... J-Y(ST)Y min. 2 x 0.6
Terminating resistor ..... 120 Ω (0.25 W) connectable via DIP switch
Device address, BMS bus ..... 1 (internal), 1...99 (external)
Factory setting device address ..... 1 (Master)
EIB module ..... 15 inputs, 16 outputs (optionally)

Programming

Interfaces ..... RS-485 external or RS-232
Software ..... Medi-Set version 1.15 or higher
Factory setting password ..... activated

Switching elements

Relay contacts programmable ..... 2 changeover contacts (K1 and K2)
Contact data ..... according IEC 60947-5-1
Operating principle ..... N/O or N/C operation (programmable)

Rated operational voltage U_e ..... AC 250 V / DC 220 V
Rated operational current I_e ..... AC 8 A / DC 0.2 A
Utilization category ..... AC14 / DC12
Electrical service life ..... 10.000 switching operations
Minimum contact load ..... 1 mA at AC/DC > 10 V

Relay contacts programmable ..... 6 normally open contacts (K3 and K8, extendable to 14)
Operating principle ..... N/C operation (permanently set)
Contact data acc. to IEC 60947-5-1
Rated operational voltage U_e ..... AC 230 V / DC 220 V
Rated operational current I_e ..... AC 5 A / DC 0.2 A
Utilization category ..... AC14 / DC12
Electrical service life ..... 10.000 switching operations
Minimum contact load ..... 1 mA at AC/DC > 10 V
Colour front foil ..... RAL 9006 (silver-grey)
Colour marking ..... black

General data

EMC immunity ..... acc. to EN 61000-6-2
EMC emission ..... acc. to EN 61000-6-4
Classification of climatic conditions acc. to IEC 60721
Stationary use 3K5
Transport 2K3
Long-term storage 1K4
Operating temperature ..... -5 °C ... +55 °C
Classification of mechanical conditions acc. to IEC 60721
Stationary use 3M4
Transport 2M2
Long-term storage 1M3
Operating mode ..... continuous operation
Mounting position ..... any position
Connection details ..... plug-in terminals
Connection properties (relay outputs)
rigid / flexible / AWG ..... 0.2 ... 2.5 / 0.2 ... 2.5 mm^2 / 24-12 AWG
flexible with ferrules with/without plastic collar ..... 0.25 ... 2.5 / 0.25 ... 2.5 mm^2
Multi-conductor connection (2 conductors with the same cross section)
rigid / flexible ..... 0.2 ... 1 / 0.2 ... 1.5 mm^2
flexible with ferrules without plastic collar ..... 0.25 ... 1 mm^2
flexible with TWIN type ferrules with plastic collar ..... 0.5 ... 1.5 mm^2
Connection properties (supply voltage, inputs, BMS bus)
rigid / flexible / AWG ..... 0.08...1.5 / 0.08...1.5 mm^2 / 28-16 AWG
flexible with ferrules with/without plastic collar ..... 0.25...1.5 / 0.25...0.5 mm^2
Multi-conductor connection (2 conductors with the same cross section) .....
rigid / flexible ..... 0.08...0.5 / 0.8...0.75 mm^2
flexible with ferrules without plastic collar ..... 0.25...0.34 mm^2
flexible with TWIN type ferrules with plastic collar ..... 0.5 mm^2
Stripping length ..... 7 mm
Tightening torque ..... 0.5...0.6 Nm
Degree of protection, TM panel (DIN EN 60529) ..... dependent on the design , max. IP54
Degree of protection, basic module BM1000 (DIN EN 60529) IP00
Flammability class UL94V-0

9.2 Dimensions

9.2.1 Flush-mounting enclosure with mounting frame

Enclosure material: aluminium, silver matt anodized

Type	design	Outer dimensions of enclosure/ (W x H) mm	Outer dimensions / (W x H) mm
UPE-1	mounting frame	297 x 297	300 x 300
UPE-2	mounting frame	447 x 297	450 x 300
UPE-3	mounting frame	297 x 447	300 x 450
UPE-4	mounting frame	447 x 447	450 x 450
UPE-5	mounting frame	447 x 597	450 x 600
UPE-6	mounting frame	597 x 447	600 x 450
UPE-7	mounting frame	597 x 597	600 x 600
UPE-8	mounting frame	597 x 747	600 x 750

The dimensions refer to a tile pattern of 150 mm.
The enclosure consists of a 4 mm wall thickness.

9.2.2 Flush-mounting enclosure with bezel frame

Enclosure material: aluminium, silver matt anodized

Type	Dimensions including bezel frame / (W x H) mm	Outer dimensions of enclosure/ (W x H) mm	Cut-out dimensions / (W x H) mm
UPB-1	340 x 340	314 x 314	316 x 316
UPB-2	492 x 340	466 x 314	468 x 316
UPB-3	340 x 492	314 x 466	316 x 468
UPB-4	492 x 492	466 x 466	468 x 468
UPB-5	492 x 644	466 x 618	468 x 620
UPB-6	644 x 492	618 x 466	620 x 468
UPB-7	644 x 644	618 x 618	620 x 620
UPB-8	644 x 796	618 x 770	620 x 772

The enclosure consists of a 4 mm wall thickness.

9.2.3 Surface-mounting enclosure

Enclosure material: aluminium, silver matt anodized

Type	Dimensions (W x H x D) / mm
AP-1	300 x 300 x 150
AP-2	450 x 300 x 150
AP-3	300 x 450 x 150
AP-4	450 x 450 x 150
AP-5	650 x 450 x 150
AP-6	450 x 600x 150
AP-7	600 x 600 x 150
AP-8	600 x 750 x 150

9.3 Ordering details

Description	esb Art.No.
Null-modem cable PC -> panel	101448
Software Medi-Set/MediHistory	
Suction cup D = 80 mm	102850
Suction cup D = 55 mm	102851
Package A: Software package consisting of: 1 null-modem cable and Medi-Set/MediHistory.	100077
Package B: RS-485 package for the connection of the PC to the BMS bus.	100078

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BMS-Bus

Bender-Messgeräte-Schnittstelle

Deutsch

Bestimmungsgemäße Verwendung

Der BMS-Bus dient zur Kommunikation von BENDER-Geräten untereinander. BMS steht für Bender Messgeräte Schnittstelle. Dabei handelt es sich um eine RS485-Schnittstelle mit einem speziell für BENDER-Geräte entwickelten Protokoll.

Der BMS-Bus überträgt zyklisch Alarm- und Betriebsmeldungen. Außerdem beinhaltet das Protokoll Befehle zur Abfrage und Änderung von Geräteparametern, sowie diverse Steuerbefehle.

Sicherheitshinweise allgemein

Montage, Anschluss und Inbetriebnahme nur durch Fachkraft!
Beachten Sie unbedingt:

- die bestehenden Sicherheitsvorschriften und
- das beiliegende Blatt "Wichtige sicherheitstechnische Hinweise für BENDER-Produkte".

Sicherheitshinweise, spezifisch

Nehmen Sie an bestehenden BENDER-Systemen nur Änderungen vor, wenn Sie die Folgen überblicken können. Auch kleine Änderungen können zu Fehlfunktionen oder gar zu einem Ausfall der Systeme führen

Funktionsbeschreibung

Master-Slave-Prinzip
Der BMS-Bus arbeitet nach dem Master-Slave-Prinzip. Das bedeutet, dass ein Gerät als MASTER arbeitet, während alle anderen Geräte SLAVE sind. Es darf also pro BMS-Bus nur einen Master geben. Der Master fragt zyklisch alle Geräte des Busses ab, lauscht auf deren Signale und führt dann entsprechende Befehle aus. Während des Betriebes ist eine vorübergehende Masterübernahme durch einen Slave möglich.

Alle am BMS-Bus angeschlossenen Geräte erhalten eine eindeutige Adresse. Der Master hat die Adresse 1. Ausnahmen sind dabei PGH47x, PRC470(E) und EDS47x-12. Diese Geräte enthalten einen separaten DIP-Schalter für die Master/Slave Einstellung.

Interner und externer Bus
Mehrere BMS-Bus-Systeme können zu einem übergreifenden System verbunden werden. Hierzu wird für jedes der BMS-Bus-Systeme ein Steuer- und Anzeigegeräte PRC1470 oder ein TM-Bedientableau benötigt.

Bender Measuring Device Interface

English

Intended use

The BMS Bus provides communication between the various pieces of BENDER equipment. BMS stands for Bender Measuring Device Interface. It therefore pertains to an RS485 interface with a specially developed protocol for BENDER equipment.

The BMS bus cyclically transmits alarm and status indications In addition, the protocol contains commands for scanning and modifying device parameters as well as various control commands.

Safety information

Installation, connection and commissioning of electrical equipment shall only be carried out by qualified electricians:
Particular attention shall be paid to:

- the current safety regulations and
- the enclosed sheet "Important safety instructions for BENDER products".

Device-specific safety information

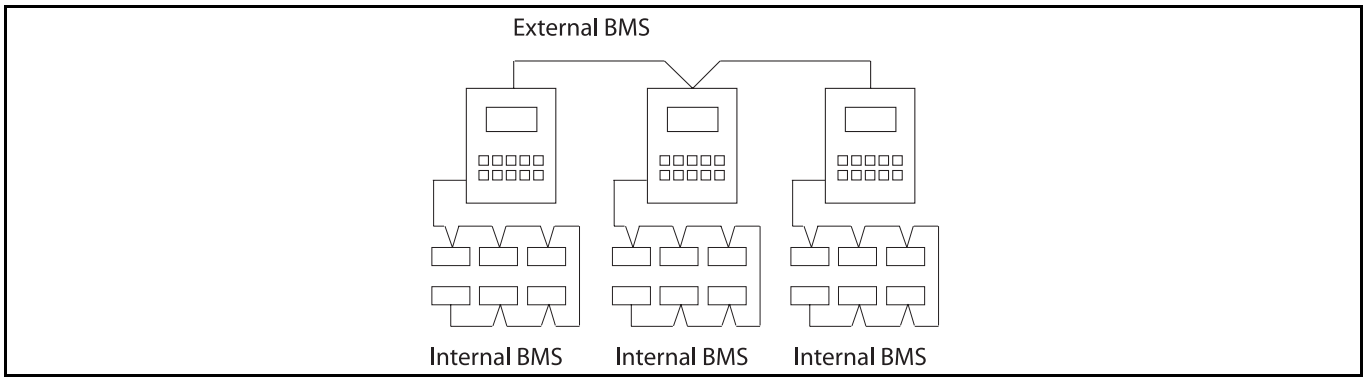
Only undertake changes to existing BENDER systems in cases where you are able to review the consequences. Even small changes can result in maloperations or even to a system failure.

Function

Master-Slave principle
The BMS bus operates according to the Master-Slave principle. That means that one device operates as the MASTER and all other devices function as SLAVES. Thus there can only be one Master per BMS bus.
The Master cyclically scans all devices on the bus, listens for the equipment signals and then carries out the respective commands. During operation, a slave may take over as temporary Master.

All devices connected to the BMS bus receives a unique address. The Master address is 1. Exceptions to this include PGH47x, PRC470(E) und EDS47x-12. These device have a separate DIP switch for the Master/Slave setting.

Internal and external bus
Several BMS bus subsystems can be connected to an overall system. A control and indicating device PRC1470 or a TM operator panel is needed for each of the BMS bus systems.



Mehrere PRC1470 oder TM-Bedientableaus kommunizieren über den externen Bus miteinander. Sie erhalten dabei fortlaufende Adressen. Die Master-Übernahme erfolgt nach dem sogenannten Passing-Token-Verfahren. Das bedeutet, dass die Masterfunktion nacheinander jedem PRC1470 bzw. TM-Bedientableau für eine gewisse Zeit zugewiesen wird.

Auf dem internen Bus kommuniziert das einzelne PRC1470 oder TM-Bedientableau mit den Geräten des jeweiligen BMS-Systems. Dabei ist es Master und hat die Adresse 1.

Sofern nicht ausdrücklich anders beschrieben, beziehen sich alle folgenden Angaben auf den internen Bus.

Several PRC1470s or TM operator panels communicate with each other via the external bus. They thus receive consecutive addresses. Takeover of the Master is done according to the so-called Passing Token procedure. This means that the master function is assigned to each PRC1470 or TM operator panel in succession for a certain period of time.

The individual PRC1470 or TM operator panel communicates with the devices of the respective BMS system on the internal bus. It is therefore the Master and has the address 1.

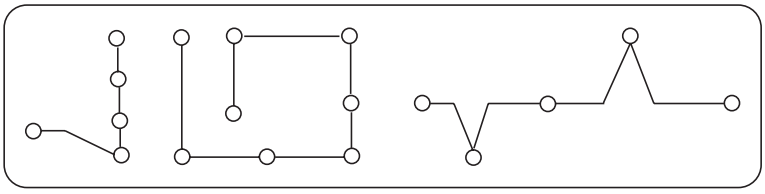
All of the following information refers to the internal bus, unless expressly stated otherwise.

Montage und Anschluss

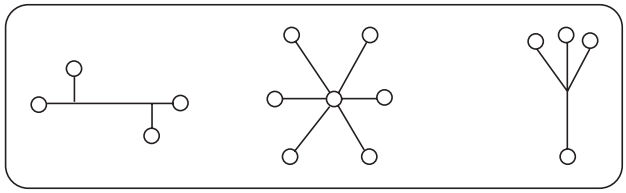
Stellen Sie vor Einbau der Geräte und vor Arbeiten an den Anschlüssen der Geräte sicher, dass die Anlage spannungsfrei ist.
Wird dies nicht beachtet, so besteht für das Personal die Gefahr eines elektrischen Schlages.
Außerdem drohen Sachschäden an der elektrischen Anlage und die Zerstörung der Geräte.

Aufbau der Schnittstelle (interner und externer BMS-Bus)
Der optimale Aufbau für den BMS-Bus ist eine Punkt-zu-Punkt-Verbindung. Dabei ist Gerät 1 mit Gerät 2, Gerät 2 mit Gerät 3, Gerät 3 mit Gerät n verbunden (Daisy chain Verbindung). Der BMS-Bus stellt also eine unverzweigte, kontinuierliche Strecke dar.

Streben Sie eine günstige Verlegung an. Beispiele:



Vermeiden Sie eine ungünstige Verlegung. Beispiele:



Installation and connection

Before installing the device and before working on the devices connections, make sure that the installation is de-energized.
If the above instructions are not followed, there is danger of electric shock to personnel.
In addition, there is danger of property damage to the electrical installation and destruction of the equipment.

Installation of the interface (internal and external BMS bus)
The optimal installation for the BMS bus is a point-to-point connection. Thus Unit 1 is connected to Unit 2, Unit 2 to Unit 3, Unit 3 to Unit n (Daisy chain connection). The BMS bus thus represents an unbranched, continuous route.

Always aim for a favourable laying of cable. Examples:

Avoid any adverse laying of cable. Examples:

Leitungen und Leitungslänge (interner und externer BMS-Bus)
Die Spezifikation der RS485-Schnittstelle begrenzt die maximale Länge des Busses auf 1200 m. Bei längeren Leitungen sind zusätzliche Maßnahmen (Installation von Zwischenverstärkern DI-1) notwendig. Als Schnittstellenleitung ist geschirmte Leitung einzusetzen. Geeignet ist beispielsweise der Leitungstyp JY(ST)Y 0,6.

Werden Schnittstellenleitungen als Stichleitungen ausgeführt, so ist die maximale Länge des Stiches auf 1 m begrenzt. Die sichere Kommunikation kann bei längeren Stichleitungen nicht garantiert werden.

Die Anzahl der Geräte am Bus ist auf 32 beschränkt. Durch den Einsatz von Zwischenverstärkern (z.B. BENDER DI-1) können weitere 32 Geräte angeschlossen werden bzw. kann die Leitungslänge um weitere 1200 m verlängert werden. Es können maximal 256 Zwischenverstärker in einem BMS-Bus-System eingesetzt werden.

Abschlusswiderstände (interner und externer BMS-Bus)
Der BMS-Bus muss an seinen beiden Enden mit Abschlusswiderständen 120 Ω (0,25 W) abgeschlossen (terminiert) werden. Die Widerstände werden parallel zu den Klemmen A und B angeschlossen. Ein nicht terminierter BMS-Bus kann instabil werden und Fehlfunktionen zeigen.

Nur das erste und das letzte Gerät dürfen terminiert werden. Überprüfen Sie deshalb bei allen dazwischen liegenden Geräten, ob eventuell bestehende Abschlusswiderstände entfernt oder ausgeschaltet sind.

Enthält der BMS-Bus Stichleitungen, so werden diese nicht terminiert.

Grundregeln für den Aufbau des BMS-Busses

1. Jeder BMS-Bus muss von einem MASTER geführt werden.
2. In jedem BMS-Bus-System darf nur ein MASTER vorhanden sein.
3. Jedem Busteilnehmer muss eine eindeutige Adresse zugewiesen werden.
4. Adressen dürfen niemals doppelt vergeben werden.
5. Der BMS-Bus muss an seinen beiden Enden mit 120 Ω Abschlusswiderständen terminiert werden.
6. Der BMS-Bus darf eine maximale Leitungslänge von 1200 m nicht überschreiten, sofern keine Zwischenverstärker eingesetzt sind.
7. Die Anzahl der Geräte innerhalb eines BMS-Busses darf 32 nicht übersteigen, sofern keine Zwischenverstärker eingesetzt sind.
8. Der BMS-Bus muss einen günstigen Aufbau (ohne Verzweigungen) aufweisen.
9. Die Busleitung (JY(St)Y 2 x 0,6) muss abgeschirmt und einseitig geerdet sein.
10. Niemals Busklemmen A und B vertauschen.

Nur durch das Beachten dieser Grundregeln gewährleisten Sie eine sichere Funktion des BMS-Busses.

Wiring and wiring length (internal and external BMS bus)
The specification for the RS485 interface restricts the maximum length of the bus to 1200 m. Additional measures are required for longer electric lines (installation of intermediate amplifiers DI-1). Shielded cable must be used for interface cabling. One type of suitable cable is line type JY(ST)Y 0.6, for example.

If interface cabling is designed to be used as stub wires, the maximum length of the stub is limited to 1 m. There is no guarantee of reliable communication when using longer stub lines.

The number of devices on the bus is limited to 32. By using intermediate amplifiers (e.g. BENDER DI-1), an additional 32 devices can be connected or the cable length can be extended by another 1200 m. A maximum of 256 repeaters can be used in a BMS bus system.

Terminating resistors (internal and external BMS bus)
The BMS bus must be terminated at both ends with terminating resistors 120 Ω (0.25 W). The resistors are connected parallel to terminals A and B. A non-terminated BMS bus can become unstable and exhibit maloperations.

Only the first and last device may be terminated. Therefore, be sure to check all intervening devices to see if any existing terminating resistors have been removed or switched off.

If the BMS bus includes stub lines, they will not be terminated.

Basic rules for installing the BMS bus

1. Every BMS bus must be guided by a MASTER.
2. There must always be only one MASTER in each BMS bus system.
3. A unique address must be assigned to each bus participant.
4. Addresses must never be assigned twice.
5. The BMS bus must be terminated at both ends with 120 Ω terminating resistors.
6. The BMS bus may not exceed a maximum cable length of 1200 m, unless an repeater has been installed.
7. The number of devices within the BMS bus may not exceed 32, unless an repeater has been installed.
8. The BMS bus must be properly installed (no branching).
9. The electric bus line (JY(St)Y 2 x 0.6) must be shielded and have a single-ended connection to ground.
10. Never transpose bus terminals A and B.

These basic rules should be carefully observed in order to ensure a safe function of the BMS bus.

Einstellen und Bedienen

Einstellungen werden zentral oder an den einzelnen Geräten vorgenommen. Dies geschieht je nach Bauweise des jeweiligen Gerätes entweder direkt am Gerät (Einstellmenüs, DIP-Schalter) oder über Softwareprodukte (z.B. Medi-Set). Zur zentralen Einstellung können die Geräte PRC1470, PRC470 oder FTC470XET eingesetzt werden.

BMS-Protokoll
Aufbau des BMS-Protokolls:
Master :;XXX:ABCDE 12345&XYZ [CR][LF]
Slave ::XXX:ABCDE 12345&XYZ [CR][LF]
Dabei bedeutet:

:;	Erkennung Start der Übertragung Master
::	Erkennung Start der Übertragung Slave
XXX	Adresse
:	Startbyte für Befehl
ABCDE	Befehl, bestehend aus max. 5 ASCII-Zeichen
(Leer-zeichen)	Startbyte für Daten
12345	Daten, bestehend aus max. 5 ASCII-Zeichen, max. Größe: 65 535
&	Startbyte für Checksumme
XYZ	Checksumme, bestehend aus max. 3 ASCII-Zeichen
[CR][LF]	Ende der Übertragung (Carriage Return, Line Feed)

Adressen und Adressbereiche
Alle am BMS-Bus angeschlossenen Geräte erhalten eine eindeutige Adresse. Der Master hat die Adresse 1. Die Adresse 000 ist "Broadcast-Adresse". Sie spricht alle Adressen an und darf deshalb nicht vergeben werden.

Von den theoretisch vergebbaren 255 Adressen (1 byte Adresse, also $2^8 = 256$) werden derzeit 150 genutzt. Grund dafür ist die Einteilung in Adressbereiche, die für bestimmte Gerätegruppen definiert wurden.

Für EDS- und RCMS-Systeme die so groß sind, dass der Adressbereich 1 ... 30 nicht ausreicht, wurden erweiterte Adressbereiche geschaffen. Für den erweiterten Adressbereich sind speziell angepasste Geräte verfügbar (RCMS470**E**-12, EDS47x**E**-12, PGH47x**E**).

Set-up and operation

Settings are done centrally or at the individual devices. Depending on the construction of the particular device, the settings are either done directly on the device (set-up menus, DIP switch) or using software products (e.g. Medi-Set). The devices PRC1470, PRC470 or FTC470XET can be used to create settings centrally.

BMS protocol
Configuration of the BMS protocol:
Master :;XXX:ABCDE 12345&XYZ [CR][LF]
Slave ::XXX:ABCDE 12345&XYZ [CR][LF]
This means:

:;	Identification of start of transmission master
::	Identification of start of transmission slave
XXX	Address
:	Startbyte for command
ABCDE	Command, consisting of a maximum of 5 ASCII characters
(Space characters)	Startbyte for data
12345	Data, consisting of a maximum of 5 ASCII characters, maximum size: 65 535
&	Startbyte for check sum
XYZ	Check sum, consisting of a maximum of 3 ASCII characters
[CR][LF]	End of transmission (carriage return, line feed)

Addresses and address ranges
All devices connected to the BMS bus receive a unique address. The address of the Master is 1. The address 000 is the “broadcast address”. It communicates with all addresses and therefore cannot be assigned.

Of the 255 addresses that theoretically can be assigned, (1 byte address, i.e. $2^8 = 256$), there are currently 150 in use. The reason for this is the classification into address ranges, which are defined for specific device groups.

For EDS and RCMS systems, which are so large that the address area 1 ... 30 is not sufficient, expanded address ranges are created. Specially adapted devices are available for the expanded address range (RCMS470**E**-12, EDS47x**E**-12, PGH47x**E**).

Adressbereiche

Address ranges

Adresse / Address	Beschreibung	Description	Geräte / Devices
1-30 *	Überwachungsgeräte, die Alarm- oder Betriebsmeldungen erzeugen.	Monitoring devices, which produce alarm or status indications.	107TD47, EDS47x-12, FTC470XDP, FTC470XET, IMS480, IRDH375B, IRDH575, MK2000, MK2007CB2, MK2418, PRC487, RCMS470-12, SMI471-12, PRC1470
1-90			MK2007CBM
1-150			MK2430
31-60	Schaltgeräte, die bei Alarm oder auf Befehl einen Kontakt schalten sowie EDS470E2-12 (also Alarm- und Betriebsmeldungen erzeugende Geräte)	Switching devices that operate a contact upon alarm or command as well as EDS470E2-12 (i.e. alarm and status indication producing devices)	SMO480-12, SMO481-12, EDS47xE2-12
61-90	Überwachungsgeräte, die Alarm- oder Betriebsmeldungen erzeugen	Monitoring devices, which produce alarm or status indications.	RCMS470E-12, EDS47xE-12
91-99	Geräte ohne eigene Messaufgaben	Devices without their own measuring tasks	
100	Master ohne eigene Messaufgaben	Master without its own measuring tasks	PRC470, PRC470E
101-103	Zusätzliche Master, die vorübergehend die Masterfunktion übernehmen	Additional Master, which takes over the master function temporarily	
111-119	Prüfgerät für Isolationsfehlersuche	Test device for insulation fault location	PGH47x
121-150	Prüfgeräte für Isolationsfehlersuche mit Zusatzbezeichnung E	Test device for insulation fault location with additional designation E	PGH47xE

* Einige Geräte des Adressbereiches 1 ... 30 können nur von 2 ... 30, 3 ... 30 oder nur auf 1 (PRC1470) eingestellt werden.

* Some of the devices in address area 1 ... 30 can only be set from 2 ... 30.3 ... 30 or only to 1 (PRC1470).

Details zur Adressvergabe

Details on assigning addresses

Gerät/Device	Funktion	Function	Adresse interner Bus/ Address internal Bus		Master für/for
			Master	Slave	
107TD47	Isolationswächter mit Überlast/ Übertemperatur	Insulation monitoring device with transformer overload and temperature monitoring	-	2 ... 30	-
EDS47x-12	Isolationsfehler-Auswertegerät	Insulation fault evaluator	1	1 ... 30	-
EDS47xE-12	Isolationsfehler-Auswertegerät	Insulation fault evaluator	-	61 ... 90	-
EDS47xE2-12	Isolationsfehler-Auswertegerät	Insulation fault evaluator	-	31 ... 60	-
FTC470XDP, FTC470XMB	Gateway zu Profibus-DP, Modbus	Gateway to PROFIBUS-DP, Modbus	1	2 ... 30	MEDICS, EDS, RCMS
FTC470XET	Gateway zu TCP/IP	Gateway to TCP/IP	1	2 ... 30	MEDICS, EDS, RCMS
IMS480	Scanning System für LIM2000-1NL	Scanning system for LIM2000-1NL	-	2 ... 30	-
IRDH375B	Isolationsüberwachungsgerät	Insulation monitoring device	1	2 ... 30	MEDICS, RCMS, ISO-net
IRDH575	Isolationsüberwachungsgerät mit Prüfgerät	Insulation monitoring device with test device	1	2 ... 30	MEDICS, RCMS, EDS

Gerät/Device	Funktion	Function	Adresse interner Bus/ Address internal Bus		Master für/for
			Master	Slave	
LIM2000	Line Isolation Monitor	Line Isolation Monitor	1	-	MK2000
MK2000/ MK2007CB2	Melde- und Prüfkombination	Remote alarm indicator and operator panel	1	2 ... 30	MEDICS, RCMS
MK2007CBM	Melde- und Prüfkombination	Remote alarm indicator and operator panel	1	2 ... 90	MEDICS, RCMS
MK2418(C)-xx	Melde- und Prüfkombination	Remote alarm indicator and operator panel	1	2 ... 30	MEDICS, RCMS
MK2430	Melde- und Prüfkombination	Remote alarm indicator and operator panel	1	2 ... 150	MEDICS, EDS, RCMS
PGH47x	Isolationsfehlerprüfgerät	Insulation fault test device	111..119	111..119	MEDICS, EDS (für 1 IT-Netz), RCMS
PGH47xE	Isolationsfehlerprüfgerät	Insulation fault test device	-	121..150	-
PRC470	Steuer- und Anzeigegerät	Control and indicating device	100	-	MEDICS, EDS, RCMS
PRC470E	Steuer- und Anzeigegerät	Control and indicating device	100	-	MEDICS, EDS, RCMS
PRC487	Steuergerät für Umschalteinrichtungen	Control device for switch-over modules	-	2 ... 30	-
RCMS470-12	Differenzstrom-Auswertegerät	Residual current evaluator	1	1 ... 30	-
RCMS470E-12	Differenzstrom-Auswertegerät	Residual current evaluator	-	61 ... 90	-
SMI471-12	Umsetzer Digitaleingänge auf BMS	Converter digital inputs to BMS	-	3 ... 30	-
SMI472-12	Umsetzer Digitaleingänge auf BMS	Converter digital inputs to BMS	-	3 ... 30	-
SMO480-12	Umsetzer BMS auf Relaisausgänge	Converter BMS to relay outputs	-	31 ... 60	-
SMO481-12	Umsetzer BMS auf Relaisausgänge	Converter BMS to relay outputs	-	31 ... 60	-
SMO482-12	Umsetzer BMS auf Relaisausgänge	Converter BMS to relay outputs	-	31 ... 60	-
TM Tableau und PRC1470 *	Anzeigetableau	Indication panel	1	-	MEDICS, EDS, RCMS

* *Auf der externen Schnittstelle erhalten TM Tableaus und Steuer- und Anzeigegeräte PRC1470 die Adressen 1 ... 255.*

* *On the external interface, the TM panels and control and indicating devices PRC1470 receive the addresses 1 ... 255.*

Fortlaufende Adressen (interner und externer BMS-Bus)
Vergeben Sie die Adressen eines Adressbereiches immer fortlaufend, das heißt möglichst direkt hintereinander.

Ein BMS-Master fragt einen Adressbereich bei 1 beginnend ab. Stößt er dabei auf eine Lücke von 5 nicht vergebenen Adressen, so hört er mit der Abfrage dieses Adressbereiches auf und beginnt, den nächsten Adressbereich abzufragen. Dies gilt für den internen Bus.
Am externen Bus ist bei TM-Tableaus und PRC1470 die „Lücke" auf 3 Adressen gestellt.

Consecutive addresses (internal and external BMS bus)
Always assign the addresses of one address range consecutively, i.e. one directly after the other whenever possible.

A BMS Master scans an address range beginning at 1. If it comes across a gap of 5 non-assigned addresses, then the scan of this address range is stopped and it begins to scan the next address range. This applies to the internal bus.

On the external bus, the "gap" is set at 3 addresses for the TM panel and the PRC1470.

Master-Redundanz
Einige neuere BMS Geräte wie FTC470XDP, FTC470XMB, FTC470XET und MK2430 haben die Fähigkeit, als redundanter Master zu arbeiten. In diesem Fall wird ein solches Gerät bei Ausfall des regulären Master (mit der Adresse 1), nach ca. 60 Sekunden die Masterfunktion übernehmen und den BMS Bus steuern. Sollte der reguläre Master wieder aktiv werden, so gibt das FTC470 die Masterfunktion zurück. Diese redundante Masterfunktion haben diese Geräte automatisch.

Abfrage der angeschlossenen Geräte (interner BMS-Bus)
Im normalen Betrieb fragt der Master die Adressbereiche nach der Anzahl von Alarmmeldungen ab. Liegen Alarmmeldungen vor, werden alle Kanäle des entsprechenden Gerätes abgefragt. Anschließend werden die Adressbereiche nach der Anzahl der Betriebsmeldungen abgefragt, bei Rückmeldungen die Kanäle des entsprechenden Gerätes. Zusätzlich werden alle 2 Sekunden über die Broadcastadresse 0, alle Slaves gefragt, ob sie einen Interrupt ausgelöst haben. So ist gewährleistet, dass neue Alarmmeldungen nach spätestens 2 Sekunden auf dem Bus zur Verfügung stehen.

Überwachung von Geräteausfällen
Einige BMS-Geräte können andere BMS-Busteilnehmer auf Geräteausfall überwachen. An dem überwachenden Gerät wird dazu eingestellt, welche Geräteadressen überwacht werden. Geräteausfälle können überwacht werden von Geräten wie TM-Tableaus, PRC1470, MK2418 und FTC470XET.

Störungshilfen

Im Falle von Fehlfunktionen empfehlen wir folgende Vorgehensweise:

1. Prüfen Sie, ob die Grundregeln für den Aufbau des BMS-Busses eingehalten wurden
2. Prüfen Sie, ob zwischen den Klemmen A und B ein Spannungspegel von mindestens 200 mV anliegt. Ist dies nicht der Fall, sind eventuell zu viele Abschlusswiderstände eingebaut.
3. Zeichnen Sie den Datenverkehr auf dem BMS-Bus auf und werten Sie die Daten aus.

Um den Datenverkehr aufzuzeichnen benötigen Sie:

- einen PC mit serieller Schnittstelle
- ein Terminalprogramm (z.B. HyperTerminal, das auf den meisten PCs mit WINDOWS-Betriebssystem unter Programme -> Zubehör vorhanden ist)
- einen Schnittstellenkonverter DI-2

Führen Sie nun die folgenden Schritte aus:

- Verbinden Sie den PC über den DI-2-Konverter mit dem BMS-Bus (intern oder extern)
- Starten Sie ein Terminal Programm (z.B. HyperTerminal)
- Stellen Sie die Schnittstellenparameter zum BMS-Bus passend ein (9600 Bits pro Sekunde, 7 Datenbits, gerade Parität, 1 Stoppbit, keine Flusssteuerung).

Damit ist die Verbindung hergestellt. Auf dem Bildschirm des PCs werden nun kontinuierlich die auf dem BMS-Bus übertragenen Daten dargestellt.

- Stellen Sie das Terminalprogramm so ein, dass die Daten mitgeschrieben und gespeichert werden.

Master redundancy
Some of the newer BMS equipment such as the FTC470XDP, FTC470XMB, FTC470XET and MK2430 are capable of operating as a redundant Master. In this case, upon failure of the regular Master (with the address 1), one of these devices would take over the Master functions after approx. 60 seconds and control the BMS. If the regular Master becomes active again, the FTC470 returns the master function. These devices automatically have this redundant Master function.

Scanning the connected devices (internal BMS bus)
During normal operation, the Master scans the address ranges according to the number of alarm indications. If there are alarm indications on hand, all channels of the respective device will be scanned. Following this, the address ranges are scanned according to the number of status indications, and in the case of return messages, the channels of the respective device. In addition, all slaves are queried every 2 seconds via the broadcast address 0, to see if they have triggered an interrupt. This ensures that new alarm indications are available on the bus after a maximum of 2 seconds.

Monitoring of device failures
Some BMS devices, such as TM operator panels, PRC1470, MK2418 and FTC470XET, are capable of monitoring other BMS participants for device failure. for this purpose, the address of the devices to be monitored are to be set at the respective monitoring device.

Help in the event of faults

In case of a malfunction, we recommend the following procedure:

1. Check to see if the basic rules for setting up the BMS bus have been complied with.
2. Check to see whether a voltage level of at least 200 mV is present between terminals A and B. If this is not the case, there may be too many terminating resistors installed.
3. Record the communication on the BMS bus and evaluate the data.

To record the communication, you will need:

- a PC with serial interface
- a terminal program (e.g. HyperTerminal, which is available on most PCs with the WINDOWS operating system under program -> accessories)
- an interface converter DI-2

Now carry out the following steps:

- Connect the PC to the BMS bus (internal or external) via the D1-2 converter
- Start up a terminal program (e.g. HyperTerminal)
- Set the interface parameters so that they are compatible with the BMS bus (9600 bits per second, 7 data bits, even parity, 1 stopbit, no flow control).

The connection is thus established. The data being transmitted on the BMS bus is now continuously displayed on the PC screen.

- Set the terminal program so that the data is also written up and saved.

Any type of editor desired is suitable for presenting the recorded

Für die Darstellung der aufgezeichneten Daten ist jeder beliebige Editor geeignet. Die Auswertung setzt eine grundlegende Kenntnis des Befehlssatzes des BMS-Busses voraus.

Technische Daten

Hardwareeigenschaften

Verbindung ..... Halb-Duplex
Kommunikation ..... Master/Slave
Teilnehmer max. 32

Schnittstellenparameter

Übertragung ..... 1 Startbit, 7 Datenbits, 1 Paritätsbit, 1 Stopbit
Parität ..... gerade (even)
Checksumme / Summe aller übertragenen Bytes ..... 0 (ohne CR und LF)
Datenübertragung ..... mit ASCII-Zeichen, es sind jedoch nicht alle Zeichen zulässig

Interner BMS-Bus

Schnittstelle / Protokoll RS485/BMS
Anschluss ..... Klemmen IA/IB
Max. Leitungslänge ..... ≤ 1200 m
Empfohlene Leitung (geschirmt, Schirm einseitig an PE) ..... JY(ST)Y 2 x 0,6
Abschlusswiderstand ..... 120 Ω (0,25 W)
Baudrate ..... 9600 Baud

Externer BMS-Bus

Schnittstelle / Protokoll ..... RS485/BMS extern
Anschluss ..... Klemmen EA/EB
Max. Leitungslänge ..... ≤ 1200 m
Empfohlene Leitung (geschirmt, Schirm einseitig an PE) ..... JY(ST)Y 2 x 0,6
Abschlusswiderstand ..... 120 Ω (0,25 W)
Baudrate ..... 19200 ... 57600 Baud

data. A basic knowledge of the command set of the BMS bus is required for doing the evaluation.

Technical data

Hardware properties

Connection ..... Half duplex
Communication ..... Master/Slave
Maximum number of participants 32

Interface parameter

Transmission ..... 1 startbit, 7 data bits, 1 parity bit, 1 stopbit
Parity ..... even
Check sum / sum of all transmitted bytes ..... 0 (excluding CR and LF)
Data transmission ..... with ASCII characters, although not all characters are permissible

Internal BMS bus

Interface / protocol RS485/BMS
Connection ..... terminals IA/IB
Maximum cable length ..... ≤ 1200 m
Recommended electric line (shielded, shield connected to PE on one side) ..... JY(ST)Y 2 x 0.6
Terminating resistor ..... 120 Ω (0.25 W)
Baud rate ..... 9600 baud

External BMS bus

Interface / protocol ..... RS485/BMS external
Connection ..... terminals EA/EB
Maximum cable length ..... ≤ 1200 m
Recommended cable (shielded, shield connected to PE on one side) ..... JY(ST)Y 2 x 0.6
Terminating resistor ..... 120 Ω (0.25 W)
Baud rate ..... 19200 ... 57600 baud

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