



# COMTRAXX® MK2430



Alarm indicator and test combination

Software version: 4.1x



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# 1. Important information

## 1.1 How to use this manual

This operating manual describes the MK2430 alarm indicator and test combination with the software version indicated on the cover page. The functions and processes described may vary from those featured in other versions.



*This manual is intended for **qualified personnel** working in electrical engineering and electronics!*

### **Always keep this manual within easy reach for future reference.**

To make it easier for you to understand and revisit certain sections in this manual, we have used symbols to identify important instructions and information.

The meaning of these symbols is explained below:



*This signal word indicates that there is a **high risk of danger** that will result in **death or serious injury** if not avoided.*



*This signal word indicates a **medium risk** of danger that can lead to **death or serious injury** if not avoided.*



*This signal word indicates a **low-level risk** that can result in **minor or moderate injury or damage to property** if not avoided.*



*This symbol denotes information intended to assist the user to make **optimum use** of the product.*

Although great care has been taken in the drafting of this operating manual, it may nevertheless contain errors and mistakes. Bender cannot accept any liability for injury to persons or damage to property resulting from errors or mistakes in this manual.

## 1.2 Technical support: service and support

For commissioning and troubleshooting Bender offers you:

### 1.2.1 First level support

Technical support by phone or e-mail for all Bender products

- Questions about special customer applications
- Commissioning
- Troubleshooting

**Telephone:** +49 6401 807-760\*  
**Fax:** +49 6401 807-259  
In Germany only: 0700BenderHelp (Tel. and Fax)  
**E-mail:** support@bender-service.de

### 1.2.2 Repair service

Repair, calibration, update and replacement service for Bender products

- Repair, calibration, testing and analysing Bender products
- Hardware and software update for Bender devices
- Delivery of replacement devices for faulty or incorrectly delivered Bender devices
- Extended warranty for Bender devices with in-house repair service resp. replacement devices at no extra cost

**Telephone:** +49 6401 807-780\*\* (technical issues)  
+49 6401 807-784\*\*, -785\*\* (commercial matters)  
**Fax:** +49 6401 807-789  
**E-mail:** repair@bender-service.de

Please send the devices for **repair** to the following address:

Bender GmbH, Repair-Service,  
Londorfer Straße 65,  
35305 Grünberg

### 1.2.3 Field service

On-site service for all Bender products

- Commissioning, parameter setting, maintenance, troubleshooting for Bender products
- Analysis of the electrical installation in the building (power quality test, EMC test, thermography)
- Practical training courses for customers



**Telephone:** +49 6401 807-752\*\*, -762 \*\*(technical issues)  
+49 6401 807-753\*\* (commercial matters)  
**Fax:** +49 6401 807-759  
**E-mail:** [fieldservice@bender-service.de](mailto:fieldservice@bender-service.de)  
**Internet:** [www.bender.de](http://www.bender.de)

\*Available from 7.00 a.m. to 8.00 p.m. on 365 days of the year (CET/UTC+1)

\*\*Mo-Thu 7.00 a.m. - 8.00 p.m., Fr 7.00 a.m. - 13.00 p.m.

### 1.3 Training courses

Bender is happy to provide training regarding the use of test equipment. The dates of training courses and workshops can be found on the Internet at [www.bender-de.com](http://www.bender-de.com) -> Know-how -> Seminars.

### 1.4 Delivery conditions

The conditions of sale and delivery set out by Bender apply.

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

Conditions of sale and delivery can be obtained from Bender in printed or electronic format.

### 1.5 Inspection, transport and storage

Inspect the packaging and equipment packaging for damage, and compare the contents of the package with the delivery documents. In the event of damage in transit, please contact Bender immediately.

The devices must only be stored in areas where it is protected from dust, humidity and spray or dripping water, and in which the specified storage temperatures can be assured.

### 1.6 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:

- Improper use of the device.
- Incorrect mounting, commissioning, operation and maintenance of the device.
- Failure to observe the instructions in this operating manual regarding transport, commissioning, operation and maintenance of the device.
- Unauthorised changes to the device made by parties other than the manufacturer.
- Non-observance of technical data.
- Repairs carried out incorrectly and the use of replacement parts or accessories not approved by the manufacturer.
- Catastrophes caused by external influences and force majeure.
- Mounting and installation with device combinations not recommended by the manufacturer.

This operating manual, especially the safety instructions, must be observed by all personnel working on the device. Furthermore, the rules and regulations that apply for accident prevention at the place of use must be observed.

## 1.7 Disposal

Abide by the national regulations and laws governing the disposal of this device. Ask your supplier if you are not sure how to dispose of the old equipment.

The directive on waste electrical and electronic equipment (WEEE directive) and the directive on the restriction of certain hazardous substances in electrical and electronic equipment (RoHS directive) apply in the European Community. In Germany, these policies are implemented through the "Electrical and Electronic Equipment Act" (ElektroG). According to this, the following applies:

- Electric and electronic equipment are not to be included in household waste.
- Batteries and accumulators are not to be included in household waste but must be disposed of in accordance with the regulations.
- Old electrical and electronic equipment from users other than private households which was introduced to the market after 13th August 2005 must be taken back by the manufacturer and disposed of properly.

For more information on the disposal of Bender devices, refer to our website at [www.bender-de.com](http://www.bender-de.com) -> Service & support.

## 2. Safety instructions

### 2.1 General safety instructions

Part of the device documentation in addition to this manual is the enclosed " Safety instructions for Bender products".

Bender devices are built in accordance with state-of-the-art technology and accepted recognised safety regulations. However, the use of such devices may introduce risks to the life and limb of the user or third parties and/or result in damage to the Bender devices and other property.

- Only use Bender devices:
  - As intended
  - In perfect working order
  - In compliance with the accident prevention regulations and the guidelines applicable at the location of use
- Immediately rectify any faults that may endanger safety.
- Do not make any unauthorised changes and only purchase spare parts and optional accessories recommended by the manufacturer of the devices. Failure to observe this requirement can result in fire, electric shock and injury.
- Reference signs must always be clearly legible. Replace damaged or illegible signs immediately.

Make sure that the dimensions of the BSV (battery-supported safety power supply), the generator set 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.

### 2.2 Work activities on electrical installations



Only **qualified personnel** are permitted to carry out the work necessary to install, commission and run a device or system.


**DANGER**

### **Risk of fatal injury due to electric shock!**

*Touching live parts of the system carries the risk of:*

- *An electric shock*
- *Damage to the electrical installation*
- *Destruction of the device*

**Before installing and connecting the device, make sure that the installation has been *de-energised*.** Observe the rules for working on electrical installations.

**Refer to the rated and supply voltage values as specified in the technical data!**

If the device is being used in a location outside the Federal Republic of Germany, the applicable local standards and regulations must be complied with. European standard EN 50110 can be used as a guide.

## 2.3 Intended use

The universal MK2430 alarm indicator and test combination is used for visual and acoustic indication of operating status and alarm messages from Bender's EDS, RCMS, ATICS® and MEDICS® systems. In MEDICS® monitoring systems, the MK2430 meets the requirements of IEC 60364-7-710:2002-11 and DIN VDE 0100-710:2002-11 with regard to test functions for IT system monitoring and alarms from changeover devices. IT system monitoring equipment can be tested using the programmable "TEST" button.

Important display functions:

- Normal operation indicator (green LED)
- Insulation fault
- Overload
- Overtemperature
- Messages from EDS... insulation fault location systems and RCMS... residual current monitoring systems
- Interruption of the system conductor or PE conductor connection of the ISOMETER®
- Supply line failure
- Power supply fault conditions and changeover device faults
- Device failure
- Test results
- Measured values

The clear text display makes information easy to understand. The connection between the MK... and the transfer switching and monitoring modules is implemented with bus technology. During normal operation, the MK2430 indicates the readiness for operation of the system.

Version MK2430-11 features 12 digital inputs allowing messages from other technical equipment to be recorded and displayed on the MK2430, for example from medical gases or battery-supported safety power supply systems (BSV systems).

MK2430 are used in:

- Healthcare facilities
- Industrial and office buildings
- Public buildings

Please heed the limits of the area of application indicated in the technical specifications. Any other use than that described in this manual is regarded as improper.

**Intended use implies:**

- Equipment-specific settings compliant with local equipment and operating conditions.
- The observation of all information in the operating manual.
- Compliance with test intervals.

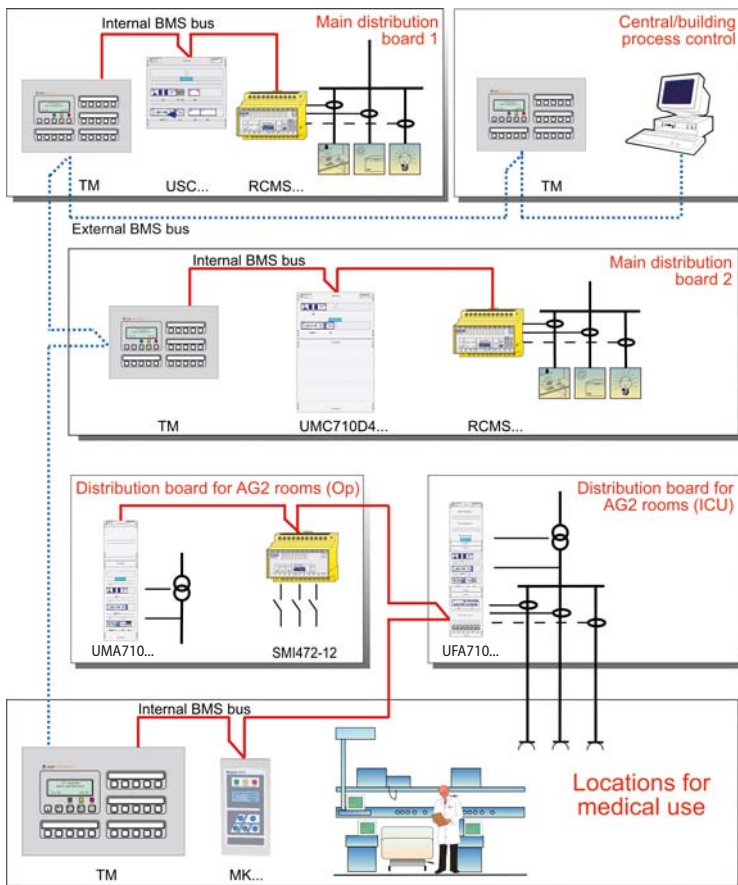


## 3. System description

### 3.1 MEDICS®

The MK2430 alarm indicator and test combinations are integral components of the MEDICS® system. MEDICS® is an intelligent system that guarantees safe power supply in medical locations.

Example of a section of a hospital where a MEDICS® system is installed:



### Legend of the example

MK2430	Alarm indicator and test combination
RCMS...	Residual current monitoring systems for TN-S systems
SMI472	Signal converter for third-party systems (e.g. med. gases, BSV systems)
TM...	Alarm indicator and operator panel
UFA107E...	Changeover and monitoring module for IT systems with an EDS...insulation fault location system
UMA107E...	Changeover and monitoring module for IT systems
UMC710D...	Changeover module for main distribution boards
USC710D...	Control module for changeover devices (preferably in main distribution boards)
ZLT	Central Control System
GLT	Building Control System

### MEDICS® includes:

- Display and operating units such as TM... alarm indicator and operator panels or MK... alarm indicator and test combinations
- Single and three-phase monitoring modules. Examples for such modules for the MEDICS® system are: UMC..., USC..., UFC... and/or EDS... insulation fault location systems.
- Communication between these components via the BMS bus (two-wire connection).
- The connection of third-party systems by means of protocol converters (gateways) or via digital inputs and relay outputs.

The real strength of MEDICS® lies in the communication between all components and the resulting information for the user. The functionality of the equipment is continuously monitored. Operating states, irregularities, faults and device failures are displayed. This means high operational reliability of the installation for the user.

## 3.2 Characteristics

On its backlit display (4 x 20 characters), the MK2430 displays messages from all BMS bus devices assigned via alarm addresses. As well as being used as a standalone indicator, the MK2430 also supports parallel indication of several MK2430 in different rooms.

In the event of an alarm message, the yellow "WARNING" LED or the red "ALARM" LED lights up and the message appears on the LC display in plain text format. At the same



time there is an acoustic signal (acknowledgeable/can be muted). If a second message is received while the first is still pending, the acoustic signal will sound again and the messages appear alternately on the LC display. The address of the device triggering the alarm can also be requested. The acoustic signal sounds again once a configurable period of time has elapsed (repetition can be deactivated).

Internal device parameters (alarm addresses, test addresses...) and the parameterisation of EDS and RCMS systems can be accessed via the menu system. The MK2430 can be used as a master device in installations with several IT and EDS systems. The "TEST" button can be used to check the function of the associated devices such as insulation monitoring devices, LIM (Line Isolation Monitors) or GFCI (Ground Fault Circuit Interrupters). A message will only be displayed on the MK2430 on which the "TEST" button has been pressed. The test and its individual evaluations are carried out sequentially. Finally, a message appears that the test was successful or a fault message will be output.

#### **The MK2430 has the following features:**

- Display of operating status, warning and alarm messages in accordance with IEC 60364-7-710, DIN VDE 0100-710 and other standards
- Backlit clear LC text display (4 x 20 characters)
- Standard texts for messages in 20 national languages
- 200 freely programmable message texts (with TMK-SET PC software)
- Bus technology for easy installation and reduced fire load
- Acoustic alarm (can be acknowledged or muted)
- Adjustable via menu (German/English): MK2430 basic parameters and via BMS bus: EDS46x, EDS47x, EDS49x, RCMS460, RCMS470, RCMS490
- Version for flush mounting and surface mounting
- Easy commissioning due to predefined alarm text messages
- 12 digital inputs (MK2430-11 only)
- History memory with real-time clock to store 250 warnings and alarms
- Replace MK2418

## 3.3 Function

### 3.3.1 Display/operating elements

The backlit display features four lines of 20 characters each. It supplies medical and technical personnel with clear and unambiguous information to help them make decisions. Every alarm message comprises three lines which appear spontaneously and three additional lines which can be displayed at the touch of a button. The fourth line contains status information (i.e. number of messages, test procedures, menu information). Three LEDs are located above the text display. They indicate:

Normal operation (green), warnings (yellow) or alarms (red).

Five buttons are available for acknowledging or muting alarms and warnings, testing assigned devices and for the menu system.



### 3.3.2 Programmable messages

Standard message texts can be activated by enabling alarm addresses. These texts are available in 20 languages. Alarm addresses can be enabled via the device menu system (without PC). Individual message texts, each comprising 6 lines of 20 characters can be programmed with the TMK-SET PC software.

An LED (yellow or red) and an acoustic signal can be assigned to each message. For this purpose, the PC is connected to the USB interface or BMS bus (RS-485).

### 3.3.3 History memory

Warnings and alarms are written to the history memory. 250 text messages can be stored. Each subsequent message overwrites the oldest message in the history memory (message 251 overwrites message 1 etc.). The history memory can be read via the operating menu or the TMK-HISTORY PC software.

## 3.4 Versions

### 3.4.1 MK2430-12

The MK2430-12 is used for visual and acoustic indication of alarms from Bender's EDS, RCMS and MEDICS systems® and for testing assigned devices (e.g. insulation monitoring devices, LIM, GFCI). Furthermore, the MK2430-12 can be used as parallel indication in conjunction with MK2430-11 and SMI472-12. The programmed message texts are displayed on the LCD in the selected national language.

### 3.4.2 MK2430-11

The MK2430-11 features all the functions of the MK2430-12. In addition, the MK2430-11 provides 12 digital inputs and a programmable relay output. All digital inputs, divided into three groups of 4, are galvanically isolated from each other. The input voltage is LOW = 0...2 V). In practice, these digital inputs (IN1... IN16) are controlled via potential-free contacts (N/C or N/O operation configurable). The voltage required for these inputs is provided via the power supply unit, which also supplies power to the MK2430. Any message text can be assigned to the inputs.

### 3.4.3 MK2430C-...

The MK2430C-... includes factory programming according to customer specifications.

### 3.4.4 Interfaces

MK2430 feature a BMS bus and USB interface.

#### 3.4.4.1 BMS bus

The BMS bus is used for communication with BMS bus nodes

- such as UMC..., UMA..., UFA..., UFC..., LFC... modules
- or devices like RCMS..., EDS..., SMI..., SMO... ATICS®, alarm indicator and operator panels.

The MK2430 acts as the master whenever the address is set to 1 and as slave when the address is set between 2 and 150.

The master is responsible for specific tasks:

- As "master clock", it synchronises the time of all devices on the internal BMS bus;
- it controls the data traffic on the BMS bus.

#### 3.4.4.2 USB interface

A PC can also be connected to the MK2430 via the USB interface with a USB cable (type A plug onto type B plug). To access the interface, the MK2430 has to be removed.

Only the connected MK2430 can be read out and set via the USB interface.

### **Programming and reading the MK2430**

Connect the MK2430 to a PC:

- directly via the USB interface or
- via an RS-232/RS-485 converter DI-2 or a USB/RS-485 converter DI-2USB to the BMS bus.

You can use the optional TMK-SET PC software to display and change the MK2430 settings. The optional PC software TMK-HISTORY can be used to read out the MK2430.

## 4. Installation and connection

### 4.1 Safety instructions



Only **qualified personnel** are permitted to carry out the work necessary to install, commission and run a device or system.



**DANGER**

#### **Risk of fatal injury due to electric shock!**

Touching live parts of the system carries the risk of:

- An electric shock
- Damage to the electrical installation
- Destruction of the device

**Before installing and connecting the device, make sure** that the **installation** has been **de-energised**. Observe the rules for working on electrical installations.

**Refer to the rated and supply voltage values** as specified in the technical data!

## 4.2 Installing the device

### 4.2.1 Overview of enclosure variants

- The MK2430 is installed in a flush-mounting enclosure. With a special mounting kit it is also suitable for installation in a panel or cavity wall.
- MK2430A in surface-mounting enclosure

### 4.2.2 Dimension diagram flush-mounting enclosure

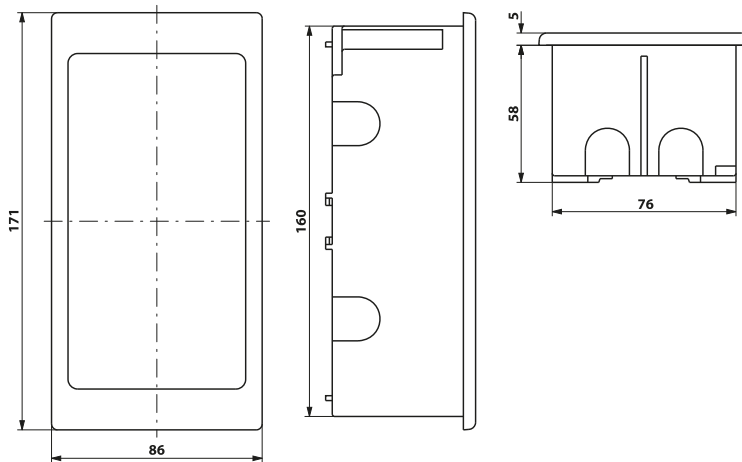


Fig. 4.1: MK2430 in flush-mounting enclosure  
Front panel cutout: 161 x 77 mm



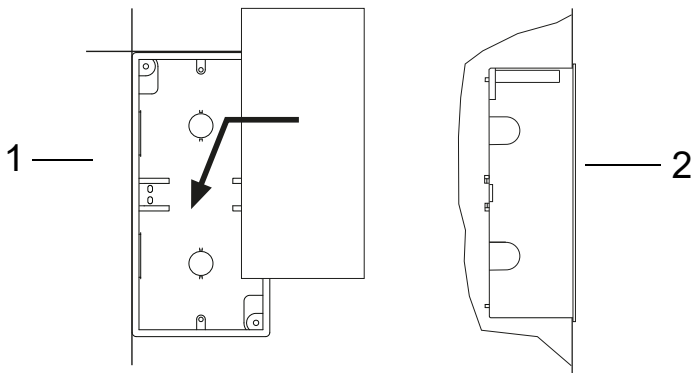
The MK2430 is fixed in its enclosure with brackets. In addition, the MK2430 can be secured in its enclosure with screws. For this purpose, markings for the drilling holes are prepared at the back of the front plate (drilling hole: 3 mm  $\varnothing$ , lowering from the outside: 6 mm  $\varnothing$ ). The versions MK2430S-11, MK2430S-12 and MK2430H-12 are mounted with 2 screws in the in-wall casing.

*When screw mounting, make sure that the front panel does not bend!*

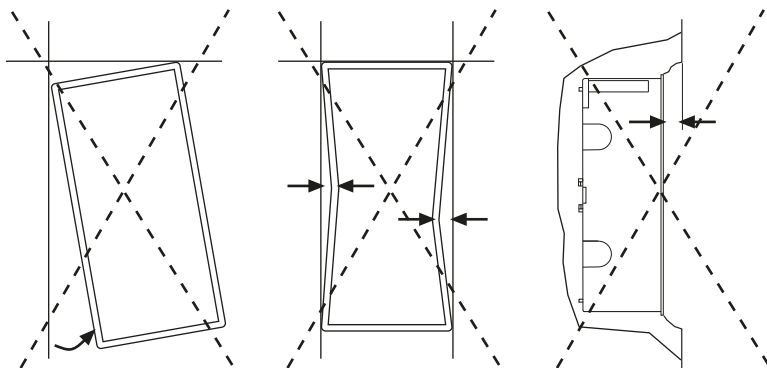
### 4.2.2.1 Flush-mounting

The flush-mounting enclosure is already included in the scope of delivery of the MK2430.

1. Insert the cardboard that has been supplied into the flush-mounting enclosure to provide protection against pollution.
2. Insert the enclosure so that it is flush with the wall surface.

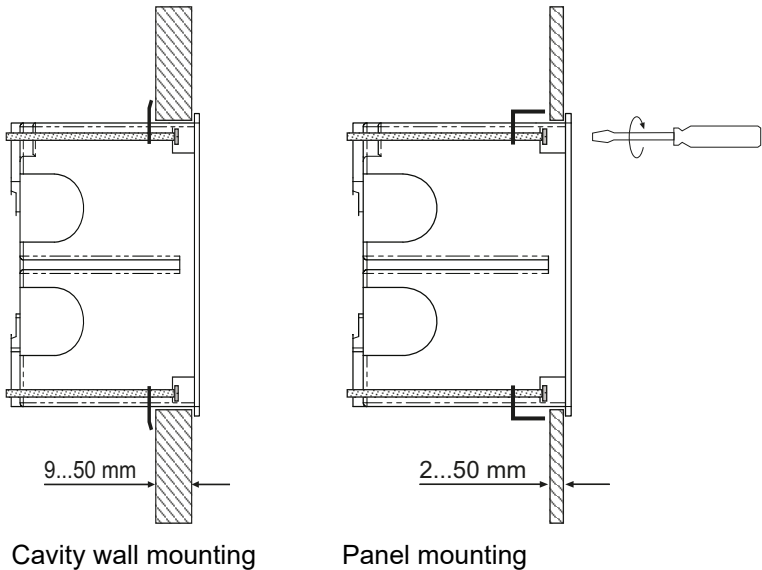


The flush-mounting enclosure must not be installed lopsidedly or warped, and must not be installed too deep below the surface.



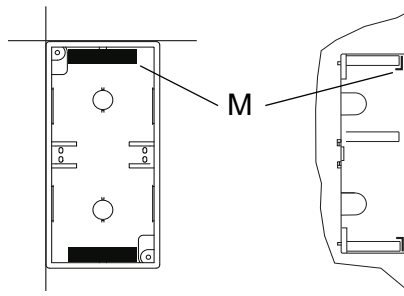
#### 4.2.2.2 Cavity wall and panel mounting

For cavity wall or panel mounting you will need a "Complete mounting kit" (Art. No. B95101000).



#### 4.2.2.3 Mounting brackets

By means of the mounting brackets (attached on each side) the MK2430 snaps into the flush-mounting enclosure. Two mounting brackets (M) are used for additional support. They are needed in particular if the MK2430 has to be fixed into an existing flush-mounting enclosure (e.g. MK2418) which is not intended for snap-on mounting. The "Complete mounting kit (Art. No. B95101000)" is required for this.







### **Screw mounting**

The MK2430S-11, MK2430S-12 and MK2430H-12 versions are designed for screw mounting. MK2430H-12 is mounted horizontally.

When screw mounting, make sure that the front panel does not bend!

## 4.2.3 Dimension diagram surface-mounting enclosure

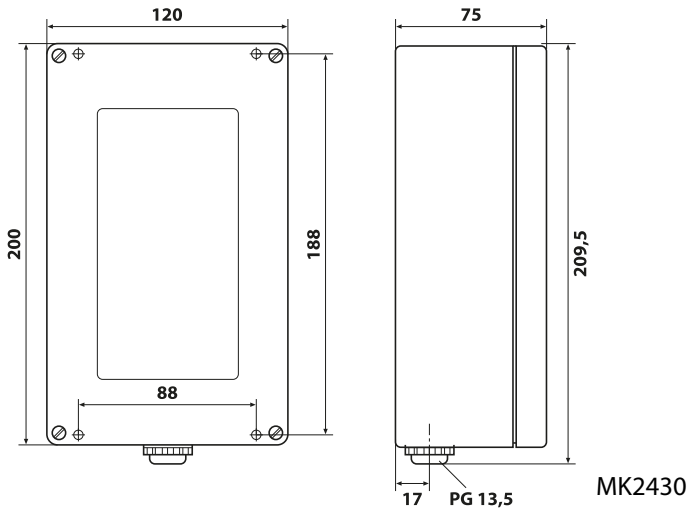


Fig. 4.2: MK2430 in surface-mounting enclosure

### 4.2.3.1 Installation of the surface-mounting enclosure



A smooth and even surface is a precondition for installation. Only the fastening screws specified below should be used. Failure to observe this can result in deformation or damage to the enclosure.

- Use the empty enclosure as a template to mark the drilling holes.

Maximum diameter of the screws:

Thread of screw: 3 mm, bolt head: 7 mm.

## 4.3 Connecting the device

### 4.3.1 Safety instructions



**DANGER**

#### ***Danger of electric shock!***

*Follow the basic safety rules when working with electricity. **Observe the information on rated voltage and supply voltage** specified in the technical data!*



**DANGER**

*Connect the MK2430 exclusively according to the wiring diagram in this chapter. Do not make **any changes to the internal wiring**. Non-compliant connection or arbitrary changes can lead to serious malfunctions or even the complete failure of the MK2430.*



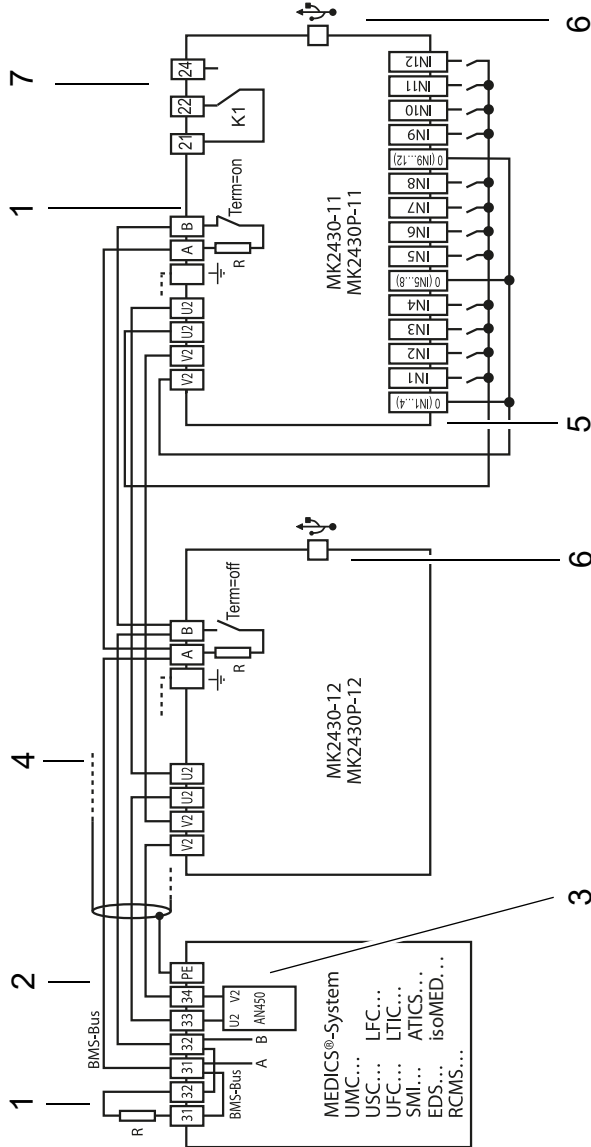
**CAUTION**

*The device contains components that can be damaged by **electrostatic discharges (ESD)**. When work activities are carried out at when the device is open, the safety precautions concerning the dissipation of electrostatic electricity have to be observed.*

### 4.3.2 Notes on the connection

- Connect the MK2430 to the supply voltage (terminals U2/V2).
  - If you are supplying the MK2430 with a DC voltage of 24 V: Take the line voltage drop into account if you are using long supply cables for the supply voltage.
  - Consider the maximum permissible cable lengths for the supply voltage U2/V2 when using an AN450 or AN410 power supply unit (refer to „Technical data“).
- The connection to the internal BMS bus is made via the terminals A/B. Connect the BMS bus as described in the "BMS bus" instruction leaflet. Use a shielded and twisted cable with a diameter of at least 0.8 mm for the interface line (e.g. J-Y(St)Y nx2x0.8). Connect the shield to PE (earth) at one end. Please note that, when routing the supply voltage  $U_s$ , a 4-wire cable (2 x BUS, 2 x  $U_s$ ) with suitable cross section is required.
- Set the terminating resistor for the BMS bus on the "Term" DIP switch. Factory setting: off.
- MK2430-11 only: Use cables with a cross section of at least 0.75 mm<sup>2</sup> when connecting the digital inputs and the relay output. The maximum cable length per connection is 500 m.

### 4.3.3 Wiring diagram



## Legend to wiring diagram



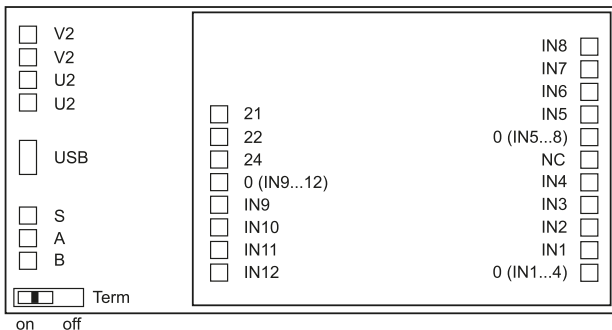
Make sure that the MK2430 power supply is **isolated from PE**. If this is not taken into consideration and if a PC is connected to the USB interface, the MK 2430 device and the PC may be damaged.

1	<p>Terminating resistor: If two or more devices are connected to each other via the BMS bus, the bus line must be terminated at both ends with a resistor (<math>R = 120 \Omega</math>). (The resistors can be activated via DIP switch on the MK2430 and alarm indicator and operator panel).</p>
2	<p>BMS bus connection: Various Bender devices with a BMS bus interface, such as insulation monitoring devices isoMED427P, 107TD47, control devices PRC487, residual current monitors RCMS470, can be connected to the BMS bus.</p>
3	<p>Power supply unit in the MEDICS® module, sufficient for supplying power to at least three MK2430.</p>
4	<p>Cable between the MEDICS® module and the MK2430. Please observe the permissible cable lengths and cross sections when using the AN450 power supply unit in MEDICS® modules.</p>
5	<p>Digital inputs. The digital inputs may be activated either via internal or external voltage or potential-free contacts. If the inputs are controlled via an external voltage, the common 0(-) is applied to terminal "0" and the 1(+) signal to the relevant input IN1 ... IN12. In this case, the connections between terminals 0 and V2, and the common connections and U2 are not required.</p>
6	<p>USB interface. For PC connection. The TMK-SET PC software is used to program the MK2430. You can use the PC software TMK-HISTORY to read out the MK2430 history memory.</p>
7	<p>MK2430-11 only: Relay output. Programmable contact for device errors, test of assigned devices*, device failure and common alarm message.</p>

\* Devices without BMS bus connection, but with test input (e.g. ISOMETER®)

### 4.3.4 Connection assignment

The connections are located on the back of the device.



#### 4.3.4.1 MK2430-12

The MK2430-12 features only one terminal strip as it receives all messages via the BMS bus. These messages can be received from an isoMED427P, 107TD47, an MK2430-11, a signal converter SMI47x, an EDS... or an RCMS..., for example.

U2, V2	Supply voltage $U_s$ : looped-through connection for supply voltage $U_s$ . <b>Note: Make sure that the power supply of the MK2430 is isolated from PE. If this is not taken into consideration and if a PC is connected to the USB interface, the MK 2430 device and the PC may be damaged.</b>
USB	USB connection. Cable: type A plug on type B plug
S	BMS bus and USB interface shield
A, B	BMS bus
Term	BMS bus terminating resistor, switchable

#### 4.3.4.2 MK2430-11

The MK2430-11 alarm indicator and test combination provides additional terminal strips for the 12 digital inputs and one optional relay output.

IN1...IN12	Digital inputs 1...12
0 (IN1...4)	Common connection "0" for digital inputs 1...4
0 (IN5...8)	Common connection "0" for digital inputs 5...8
0 (IN9...12)	Common connection "0" for digital inputs 9...12
21, 22, 24	Relay output (option)
NC	No function (not connected)

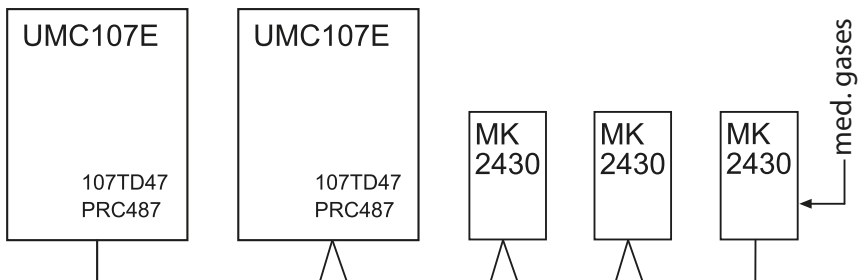
Also refer to „Settings menu 4: Digital inputs (MK2430-11 only)“ on page 62.

## 4.4 Examples for BMS bus connection and addressing

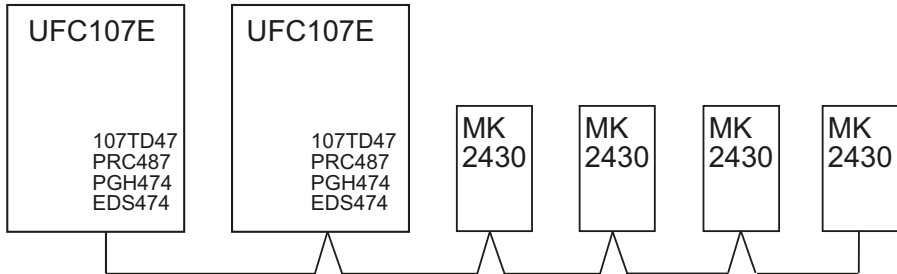


*Missing or incorrectly installed terminating resistors (e.g. in the middle of the bus) will cause bus instability. Please also note the information in the "BMS bus" operating manual.*

**Example 1: Operating theatre or intensive care unit with two IT systems and three rooms**



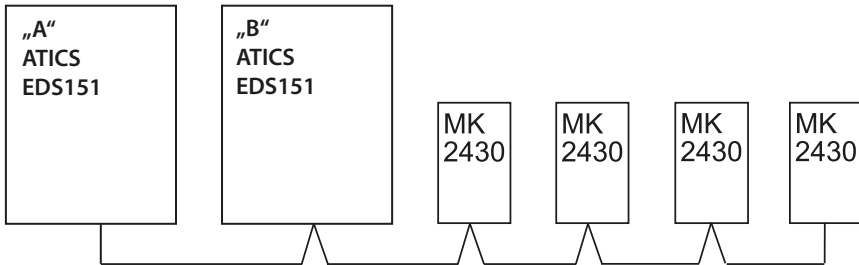
Device	Parameter	Address settings
<b>First UMC107E changeover and monitoring module</b>		
<b>107TD47</b>	Bus address	3
<b>PRC487</b>	Bus address	4
<b>Second UMC107E changeover and monitoring module</b>		
<b>107TD47</b>	Bus address	5
<b>PRC487</b>	Bus address	6
<b>Alarm indicator and test combinations</b>		
<b>First MK2430...</b>	Bus address	1
	Test address	3, 5
	Alarm address	2, 3, 4, 5, 6, 7
<b>Second MK2430...</b>	Bus address	2
	Test address	3, 5
	Alarm address	1, 3, 4, 5, 6, 7
<b>Third MK2430...</b>	Bus address	7
	Test address	3, 5
	Alarm address	1, 2, 3, 4, 5, 6

**Example 2: Intensive care unit with two IT systems and four rooms**


Device	Parameter	Address settings
<b>First UFC107E changeover and monitoring module</b>		
107TD47	Bus address	3
PRC487	Bus address	4
PGH474	Bus address	111
EDS474-12	Bus address	61
<b>Second UFC107E changeover and monitoring module</b>		
107TD47	Bus address	5
PRC487	Bus address	6
PGH474	Bus address	112
EDS474-12	Bus address	62
<b>Alarm indicator and test combinations</b>		
<b>First MK2430...</b>	Bus address	1
	Test address	3, 5
	Alarm address	2, 3, 4, 5, 6, 7, 8, 61, 62, 111, 112
<b>Second MK2430...</b>	Bus address	2
	Test address	3, 5
	Alarm address	1, 3, 4, 5, 6, 7, 8, 61, 62, 111, 112

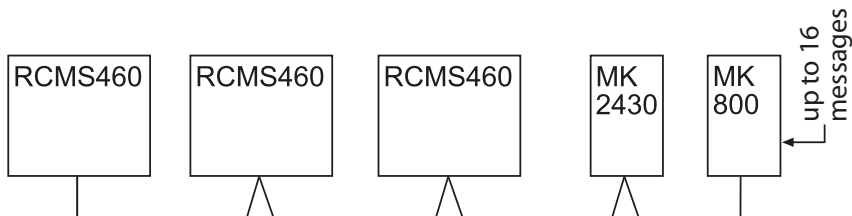


Device	Parameter	Address settings
<b>Third MK2430...</b>	Bus address	7
	Test address	3, 5
	Alarm address	1, 2, 3, 4, 5, 6, 8, 61, 62, 111, 112
<b>Fourth MK2430...</b>	Bus address	8
	Test address	3, 5
	Alarm address	1, 2, 3, 4, 5, 6, 7, 61, 62, 111, 112

**Example 3: Intensive care unit with two IT systems and four rooms**


Device	Parameter	Address settings
<b>First changeover and monitoring module</b>		
ATICS "A"	Bus address	3
EDS151 "A"	Bus address	4
<b>Second changeover and monitoring module</b>		
ATICS "B"	Bus address	5
EDS151 "B"	Bus address	6
<b>Alarm indicator and test combinations</b>		
First MK2430...	Bus address	1
	Test address	3, 5
	Alarm address	2, 3, 4, 5, 6, 7, 8
Second MK2430...	Bus address	2
	Test address	3, 5
	Alarm address	1, 3, 4, 5, 6, 7, 8
Third MK2430...	Bus address	7
	Test address	3, 5
	Alarm address	1, 2, 3, 4, 5, 6, 8
Fourth MK2430...	Bus address	8
	Test address	3, 5
	Alarm address	1, 2, 3, 4, 5, 6, 7

**Example 4: System with 3 RCMS, one MK2430 and one MK800**



Device	Parameter	Address settings
<b>Residual current monitors</b>		
<b>1. RCMS460</b>	Bus address	3
<b>2. RCMS460</b>	Bus address	4
<b>3. RCMS460</b>	Bus address	5
<b>Alarm indicator and test combinations</b>		
<b>MK2430...</b>	Bus address	2
	Test address	-
	Alarm address	1, 3, 4, 5
<b>MK800...</b>	Bus address	1
	Test address	-
	Alarm address	2, 3, 4, 5,



## 5. Commissioning and testing

The following flow chart explains the commissioning process:

1. Tests before switching on
2. Tests after switching on
3. Parameter setting
  - Settings on the MK2430
  - Settings using the software TMK-SET
4. Tests after parameter setting



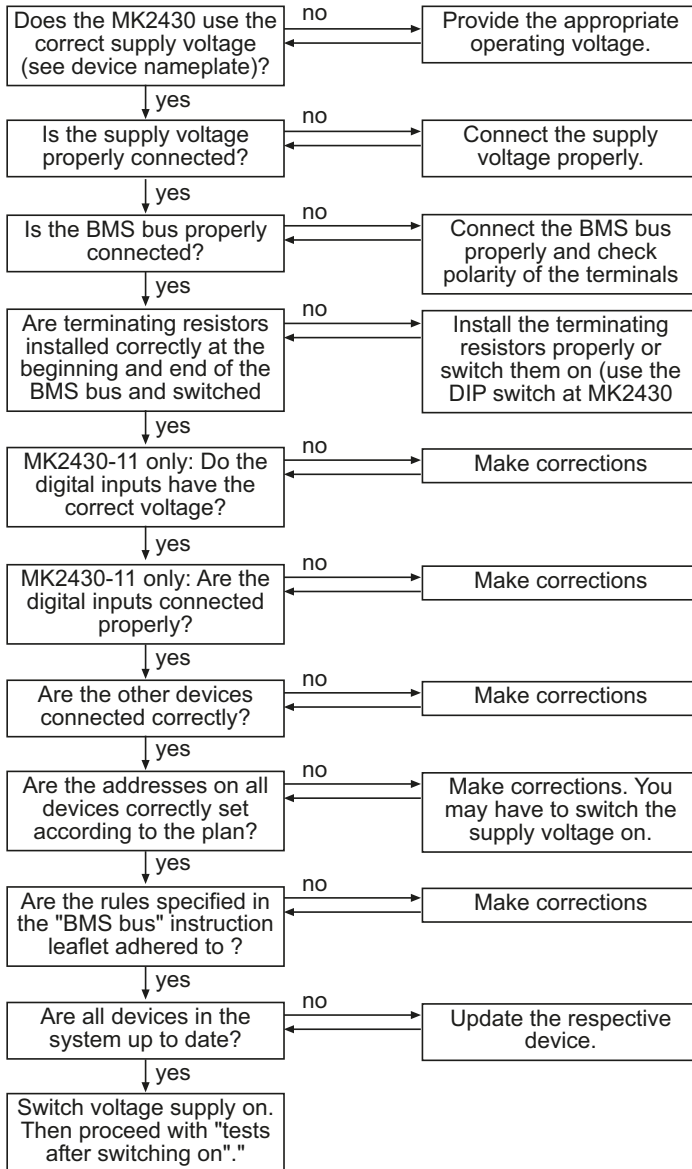
---

*Please write down all settings and keep them with the equipment or installation documentation.*

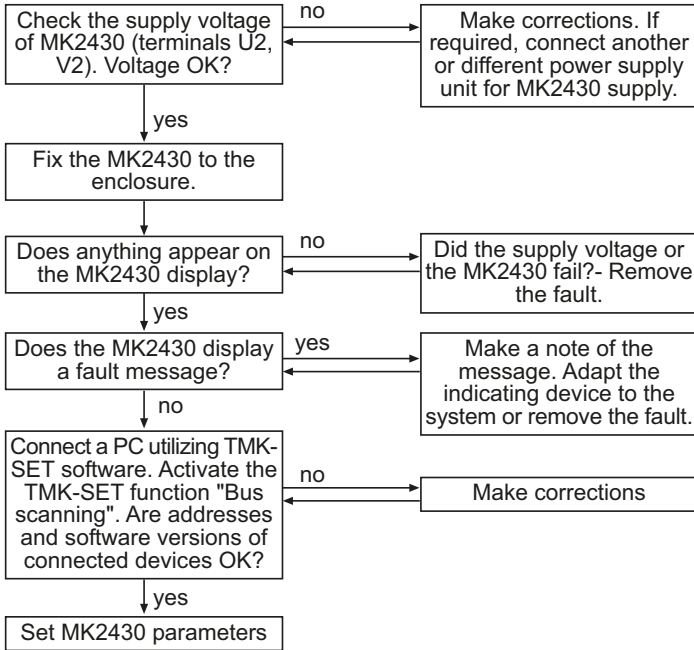
*When setting the MK2430 with the configuration software TMK-SET, a project file is created. Save this file. Create a backup copy of this file and keep it in a safe place.*

---

## 5.1 Tests before switching on



## 5.2 Tests after switching on

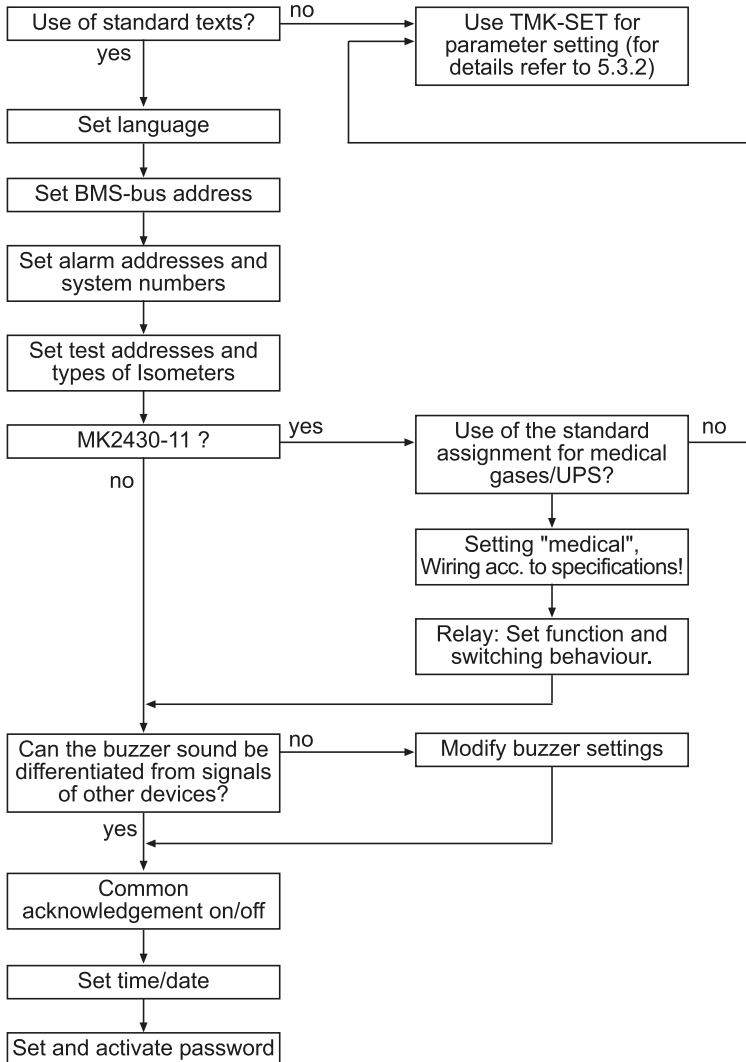


## 5.3 Parameter setting



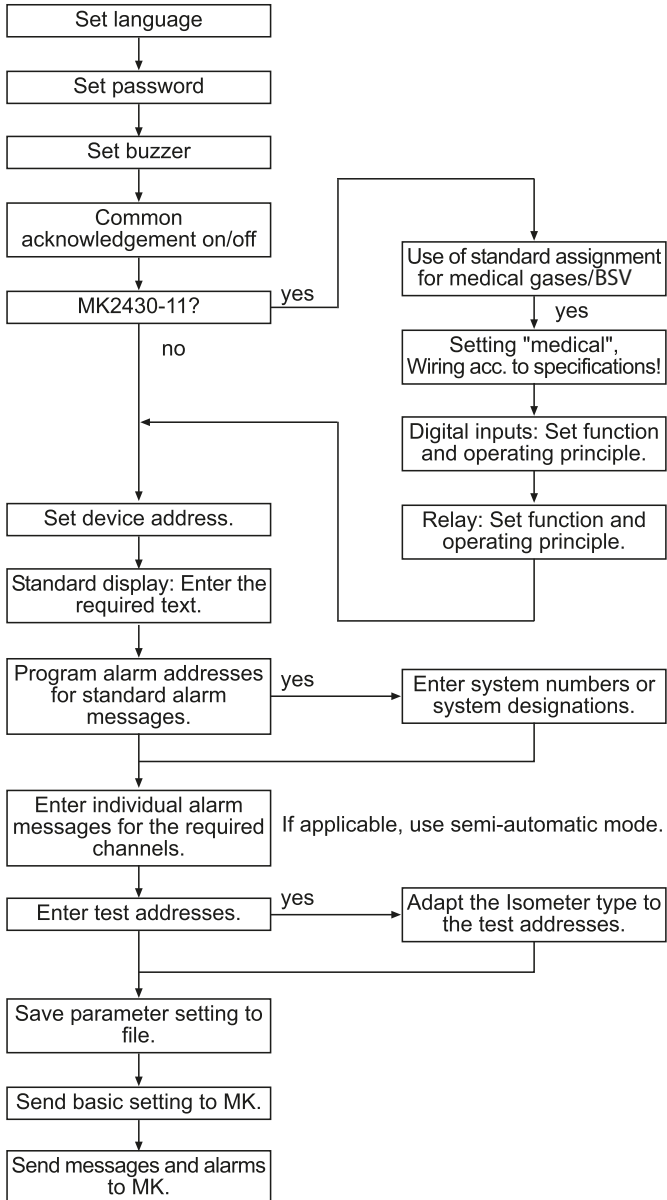
**All settings can be carried out via the TMK-SET software. Alternatively, the basic settings can be carried out via the MK2430 menu (see diagrams).**

### 5.3.1 Settings on the MK2430

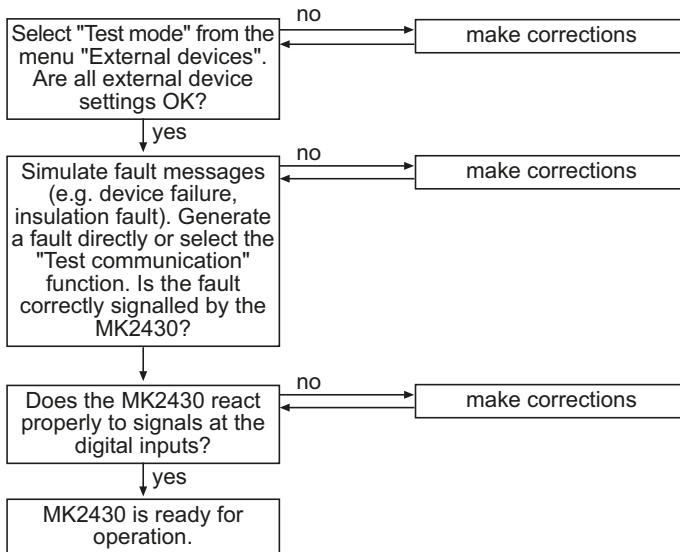




### 5.3.2 Settings using the TMK-SET software



### 5.3.3 Tests after parameter setting



## 5.4 Periodic verification and service

### 5.4.1 Periodic verification

The following periodic verification must be performed on electrical installations in compliance with the local or national regulations that apply. For your Bender products, we recommend:

Action	Carried out by	Interval
Functional test of the IT system monitoring (insulation, load current, transformer temperature and connection monitoring) by pressing the "TEST" button on the alarm indicator and test combination or on the alarm indicator and operator panel.	Medical personnel	Once every working day
Functional test of the changeover device*: Functional test of the automatic changeover device. The instructions in chapter "Test of the changeover device" (manual changeover device) have to be observed!	Electrically skilled person	Every six months
Functional test of the IT system monitoring (insulation, load current, transformer temperature and connection monitoring) on the insulation monitoring device.	Electrically skilled person	Every six months
Checking the setting values and changeover periods.	Electrically skilled person	Every 12 months
Test the changeover device, the IT system monitoring, and the connection to the SCADA system (Supervisory Control and Data Acquisition) (if applicable) as well as the interaction between the components in the system. The test encompasses the following: - <b>Inspection:</b> Marking, display elements, mechanical components, wiring, parameterisation, connection of third-party systems, evaluation of fault memory - <b>Measurement:</b> Internal/external supply voltages/potentials, bus voltage, bus protocol, bus scan - <b>Testing:</b> Device function, device communication - <b>Documentation:</b> Test results, recommendations for eliminating defects	Bender	Every 24 months

\* This test must only be performed by an authorised electrically skilled person in agreement with the medical locations concerned.

Before carrying out the tests, please refer to the instructions relating to the functional tests in the check list. If no national directives apply, you should perform the tests recommended by IEC 60364-7-710 :2002-11, section 710.62 and DIN VDE 0100-710 (VDE 0100 Part 710).

### **5.4.2 Maintenance**

MK2430 does not contain any parts that require maintenance. Despite this, the intervals specified for periodic verification should be adhered to.

### **5.4.3 Cleaning and disinfection**

The front foil is glued in ensuring marginal fit. The device is mounted without using screws (all versions except MK2430S). The front is easy to clean with conventional cleaning and disinfection agents and thus complies with hygienic requirements.

## 6. Troubleshooting

### 6.1 MK2430 error messages

The following errors are recognised by the MK2430 and indicated on the display. The buzzer emits a beep code every 10 seconds corresponding to the error number.

MK2430..-11 only: If the function "Device error" has been set in the „Settings menu 10: Relay“, the alarm relay will also switch.

No.	Display	Description	Actions
1	DISPLAY ERROR	Display defective	Replace the MK2430*
2	I2C-BUS ERROR(X)	Fault I <sup>2</sup> C bus	Switch off the device for 10 minutes, then switch it on again; if unsuccessful: Replace the MK2430*
3	RTC ERROR	Clock chip defective	Replace the MK2430*
4	FLASH ERROR	Assignment chip defective	Replace memory chip D15 (socketed) or replace MK2430*
5	Address ERROR (XXX)	Address of the MK2430 on the internal BMS bus is already in use (XXX=current address)	Change the MK2430 address in the menu
6	Overflow ERROR (03)	More than 80 alarm messages are present at the same time	Reduce number of messages
	Overflow ERROR (05)	There are more than 200 device failure messages	Reduce number of messages
	Overflow ERROR (07)	There are more than 99 text messages	Reduce number of messages
	Overflow ERROR (08)	Automatic correction of the history memory is carried out because of voltage interruption.	None
	Overflow ERROR (11)	Stack Error	Write down the error code and contact the Bender service.
7	Checksum ERROR	Program memory defective	Replace the MK2430*

\* Please write down the cause of error, the error number and if applicable the error code. This information facilitates the diagnosis and repair of the device.

X Error code

## 6.2 Malfunctions

List of possible errors and proposals for the correction of the faults. This error list does not claim to be exhaustive.

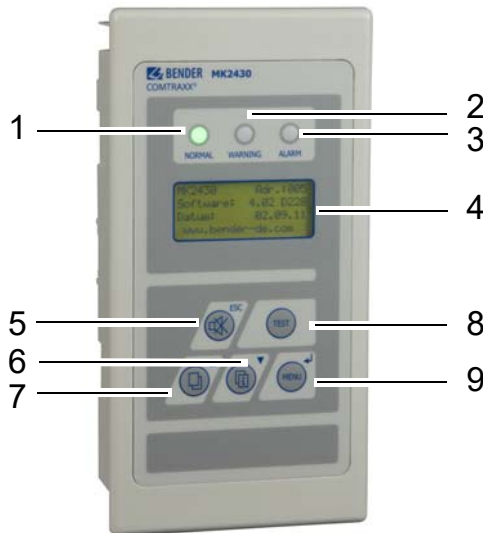
Possible error codes occurring during a test are listed in the chapter "Test function" on page 51f.

Error	Possible cause/Actions
MK2430 display blank.	Check AC/DC 24 V power supply.
Display is lit but the screen is empty.	Replace MK2430.
Control buttons not responding.	Replace MK2430.
LEDs do not light	Replace MK2430.
Character matrix visible on display, but firmware does not run.	Processor does not start; Replace MK2430.
Time is reset to zero in case of short-term voltage failure.	Replace MK2430.
Error during transfer of the assigned addresses or basic settings via the USB interface.	MK2430 address not properly set (menu); MK2430 address does not match setting of TMK-SET configuration software; USB cable defective; wrong serial interface (com port) set in TMK-SET.
Error on internal BMS bus.	Device addresses not properly set on the internal bus; interface cables A/B mixed up; network incorrectly terminated or not terminated at all; incorrect parameter setting with TMK-SET.
Digital input function error.	Digital inputs not correctly set with TMK-SET. Defective connection (does not match pre-assignment). Incorrect setting "neutral/medical".

## 7. Operation

This chapter can also be used as a quick-start guide by technical operating personnel.

### 7.1 Operator control and display elements



#### LED and LCD

1	"NORMAL" LED: Power On indicator, green (is only lit when no warnings or alarms are pending)
2	"WARNING" LED: Warnings, yellow
3	"ALARM" LED: Alarm messages, red
4	LCD: Display of operating status, warning and alarm messages as well as menu functions

**The buttons have the following functions:**

No.	In operating mode	In menu mode
5	"🔇" button (mute button); Set buzzer to mute after an alarm/ acknowledge alarm.	"ESC" button; Exit function (without saving) or go up one menu level. When the buzzer is activated, the ESC button will mute the buzzer.
6	"📄" button (additional text); Toggle between display text and addi- tional alarm text (if available).	Arrow button "▼"; to go down in the menu.
7	"📄" button (scroll); Scroll through the warnings and alarms if there is more than one message pend- ing.	Arrow button "▲"; to go up in the menu.
8	"TEST" button; Press and release: LED test; Press and hold: Trigger the test of assigned devices (insulation monitoring devices, LIM, GFCI).	No function.
9	"MENU" button; Starts menu mode for setting the MK2430; for display and control functions.	"↵" button (ENTER button); To confirm the selected menu item.



## 7.2 Quick-start guide

The illustrations below serve as examples.

### 7.2.1 Display in fault-free operating condition

There are no warnings or alarms pending.

- The green "Normal" LED is lit.
- The LC display shows the programmed standard display.
- A maximum of 3 measured values can be displayed in lines 1...3.

```

Power supply: OK
Med. gases :  OK

                                09 : 50
  
```

- Line 1...3: user-definable standard display text.
- Line 4 status bar, indicates the time of day (can be switched off).

### 7.2.2 Display in fault condition

A warning or an alarm message is pending.

- Depending on the type of fault, either the yellow "Warning" LED or the red "Alarm" LED will light up. The green "Normal" LED goes out.
- At the same time the buzzer sounds. If the cause of fault cannot be remedied immediately, the buzzer can be muted by pressing the "🔇" (5) button.
- The LC display shows details about the message.

```

Intensive care unit 03
Insulation fault
Measured value 43 kΩ
xx/yy 📊 zzz 09 : 50
  
```

- Line 1: Standard display: "System:"  
User-defined text here: "Intensive care unit 03"
- Line 2...3: Message text, with measured value (if applicable)

- Line 4            Status line
- xx            = Consecutive number of message displayed
- yy            = Number of pending messages
- [ ]           = Message text page, in this case page 1
- zzz           = Insulation fault location or test in progress (refer to table)
- 09:50        = Time (example)

Possible displays during insulation fault location or testing:

zzz	Meaning
EDSa	EDS insulation fault location in progress (automatic).
EDSp	Continuous EDS insulation fault location in progress.
EDSs	Single-pass EDS fault location in progress.
EDS	EDS insulation fault location was deactivated, the current test procedure is still running.
TEST	Test is running. The message "TEST" flashes if the message being displayed has been caused by the test.
noMA	No master
MAST	Device is currently "substitute master".

- Press the "[ ]" button (6) to receive further information.

```

Since: 01.05.12 16:52
Device:      Isometer
Addr/channel: 003/00
xx/yy [ ]    17:30
    
```

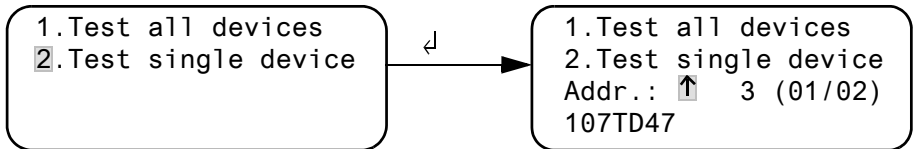
- Line 1:            Date and time the message occurred
- Line 2:            Device triggering the message
- Line 3:            Address and channel of device triggering the message
- Line 4            xx = number of the message displayed  
                      yy = number of pending messages  
                      [ ] = alarm test page, in this case page 2  
                      17:30 = time of day (example)



*The display may deviate depending on user-defined messages. If messages are pending and one of the arrow buttons is pressed, the latest message will appear on the display. If no further button is pressed, this message will be displayed for 15 seconds.*

### 7.2.3 Test function

Press and hold down the "TEST" button for at least one second to check the function of the assigned insulation monitoring devices (e.g. isoMED427P, 107TD47, IRDH...), LIM (Line Isolation Monitors) and GFCI (Ground Fault Circuit Interrupters). A message will only be displayed on the MK2430 on which the "TEST" button has been pressed.



- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Test all devices</li> <li>2. Test single device</li> </ol> | <p>Tests all devices set in the "Test addresses" menu.</p> <p>Select a device using the arrow buttons and press the "↵" button.</p> |
|--|---|

During the test the status line displays "TEST". The message "TEST" flashes if the message being displayed has been caused by the test.

The assigned devices are tested one after another. The MK2430 automatically evaluates the messages that appear. Once the process is completed, either a common message about a successful test or an error message is displayed.

If more than one device has been tested, a separate error code will be displayed for each device failing the test.

The following error codes are displayed in the event of an ISOMETER® failing the test:

Error code	Meaning for hospital ISOMETER®s (e.g. 107TD47, isoMED427P, ATICS ...)	Meaning for industrial ISOMETER®s (e.g. IRDH...)	Note
0	No messages received from the ISOMETER® although the test command was confirmed by the ISOMETER®.	No messages received from the ISOMETER® although the test command was confirmed by the ISOMETER®.	
1	Only insulation fault message received.	Only insulation fault message from channel 1 received.	Channel 1
2	Only overload message received.	Only insulation fault message from channel 2 received.	Channel 2
3	Only insulation fault message and overload message received.		Channel 1 and 2
4	Only overtemperature message received.		Channel 3
5	Only insulation fault message and overtemperature message received.		Channel 1 and 3
6	Only overload message and overtemperature message received.		Channel 2 and 3
14	Test command could not be sent because no query was made (slave).	Test command could not be sent because no query was made (slave).	Slave only
15	ISOMETER® did not confirm the test command (no answer).	ISOMETER® did not confirm the test command (no answer).	

### Information on error codes

- For MK2430 devices operating as slaves on the BMS bus a timeout of 50 seconds applies to error code 0 and 14.
- Error code 14 occurs when the slave is requested to carry out a test. The test command, however, cannot be sent because MK2430 was not queried. This may be the case if the address gap upstream of the MK2430 is so large that the master does not scan the MK2430. (refer to "BMS bus" operating manual). This error code is not so much an indication of a faulty ISOMETER® but that the BMS bus system is faulty.

## 8. Menu mode: Operation and setting

### 8.1 Switching on and calling up the main menu

If the MK2430 is connected to the voltage supply, the following information appears on the display for approx. 3 seconds. Details about the address and the firmware version of the device are displayed. This information is also available in the "Info" menu.

```
MK2430-11   Addr. : 001
Software 4.02   D228
Date:         02.05.12
www.bender.de
```



*If the MK2430 has not been turned on for several days, a longer time may be required for start-up (approx. 30 seconds). In this case, enter the time and date again.*


If there are no messages pending, the standard display will be shown when the starting procedure is completed.

SYSTEM READY!

09 : 50

The TMK-SET software allows you to change the standard display and the message texts.

To open the main menu, press and hold the "Menu" button for approx. two seconds.



1. Exit  
2. History  
3. Settings  
4. Control

6. External devices  
7. Info

In the main menu, use the following buttons:

ESC	Exit function or go up one menu level
▲, ▼	Select menu items
↵	Confirm the selected menu item (Enter)



*If no buttons have been pressed in a menu for more than five minutes, menu mode is exited automatically (exception: "Test communication" in the "Control" menu and "Position mode" in the "External devices" menu).*



*Some menus are password-protected. Password protection is only effective if the password has been activated (enabled).  
When an attempt is made to open one of these menus, the password entry screen appears automatically:*

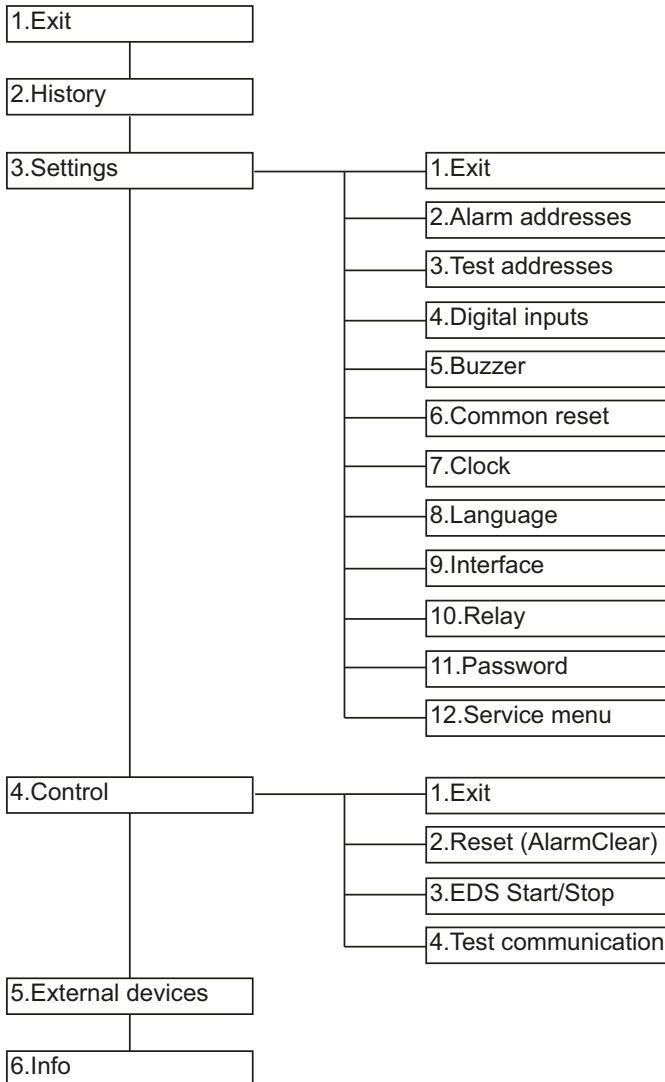


Enter  
password  
⬆️ 0 0 0

*Once a valid password has been entered, full access will be given to all menus (except the service menu) until menu mode is exited.*

## 8.2 Menu overview diagram

The following diagram will help you to navigate through the menus:



## 8.3 Main menu functions

Menu item	Function	Page
1. Exit	Exit menu mode	
2. History	Displays the history memory with information about messages, acknowledgements and their timestamps.	57
3. Settings	Various settings for this MK2430	58
4. Control	Control setting options for the overall system.	70
5. External devices	Settings at the connected monitoring devices (e.g. EDS4xx and RCMS4xx).	72
6. Info	Information about the device type, the firmware version and the last time the assignments were transmitted.	73

## 8.4 The main menu

### 8.4.1 Exit

Exits menu mode.

1. Exit
2. History
3. Settings
4. Control



### 8.4.2 Menu 2: History

The MK2430 can store up to 250 messages in the history memory (ring buffer). If more than 250 messages are stored by the MK2430, message 251 will overwrite entry 1. The "History" menu provides information about messages, acknowledgements and their timestamps. It also indicates whether an alarm is still pending or when it was acknowledged/muted with the "🔇" button. The complete content of the history memory with additional texts and the address of the device sending the message can be displayed on a PC and printed out using the TMK-HISTORY software, version V3 or higher. All interfaces of the MK2430 can be used for connection.

1. Use the arrow buttons to select the entry you require.  
The latest entry appears first on the display. Older messages can be selected using the arrow buttons.

Entry No. :	↕003/003
From:	21.05.12 16:00
Ack. :	21.05.12 16:00
To:	22.05.12 11:15

2. Press the "↵" button to call up the message text of the selected entry. The last line shows the address via which the message has reached the MK2430. In this case, an insulation fault was received via the internal BMS bus from address 003, channel 01.

The table on the following page contains information about other possible displays.

System:	01
Insulation fault	
Meas. value:	↑
Address	003/01

3. If analogue values are displayed as shown in the example above you can press the "▲" button to display the min. and max. values.
4. Press the "↵" button again to return to the entry selection.

Repeat these operating steps for all messages you need. Then press "ESC" to exit the menu.

Possible displays in the last line of the history memory message text display:

Text	Meaning
Address: aaa/kk	Address of the device triggering the message (aaa= device address, kk= channel no. of the message).
Digital In No.: kk	Number (kk) of the digital input on this MK which triggered the message.
TESTex	Note that the latest history entry was made due to a test initiated on this MK.
TESTin	Note that the latest history entry was made due to a test initiated on the device assigned to it (insulation monitoring device, LIM, GFCI).

### 8.4.3 Menu 3: \*Settings

The following menu items are available for configuring the MK2430:

Menu item	Function	Page
1. Exit	Exit "Settings" menu; go up one menu level.	
2. Alarm addresses	Setting bus addresses for devices so that the alarm messages of these devices can be displayed on this MK2430.	60
3. Test addresses	Setting bus addresses for devices which are required to carry out a test when the "TEST" button is pressed.	61
4. Digital inputs	MK2430-11 only: Setting the operating behaviour for digital inputs.	62
5. Buzzer	Setting the frequency and repetition rate of the buzzer signal.	64
6. Common acknowledgement	Determining if the MK2430 should respond to a common acknowledgement initiated by the reset button of another device.	64
7. Clock	Setting the date and time of the real-time clock on this MK2430. At the same time this setting is sent via BMS bus and all other devices are synchronised. The device with address 1 (MK2430 or alarm indicator and operator panel) synchronises all other devices every hour.	65
8. Language	Selecting the operating language for the MK2430 (German or English).	66

Menu item	Function	Page
9. Interface	Setting the device address and baud rate for this MK2430.	67
10. Relay	Mode of operation and function of the common alarm relay (alarm relay) on the MK2430-11.	68
11. Password	Changing the password, enabling/disabling the password.	69
12. Service menu	These settings can only be made by authorised Bender service personnel. Retrieve information about the device status, make settings for special operating conditions and execute firmware update.	69

#### 8.4.3.1 Exit

Exit menu mode.

- 1.Exit
- 2.Alarm addresses
- 3.Test addresses
- 4.Digital inputs

### 8.4.3.2 Settings menu 2: Alarm addresses

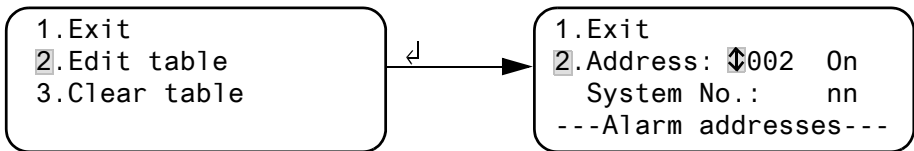
Setting the bus addresses for devices the alarm messages of which are to be displayed on this MK2430.

The address of this MK2430 is automatically set to "On". All other alarm addresses are set to "Off".

Set the addresses of the devices whose messages are to be displayed on this MK2430 to "On". Only these addresses will be looked for on the BMS bus. If a device cannot be found on the bus, an alarm message will be displayed.

The text of individual messages can be modified using the TMK-SET software.

If several systems or areas (e.g. several operating theatres) are connected to the MK2430, then these systems can be assigned numbers 1...4.



- |                |  |
|----------------|--|
| 1. Exit        | Back to the main menu.   |
| 2. Edit table  | <p>Use the arrow buttons to select the internal BMS bus address and confirm your selection by pressing the "↵" button.</p> <p>Use the arrow buttons to select "On" and activate this address ("Off" = deactivate). Press the "↵" button to accept the entry.</p> <p>Use the arrow buttons to select system number: "nn" and confirm with the "↵" button.</p> <p>Repeat the procedure to activate more alarm addresses.</p> |
| 3. Clear table | Deactivate all addresses ("Off"). "Clear table" is only possible when there are no test addresses activated (see setting menu 3 "Test addresses").   |

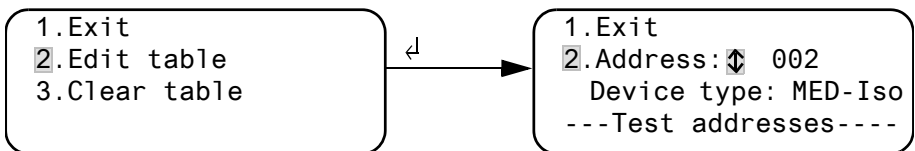
Possible system number settings:

nn	Meaning
00	There is no text in line 1 of the alarm message.
01...04	Texts of "System 01" to "System 04" are displayed.
T	Programmed text is displayed.

### 8.4.3.3 Settings menu 3: Test addresses

Set the bus addresses for insulation monitoring devices (e.g. isoMED427P, 107TD47, IRDH...), transfer switching and monitoring devices (ATICs®), LIM (Line Isolation Monitors) and GFCI (Ground Fault Circuit Interrupters) which are required to carry out a test when the "TEST" button is pressed. The setting can only be made for devices which have also been activated in the "Alarm addresses" menu and/or programmed for individual alarm texts. Individual alarm texts are a minimum requirement for:

- Channel 1...3 (setting "107TD47")
- Channel 1 (setting "IRDHxxx")



1. Exit
2. Edit table

Back to the main menu.

Use the arrow buttons to select the internal BMS bus address and confirm your selection by pressing "↵".

Use the arrow buttons to select the device type:

- LIM            Line Isolation Monitors
- GFCI        Ground Fault Circuit Interrupter
- MED-Iso     Medical insulation monitoring device
- Off           Address deactivated

Press "↵" to accept the entry.

Repeat the procedure to activate more addresses.

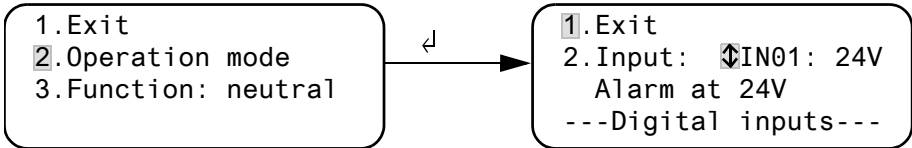
3. Clear table

Deactivate all addresses ("Off").

#### 8.4.3.4 Settings menu 4: Digital inputs (MK2430-11 only)

Setting the operating behaviour for digital inputs IN01...IN12. The following setting can be made individually for each input: "24V" (high) or "0V" (low).

For inputs set to "24V", an alarm message is sent when 24 V are applied. If "0V" is set for an input, an alarm message will be sent when the voltage detected is 0 V. For this reason, always set unused digital inputs to "24V".



1. Exit                      Back to the main menu.
2. Operating modeSelect the digital input using the arrow buttons and confirm with "↵".  
Use the arrow buttons to select "24 V" or "0 V". Press "↵" to accept the entry.  
Repeat the procedure to set more digital inputs.
3. Function                Set the message text category to "neutral" or "medical", see chapter „Neutral and specific alarm messages“ on page 63.

#### Alarm texts for digital inputs

A neutral or specific alarm message can be assigned to every digital input. A neutral alarm message indicates the alarm, the channel and the address of the device triggering the alarm. In comparison, a specific alarm message (medical) signals a fixed pre-programmed alarm, e.g. "oxygen".

Assign the inputs according to the table „Neutral and specific alarm messages“ on page 63.

The TMK-SET PC software can be used to assign other messages to individual or all digital inputs.

If freely programmable alarm messages need to be displayed on a different MK2430 or on an alarm indicator and operator panel, the alarm messages programmed for the display device must be identical.

The alarm messages in the following table are sent to other MK... or alarm indicator and operator panels via BMS bus and displayed there in plain text format.

## Specific alarm messages

These messages contain details about medical gases and BSV systems.



*Alarm messages for medical gases are signalled by the red "ALARM" LED and the sound of the buzzer. The buzzer can be set to mute (acknowledged). The buzzer sounds again after 15 minutes as a reminder. Different settings can only be made using the TMK-SET software.*

## Neutral and specific alarm messages

Inputs	Neutral alarm messages "Function: neutral"	Specific alarm messages "Function: medical"
IN1	Alarm: Address/channel XXX/01	Alarm: Oxygen
IN2	Alarm: Address/channel XXX/02	Alarm: Vacuum
IN3	Alarm: Address/channel XXX/03	Alarm: Nitrous oxide
IN4	Alarm: Address/channel XXX/04	Alarm: Compressed air 5 bar
IN5	Alarm: Address/channel XXX/05	Alarm: Compressed air 8 bar
IN6	Alarm: Address/channel XXX/06	Alarm: Nitrogen
IN7	Alarm: Address/channel XXX/07	Alarm: CO2
IN8	Alarm: Address/channel XXX/08	Alarm: BSV battery operation
IN9	Alarm: Address/channel XXX/09	Alarm: BSV overload
IN10	Alarm: Address/channel XXX/10	Alarm: BSV converter failure
IN11	Alarm: Address/channel XXX/11	Alarm: BSV fault
IN12	Alarm: Address/channel XXX/12	Alarm: BSV test run

### 8.4.3.5 Settings menu 5: Buzzer

The buzzer will sound in the event of a warning or an alarm message. Setting of the audio frequency and repetition rate to distinguish both buzzer sounds.

1. Exit	
2. Warning:	5
3. Alarm:	2

1. Exit                      Back to the main menu.
2. Warning
3. Alarm                    A variety of signals can be preset for "Warning" and "Alarm".  
An individual buzzer sound can be selected via TMK-SET.

During the setting procedure the selected buzzer signal sounds and the LED lights up or flashes.

### 8.4.3.6 Settings menu 6: Common acknowledgement

Setting indicating whether this MK2430 should respond (On) or not (Off) to the acknowledgement of the buzzer (buzzer mute) initiated by pressing the "☒" button on another MK... or TM... remote alarm indicator and operator panel.

Activating the common reset function can for example make it possible to acknowledge (mute) an alarm (buzzer tone) on an MK... or a TM... located in a neighbouring building from an MK2430 in a central location.

The alarm message itself will remain visible on the display until its cause has been rectified.

1. Exit	
2. Common ack:	On

1. Exit                      Back to the main menu.
2. Common ack.: Setting of the common acknowledgement for the internal bus.  
On      Buzzer can be acknowledged/muted externally.  
Off     Buzzer cannot be acknowledged/muted externally.



### 8.4.3.7 Settings menu 7: Clock

This menu is used to set the time, the date and the date format. These settings remain stored for approx. 5 days following a power supply failure.

The clock switches automatically to Central European summertime (CEST) and wintertime (CET). Reset the clock if the time differs from your local time following the automatic switchover. The automatic switchover can be deactivated (menu item "5. Summertime").

1. Exit	(CEST)
2. Time:	17:45
3. Date:	21.09.11
4. Format:	dd.mm.yy

- |                  |  |
|------------------|--|
| 1. Exit          | Back to the main menu  |
| 2. Time          | Set the time (hours and minutes)   |
| 3. Date          | Set the date (according to the format indicated in line 4)   |
| 4. Format        | Select German (dd.mm.yy) or American (mm/dd/yy)  |
| 5. Daylight sav. | Setting for automatic switchover to Central European summertime:<br>Auto automatic switchover<br>Off no switchover |



*Time and date for the system can be set on any MK... or TM... panel. The settings are transferred via the BMS bus to the master device (address 1), which transfers the settings to all other MK... or TM... panels.*

### 8.4.3.8 Settings menu 8: Language

Selection of the language for menu operation and message display (alarm and operating messages) of the MK2430. Changes will be effective immediately.

1. Exit
  2. Menu: English
  3. Messg.: English

1. Exit                      Back to the main menu.
2. Menu                     Set the operating language for the menu:  
German or English
3. Mess.                    Select the language for the message display. Choose from:

German	English	French	Italian
Spanish	Portuguese	Portuguese (Brazil)	Dutch
Norwegian	Swedish	Finnish	Danish
Polish	Hungarian	Czech	Slovenian
Croatian	Serbian	Turkish	Indonesian



*The language setting activates the language-specific special characters. However, user-defined alarm texts remain unchanged. Therefore, do not program or transfer the individual alarm texts until the language settings have been configured.*

### 8.4.3.9 Settings menu 9: Interface

Sets the actual device address and indicates the transmission rate (baud rate) for the connection to the internal BMS bus (RS-485).

```
1. Exit
2. Addr. RS485: 001
3. Baud RS485: 09600
```

1. Exit Back to the main menu.
2. Addr. Device address setting of this MK2430.  
Addresses between 1 and 150 can be selected. The addresses 100 to 110 are intended for special applications (e.g. PC, OPC) and cannot be used for devices.  
Factory setting is address 001 (master).
3. Baud The fixed preassigned baud rate is 9600 bit/s.

Change the corresponding device address if several MK2430 are connected to one internal BMS bus. One MK2430 must have address 1 (master). All other MK2430 are addressed in consecutive order: 2,3,4... There should be no gaps between addresses. Only in this way the functionality of the system can be ensured (also refer to the "BMS bus" manual).

Data exchange will only work between devices with the same baud rate.

### 8.4.3.10 Settings menu 10: Relay

Set the operating mode and function for the optional alarm relay of the alarm indicator and test combination. This menu only exists for MK2430..-11.

1.Exit  
 2.Relay mode: N/O  
 3.Function:  
 Device error

1. Exit                      Back to the main menu.
2. Relay mode Set the operating mode:  
                   N/O    N/O operation  
                   N/C    N/C operation
3. Mode    Alarm relay switches in the event of:

Setting	Description
Device error	Relay switches in case of an internal fault on the MK2430-11.
Common alarm	Relay switches in case of any warning or alarm message.
Device failure	Relay switches as soon as the MK2430 recognises a device failure.
ISOMETER test	Relay switches for approx. 3 seconds once a test has been started via the "TEST" button on the assigned devices (insulation monitoring devices, LIM, GFCI).
Buzzer function	The relay switches as soon as the buzzer sounds. Also other signalling devices can be installed to indicate pending messages on the MK2430.
Programmable	Programming via TMK-SET -> individual alarms or operating messages.

### 8.4.3.11 Settings menu 11: Password

Change password, enable/disable password.

1. Exit	
2. Password:	X X X
3. Status:	Off

- |             |  |
|-------------|--|
| 1. Exit     | Back to the main menu.                 |
| 2. Password | Change password. Factory setting: 807  |
| 3. Status:  | Enable or disable password protection. |



*Some menus are password-protected. Password protection is only effective if the password has been activated (enabled).*

*When an attempt is made to open one of these menus, the password entry screen appears automatically:*

Enter password 0 0 0
----------------------------

*Once a valid password has been entered, full access will be given to all menus (except the service menu) until menu mode is exited.*

### 8.4.3.12 Settings menu 12: Service menu

Only authorised Bender service staff is allowed to make settings in this menu. This menu is only accessible after entering a master password.

In the service menu, information about the device status can be called up and settings for specific operating conditions can be made.

### 8.4.4 Menu 4: Control

This menu offers various options for controlling individual devices or the whole system:

Menu item	Function	Page
1. Exit	Exit "Control" menu; go up one menu level.	
2. Reset (AlarmClear)	Resetting all fault messages pending on the BMS bus.	70
3. EDS Start/Stop	Manual start/stop of test procedures on EDS system.	71
4. Test Communication	Testing communication via the BMS bus (MK2430-11 only).	71

#### 8.4.4.1 Exit

Exit menu mode.

1. Exit  
2. Reset (AlarmClear)  
3. EDS start/stop  
4. Test Communication

#### 8.4.4.2 Control menu 2: Reset (AlarmClear)

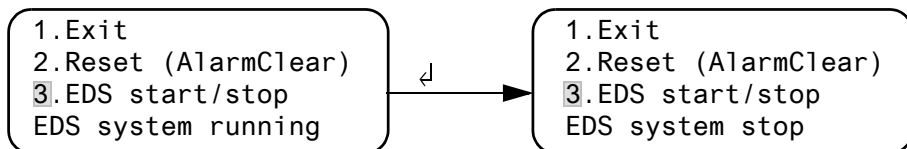
Press "↵" to reset all fault messages pending on the BMS bus. "Reset done!" will then appear in the last line.

1. Exit  
2. Reset (AlarmClear)  
3. EDS start/stop  
Reset done!

This reset command is sent via the BMS bus. Note that some devices (e.g. PRC470) do not respond to this reset.

### 8.4.4.3 Control menu 3: EDS Start/Stop

Press "↓" to manually start and stop the EDS system test procedure. This function can only be activated for the master. The current status appears in the last line.



**EDS system running** Once started, the EDS4xx-12 and PGH47x run continuously. If you exit the menu, the standard display "EDSp" will appear in the last line in order to indicate continuous running\*.

**EDS system stop** Stops the continuous running of EDS4xx-12 and PGH47x. If you exit the menu, the standard display "EDS" will appear in the last line until the current test run finishes.

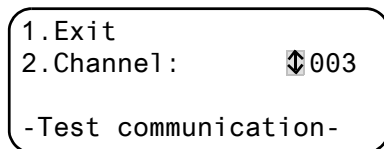
\* Other abbreviations that might appear in the last line of the display:

**EDSa** Automatic mode: Insulation fault location has been started on PGH47x by e.g. ISOMETER®, ATICS® or isoMED427P.

**EDSs** Single mode: A single run has been started by IN2 on PGH471.

### 8.4.4.4 Control menu 4: Test communication (MK2430-11 only)

Testing the communication via the BMS bus. For this purpose, an error message is simulated on a digital input. This fault message is sent to evaluating devices (such as MK..., TM..., SMO...) via the BMS bus. Check that these devices are responding to the fault message as requested.



Channel 003

Setting the channel whose message is to be activated.

### 8.4.5 Menu 5: External devices

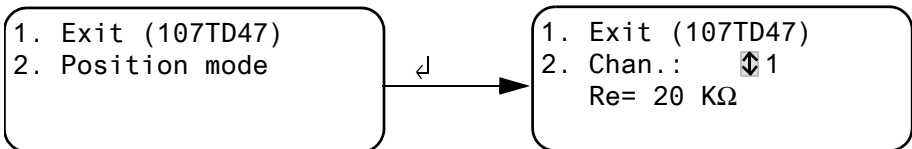
This menu is used to set and control external devices. Functions include for example displaying information about connected devices (address, software version, device type) or continuous displaying of a channel on a connected monitor.

All devices connected to the BMS bus are indicated. Select the address of the external device to be displayed (e.g. EDS4xx-12 or RCMS4xx-12).

```
1. Exit
001: MK2430      V4.02
002: EDS151      V1.00
003: ATICS2-ISO V1.08
```

Address, type and version of the connected device are indicated. If no device is detected under the address, the character "?" appears. Use the arrow buttons to select the address of the external device and confirm your selection with the "↵" button.

If the device has been recognised, the MK2430 will read the current settings of the connected device. The device type is displayed in the first line of the display. Use the arrow buttons to select the appropriate function or device setting. Confirm with the "↵" button. Example:



A variety of setting options are available in the EDS or RCMS menu. These are described in more detail in the operating manuals of the corresponding systems.

```
1. Exit (EDS470)
2. General
3. Channel
4. Relay
```



### 8.4.6 Menu 6: Info

MK2430-11	Addr. :001
Software	4.02 D228
Date:	02.09.11
www.bender.de	

Information about the device type, the version and the last time the assignments were transmitted. Assignments are settings carried out via the PC software TMK-SET:

- Enter standard texts
- Assign texts and functions to the alarm messages and digital inputs of the MK2430
- Set parameters

Select:

ESC	Exit menu mode
▲	Show date of last assignment transmission.
▼	Show version of standard texts and number of - activated alarm addresses - activated test addresses - individually programmed messages
↵	Go back to the main menu

## 8.5 Overview of setting options

The MK2430 supports various setting options. The table below shows where the individual parameters can be set.

Parameter Name	Range	Factory setting	User setting	Set in			Note
				MK2430 menu	MK2430 Service menu	TMK-SET Parameter menu	
History entries	--	--	--	--	clear	clear	Data records Clear history
Power-down watchdog Time-out int.	-- 42...200 ms	-- 60 ms	--	--	clear	clear	Reset counter
ALMI idle time	1...2 s	1 s	--	M13	X	X	Change only for test purposes!
Backlight S/W time	autom./cont. autom./OFF	autom. autom.	--	M13 M8	X --	X X	Automat. summer/winter time
Buzzer	ON/OFF for 1...9 hrs	ON	--	M13	X	--	e.g. for commissioning
Password prompt	Y/N	Y	--	M12	--	X	Activate password prompt
Password	000...999	807	--	M12	--	X	Change password
Language (for menu only)	English/ German	German	--	M9	--	X	
Language (for message only)	20 languages	German	--	M9	--	X	
Time/message	3...8 s	5 s	--	M13	X	X	Message interval
Buzzer settings	Duration/ interval 1...5 frequency	2	--	M6	--	X	
Common acknowledge int.	Y/N	Y	--	M7	--	X	Response to "buzzer OFF" via BMS bus
Time of day/date			--	M8	--	X	
RS-485 settings address	1...150	1	--	M7	--	X	Int. BMS bus address
Time display	Y/N	Y	--	M13	X	X	Time in the standard display
Display ATICS maintenance messages	Y/N	N	--	M13	X	X	

## 9. Technical data

### 9.1 Technical data

#### Insulation coordination acc. to IEC 60664-1

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

#### Supply voltage

Supply voltage $U_s$ .....	AC/DC 24 V
Frequency range $U_s$ .....	0/40 . . . 60 Hz
Operating range $U_s$ .....	AC 18 . . . 28/DC 18 . . . 30 V
Power consumption .....	$\leq 3$ W
Voltage failure without reset .....	$\leq 15$ s

#### Displays and LEDs

Display, characters .....	four lines, 4 x 20 characters
Standard message texts .....	in 20 languages
Alarm addresses .....	$\leq 150$
Programmable text messages .....	200
History memory (messages) .....	250
Standard text message .....	3 x 20 characters
Additional text message (press button to access) .....	3 x 20 characters
Alarm LEDs (a set of LEDs) .....	NORMAL (green)
.....	WARNING (yellow)
.....	ALARM (red)
Menu texts .....	German/English
Buttons .....	5 (test of assigned devices, buzzer mute, additional text, scroll, menu)

#### Buzzer

Buzzer message .....	can be acknowledged, adoption of characteristics of new value
Buzzer interval .....	configurable
Buzzer frequency .....	configurable
Buzzer repetition .....	configurable

**Inputs (MK2430...-11 only)**

Digital inputs.....	12 (IN1... IN12)
Galvanic separation .....	yes
Activation of the digital inputs.....	via potential-free contacts/extraneous voltage
Operating principle.....	N/O or N/C operation individually selectable for each input
Factory setting .....	N/O operation
Voltage range (high) .....	AC/DC 10...30 V
Voltage range (low) .....	AC/DC 0...2 V
Recommended cable: J-Y(St)Y min. n x 0.8	
Cable length.....	≤ 500 m

**Interfaces**

Interfaces.....	RS-485 and USB (V2.0/V1.1)
RS-485 interface data:	
Protocol .....	BMS
Baud rate.....	9.6 kbit/s
Cable length.....	≤ 1200 m
Cable: twisted pair, one end of shield connected to PE: J-Y(St)Y min. 2 x 0.8	
Terminating resistor .....	120 Ω (0.25 W) connectable via DIP switch
Device address, BMS bus.....	1...150
Factory setting device address.....	1 (master)

**Programming**

Interfaces.....	RS-485 or USB (V2.0/V1.1), USB cable: type A plug on type B plug
Software.....	TMK-SET V 4.0 and higher
Factory setting password .....	activated

**Max. cable length in case of power supply of 1/2/3 MK24.. from one AN450**

0.28 mm <sup>2</sup> (e.g. J-Y(St)Y nx0.6).....	160/40/-- m
0.5 mm <sup>2</sup> (e.g. J-Y(St)Y nx0.8).....	250/70/-- m
0.75 mm <sup>2</sup> .....	400/100/-- m
1.5 mm <sup>2</sup> .....	800/210/10 m
2.5 mm <sup>2</sup> .....	1300/360/20 m

**Max. cable length in case of power supply of 1/2/3 MK24.. from one AN410**

0.28 mm <sup>2</sup> (e.g. J-Y(St)Y x0.6).....	300/150/100 m
0.5 mm <sup>2</sup> (e.g. J-Y(St)Y nx0.8).....	500/250/150 m
0.75 mm <sup>2</sup> .....	750/375/250 m
1.5 mm <sup>2</sup> .....	1500/750/500 m
2.5 mm <sup>2</sup> .....	2500/1200/750 m

**Colours**

Front foil ..... RAL 7035 (light grey); RAL 7040 (basalt grey)  
 Marking ..... RAL 5005 (ultramarine blue)  
 Front plate ..... RAL 7035 (light grey)

**Switching elements (MK2430...-11 only)**

Number ..... 1 changeover contact  
 Function ..... programmable  
 Operating principle ..... N/C or N/O operation (programmable)  
 Electrical endurance under rated operating conditions, number of cycles ..... 10,000  
 Contact data acc. to IEC 60947-5-1  
 Utilisation category ..... AC-13 ..... AC-14 ..... DC-12  
 Rated operational voltage ..... 24 V ..... 24 V ..... 24 V  
 Rated operational current ..... 5 A ..... 3 A ..... 1 A  
 Minimum contact rating ..... 1 mA at AC / DC > 10 V

**Environment/EMC**

EMC immunity ..... acc. to EN 61000-6-2  
 EMC immunity ..... acc. to EN 61000-6-3  
 Classification of climatic conditions acc. to IEC 60721:  
 Stationary use ..... 3K5  
 Transport ..... 2K3  
 Long-term storage ..... 1K4  
 Operating temperature ..... -5 ... +55 °C  
 Classification of mechanical conditions acc. to IEC 60721:  
 Stationary use ..... 3M4  
 Transport ..... 2M2  
 Long-term storage ..... 1M3

**Connection**

Connection ..... pluggable screw terminals

**Connection properties (supply voltage, BMS bus)**

Connection of single conductors:  
 rigid/flexible/conductor sizes ..... 0.2 ... 2.5/0.2 ... 2.5 mm<sup>2</sup>/AWG 24-12  
 flexible with ferrules, without/with plastic sleeve 0.25 ... 2.5/0.25 ... 2.5 mm<sup>2</sup>  
 Multi-conductor connection (2 conductors with the same cross section):  
 rigid/flexible ..... 0.2 ... 1/0.2 ... 1.5 mm<sup>2</sup>  
 flexible with ferrule without plastic sleeve ..... 0.25 ... 1 mm<sup>2</sup>  
 flexible with TWIN ferrule with plastic sleeve ..... 0.5 ... 1.5 mm<sup>2</sup>

### Connection properties (inputs)

Connection of single conductors:

rigid/flexible/conductor sizes ..... 0.08... 1.5/0.08... 1.5 mm<sup>2</sup>/AWG 28-16

flexible with ferrules, without/with plastic sleeve\* ..... 0.25... 1.5/0.25... 0.5 mm<sup>2</sup>

Multi-conductor connection (2 conductors with the same cross section):

rigid/flexible ..... 0.08... 0.5/0.08... 0.75 mm<sup>2</sup>

flexible with ferrule without plastic sleeve ..... 0.25... 0.34 mm<sup>2</sup>

flexible with TWIN ferrule with plastic sleeve ..... 0.5 mm<sup>2</sup>

Stripping length ..... 7 mm

Tightening torque ..... 0.5... 0.6 Nm (4.5... 5.3 lb-in)

### Other

Operating mode ..... continuous operation

Mounting ..... display-oriented

Degree of protection, internal components (DIN EN 60529) ..... IP50 (surface-mounting type: IP54)

Degree of protection, terminals (DIN EN 60529) ..... IP20

Flammability class ..... UL94V-0

### Weight

Flush-mounting type ..... ≤ 210 g

Surface-mounting type ..... ≤ 400 g

\*For MK2430H-12 (B95100024) no ferrules with plastic sleeves may be used!

### 9.1.1 Standards, approvals and certifications

The MK2430 alarm indicator and test combination meets the requirements of the regulations for installation IEC 60364-7-710:2002-11 and DIN VDE 0100-710 (VDE 0100 Part 710).



## 9.2 Ordering details

Type	Description	Art. No.
MK2430-11	Alarm indicator and test combination according to IEC 60364-7-710:2002-11/DIN VDE 0100-710, featuring a BMS bus and a USB interface, 12 digital inputs, one relay output, alarm texts programmable via interfaces and PC, standard text display. Version: Flush-mounting enclosure.	B 9510 0001
MK2430-12	Alarm indicator and test combination according to IEC 60364-7-710:2002-11/DIN VDE 0100-710, featuring a BMS bus and a USB interface, alarm texts can be programmed via interfaces and PC, standard text display. Version: Flush-mounting enclosure.	B 9510 0002
MK2430C-11	As MK2430-11, but programmed in the factory.	B 9510 0003C
MK2430C-12	As MK2430-12 but programmed in the factory.	B 9510 0004C
MK2430A-11	As MK2430-11, but with surface-mounting enclosure.	B 9510 0005
MK2430A-12	As MK2430-12, but with surface-mounting enclosure.	B 9510 0006
MK2430CA-11	As MK2430A-11, but programmed in the factory and with surface mounting enclosure.	B 9510 0007C
MK2430CA-12	As MK2430A-12, but programmed in the factory and with surface mounting enclosure.	B 9510 0008C
MK2430S-11	As 2430-11, but front plate with screw fixing.	B 9510 0011
MK2430S-12	As 2430-12, but front plate with screw fixing.	B 9510 0012
MK2430 mounting kit, complete	Mounting angle kit for flash-mounting enclosure for snap on mounting of the MK2430. Mounting kits for cavity wall mounting, panel mounting or DIN rail mounting.	B 9510 1000
MK2430H-12	Same as MK2430A-12, but for horizontal installation with screw fixing of the front panel. Without flush-mounted enclosure and mounting kit.	B95100024
Flush mounting enclosure	Flush mounting enclosure	B 923 710

Type	Description	Art. No.
Parameterisation software	<ul style="list-style-type: none"><li>- TMK-SET V 4.x parameterisation software for MK2430, MK800, TM800</li><li>- TMK-HISTORY V 3.x for MK2430, MK800, TM800, TM1000 and PRC1470</li><li>- USB driver software for MK2430, MK800 and TM800</li><li>- MEDISET V1.x parameterisation software for TM1000 and PRC1470</li></ul>	as Internet download



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