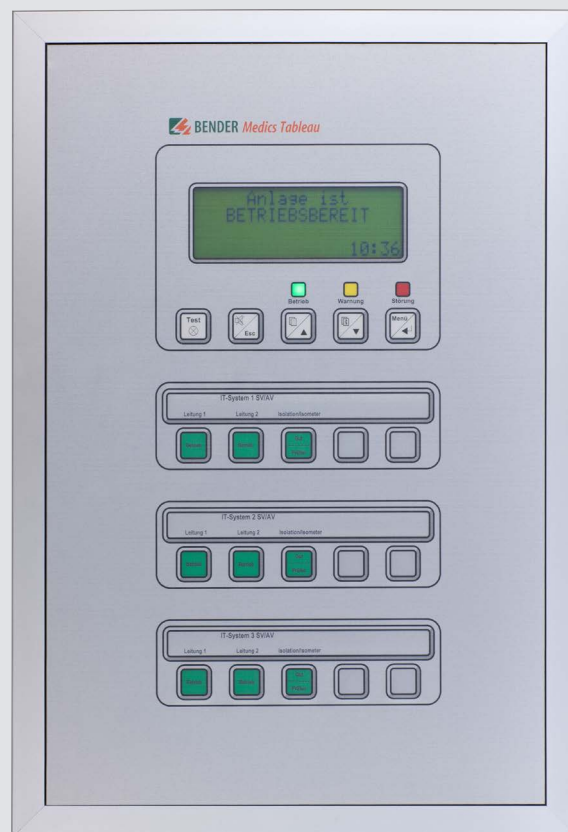
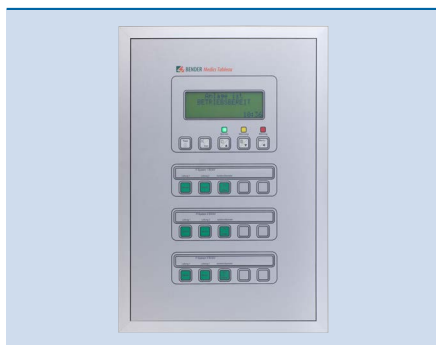


# TM800

Remote alarm indicator and operator panels





TM800

### Device features

- Display, control and operation of Bender monitoring systems and third-party systems
- Backlit clear LC text display (4 x 20 characters, 8 mm)
- Display of additional text supplies medical and technical personnel with specific information
- A set of LEDs, red, yellow and green, allowing messages to be indicated in an order of priority
- Predefined standard texts in 21 languages for Bender MEDICS® systems
- 1000 freely programmable message texts (with TMK-SET PC software)
- Quittierbarer/stummschaltbarer akustischer Alarm
- Easy parameter setting with PC (USB interface) or menu
- Memory with real-time clock to store 1000 alarm messages with date and time stamp
- Variable illuminated pushbutton modules allow freely configurable function assignment
- Closed foil surface allowing, easy integration of third-party systems, such as operating theatre table controls, medical gases, intercom systems, etc.
- Control of third-party systems by flexible I/O modules with galvanic separation
- Alarm LED at each input/output for fast diagnosis
- Functions can easily be expanded by adding I/O modules
- Clearly defined project structure due to an external and internal bus
- Non-reflecting, multicoloured foil.
- Optionally available with an antibacterial foil surface.

### Product description

In terms of the human/machine interface, alarm indicator and operator panels play a crucial role. Their task is to take system information and transform it into clear instructions, particularly in the event of critical operating situations. The flexible TM800 panels provide solutions that meet the requirements of modern medical facilities as well as industrial and functional buildings. They are used for

- indication and visualization of operating status and alarm messages;
- central operation and parameter setting of BMS bus devices;
- visual and audible indication of alarm messages;
- displaying measured values and setting of response values for monitoring purposes from Bender monitoring systems with BMS-bus capability, such as MEDICS, RCMS or EDS. Furthermore, they are used for indication, control and operation of

- operating theatre tables
  - medical gas supply equipment
  - air conditioning and ventilation systems
  - interior lighting
  - communication systems
- and third-party systems. The integration of third-party systems in one single panel allows the creation of a kind of "technical control centre" in the appropriate room.

### LC display with a set of LEDs

Text is displayed on an illuminated LC display in 4 x 20 characters (8 mm high). It supplies medical and technical personnel with information that is always clear and unambiguous, in order to help them to 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. This additional text provides further information, e.g. instructions with the respective telephone number.

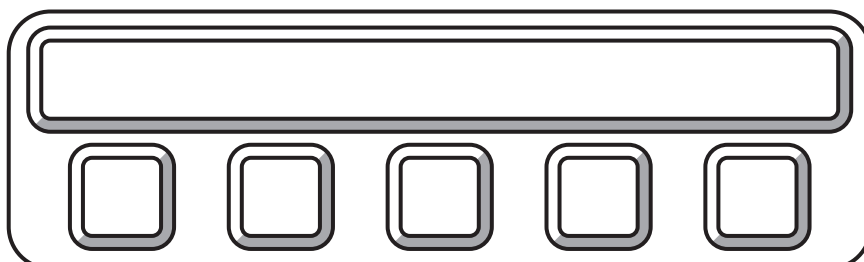
The fourth line contains status information, such as number of messages, test procedures or menu information. Three LEDs in different colours (green, yellow, red) are located below the text display which allow messages to be visually indicated in an order of priority. Five large illuminated buttons are used to operate the system in terms of the following functions:

- Acknowledgement of acoustic alarms
- Functional test of assigned ISOMETER®
- LED test
- Scrolling alarm textes and messages
- Parameter setting

### 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 a PC software. The link between the pushbutton and the appropriate input, output or interface is also carried out via the PC software. In addition, different acoustical messages can be set. This emphasizes the essential benefit of the TM800 panel: Functions can also be modified later without any problems, the hardware need not to be changed.

### Example of a pushbutton module

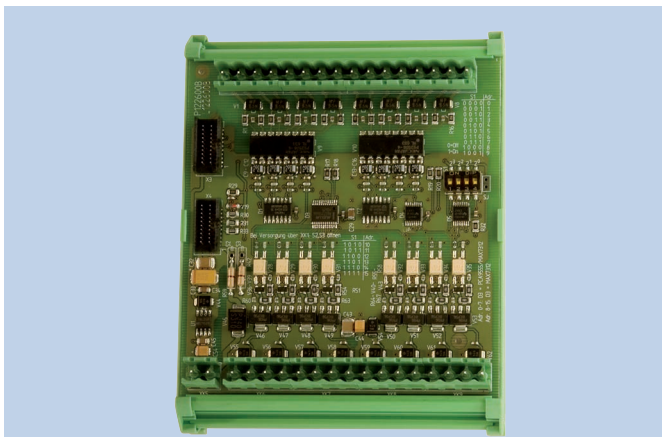


**Inputs and outputs**

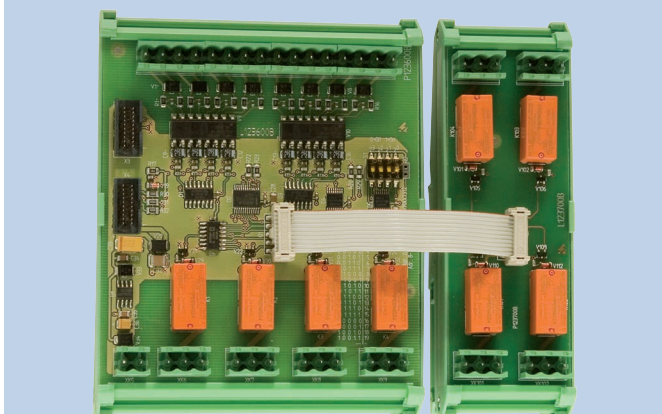
Digital inputs and outputs as well as relay outputs are provided for the control and indication of different technical equipment. The digital inputs are designed for a voltage of AC /DC 0...30 V, but in practical application the messages often arrive as potential-free contacts, this voltage is supplied by the integrated power supply unit. The performance of the alarm contact at the digital input (N/O contact or N/C contact) can be assigned via this PC software. That means that subsequent modifications of the contact performance do not require hardware modifications on the panel. The relay outputs (potential-free contacts) are controlled through operating or alarm messages or via the pushbutton modules. The assignment message resp. pushbutton/relay output is carried out via the TMK-Set PC software. Freely selectable text messages can be assigned to each input/output.

The I/O modules are installed into the flush-mounting box on a DIN rail separately from the display and the pushbutton modules. So the system can easily be expanded. Each input and output provides an alarm LED so that the status is clearly visible at a glance. The following I/O modules are available:

- BMI8/8 8 digital inputs, 8 open-collector outputs
- BMI8/4 8 digital inputs, 4 relay outputs (one changeover contact each)
- BMI0/4 extension for BMI8/4 by further 4 relay outputs (BMI0/4 can only be used in connection with BMI8/4).



I/O module BMI8/8



I/O module BMI8/4 with BMI0/4

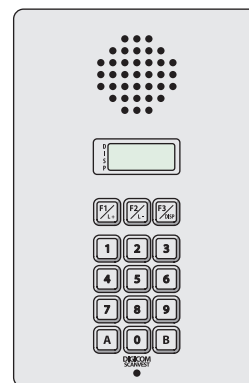
**History memory**

Warning and alarm messages with date and time stamp are automatically stored in the memory. This guarantees reproducibility at all times. A total of up to 1000 messages can be stored. The history can be read out via the TK-History PC software or the function keys at the TM panel.

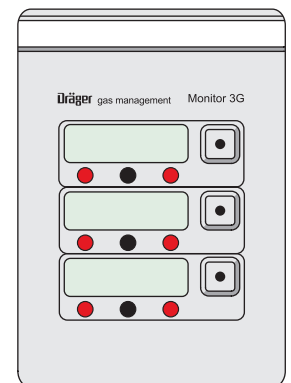
**Individual components to be built in**

In addition to the operating functions which can be activated via pushbuttons, often complete operating units of third-party systems 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 Bender in order to provide an aesthetically attractive functional solution. The required connections are wired to terminals the designations of which correspond to the indications of the respective manufacturer. In this way, the technician is assisted and connection can be carried out with a minimum of time and effort. Generally, there is no limit on the installation of third-party systems. There are cost-efficient solutions available for special products.

Typical examples of third-party systems used in medical locations			
Medical gases	Intercom systems	Operating theatre luminaires	Operating theatre table
Dräger	Digicom-Scanvest Gehrke Schneider Stentofon Telecom Behnke	ALM Berchtold Dräger Haraeus	Maquet Trumpf

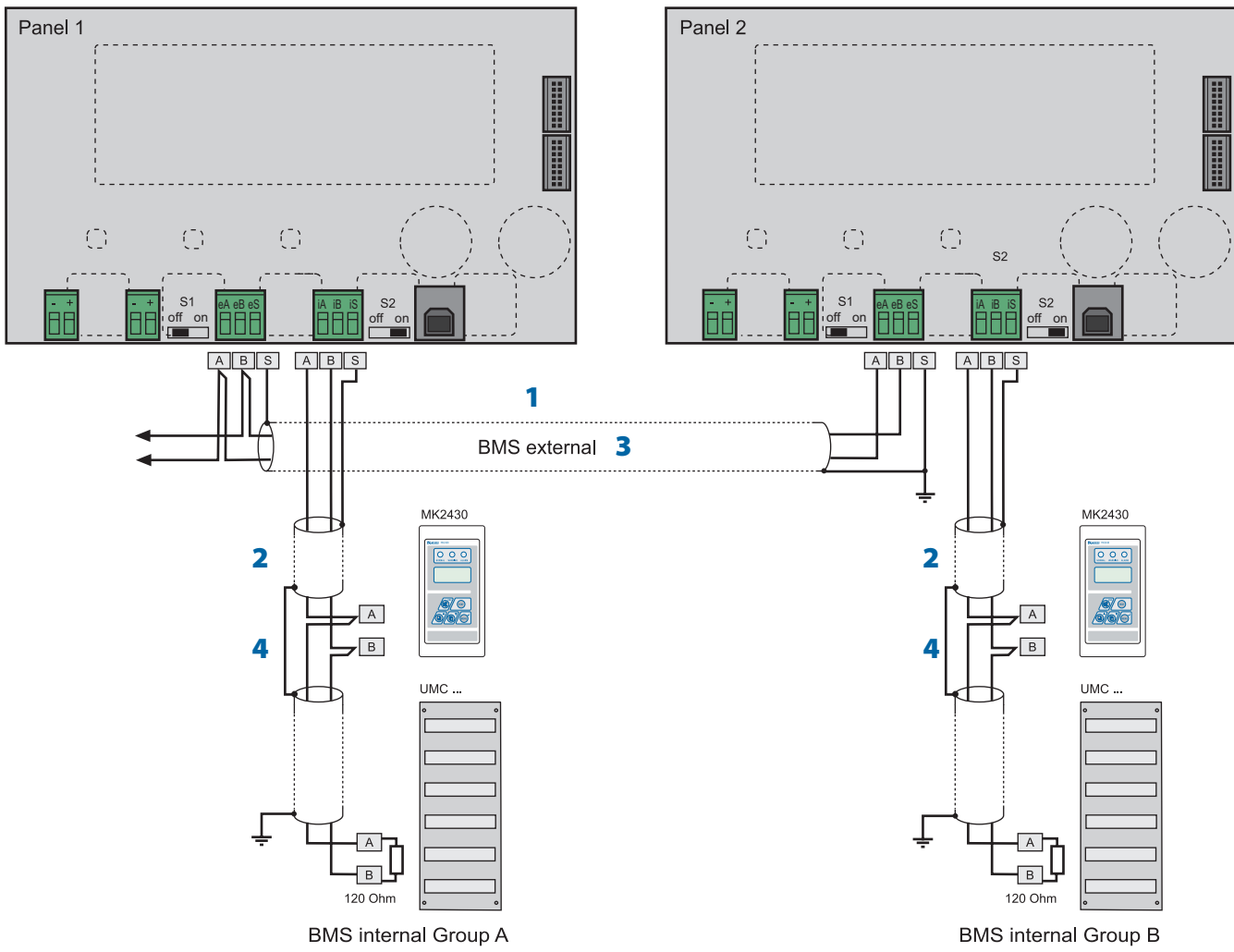


Communication system – Digicom



Dräger Monitor 3G

**Example of the categorization into internal and external bus devices**

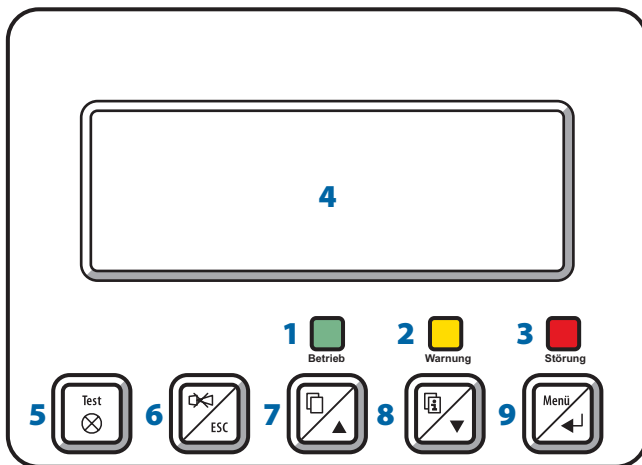






- 1 - External BMS subsystems: All internal BMS subsystems integrated into a higher-level BMS system, e.g. for the central technical control room.
- 2 - Internal BMS subsystems: For all BMS components within one section, e.g. operating theatre section, intensive care unit
- 3 - Bus devices 1...30 (99)
- 4 - Bus devices 1...30 (150)

**Communication**

The alarm indicator and operator panels of the TM800 series and the changeover and monitoring modules of the MEDICS series (UFC, UMC, LFC ...) can be connected via the BMS bus to exchange data with each other. Generally, a distinction is made between the internal and external bus. That allows a clearly defined project structure and certain areas can easily be grouped. A panel and all the monitoring equipment of an operating theatre section are connected to the internal bus, for example. All panels of the TM800 series or alarm and test combinations of the TM800 series are connected to the external bus. Alarm address assignment allows to predefine which messages from which sector are to be displayed on the respective panel. Up to 30 devices can be connected to each internal bus line (in combination with repeaters up to 150 devices). Each bus device receives an address with which it can be identified within the bus line. On each bus line one master is available who controls the information exchange. Generally, this is the panel (TM800 series) or an alarm and test combination.

**Operating and display elements – Basic version**



- 1 - LED „NORMAL“: Power On indicator, green (only lights up if no warnings or alarms are pending)
- 2 - LED „WARNING“: Warnings, yellow
- 3 - LED „ALARM“: Alarm messages, red
- 4 - LCD: Display of operating status, warning and alarm messages as well as menu functions
- 5 - Test button “TEST”:  
Press and release: LED test  
Press and hold down: Initiate test of assigned ISOMETER®.
- 6 - “” (Mute) button: Set buzzer to mute following alarm.  
“ESC” button: Exit function (without saving) resp. go up one menu level. When the buzzer is sounding, you can press ESC to set it to mute.
- 7 - “” (Scroll) button: To scroll through the warning and alarm messages listed on the display  
“▲” (Up) button: to scroll up in the menu
- 8 - “” (Additional text) button: Alternate indication between normal text and additional text.  
“▼” (Down) button: to scroll downwards the menu
- 9 - “Menu” button: Starts menu mode to carry out TM800 settings; for display and control functions  
“” key (ENTER) button: Confirm menu option selection

**Mechanical design**

The design of the alarm indicator and operator panels is based on the individual customer requirements in terms of interior design and the architect's and constructor's needs. The following basic versions of alarm indicator and operator panels are available:

- Flush-mounting type enclosure with bezel frame
- Flush-mounting type enclosure with mounting frame
- Surface-mounting type enclosure with a frame of anodized aluminium

But also room-high stainless-steel panels or other versions present no problem. Due to its continuous foil surface, the panel is easy to clean and suits hygiene critical surface applications. For additional protection, the front panel surface can also be delivered with anti-bacterial surface.

The mounting frame is made of anodized aluminium, which can be adjusted accurately to the tile pattern, and in this way permits close wall mounting. Bezel frames are made of anodized aluminium in order to ensure increased mechanical stability. The support frame inside the flush mounting or surface mounting case is provided with a permanent 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 rugged hinges. That ensures easy installation and easy access to the terminal strips. All necessary pcb boards and indicating elements are permanently fixed to the front plate using threaded bolts or plaster 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 directly connected to the I/O modules, which are 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. 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.

**Parameter setting**

The intuitive, user-friendly TMK-Set PC software allows individual texts to be programmed and assigned to 1000 individual messages via USB interface or the BMS bus. A warning or alarm LED as well as an acoustic signal can be assigned to each message. 80 pre-defined standard message texts each in 20 languages facilitate parameter setting.

**Standards**

The TM800 remote alarm indicator and operator panel complies with the requirements of DIN VDE 0100-710, IEC 60364-7-710.

## Flush-mounting type and surface-mounting type enclosures for alarm indicator and operator panels



AP version

### AP version

Surface-mounting enclosure (AP) made of anodized aluminium suitable for both pure surface mounting or for partially recessed mounting.  
Mounting depth: 90, 150 or 210 mm



UPB version

### UPB version

A gap of up to 12 mm between the flush-mounting enclosure and the wall can be concealed with 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.



UPE version

### UPE version

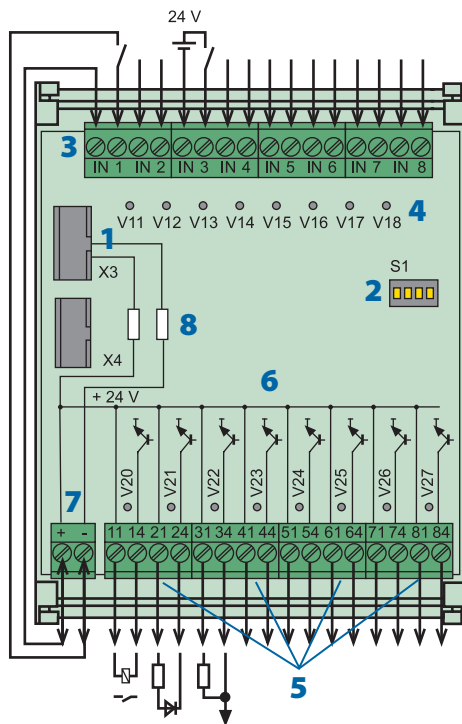
The plaster frame permits accurate and close wall mounting and is made of anodized aluminium. This type of mounting frame is preferably used where the enclosure must precisely fit the tile pattern.

### Features:

- Buckling resistant plastic enclosure for flush-mounting or anodized aluminium frame for surface mounting.
- A seal against ingress of liquids into the panel (IP54).
- Easy to install by fixing the front plate to rugged hinges.
- The front plate can be fixed without screws, the foil surface remains closed.
- Customer-specific adaptation of the enclosure dimensions.
- Standard enclosures for different tile patterns.
- Anodized aluminium mounting frame allows close wall mounting.
- Pre-perforated knockouts for cable entry.
- Flame resistant plastic material.

The flush-mounting enclosure of the UPE series (mounting frame) and the UPB series (bezel frame) are made of inherently stable plastic material (flame-resistant, self-extinguishing). The external dimensions of the alarm indicator and operator panel depends on the internal components and the local installation conditions, like the tile pattern, for example. The standard installation depth (top edge front plate/bottom edge flush-mounting enclosure) is 120 mm. Conforming to the standards, the panel is connected with the built-in enclosure via a rugged hinge. That not only allows easy installation, but also is of advantage when the enclosure has to be opened. The hinge is generally located on the right. Lead the cable into the enclosure from above.

Wiring diagram I/O module BMI8/8

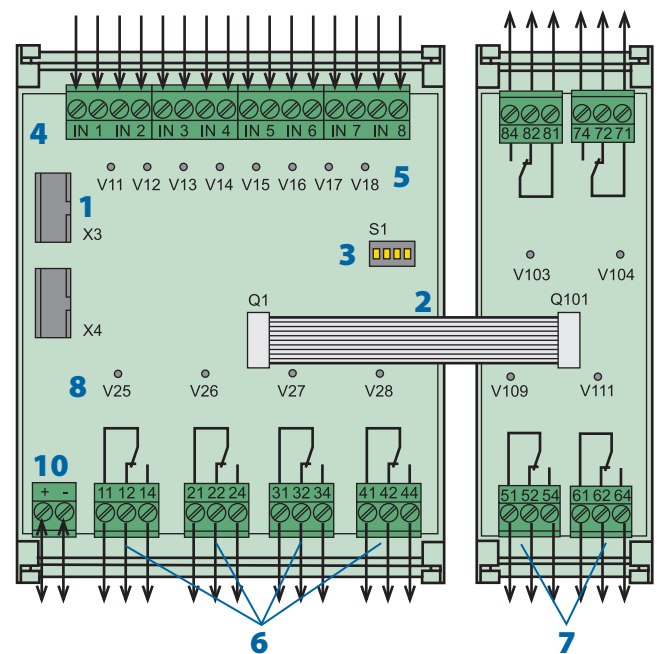


- 1 - X3 Connector for connecting additional I/O modules and connection to the display module
- 2 - S1 DIP switch for address setting.
- 3 - IN1...8 Digital inputs 1...8. The digital inputs either have to be activated via potential-free contacts or via voltage signals.
- 4 - V11...V18 Alarm LEDs, light up when voltage is connected to the associated digital input.
 

Input	Alarm LED	Input	Alarm LED
IN1	V11	IN5	V15
IN2	V12	IN6	V16
IN3	V13	IN7	V17
IN4	V14	IN8	V18
- 5 - 11...84 Open-collector output for activating LEDs, relays etc.
- 6 - V20...V27 Alarm LED, lights up when the associated open-collector output is closed.
 

Output	Alarm LED	Output	Alarm LED
11, 14	V20	51, 54	V24
21, 24	V21	61, 64	V25
31, 34	V22	71, 74	V26
41, 44	V23	81, 84	V27
- 7 - A1, A2 Supply voltage US DC
- 8 - S2, S3 Remove the bridges R42, R59 entfernen, in case of US from an external supply.

Wiring diagram I/O modules BMI8/4 with BMI10/4



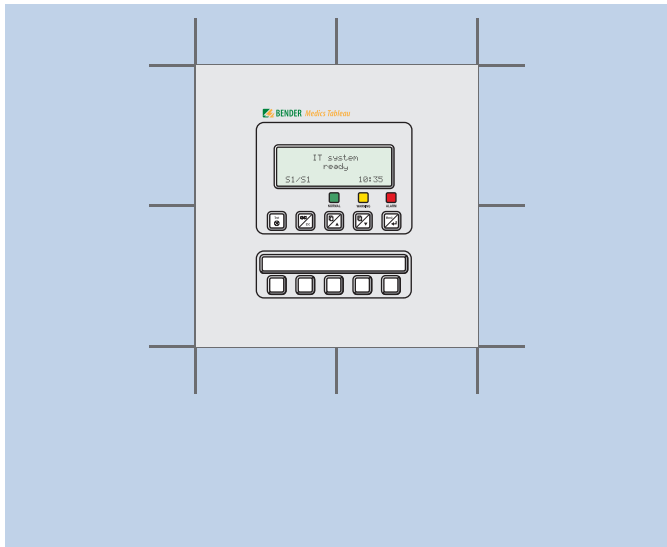
- 1 - X3 Connector for connecting additional I/O modules and connection to the display modules
- 2 - Q1, Q101 Connecting cable between BMI8/4 and BMI10/4
- 3 - S1 DIP switch for address setting.
- 4 - IN1...8 Digital inputs 1...8. The digital inputs either have to be activated via potential-free contacts or via voltage signals.
- 5 - V11...V18 Alarm LEDs, light up when voltage is connected to the associated digital input.
 

Input	Alarm LED	Input	Alarm LED
IN1	V11	IN5	V15
IN2	V12	IN6	V16
IN3	V13	IN7	V17
IN4	V14	IN8	V18
- 6 - 11, 12, 14... Four relay outputs on the BMI8/4 I/O module 41, 42, 44 for the activation of loads.
- 7 - 51, 52, 54... Four relay outputs on the BMI10/4 I/O module 81, 82, 84 for the activation of loads.
- 8 - V25...V28 Alarm LEDs on the BMI8/4 I/O module, light up when the associated relay is energized.
 

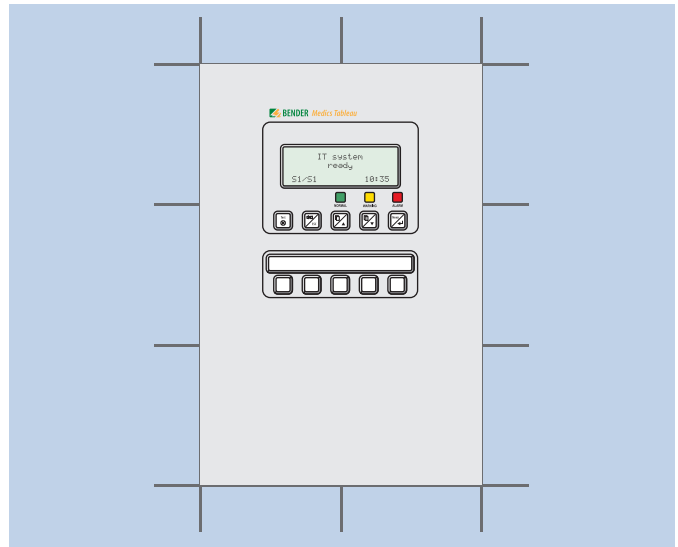
Output	Alarm LED
11, 12, 14	V25
21, 22, 24	V26
31, 32, 34	V27
41, 42, 44	V28
- 9 - V103, V104 Alarm LEDs on the BMI8/4 I/O module, light up, V109, V111 when the associated relay is energized.
 

Output	Alarm LED
51, 52, 54	V109
61, 62, 64	V111
71, 72, 74	V104
81, 82, 84	V103
- 10 - A1, A2 Supply voltage  $U_S$  DC

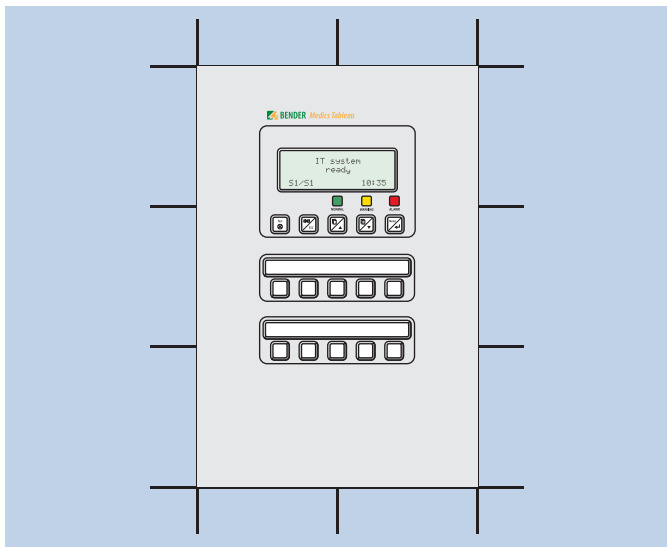
Example of different TM800 alarm indicator and operator panel versions



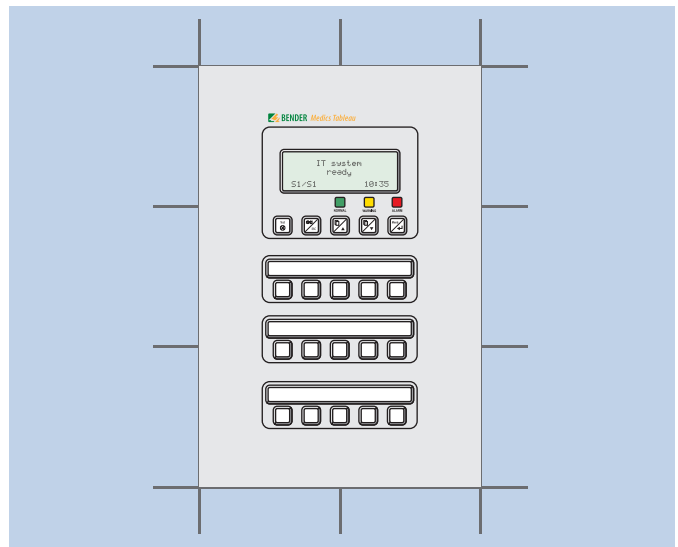
TM 22-0



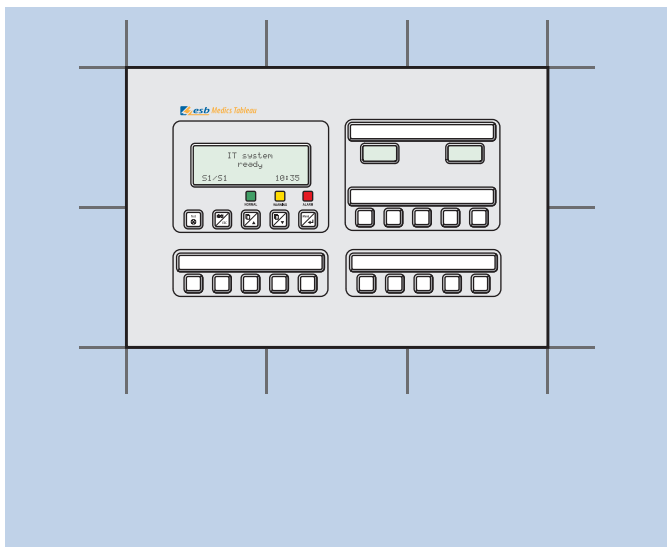
TM 23-0



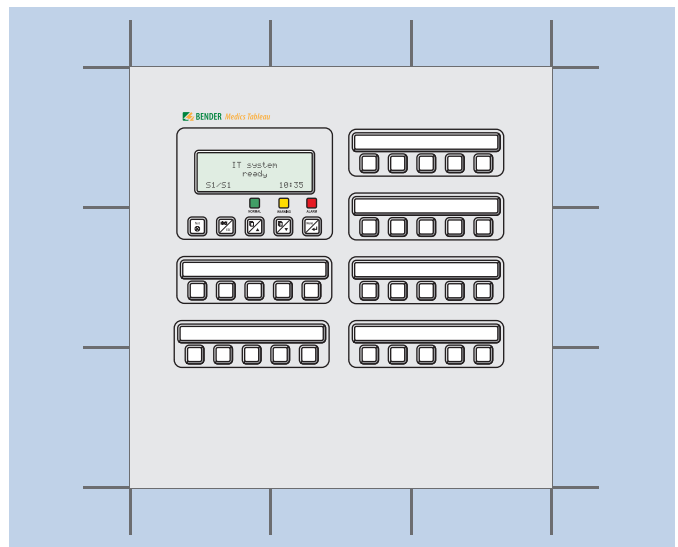
TM 23-1



TM 23-2



TM 32-03

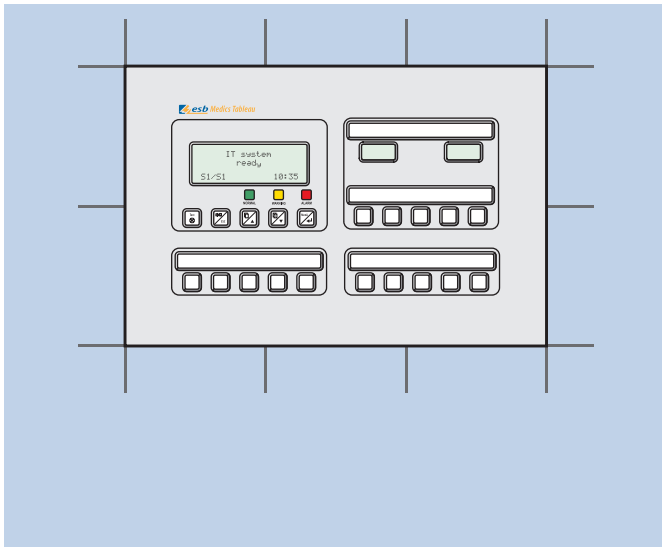


TM 33-14

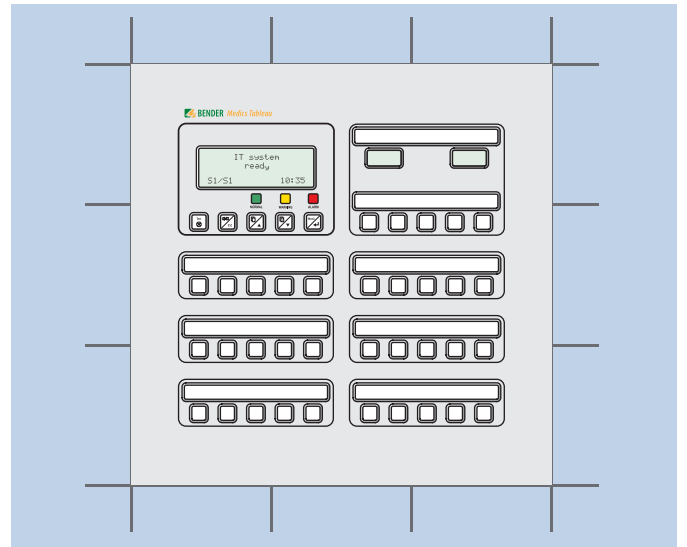
Grid dimensions approx. 150 x 150 mm



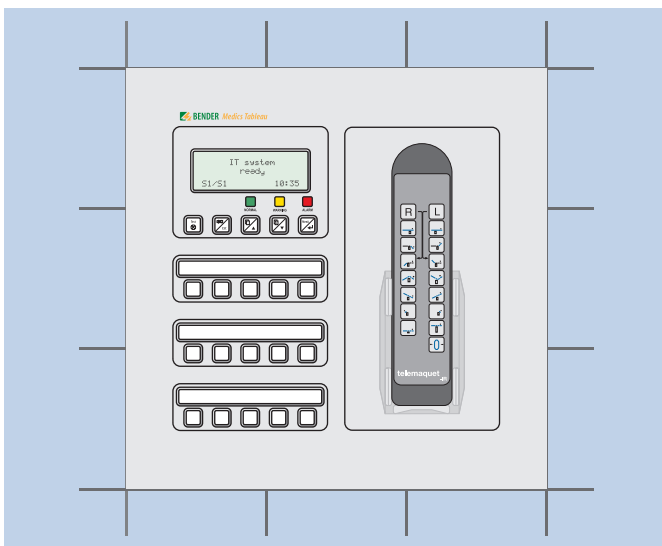
**Example of different TM800 alarm indicator and operator panel versions**



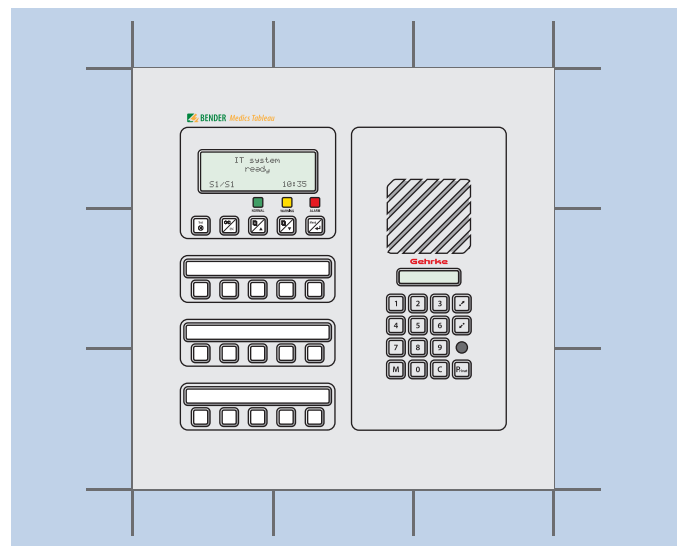
TM 32-02-K1



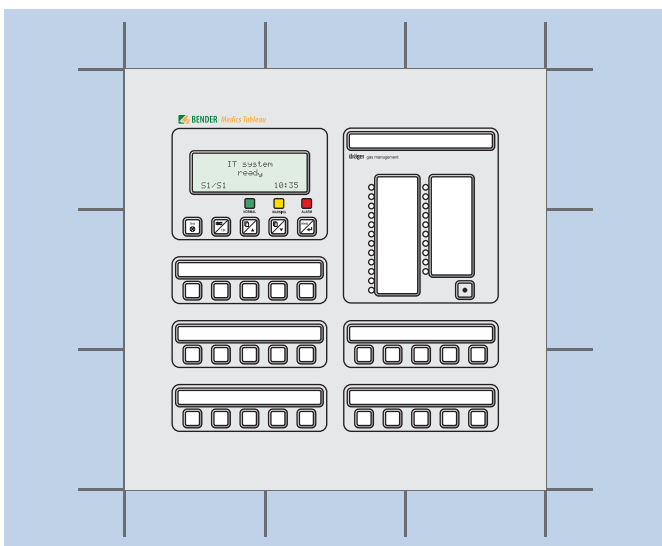
TM 33-24-K2



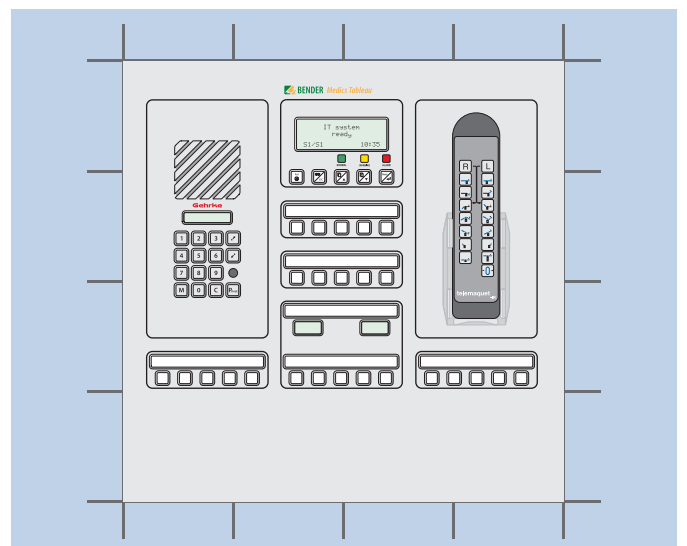
TM 33-20-0M



TM 33-20-S



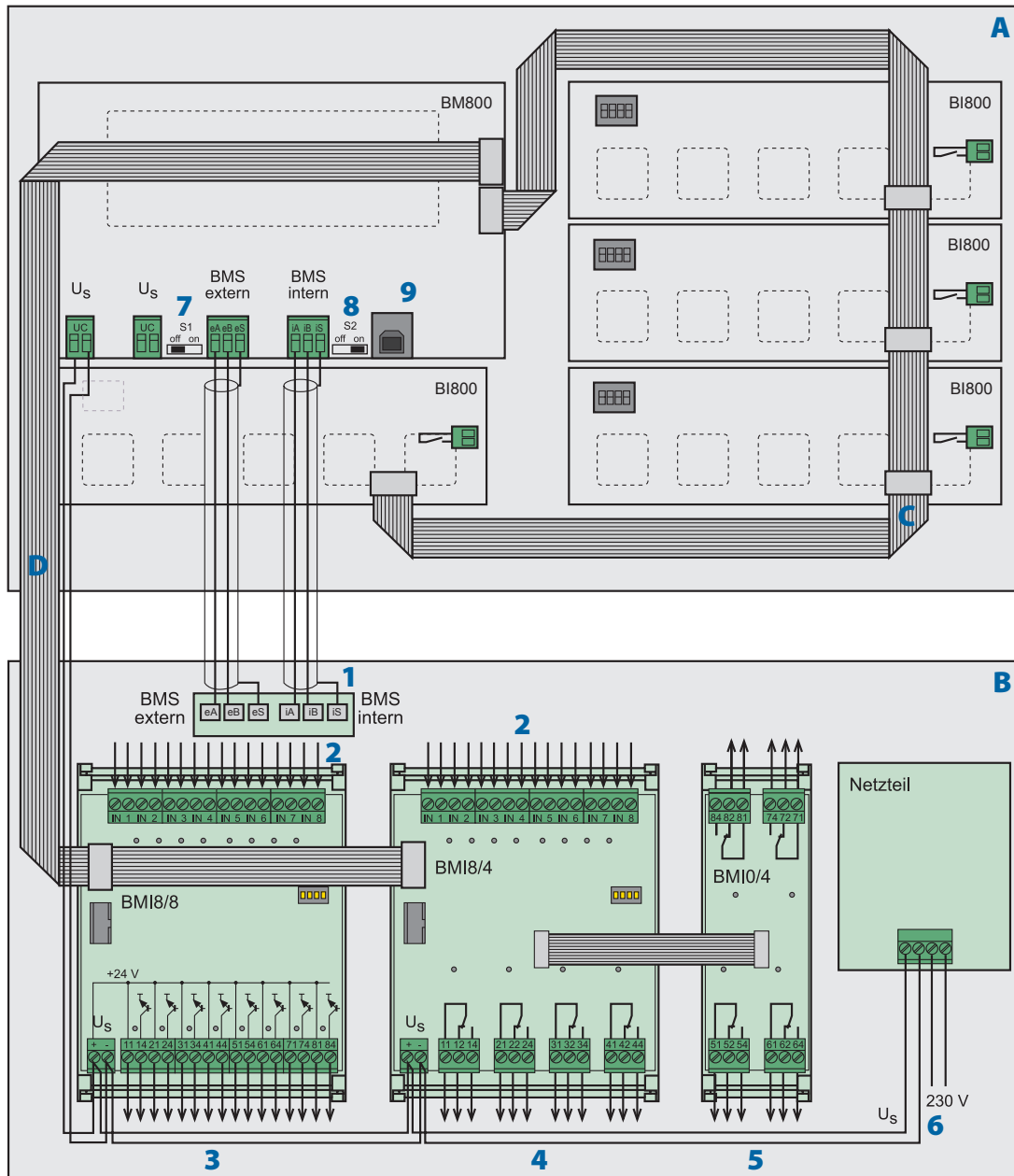
TM 33-22-ML



TM 44-121-SK20M

Grid dimensions approx. 150 x 150 mm

### Example of panel design



**A** - Rear of the front plate

**B** - Mounting plate, installed in the lower part of the enclosure

**C** - I<sup>2</sup>C bus is used for communication between the modules BM800 (resp. BM400) and the operating and display pcbs BI800. The terminals of the two I<sup>2</sup>C must not be interchanged!

**D** - I<sup>2</sup>C bus, is used for communication between the modules BM800 (resp. BM400) and the I/O modules BMI8/8, BMI8/4 and BMI10/4. The terminals of the two I<sup>2</sup>C buses must not be interchanged!

**1** - Terminal board for connection to the internal and external BMS bus (internal bus = terminals iA, iB, iS, external bus = terminals eA, eB, eS)

**2** - Digital inputs of the I/O module BMI8/4, resp. BMI8/8

**3** - Open collector output of the I/O module BMI8/8

**4** - Relay outputs of the I/O module BMI8/4

**5** - Relay outputs of the I/O module BMI10/4

**6** - Connection of the supply voltage US to the terminals 0 and 230 V of the power supply unit. The standard supply voltage is AC 230 V.

**7** - Switch S1 to terminate the external BMS bus.

**8** - Switch S2 to terminate the internal BMS bus.

**9** - USB connection for programming purposes. Cable: Type A plug on type B plug.

**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 TM800	via integrated power supply unit, data depending on the type

**BM800 module**

Supply voltage $U_s$	AC/DC 24 V
Frequency range of $U_s$	AC 40...60 Hz / DC
Operating range $U_s$	AC 18...28/DC 19...30 V
Stored energy time in the event of power system failure time, date	> 5 days
Restart in the event of voltage failure for at least	1.5 s
Display, characters	four lines, 4 x 20 characters
Standard message texts in	21 languages
Alarm addresses	≤ 250
Programmable text messages	1000
History memory (messages)	1000
Standard text message	3 x 20 characters
Additional text message (press key to access)	3 x 20 characters
Alarm LEDs (a set of LEDs)	green (normal), yellow (warning), red (alarm)
Menu texts	German/ English
Keys	5 (lamp test + Isometer test, buzzer mute, additional text, scroll, menu)
Power consumption	≤ 5 VA

**Buzzer**

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

**Internal/external 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 connected to PE at one end)	at least J-Y(St)Y 2x0.8
Terminating resistor	120 Ω (0.25 W) can be connected via DIP switch, factory setting: both „off“
Device address, BMS bus int./ext.	1...150/1...99
Int./ext. device address factory setting	1 (master)/1 (master)

**Programming**

Interfaces	RS-485 or USB (V2.0/V1.1), USB cable: Type A plug on type B plug.
Software	TMK-SET version 3.x or higher
Factory setting password	activated

**Operating and display pcbs and I/O module**
**BI800 operating and display pcbs:**

Max. number of illuminated pushbuttons	80
Buttons/alarm LEDs per panel	5
Power consumption	≤ 2 VA

**I/O module:**

Maximum number of inputs and outputs	192/192
--------------------------------------	---------

**Environment/EMC**

EMC immunity	acc. to EN 61000-6-2
EMC emission	acc. to EN 61000-6-4
Operating temperature	5...+55 °C
Climatic class acc. to IEC 60721	
Stationary use	3K5
Transport	2K3
Long-term storage	1K4
Classification of mechanical conditions acc. to IEC 60721	
Stationary use	3M4
Transport	2M2
Long-term storage	1M3

**Connection**

Connection	plug-in terminals
Connection properties (supply voltage, BMS bus)	
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>
Connection properties (inputs)	
rigid/flexible/conductor sizes	0.08...1.50/0.8...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>
Stripping length	7 mm
Tightening torque	0.5...0.6 Nm

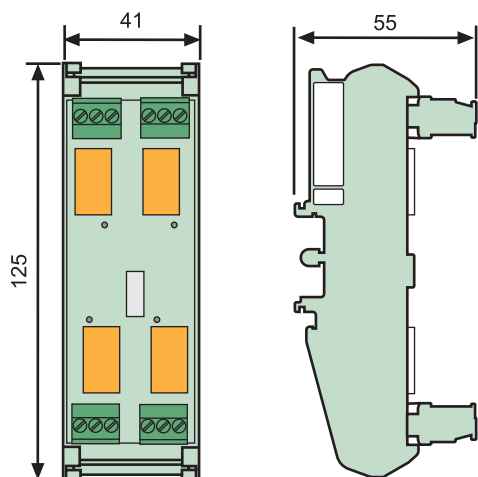
**Other**

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP50
Degree of protection, terminals (IEC 60529)	IP20
Flammability class	UL94V-0
Weight	according to the respective version

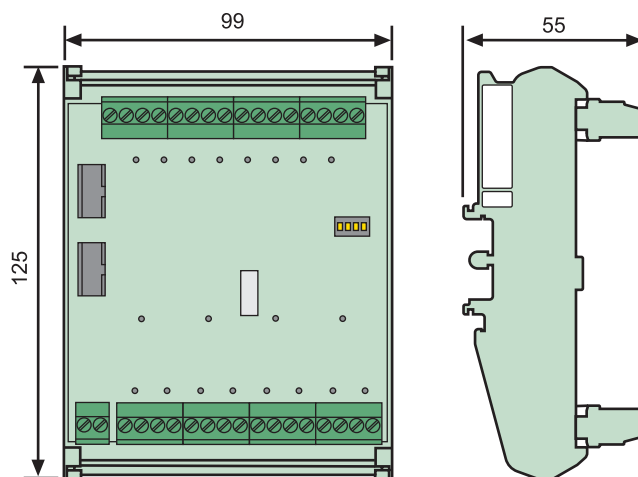
## Dimension diagramm

Dimensions in mm

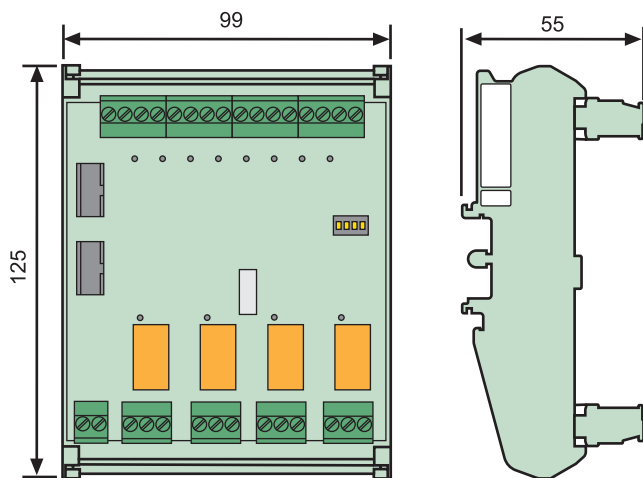
### BMI 0/4



### BMI 8/8



### BMI 8/4



### Bender GmbH & Co. KG

P.O. Box 1161 • 35301 Gruenberg • Germany  
Londorfer Strasse 65 • 35305 Gruenberg • Germany  
Tel.: +49 6401 807-0 • Fax: +49 6401 807-259  
E-Mail: [info@bender.de](mailto:info@bender.de) • [www.bender.de](http://www.bender.de)



BENDER Group