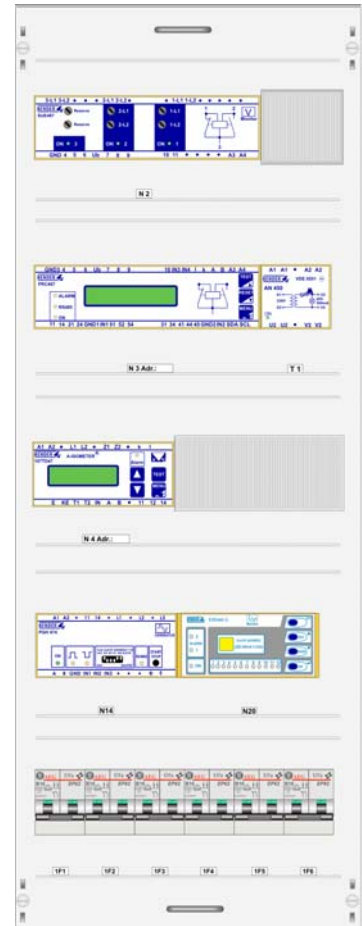


# Operating Manual



## MEDICS® UFC107E-..

Two-pole  
changeover and monitoring modules  
with insulation fault location system  
for medical locations





Dipl.-Ing. W. Bender GmbH & Co.KG  
Londorfer Str. 65 • 35305 Grünberg • Germany  
Postfach 1161 • 35301 Grünberg • Germany

Tel.: +49 6401 807-0  
Fax: +49 6401 807-259

E-mail: [info@bender-de.com](mailto:info@bender-de.com)  
Web: <http://www.bender-de.com>

**BENDER Group**

© Dipl.-Ing. W. Bender GmbH & Co.KG

All rights reserved.  
Reprinting only with permission  
of the publisher.  
Subject to change!

# Table of Contents

<b>1. How to use this operating manual effectively .....</b>	<b>5</b>
1.1 How to use this manual .....	5
1.2 Explanations of symbols and notes .....	5
<b>2. Safety instructions .....</b>	<b>7</b>
2.1 Intended use .....	7
2.2 Skilled persons .....	7
2.3 Device-specific safety information .....	8
2.4 General safety instructions .....	8
2.5 Delivery conditions, guarantee, warranty and liability .....	8
<b>3. System description .....</b>	<b>9</b>
3.1 MEDICS® .....	9
3.2 UFC107E.. features .....	10
3.3 Functionality UFC107E-.. .....	11
3.3.1 The UFC107E-... changeover and monitoring module .....	11
3.3.2 IT system monitoring .....	11
3.3.3 Monitoring the device functions .....	12
3.3.4 Power supply .....	12
3.4 System components .....	13
3.5 Design plans .....	13
3.5.1 UFC107E-..-12 design plan .....	14
3.5.2 UFC107E-..-24 design plan .....	15
<b>4. Installation and connection .....</b>	<b>17</b>
4.1 Fuses .....	17
4.1.1 Selecting a fuse with only one load .....	17
4.1.2 Selecting a fuse with several loads .....	18
4.2 Changeover and monitoring module .....	19
4.2.1 Typical connection .....	19
4.2.2 Information on the wiring diagram and circuit diagram .....	19
4.2.3 Wiring diagram UFC107E-.. with 12 channels .....	20
4.2.4 Circuit diagram UFC107E-.. with 12 channels (part 1) .....	21
4.2.5 Circuit diagram UFC107E-.. with 12 channels (part 2) .....	22

4.2.6	Wiring diagram UFC107E-.. with 24 channels .....	23
4.2.7	Circuit diagram UFC107E-.. with 24 channels (part 1) .....	24
4.2.8	Circuit diagram UFC107E-.. with 24 channels (part 2) .....	25
4.2.9	Circuit diagram UFC107E-.. with 24 channels (part 3) .....	26
4.3	Instructions for connection .....	27
4.3.1	Temperature sensor .....	27
4.3.2	Alarm indicator and test combination .....	27
4.3.3	SCADA system (Supervisory Control And Data Acquisition) .....	27
<b>5.</b>	<b>Commissioning, settings and testing .....</b>	<b>29</b>
5.1	Setting and testing according to the checklist .....	29
5.1.1	Avoiding errors .....	29
5.2	Assigning addresses-examples .....	30
<b>6.</b>	<b>Trouble shooting .....</b>	<b>35</b>
6.1	PRC487 error messages .....	35
6.2	Fuses F1...F11 .....	36
<b>7.</b>	<b>Periodic verification and service .....</b>	<b>37</b>
7.1	Periodic verification .....	37
7.1.1	Testing the changeover module .....	38
7.2	Service .....	38
7.3	Maintenance .....	38
<b>8.</b>	<b>Data .....</b>	<b>39</b>
8.1	TÜV test report .....	39
8.2	Standards .....	40
8.3	Manufacturer's certificate .....	40
8.4	Technical data .....	40
8.4.1	Dimension and weights .....	42
8.5	Ordering information .....	44
<b>9.</b>	<b>Manufacturer's certificate, checklist, circuit documentation .....</b>	<b>45</b>

# 1. How to use this operating manual effectively

## 1.1 How to use this manual

This operating manual describes how to operate the UFC107E-.. changeover and monitoring module. It is designed for skilled persons working in electrical engineering and electronics; and in particular for those designing, installing and operating electrical equipment in the medical sector.

Before using the equipment, please read this operating manual, the supplement entitled "Important safety instructions for Bender Products" and the instruction leaflets supplied with the individual system components. This document must be kept in an easily accessible location near to the equipment.

Should you have any further questions, please contact our Technical Sales Department. We are also happy to provide on-site service. Please contact our Service Department for more information.

In this manual, the two redundant supplies for the power supply will be designated "preferred supply" or "line 1" and "second supply" or "line 2". Devices with displays use the terms "line 1" and "line 2" in the text they indicate.

This manual has been compiled with great care. Nevertheless errors and omissions cannot be entirely excluded. The Bender Group cannot accept any liability for injury to persons or damage to property resulting from errors or mistakes in this operating manual.

## 1.2 Explanations of symbols and notes

The following terms and symbols are used to denote hazards and instructions in Bender documentation:



---

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

---



---

*This symbol indicates a potential risk to life and limb.  
Failure to observe these warnings and take appropriate precautions may result  
in death, severe bodily injury or substantial damage to property.*

---



---

*This symbol indicates a potentially dangerous situation.  
Failure to observe the associated instructions and take appropriate precautions  
may result in minor bodily injury or damage to property.*

---



---

*This symbol indicates important information about the correct use of the equipment purchased.*

*Failure to observe the associated instructions can result in equipment malfunctioning or cause problems in the environment in which it is being used.*

---



---

*This symbol indicates tips for using the equipment and particularly useful information. This type of information will help you to optimise your use of the equipment.*

---

## 2. Safety instructions

### 2.1 Intended use

The UFC107E-.. changeover and monitoring module is a two-pole, automatic changeover module for distribution systems used in medical locations group 1 and 2, in accordance with IEC 60364-7 710:2002-11, section 710.313.1 and DIN VDE 0100-710 (VDE 0100 Part 710):2002-11, section 710.537.6.2 extended by the IT system monitoring functions in accordance with IEC 60364-7-710:2002-11, section 710.413.1.5 and DIN VDE 0100-710 (VDE 0100 part 710):2002-11, section 710.531.3.1 and the insulation fault location system (EDS).

It is used in medical locations and monitors the power supply using two independent single-phase supply sources and the AC IT system.

The UFC107E-..module

- detects whether the preferred supply has failed and automatically performs a two-pole changeover to the second supply source.
- monitors the insulation resistance in the downstream IT system.
- monitors the load current and temperature of isolating transformers for the IT system.
- starts insulation fault location following an insulation fault.

Customised parameter settings must be made on the equipment for the purpose of adapting it to local equipment and operating conditions, in order to meet the requirements of applicable standards.

The equipment can also be used in non-medical areas provided that the intended application has been cleared with Bender in advance.

Please note the limits of the area of application indicated in the technical data. Use deviating from or beyond the scope of this is considered non-compliant.

#### Intended use also implies:

- Device-specific settings in accordance with IEC 60364-7-710:2002-11, sections 556.5.2.2, 556.7, 556.8 and DIN VDE 0100-710 (VDE 0100 Part 710):2002-11, section 710.537.6.2 (changeover periods) and for the IT system.
- The observation of all information in the operating manual.
- Compliance with test intervals.

### 2.2 Skilled persons

Only electrically skilled persons may work on Bender products. Skilled means, persons who are familiar with the assembly, commissioning and operation of the equipment and have undergone appropriate training. Such persons must have read this manual and understood all instructions relating to safety.

## 2.3 Device-specific safety information



Warning

*Device-specific settings are required in order to adapt the MEDICS® module to the existing equipment. To this end, refer to the instructions in chapter "5. Commissioning, settings and testing", page 29ff.*

## 2.4 General safety instructions

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

- Only use Bender equipment:
  - as intended
  - in perfect working order
  - in compliance with the accident prevention regulations and guidelines applicable in the location of use
- Rectify any faults that may impair safety immediately.
- Do not make any unauthorised changes and only use replacement parts and optional accessories purchased from or recommended by the manufacturer of the equipment. Failure to observe this requirement can result in fire, electric shock and injury.
- Reference plates must always be clearly legible. Replace damaged or illegible plates immediately.
- Make sure that the dimensioning of the UPS (special safety power supply source), the generator system and the whole wiring is adequate. Observe the applicable national and international standards within this context. 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.

## 2.5 Delivery conditions, guarantee, warranty and liability

The conditions of sale and delivery set out by Bender shall apply. Conditions of sale and delivery can be obtained from Bender in printed and electronic format.

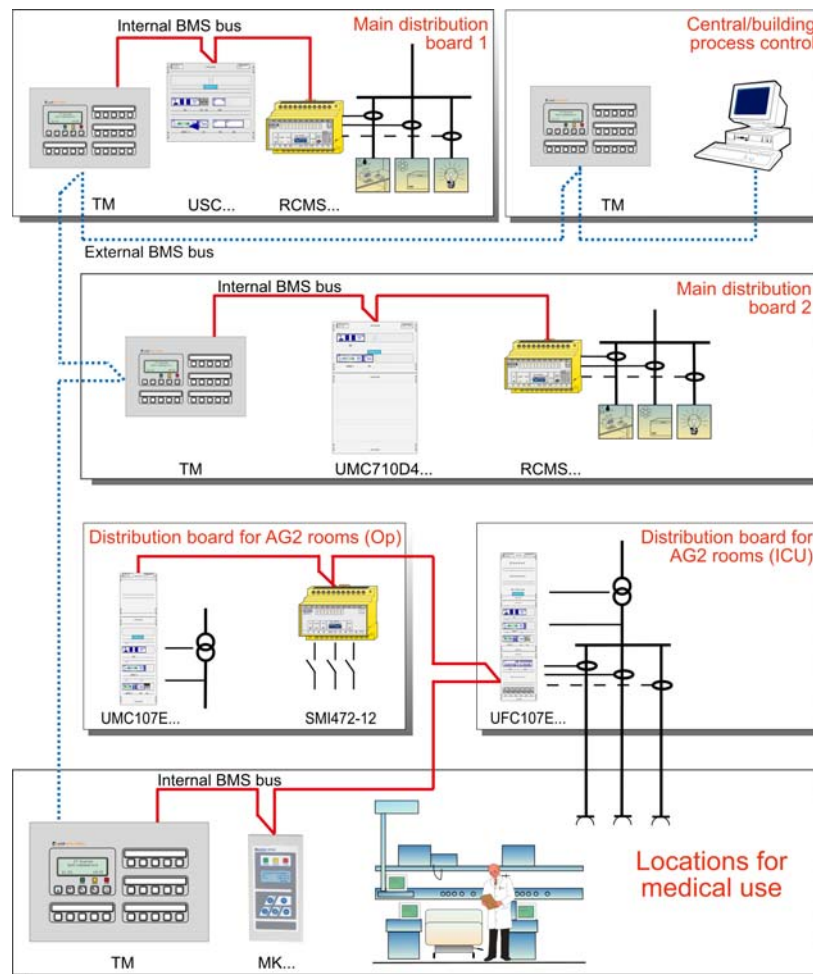


## 3. System description

### 3.1 MEDICS®

The UFC107E-.. changeover and monitoring module is a part of the MEDICS® system. MEDICS® does not refer to a single product, but rather an intelligent system for safe power supplies in medical locations.

Example of a section of a hospital with the MEDICS® system



#### Key for example

MK...	Alarm indicator and test combination
RCMS...	Residual current monitoring system for TN-S systems
SMI472	Signal converter for third-party technical equipment (e. g. med. gases, UPS)
TM	Alarm indicator and operator panel
UFC107E...	Changeover and monitoring module for IT systems with EDS... insulation fault location system
UMC107E...	Changeover and monitoring module for IT systems
UMC710D...	Changeover module for main distribution boards
USC710D...	Control module for changeover modules (preferably in main distribution boards)

MEDICS® includes:

- AC and 3(N) AC changeover and monitoring modules. Examples of modules in the MEDICS® system include UMC..., USC..., UFC... and EDS.... insulation fault location systems.
- Display and operating units such as alarm indicator and operator panels or alarm indicator and test combinations.
- Communication between these components takes place via the BMS bus (two-wire connection).
- The connection of third-party technical equipment by means of protocol converters (gateways), via digital inputs and relay outputs.

The real strength of MEDICS® is to be found in communication between all involved components and the resulting information provided to the user. Readiness for operation is monitored continuously. Operating states, irregularities, faults and equipment failures are displayed. From the user's point of view, this means high operational reliability.

### 3.2 UFC107E.. features

The UFC107E.. changeover and monitoring module has the following features:

- Two-pole changeover with contactors. Both contactors have a mechanical latching.
- Voltage monitoring on the preferred supply (line 1)
- Voltage monitoring on the second supply (line 2)
- Voltage monitoring at the output of the changeover and monitoring module (line 3)
- Monitoring of the switching elements to ensure that they are in the correct switching state and for wire breaks (connecting wires, contactor coil, coil for latching module)
- Internal functional testing including checking of the changeover times
- Monitoring of the insulation resistance in the IT system
- Monitoring of the IT system transformer load current
- Monitoring of the IT system transformer load temperature
- Monitoring of the A-ISOMETER® 107TD47 connecting wires
- Insulation fault location system for 6 ... 36 subcircuits
- Communication of components with one another via BMS bus
- Communication with remote alarm indicator and test combinations and TM alarm indicator and operator panels via BMS bus
- Possibility to set the time delay for the changeover in 50 ms increments for adaptation to the total off-time acc. to DIN VDE 0100-710 (VDE 0100 Part 710):2002-11, section 710.537.6.2k
- Can be used in systems in accordance with IEC 60364-7-710:2002-11, sections 556.5.2.2, 556.7 and 556.8 and DIN VDE 0100-710 (VDE 0100 Part 710):2002-11, section 710.564.6 with a changeover period = 15 s or = 0.5 s



Warning

*The MEDICS® module is a configured unit and is only certified and tested in this assembly. Do not make any changes to the components, their password-protected settings or the wiring without consulting Bender first.*

*In each case you should make the settings that are required for adaptation to the application case in question and local conditions.*

### 3.3 Functionality UFC107E-..

#### 3.3.1 The UFC107E-... changeover and monitoring module

If the preferred supply should fail, the UFC107E-.. ensures safe changeover of the power supply:

1. In normal condition (fault-free condition), the preferred supply (line 1) is connected via contactor K1 and mechanically latched. This makes it impossible for the IT supply to fail on account of defective contactor coils, torn lines to the contactor coil, or a failure of the control voltage.
2. If the voltage at the end of the preferred supply falls below the set value or exceeds a value of  $115\% \times U_n$ , the module automatically changes over to the second supply (line 2): Once the set response time  $t(\text{off})$  has elapsed, K1 is disconnected and, following the set idle time  $t(K1-2)$ , K2 is connected and latched.
3. On voltage recovery, switching back to the preferred supply source occurs automatically after the set return transfer time  $t(\text{on})$  has elapsed: K2 is disconnected and, following the set idle time  $t(K1-2)$ , K1 is connected and latched.



*The response time  $t(\text{off})$ , the idle time  $t(K1-2)$  and the return transfer time  $t(\text{on})$  of the UFC107E-.. can be set and must be adjusted according to the requirements of the specific application case, the short-circuit calculation and the requirements of IEC 60364-7-710:2002-11, sections 556.5.2.2, 556.7 and 556.8 and DIN VDE 0100-710 (VDE 0100 Part 710):2002-11, section 710.537.6 (automatic changeover modules) (see chapter 5. "Commissioning, settings and testing").*

The settings made at the factory ensure a changeover period of  $t = 0.5$  seconds and switching back within five seconds on voltage recovery on the preferred supply. Therefore, the UFC107E-.. can also be used in IT systems with a requirement for a changeover period  $t = 0.5$  seconds (IT systems with operating theatre lighting circuits, endoscopic field illumination in operating theatres, or other essential sources of light, etc.).

If the control device detects a supply line failure or a fault, a message appears in the LC display, the "ALARM" LED lights up, the alarm relay switches, and this alarm is transmitted to other Bender devices (such as alarm indicator and test combinations) via the BMS bus.

#### 3.3.2 IT system monitoring

##### Insulation monitoring

The insulation monitoring device measures the insulation resistance in AC IT systems which may also contain DC circuits. The adaptation to the system leakage capacitances takes place automatically.

##### Load current measurement

The load current is measured via the measuring current transformer STW2.

##### Temperature measurement

The temperature in the transformer winding is measured via PTC thermistors.

### Evaluation

If any of the measured values does not fall within the limits, an alarm (common alarm) is triggered. The "ALARM" LED lights up, the alarm relay switches and a message appears in the LC display of the insulation monitoring device. This alarm is transmitted to other Bender devices (such as an alarm indicator and test combination) via the BMS bus.

### Automatic insulation fault location system

If the A-ISOMETER<sup>®</sup> has detected an insulation fault in the IT system, the PGH474 insulation fault test device starts the insulation fault location process. The signals of all the measuring current transformers are evaluated by the EDS461-L insulation fault evaluator within a specified time frame, which is adapted to the test cycle of the PGH474. If the test current measured by a measuring current transformer exceeds the response value, the corresponding LED ("1 to 12") and "ALARM" LED light up, and the alarm relay switches. The error message is also transmitted to other Bender devices.

During the time between evaluation of the individual measuring current transformers, the A-ISOMETER<sup>®</sup> monitors the insulation resistance of the IT system. If the insulation resistance improves to such an extent that an alarm is no longer pending, the insulation fault location process stops.

### 3.3.3 Monitoring the device functions

The control circuits are constructed in such a way that even if a particular fault will almost certainly occur, it cannot cause the power supply at the output of the automatic changeover and monitoring module to fail. Examples: Failure of the control voltage, operation of a protective device, a short-circuit to exposed-conductive part or an earth fault, and an open circuit.

In addition to this, the module continuously monitors:

- The control circuit that is required for the next changeover process (coil, control contacts, connections)
- Important connecting wires, such as
  - the insulation monitoring mains/PE
  - measuring current transformer
  - temperature sensor
- For alarm indicator and test combinations, and alarm indicator and operator panels, device failure monitoring can also be programmed via the BMS bus.

Thanks to the redundant hardware design of the changeover module, it is guaranteed to function safely even if the microcontroller should fail.

### 3.3.4 Power supply

SUE487 provides the power supply for the PRC487 control device and the AN450 power supply unit, as well as the control voltage for the contactors from line 2, (or from line 1 if line 2 fails). The 107TD47 insulation monitoring device, the PGH474 insulation fault test device and the EDS461-L insulation fault evaluator are supplied by the IT system.

The AN450 power supply unit supplies power to a maximum of 3 MK2418 or 2 MK2430 alarm indicator and test combinations.

### 3.4 System components

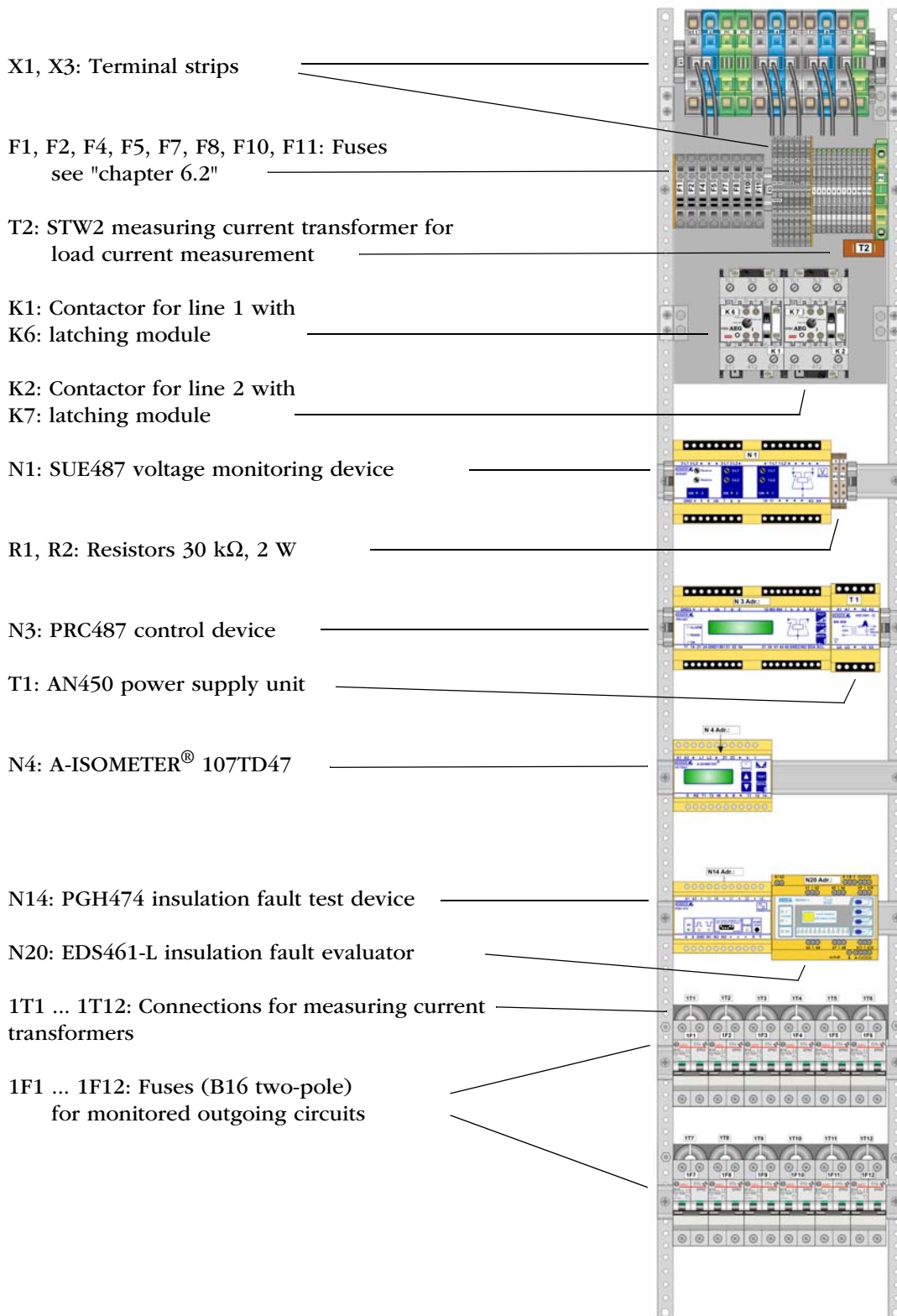
In chapter "9. Manufacturer's certificate, checklist, circuit documentation" of this operating manual, you will find instruction leaflets containing detailed information about the following system components:

PRC487	Control device for changeover modules
SUE487, SUD487	Voltage relay
A-ISOMETER®107TD47	Insulation monitoring device with transformer monitoring
BMS bus	Bender Measuring Device Interface
AN450	Power supply unit
STW2	Measuring current transformer
PGH474	Insulation fault test device
EDS461-L	Insulation fault evaluator
W10/8000 (included in instruction leaflet W10-600---W10-8000)	Measuring current transformer

### 3.5 Design plans

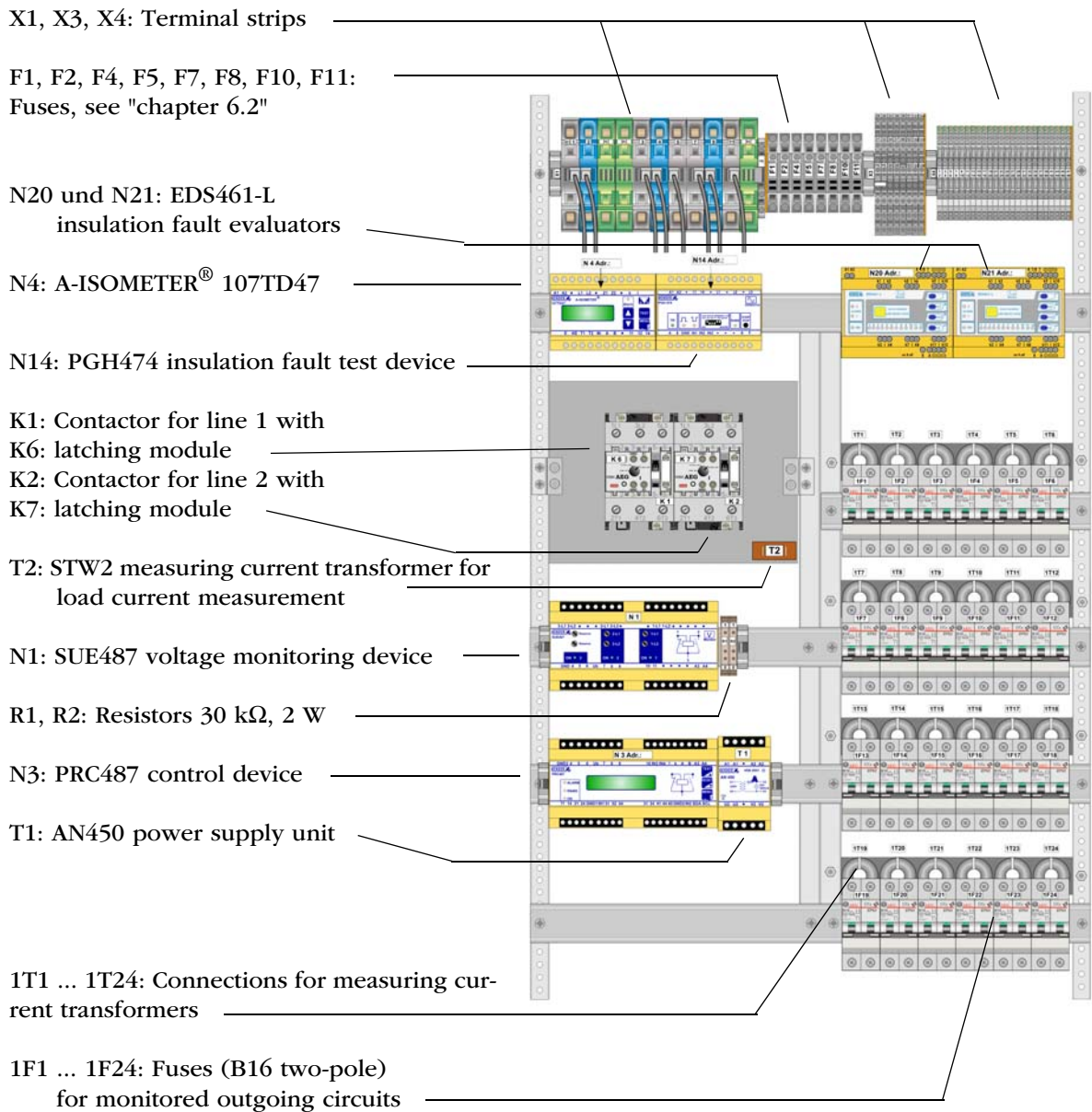
The following pages show the design plans for a typical UFC107E-.. changeover and monitoring module. Other versions deviate from these in terms of their mechanical design, depending on their rated operational current.

### 3.5.1 UFC107E-..-12 design plan



*Design example: UFC107E-.. front view, single-panel with 12 transformer connections*

### 3.5.2 UFC107E-..-24 design plan



*Design example: UFC107E-.. front view , dual-panel with 24 transformer connections*





## 4. Installation and connection

### 4.1 Fuses

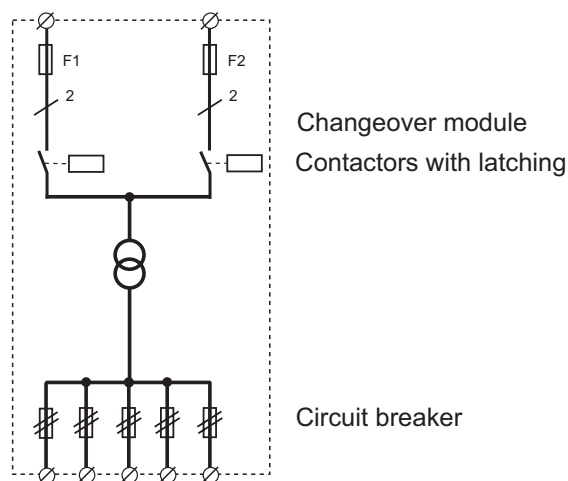
Please observe the requirements of IEC 60364-7-710:2002-11 and DIN VDE 0100-710 (VDE 0100 Part 710) when selecting fuses for the supply cables and outgoing circuits of the changeover modules:

- Section: 710.512.1.6.2 (VDE), sections 710.5.3.1, 710.512.1.6 (IEC), Transformers for the IT system: Where transformers, their primary supply conductor and secondary outgoing line are concerned, overcurrent protective devices are only permitted for short-circuit protection. The transformer supply cable from the changeover module and the transformer outgoing cable to the next distribution board section should be laid so that they are short-circuit proof and earth-fault proof.
- Section: 710.53.2 (VDE), section 710.413.1 (IEC), Protection of the cable system in Group 2 locations: The choice of protective devices must ensure that when the anticipated short-circuit current occur, the protective device upstream of a fault will selectively trip the protective devices that are further upstream.
- Section 710.537.6.2. (VDE), section 710.413.1.1 (IEC), Connecting several load groups downstream of a changeover module must not lead to all the load groups failing in the event of a fault.

As a result, the choice of fuses F should ensure both short-circuit protection for the transformer and selectivity for the overcurrent devices connected downstream in the IT systems.

When selecting fuses, please observe both the maximum permissible values laid down by the guidelines that apply to the location of use and national and international standards, in order to ensure that the contactor contacts cannot weld. The considerations presented below are based on the standard DIN VDE 0100-710 (VDE 0100 Part 710):2002-11, section 710.537.6.

#### 4.1.1 Selecting a fuse with only one load



The circuit only has one load: the IT system transformer. Taking into consideration the explanation in section 710.537.6 as well as the manufacturer's technical data for the contactor, the maximum possible fuse (F1 or F2) for the contactor can be calculated as follows:

$$I_v = \text{Manufacturer's technical data regarding max. fuse} \times 0.45$$

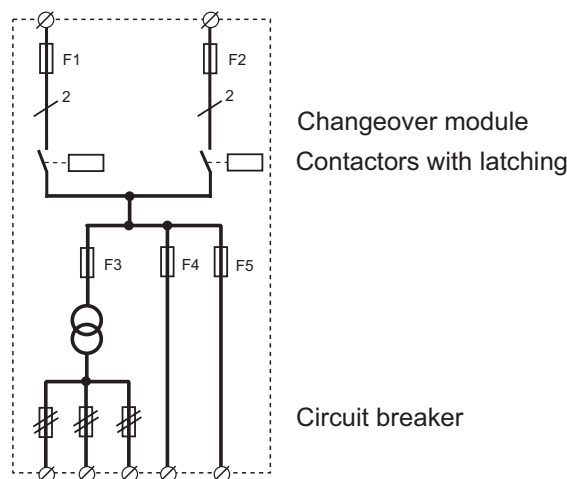
The fuse must match the fuse specified by the manufacturer of the selected IT system transformer.

The rated operational current  $I_e$  of the changeover module is calculated as follows:

$$I_e = \text{Manufacturer's technical data for the switching contact with consideration of AC-3 conditions} \times 0.45$$

This rated operational current must be greater than the rated operational current of the IT system transformer.

#### 4.1.2 Selecting a fuse with several loads



This circuit branches into several load groups. The result is that every fuse of every load group is moved downstream of the changeover module. Regardless of this, the maximum possible fuse is calculated in the same way as described above.

The rating of this fuse (F1 or F2) must be coordinated with the rating of fuse F3 (and of course F4 and F5) so that selective shutdown is ensured. The fuse specified by the manufacturer for the IT system transformer must therefore be at least two stages smaller in rating than the fuse calculated using the formula above for the changeover module. Of course, the total nominal current for the changeover module must be calculated from the sum and simultaneity factor of all load groups connected, and the required or minimum rated current calculated according to the formula above.

The values listed in the ordering information apply for the changeover modules.

## 4.2 Changeover and monitoring module

The power supply of Group 2 location is supplied via an isolating transformer. For protection against indirect contact, one of the following measures is to be used for the transformer:

- Protective insulation according to DIN VDE 0100-410 (VDE 0100 Part 410):2007-06, 413.2 (Use of a protection class II transformer)
- Protection by non-conductive location according to DIN VDE 0100-410 (VDE 0100 Part 410):2007-06, section 413.3
- Protection by a local, earth-free equipotential bonding according to DIN VDE 0100-410 (VDE 0100 Part 410):2007-06, section 413.4
- Protection by special installation. For this measure, please note the following:
  - The protection class I transformer must be installed isolated and must not be connected to the PE conductor. In Bender's ES710 range of transformers, the fixing angles are isolated from the transformer core.
  - A warning label is to be affixed to the transformer and its cover as follows:
 

Warning! Accessible parts of the transformer may be live. You must always verify that there is no voltage present before touching parts of it.
  - The transformer is to be installed behind a cover, which can only be opened using a tool or a special key. It must only be accessed by skilled persons.
  - The shield winding can be connected to the PE conductor. It must be ensured that the connecting wire is installed so that it is short-circuit proof and earth-fault proof.

### 4.2.1 Typical connection

Connect your changeover module to the supply sources as follows:

Preferred supply (line 1)	Terminals X1:1 and X1:2
Second supply (line 2)	Terminals X1:3 and X1:4

- Connect the primary winding of the transformer to the terminals X1:5 and X1:9 and the secondary winding to terminals X1:7 and X1:11. A cross section that conforms to DIN VDE 0100 Part 430 must be selected.

### 4.2.2 Information on the wiring diagram and circuit diagram

The pages that follow show the diagrams for the UFC107E-.. with 12 and 24 channels.

- The UFC107E-.. with 6 channels is the same as the UFC107E-.. with 12 channels, except that it is equipped with fewer components. At N20, channels 7...12 remain free.
- The UFC107E-.. with 18 channels is the same as the UFC107E-.. with 24 channels, except that it is equipped with fewer components. At N20 and N21 channels 10 ...12 remain free.

### 4.2.3 Wiring diagram UFC107E-.. with 12 channels

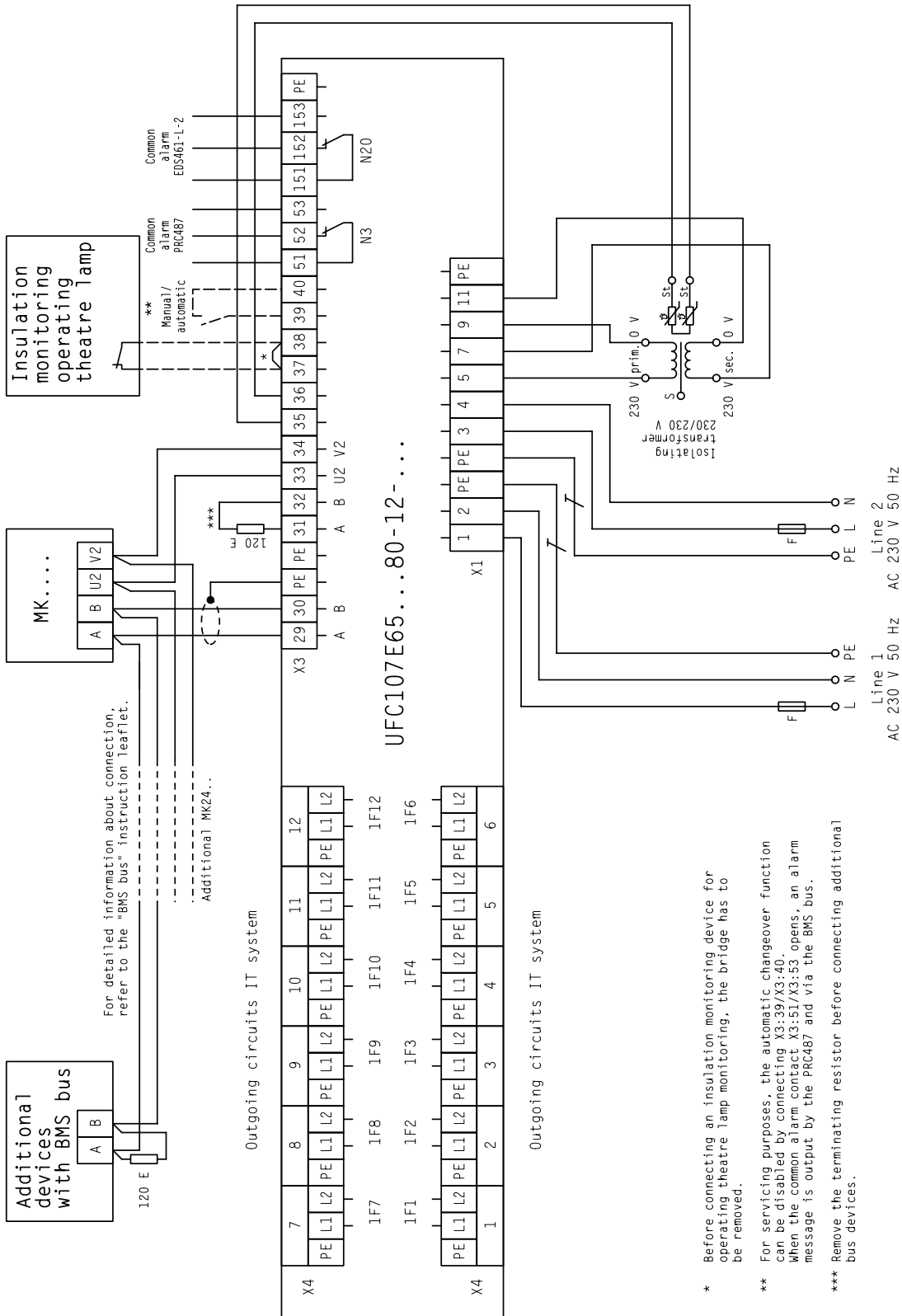


Fig. 4.1: Wiring diagram UFC107E-.. with 12 channels

### 4.2.4 Circuit diagram UFC107E-.. with 12 channels (part 1)

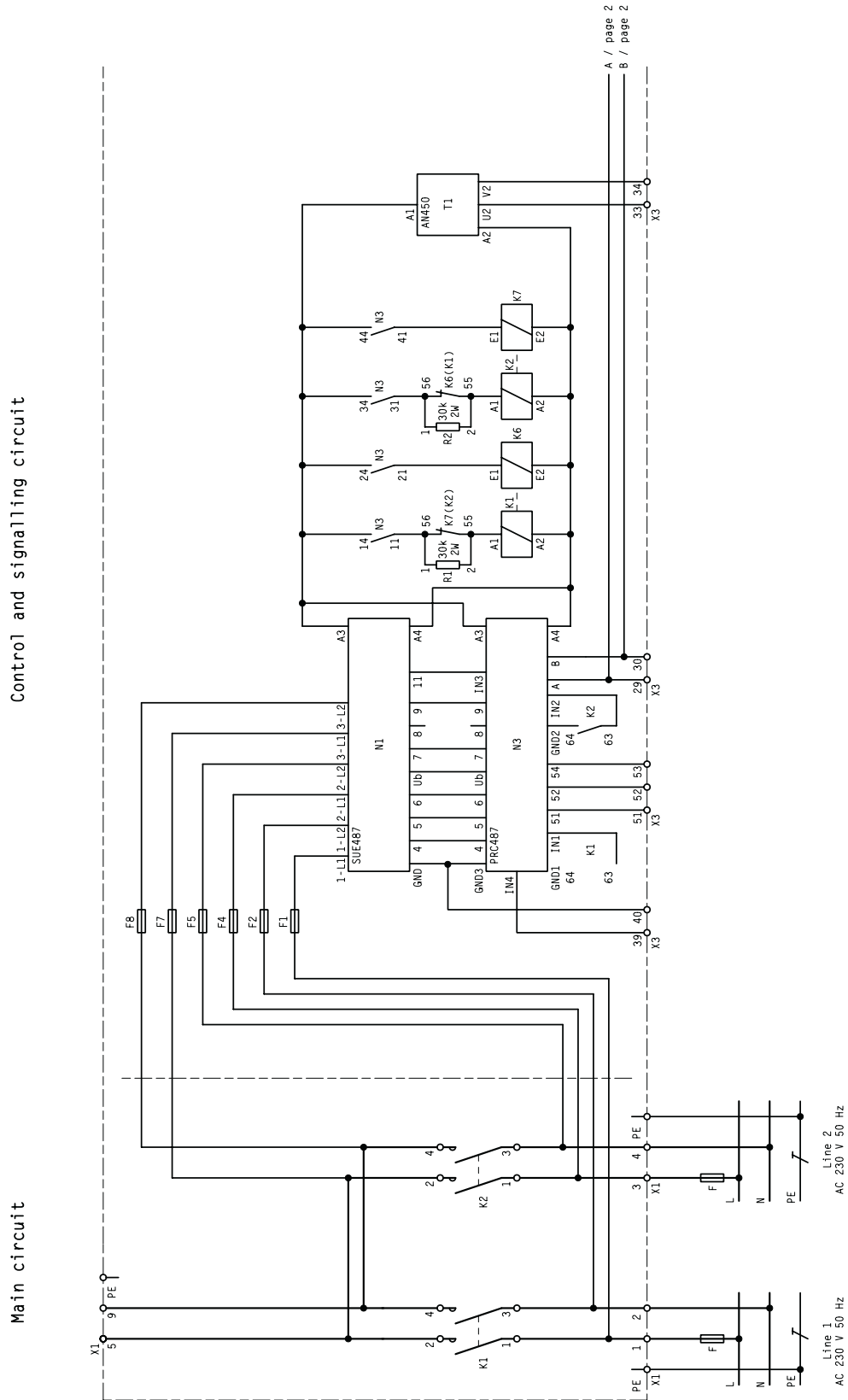


Fig. 4.2: Circuit diagram UFC107E-.. with 12 channels (part 1)



### 4.2.6 Wiring diagram UFC107E-.. with 24 channels

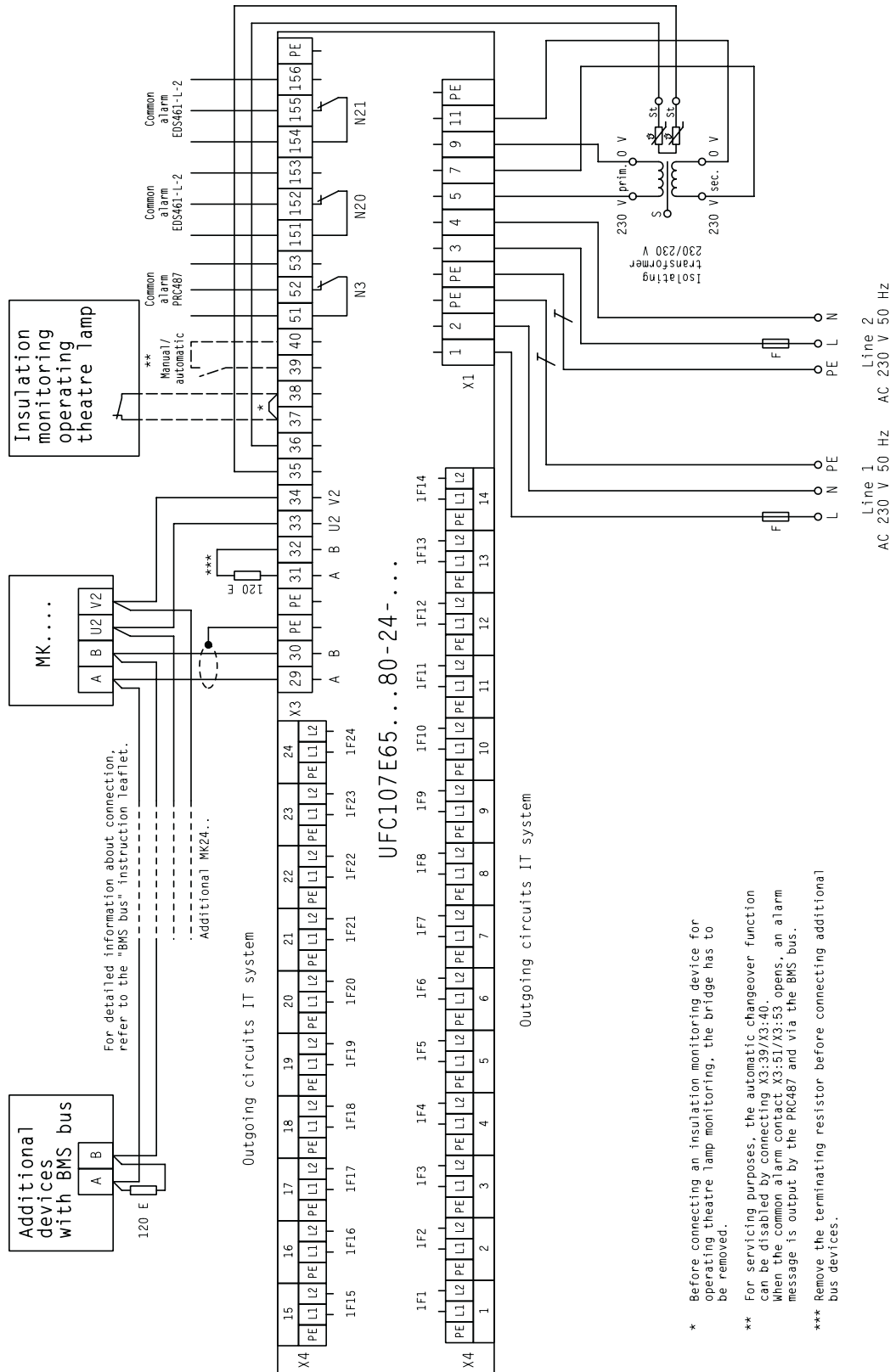


Fig. 4.4: Wiring diagram UFC107E-.. with 24 channels

## 4.2.7 Circuit diagram UFC107E-.. with 24 channels (part 1)

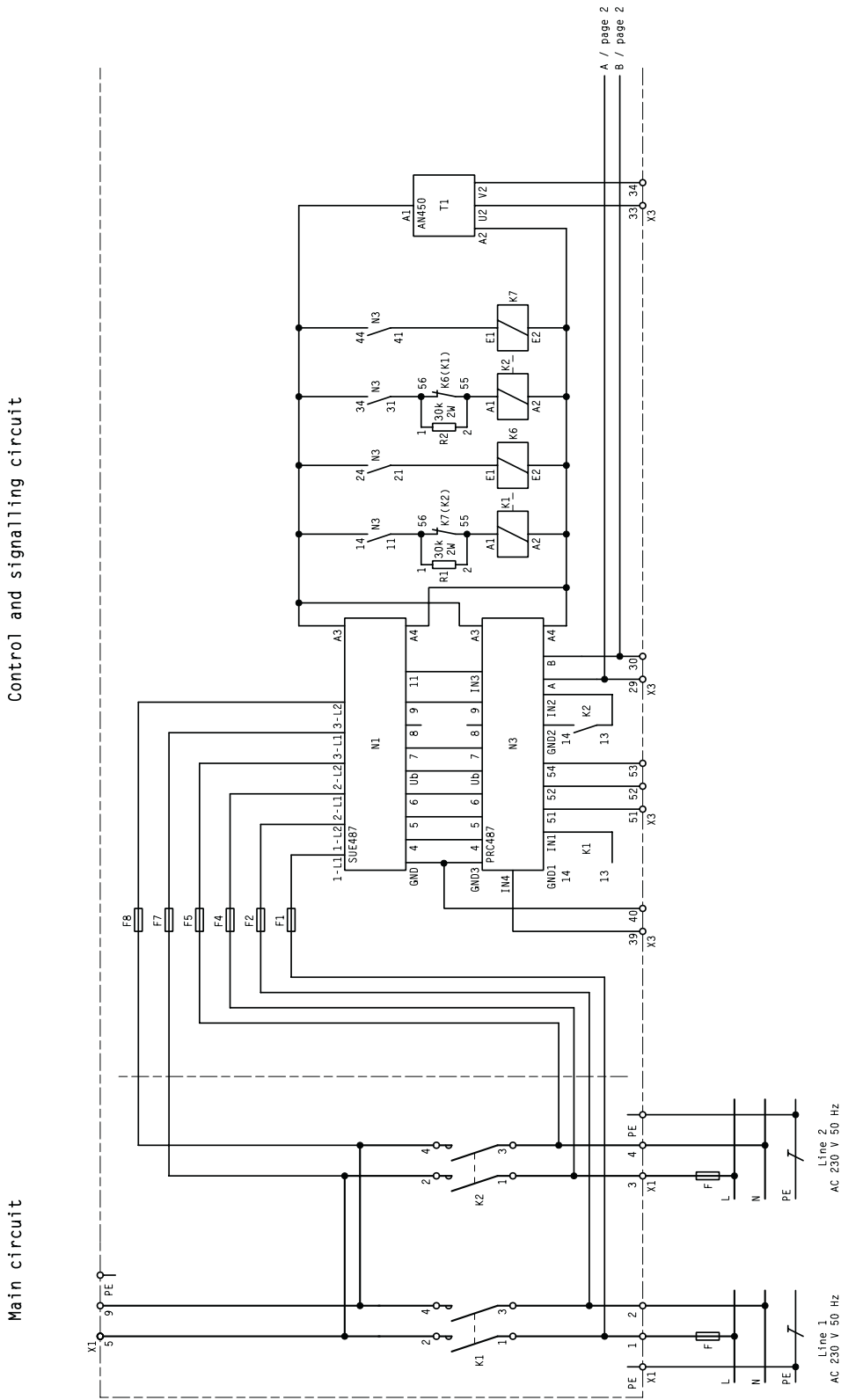


Fig. 4.5: Circuit diagram UFC107E-.. with 24 channels (part 1)



### 4.2.8 Circuit diagram UFC107E.. with 24 channels (part 2)

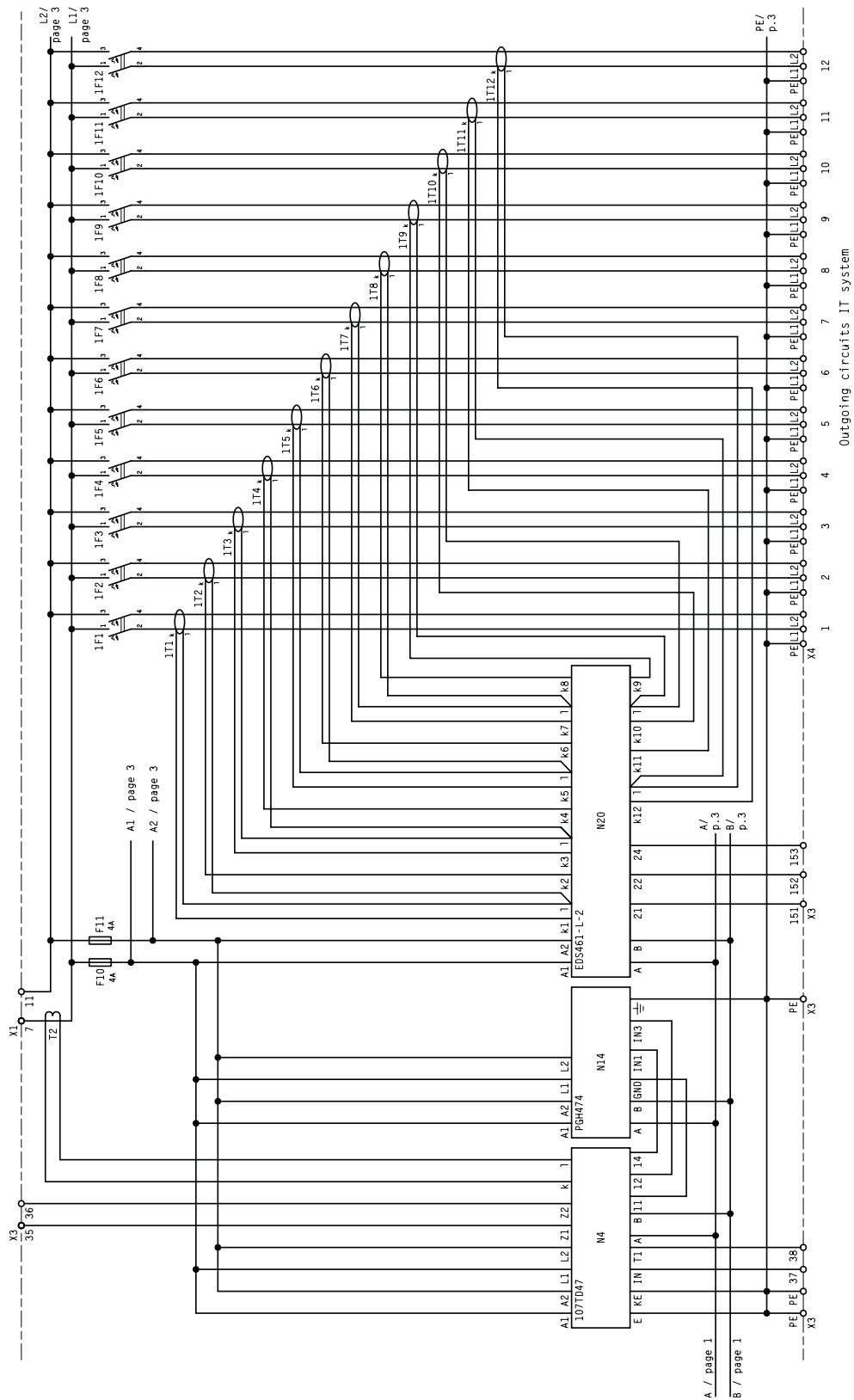


Fig. 4.6: Circuit diagram UFC107E.. with 24 channels (part 2)

### 4.2.9 Circuit diagram UFC107E-.. with 24 channels (part 3)

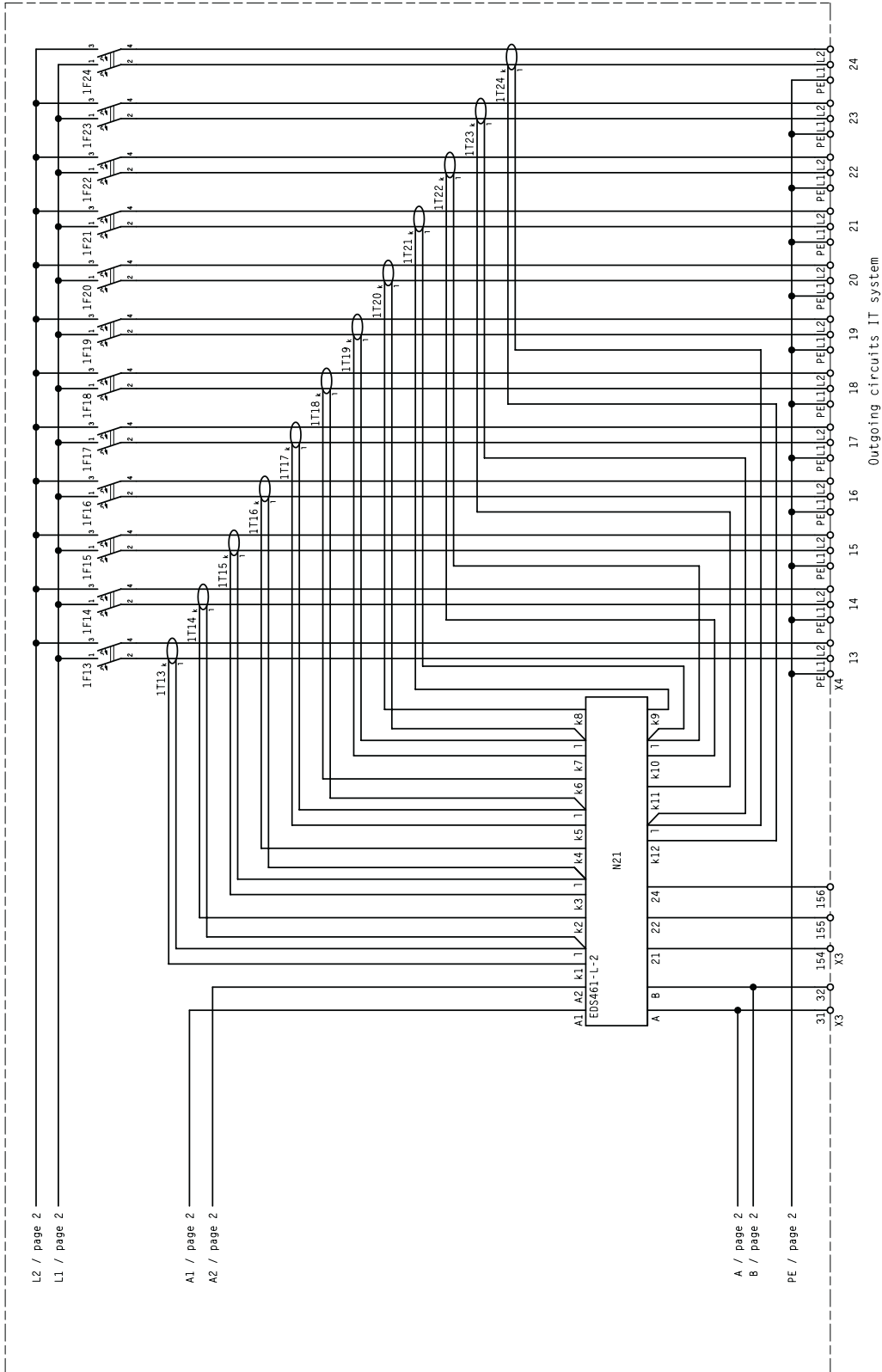


Fig. 4.7: Circuit diagram UFC107E-.. with 24 channels (part 3)

## 4.3 Instructions for connection

### 4.3.1 Temperature sensor

Bender IT system transformers are equipped with the temperature sensors required according to their insulation class. These temperature sensors (maximum of 6 sensors connected in series) are connected to terminals X3:35 and X3:36.

### 4.3.2 Alarm indicator and test combination

Ex works, the following pairs of terminals are provided for the connection of BMS bus devices:

X3:29 and X3:30 (A/B)

X3:31 and X3:32 (A/B terminals are terminated with 120  $\Omega$  at the factory)

Alarm indicator and test combinations, panels and other Bender-BMS-bus devices can be connected.

1. A BMS device or an existing BMS bus with several devices is connected to terminals X3:29 and X3:30:  
The last device at the other end of the bus must be terminated with 120  $\Omega$ .  
Terminals X3:31 and X3:32 remain terminated.
2. An existing BMS bus that has already been terminated on both ends, is disconnected; one open branch is connected to terminals X3:29 and X3:30, while the other one is connected to terminals X3:31 and X3:32:  
The 120  $\Omega$  resistor, provided ex works, must be removed and the open bus branches must be connected to the specified terminals.

Please read the information on cable routing in the "BMS bus" instruction leaflet.

The AN450 power supply unit can supply power to a maximum of 3 MK2418 or 2 MK2430 alarm indicator and test combinations via the terminals X3:33 and X3:34. In this respect, please refer to the documentation for the relevant devices. The AN450 is not suitable for supplying power to TM... operator panels.

### 4.3.3 SCADA system (Supervisory Control And Data Acquisition)

If messages from the UFC107E-.. changeover and monitoring module are to be transmitted to a SCADA system, you have the following options:

- Protocol converter (gateways)
- OPC server
- Common alarm via the relay outputs of the EDS461-L insulation fault evaluator and PRC487 control device
- Conversion between BMS bus and digital inputs and outputs by means of alarm indicator and operator panels (TM...) or signal converters (SMO480-12, SMO482-12, SMI 472-12).



## 5. Commissioning, settings and testing

### 5.1 Setting and testing according to the checklist

A total changeover time of  $t \leq 0.5$  s and switching back within five seconds to the preferred supply on voltage recovery is factory set.

The response time  $t(\text{off})$ , the idle time  $t(\text{K1-2})$  and the return transfer time  $t(\text{on})$  of the UMC107E-.. can be set and must be adjusted in line with the requirements of the specific application, the short-circuit calculation and the requirements of IEC 60364-7-710:2002-11, sections 556.5.2.2, 556.7 and 556.8 and DIN VDE 0100-710 (VDE 0100 Part 710):2002-11, section 710.537.6 (automatic changeover modules).

- The total off time permitted to occur (from the point at which the fault occurs until the arc in the overcurrent protective device is cleared) must be less than the minimum time delay for the changeover process of the automatic changeover module.  
Setting: Response time  $t(\text{off})$
- If several changeover modules are connected in series in a power supply system, it is recommended that they be time-graded.  
Setting: Response time  $t(\text{off})$ , idle time  $t(\text{K1-2})$  and return transfer time  $t(\text{on})$ .
- As part of the response delay (to be custom-set), you must, at the very least, take into account the periods of time when the circuit experiences short interruptions, and the response times of the short-circuit protective device connected upstream or downstream. Regardless of this, the idle time for the changeover process corresponding to the place of installation must be considered to prevent switching overvoltages.  
Setting: Response time  $t(\text{off})$  and idle time  $t(\text{K1-2})$ .

For this purpose, please consult the changeover time lapse diagram in the instruction leaflet for the PRC487 control device and make the settings required according to the description.

You will find a checklist in chapter "9. Manufacturer's certificate, checklist, circuit documentation". This list details the factory settings and the system-specific settings for the MEDICS<sup>®</sup> module. Please carry out all the work outlined in the list and log each test step.

The checklist contains:

- Visual inspection
- Commissioning, settings, factory settings
- Functional test

Keep this checklist with this manual in a location that is close to the MEDICS<sup>®</sup> module.

#### 5.1.1 Avoiding errors




---

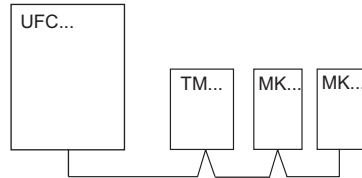
*Communication via the BMS bus can only be guaranteed when there is only one terminating resistor at the beginning and the end of the BMS bus. Additional terminating resistors can lead to malfunctions and therefore must not be used. Please also note the information in the "BMS bus" instruction leaflet.*

---

## 5.2 Assigning addresses-examples

Please also note the information in the "BMS bus" instruction leaflet.

**Example 1: A UFC107E-.. changeover and monitoring module with a TM indicator and operator panel and two alarm indicator and test combinations.**



### Device functions

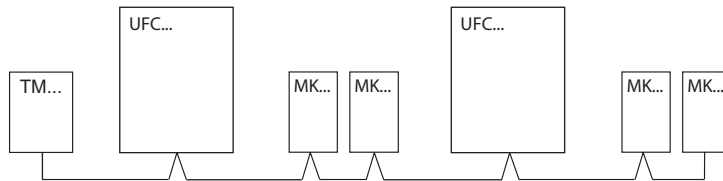
- TM... alarm indicator and operator panel
  - Displaying all UFC module messages
  - Displaying failure messages for both MK... combinations
  - Starting the test of the integrated A-ISOMETER® 107TD47 in the corresponding UFC module and displaying the results
- Two MK... alarm indicator and test combinations are assigned to the UFC module. Each MK... combination demonstrates the same functions.
  - Displaying all UFC module messages
  - Displaying failure messages for the other MK... combination
  - Starting the test of the integrated A-ISOMETER® 107TD47 in the corresponding UFC module and displaying the results

### Address setting for example 1

Device	Parameters	Address settings for a changeover module
107TD47	Bus address	3
PRC487	Address	4
TM...	Address	1
	Test address	3
	Alarm address	3, 4, 2*, 5*, 6**, (7**), 111
First MK...	Address	2
	Test address	3
	Alarm address	3, 4, 5*, 6**, (7**), 111

Device	Parameters	Address settings for a changeover module
<b>Second MK...</b>	Address	5
	Test address	3
	Alarm address	3, 4, 2*, 6**, (7**), 111
<b>PGH474</b>	Address	111
<b>EDS461-L</b>	Address	6, (7)

- \* The settings for the alarm addresses marked with an asterisk (\*) refer to reciprocal monitoring of MK... alarm indicator and test combinations.
- \*\* To obtain more detailed information about the EDS461-L channel affected by the alarm, we recommend custom-programming the alarm messages in the TM... and MK....
- ( ) The addresses in parentheses are only available for UFC107E-.. modules with more than 12 channels.

**Example 2: Two UFC107E-.. changeover and monitoring modules, each with two alarm indicator and test combinations and a TM alarm indicator and operator panel**

**Device functions**

- TM... alarm indicator and operator panel
  - Displaying all messages for both UFC modules
  - Displaying failure messages for four MK... combinations
  - Starting the test of the integrated A-ISOMETER® 107TD47 in the corresponding UFC module and displaying the results

Two MK... alarm indicator and test combinations are assigned to each UFC module.

- First MK... alarm indicator and test combination
  - Displaying all messages of the corresponding UFC module (as well as those of the EDS461-L insulation fault evaluator)
  - Displaying failure messages for the corresponding second MK... combination
  - Starting the test of the integrated A-ISOMETER® 107TD47 in the corresponding UFC module and displaying the results
- Second MK... alarm indicator and test combination
  - Displaying only the following messages of the corresponding UFC module: A-ISOMETER® 107TD47 and changeover module (not EDS461-L)
  - Displaying failure messages for the corresponding first MK... combination
  - Starting the test of the integrated A-ISOMETER® 107TD47 in the corresponding UFC module and displaying the results

**Address setting for example 2**

Device	Parameters	Address settings for the first changeover module	Address settings for the second changeover module
107TD47	Bus address	6	8
PRC487	Address	7	9
TM...	Address	1	
	Test address	6, 8	
	Alarm address	2*, 3*, 6, 7, 10**, (12**), 111, 112, 4*, 5*, 8, 9, 11**, (13**)	



Device	Parameters	Address settings for the first changeover module	Address settings for the second changeover module
First MK...	Address	2	4
	Test address	6	8
	Alarm address	6, 7, 3*, 10**, (12**), 111	8, 9, 5*, 11**, (13**), 112
Second MK...	Address	3	5
	Test address	6	8
	Alarm address	6, 7, 2*	8, 9, 4*
PGH474	Address	111	112
EDS461-L	Address	10, (12)	11, (13)

- \* The settings for the alarm addresses marked with an asterisk (\*) refer to reciprocal monitoring of MK... alarm indicator and test combinations.
- \*\* To obtain more detailed information about the EDS461-L channel affected by the alarm, we recommend custom-programming the alarm messages in the TM... and MK....
- ( ) The addresses in parentheses are only available for UFC107E-.. modules with more than 12 channels.



## 6. Trouble shooting

### 6.1 PRC487 error messages

If a fault occurs, the MEDICS<sup>®</sup> system messages will enable you to narrow down the possible causes. Some messages can have several causes. The following possible errors are indicated by messages in the PRC487 display.

If you cannot trigger a test function on the PRC487, an alarm message may already be pending, or there may be an open circuit at terminal 9-Ub of the PRC487.

PRC message	Possible causes
Failure line 1	Power supply failure on line 1. SUE487 failure. Open circuit, terminal 6-GND3. Defective fuse 1-L1, 1-L2.
Failure line 2	Power supply failure on line 2. SUE487 failure. Open circuit, terminal 5-GND3. Defective fuse 2-L1, 2-L2.
Failure distribution board	Power supply failure downstream of the changeover module. SUE487 failure. Open circuit terminal 4-GND3
Failure K3	Failure of the internal relay K3 (SUD487). Open circuit terminal IN3-GND3
K1/2 manual mode	Contactors control has been changed to manual mode. Automatic changeover will no longer be performed!
Short-circuit distribution board	Short-circuit downstream of changeover module. Following a failure on line 1 and changeover to line 2, line 2 drops out and voltage is present on line 1 again.
Wire break K1 on	Open circuit when controlling K1 via terminals 11/14 of the PRC487, auxiliary contact K2 or resistor R1.
Wire break K1 off	Open circuit when controlling K1 via terminals 21/24 of the PRC487 for the purpose of shutting down the latching module.
Wire break K2 on	Open-circuit when controlling K2 via terminals 31/34, auxiliary contact K1 or resistor R2.
Wire break K2 off	Open circuit when controlling K2 via terminals 41/44 of the PRC487 for the purpose of shutting down the latching module.
Fault K1 on	K1 cannot be activated. K1 is jammed. Open circuit, auxiliary contact at terminal GND1 or IN1 of PRC487.
Fault K1 off	K1 cannot be switched off via latching module. K1 is jammed. Open circuit, auxiliary contact at terminal GND1 or IN1 of PRC487.
Fault K2 on	K2 cannot be activated. K2 is jammed. Open circuit, auxiliary contact at terminal GND2 or IN2 of PRC487.
Fault K2 off	K2 cannot be deactivated via latching module. K2 is jammed. Open circuit, auxiliary contact at terminal GND2 or IN2 of PRC487.

PRC message	Possible causes
Failure K1	K1 on, but no voltage downstream of K1. Open circuit, main contacts K1 or line upstream or downstream of K1. SUE487 failure.
Failure K2	K2 on, but no voltage downstream of K2. Open circuit, main contacts K2. SUE487 failure. Open circuit terminal 4-GND3.
RS-485 fault	Undefined characters on the BMS bus. There is more than one master in the network. More than one slave has the same address. Interface (A,B) polarity is incorrect.
No MASTER	There is no master. No alarm indicator and test combination or operator panel connected. Bus line interrupted.
EEPROM fault	Defective EEPROM or impermissible value stored in EEPROM.
CV460 fault	Settings made in SETUP OPTION menu, even though no CV460 is connected.
RK474 fault	Settings carried out in the SETUP OPTION menu, although no RK474 was connected.

You can find additional information on messages in the instruction leaflets for the

- PRC487 control device
- 107TD47 A-ISOMETER®
- PGH474 insulation fault test device
- EDS461-L insulation fault evaluator

these are included in chapter "9. Manufacturer's certificate, checklist, circuit documentation" of this operating manual.

## 6.2 Fuses F1...F11



Caution

*If fuses F1 to F11 are tripped, there may be a defect in the changeover module. These fuses should only be replaced following consultation with Bender.*

### Technical data fuses F1 to F11

Tripping current.....	4 A, time lag
Breaking capacity .....	10 kA
ELU type .....	189140
Dimensions.....	6.25 x 32 mm

## 7. Periodic verification and service

### 7.1 Periodic verification

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

Test	To be performed by	Interval
Functional test of 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 module*: Test of the automatic changeover modules. Please observe the information in chapter "Testing the changeover module"!	Skilled person	every 6 months
Functional test of the IT system monitoring (insulation, load current, transformer temperature and connection monitoring) on the insulation monitoring device.	Skilled person	every 6 months
Testing the set values and the changeover periods	Skilled person	every 12 months
Testing of the changeover module, the IT system monitoring, the connection to the SCADA system (Supervisory Control And Data Acquisition) (if applicable) and the interaction of the components in the system. This test includes the following services: - Inspection: Marking, display elements, mechanical components, wiring, parameterisation, connection of third-party equipment, evaluation of fault memory - Measurement: Internal/external supply voltages/potentials, bus voltage, bus protocol, bus scan - Practice test: Device function, device communication - Documentation: Test results, recommendations for remedial action	Bender Service	every 24 months

\* This test must only be performed by an electrically skilled person who has been commissioned to do so in agreement with the person responsible for the medical location.

Before carrying out the tests, please refer to the instructions relating to the functional tests in the checklist. 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):2002-11, section 710.62.

### 7.1.1 Testing the changeover module

Step	Response
Disconnect line 1: 1. Disconnect the fuse switch disconnecter or fuse or 2. Remove fuse F1 or 3. Remove the microfuse on the SUE487/SUD487	1. Changeover to line 2 2. Alarm message "Failure line 1" 3. Message on PRC487: "K1off, K2on"
Reconnect line 1	1. Changeover to line 1 after delay time t(on). 2. Alarm message "Failure line 1"* goes out 3. Message on PRC487: "K1on, K2off" Exception: If an automatic switching back interlocking function is active, the changeover module remains on line 2 and displays the message "interlocking". To clear the switching back interlocking function, interrupt the connection between contacts X3:40 and X3:57.
Disconnect line 2	1. Alarm message "Failure line 2"* 2. Message on PRC487: "K1on, K2off"
Reconnect line 2	1. Alarm message "Failure line 2"* goes out 2. Message on PRC487: "K1on, K2off"
TEST on PRC487: Press the TEST button, RESET button and MENU button in sequence	1. Changeover to line 2. Display: "** TEST **" 2. Changeover to line 1 after t(on). 3. Display of changeover period "t 1->2: xxxxms" **
To return to the standard display, press the MENU button	Message on PRC487: "K1on, K2off"

- \* Or corresponding parameterised text. Alarm messages are also transferred via bus or alarm contacts to TMs, MKs or the building services control system. Test, if necessary.
- \*\* Up to a maximum of 15 s; above this no indication possible.

## 7.2 Service

Bender would be delighted to provide on-site service for commissioning and periodic verification. Please contact our Service Department for more information:

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

Carl-Benz-Straße 10 • 35305 Grünberg • Germany  
 Tel: +49 6401 807-760 • Fax: +49 6401 807-629  
 E-Mail: info@bender-service.com • www.bender-de.com

## 7.3 Maintenance

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

## 8. Data

### 8.1 TÜV test report

In 2003, the TÜV Süddeutschland, Bau und Betrieb GmbH, based in Munich, Germany, tested the changeover and monitoring modules in the MEDICS® UMC107E-.. system range. The UFC107E-.. modules are the same as the UMC107E-.. modules in terms of function and design, but have the additional feature of an insulation fault location system.

		
<b>Technischer Bericht</b>		
<b>Auftraggeber</b>	Fa. Dipl.-Ing. W. Bender GmbH & Co. KG Londorfer Str. 65 D – 35305 Grünberg	<b>Bau und Betrieb</b>  <b>Fachbereich</b> <b>Elektro- und Gebäudetechnik</b>  <b>Weestendstraße 199</b> <b>D-80686 München</b> <b>Telefon (0 89) 57 91-2432</b> <b>Telefax (0 89) 57 91-2425</b> <b>www.tuev-sued.de</b> <b>E-mail Raimund.Gebhart</b> <b>@tuev-sued.de</b> <b>München, 2003-09-15</b> <b>BB-EG1-MUC/geb</b> <b>Bender_UMC107E_030915_Nach</b> <b>prüfung_Rev02_Teil 710_SUE</b> Das Dokument besteht aus: 5 Seiten  TÜV Süddeutschland Bau und Betrieb GmbH Aufsichtsratsvorsitzender: Dr. Axel Stepken Geschäftsführer: Roland Ayx Dr. Udo Heisel Sitz: München Amtsgericht München HRB 96 869  Die auszugsweise Wiedergabe des Dokumentes und die Verwendung zu Werbezwecken bedürfen der schriftlichen Genehmigung der TÜV Süddeutschland Bau und Betrieb GmbH.  Weitere Hinweise, Einschrän- kungen, etc. bezüglich der durchgeführten Prüfung siehe Abschnitte „Ergebnis der Prüfung“ und „Zusammen- fassung“  Die Prüfergebnisse beziehen sich ausschließlich auf die untersuchten Prüfgegenstände.
<b>Auftragsnummer</b>	238591-5704793-1613271 – Rev. 02	
<b>Gegenstand</b>	MEDICS UMC 107 E - xx (Upgraded) MEDICS UMC 107 E - xx - OL (Upgraded) MEDICS UMC 108 E - xx (Upgraded)	
<b>Art der Untersuchung</b>	Prüfung auf Übereinstimmung der MEDICS- Umschalt- und Überwachungsmodulen mit den Mindestanforderungen der DIN VDE 0100 Teil 710, Abschnitt 710.521.6 und Abschnitt 710.537.6.2.	
<b>Sachverständiger</b>	Dipl. Ing. Raimund Gebhart	
<b>Datum</b>	2003-09-15	
<b>Zusammenfassung</b>	<p>Die Umschalt- und Überwachungsmodulen für medizinisch genutzte Räume vom Typ MEDICS UMC 107 E - xx (Upgrade) erfüllen die Anforderungen an selbsttätige Umschalteinrichtungen gemäß DIN VDE 0100 Teil 710, Abschnitt 710.521.6 und Abschnitt 710.537.6.2.</p> <p>Aufgrund des gleichen Aufbaus und der Verwendung von baugleichen Überwachungsgeräten in den Typen der Reihe MEDICS UMC 107 - xx -OL und UMC 108 - xx kann das Prüfergebnis auch auf diese Typen übertragen werden (<b>weitere wichtige Hinweise siehe Bericht</b>).</p>	
<b>Abteilung Elektrotechnik</b>	<b>Der Sachverständige</b>	
 ..... Thomas Wurl	 ..... Raimund Gebhart	
		

The complete test report is available at Bender.

## 8.2 Standards

The changeover and monitoring module conforms to the following standards:

- DIN VDE 0100-710 (VDE 0100 Part 710):2002-11
- DIN VDE 0100-725 (VDE 0100 Part 725):1991-11
- DIN VDE 0100-718 (VDE 0100-718):2005-10
- ÖVE/ÖNORM E8007:2007-12
- IEC 60364-7-710:2002-11
- DIN EN 61557-8 (VDE 0413 Part 8):2007-12
- IEC 61557-8:2007-01
- EN 61557-8:2007-07
- DIN EN 60439-1 (VDE 0660 Part 500):2005-01

## 8.3 Manufacturer's certificate

As part of the scope of supply for the changeover and monitoring module, you will find a manufacturer's certificate in chapter "9. Manufacturer's certificate, checklist, circuit documentation" of this manual.

## 8.4 Technical data

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

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

### Voltage ranges

Nominal system voltage $U_n$ .....	AC 230 V
Rated frequency $f_n$ .....	50...60 Hz
Supply voltage $U_S$ .....	AC 230 V
Operating range of $U_S$ .....	0.8...1.15 x $U_S$
Frequency range of $U_S$ .....	50...60 Hz

### Power section/ switching elements

Switching elements .....	latched contactors
Adjustable changeover period .....	< 0.5... 20 s
Rated operational current $I_e$ .....	see ordering data
Rated operational voltage $U_e$ .....	AC 230 V
Frequency of $U_e$ .....	50 ... 60 Hz
Operating range of $U_e$ .....	0.8...1.15 x $U_e$

### Voltage monitoring

Adjustable undervoltage response value .....	0.7 ... 0.9 x $U_e$
Response value overvoltage .....	1.15 x $U_e$
Response time $t_{an}$ .....	50 ... 250 ms
Response time t(off) can be adjusted in 50 ms increments .....	0 ... 9950 ms
Return transfer time t(on) can be adjusted in 1 s increments .....	0 ... 249 s
Idle time, can be set in 50 ms increments .....	0 ... 9950 ms

### Insulation monitoring

Response value $R_{anr}$ , adjustable .....	50 ... 500 k $\Omega$
Hysteresis .....	< 25 %



Response time $t_{an}$ where $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$ .....	< 3 s
Max. permissible system leakage capacitance $C_e$ .....	< 1 $\mu F$
Measuring voltage $U_m$ .....	12 V
Measuring current $I_m$ max. (where $R_F = 0 \Omega$ ) .....	< 50 $\mu A$
Internal DC resistance $R_i$ .....	> 240 k $\Omega$
Impedance $Z_i$ at 50 Hz .....	> 200 k $\Omega$
Max. permissible extraneous DC voltage $U_{fg}$ .....	DC 375 V

### Overload monitoring

Adjustable response value .....	5 ... 50 A
Hysteresis .....	4 %
Temperature influence .....	< 0.15 % / °C

### Overtemperature monitoring

Response value .....	4 k $\Omega$
Release value .....	1.6 k $\Omega$
PTC resistors acc. to DIN 44081 .....	max. 6 in series

### Insulation fault location system

Test current $I_T$ .....	$\leq 1$ mA
Evaluating current $I_E$ .....	$\geq 0.5$ mA
CT type .....	W10/8000
Test cycle/idle time .....	2 s / 4 s
Scan time for 12 or 24 channels .....	approx. 10 s
Number of measuring channels .....	see ordering data

### Interfaces

Interface/protocol .....	RS-485/BMS
Connection .....	terminals A/B
Max. cable length .....	$\leq 1200$ m
Recommended cable (shielded, shield connected to PE on one side) .....	at least J-Y(St)Y 2 x 0.6
Terminating resistor .....	120 $\Omega$ (0.25 W)
Device address, BMS bus .....	PRC487: 2 ... 90, 107TD47: 2 ... 90
.....	PGH: 111 ... 119, EDS: 1 ... 90
Factory device address .....	PRC487: 4, 107TD47: 3, PGH: 111, EDS: 5 (6)

### Switching elements

Number .....	2 relays, each with 1 changeover contact
Operating principle .....	NC / N/O operation (N/O operation)*
Electrical service life, number of cycles .....	10.000
Contact data acc. to IEC 60947-5-1 .....	
Utilisation category .....	AC-13 AC-14 DC-12 DC-12 DC-12
Rated operational voltage .....	230 V 230 V 24 V 110 V 220 V
Rated operational current .....	5 A 3 A 1 A 0.2 A 0.1 A
Minimum contact rating .....	1 mA at AC / DC $\geq 10$ V

### General data

EMC immunity .....	acc. to EN 61000-6-2
EMC emission .....	acc. to EN 61000-6-4
Shock resistance IEC 60068-2-27 (device in operation) .....	15 g / 11 ms
Bumping IEC 60068-2-29 (during transport) .....	40 g / 6 ms
Vibration resistance IEC 60068-2-6 (device in operation) .....	1 g / 10 ... 150 Hz
Vibration resistance IEC 60068-2-6 (device not in operation) .....	2 g / 10 ... 150 Hz
Ambient temperature during operation .....	-10 °C...+50 °C
Ambient temperature for storage .....	-40 °C...+70 °C
Climatic class acc. to DIN IEC 60721-3-3 .....	3K5
Operating mode .....	continuous operation

Mounting position.....vertical

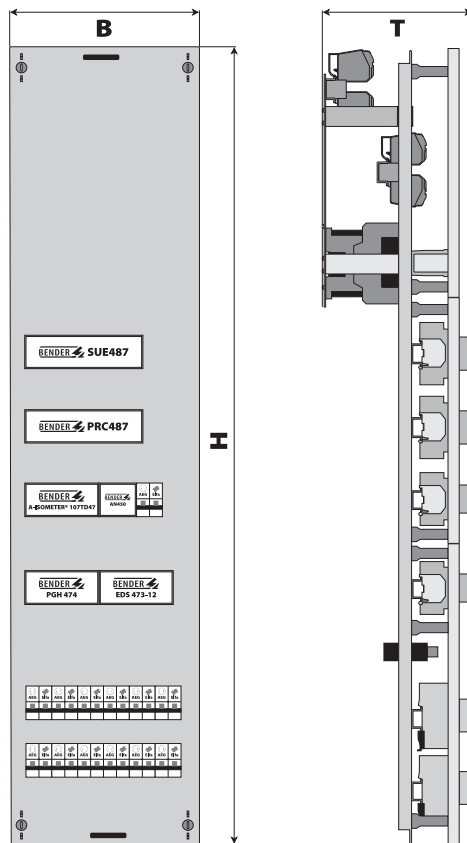
**Power section connection type**

Cage-clamp spring terminal (at  $I_e < 65$  A, AC3)..... 1.5 ... 16 mm<sup>2</sup> (AWG 16-6)  
 Tightening torque ..... 0.5 ... 0.6 Nm (4.3 ... 5.3 lb-in)  
 Cage-clamp spring terminal (at  $I_e \geq 65$  A, AC3)..... 6 ... 35 mm<sup>2</sup> (AWG 28-12)  
 Tightening torque ..... 0.5 ... 0.6 Nm (4.3 ... 5.3 lb-in)

**Control section connection type**

Cage-clamp spring terminal..... 0.08 ... 2.5 mm<sup>2</sup>  
 Degree of protection, internal components (IEC 60529)..... IP30  
 Degree of protection, terminals (IEC 60529) ..... IP20  
 Protection class .....Class I  
 Mounting into standard distribution panels ..... see table "Dimensions and weights"  
 Flammability class..... UL94V-0  
 Power consumption..... see ordering information  
 Approximate weight ..... see table "Dimensions and weights"

**8.4.1 Dimension and weights**



**Overview of dimensions and weights**

Design	Dimension W/ mm	Dimension H / mm	Dimension D* / mm	Weight/ kg	Panels/ rows
UFC107E65-06-B10	250	1200	220	19 kg	1/8
UFC107E65-06-B16	250	1200	220	19 kg	1/8
UFC107E65-12-B10	250	1350	220	23 kg	1/9
UFC107E65-12-B16	250	1350	220	23 kg	1/9
UFC107E65-18-B16	500	750	220	25 kg	2/5
UFC107E65-24-B16	500	900	220	26 kg	2/6
UFC107E65-36-B16	500	1200	220	29 kg	2/8
UFC107E80-06-B10	250	1200	220	22 kg	1/8
UFC107E80-06-B16	250	1200	220	22 kg	1/8
UFC107E80-12-B10	250	1350	220	26 kg	1/9
UFC107E80-12-B16	250	1350	220	26 kg	1/9
UFC107E80-18-B16	500	750	220	28 kg	2/5
UFC107E80-24-B16	500	900	220	29 kg	2/6

\*Recommended cabinet depth: 300 mm

## 8.5 Ordering information

Type	Outgoing circuits	Circuit breaker*	Nominal current (AC-3) changeover-module	Max. perm. current acc. to DIN VDE 0100-710	Max. perm. fuse	Recommended transformer power	Power consumption	Art. No.
UFC107E65-06-B10	6	B10	65 A	29 A	80 A	3.15 ... 6.3 kVA	51 W	B 9205 4004
UFC107E65-06-B16	6	B16	65 A	29 A	80 A	3.15 ... 6.3 kVA	51 W	B 9205 4000
UFC107E65-12-B10	12	B10	65 A	29 A	80 A	3.15 ... 6.3 kVA	51 W	B 9205 4005
UFC107E65-12-B16	12	B16	65 A	29 A	80 A	3.15 ... 6.3 kVA	51 W	B 9205 4001
UFC107E65-18-B16	18	B16	65 A	29 A	80 A	3.15 ... 6.3 kVA	54 W	B 9205 4002
UFC107E65-24-B16	24	B16	65 A	29 A	80 A	3.15 ... 6.3 kVA	54 W	B 9205 4003
UFC107E65-36-B16	36	B16	65 A	29 A	80 A	3.15 ... 6.3 kVA	56 W	B 9205 4006
UFC107E80-06-B10	6	B10	80 A	42 A	100 A	8 kVA	57 W	B 9205 4014
UFC107E80-06-B16	6	B16	80 A	42 A	100 A	8 kVA	57 W	B 9205 4010
UFC107E80-12-B10	12	B10	80 A	42 A	100 A	8 kVA	57 W	B 9205 4015
UFC107E80-12-B16	12	B16	80 A	42 A	100 A	8 kVA	57 W	B 9205 4011
UFC107E80-18-B16	18	B16	80 A	42 A	100 A	8 kVA	60 W	B 9205 4012
UFC107E80-24-B16	24	B16	80 A	42 A	100 A	8 kVA	60 W	B 9205 4013

## 9. Manufacturer's certificate, checklist, circuit documentation

The individual documents compiled for your MEDICS® module consist of:

- Manufacturer's certificate
- Commissioning checklist
- If necessary:
  - Connection diagrams
  - Circuit diagrams

This manual contains the instruction leaflets for the individual MEDICS® module components.



# INDEX

## A

assigning addresses -examples 30

## B

BMS bus 10

## C

changeover and monitoring module 11  
checklist 29  
commissioning 29  
common alarm 12  
connection 19

## D

device-specific safety information 8

## F

factory setting 29  
functional test 37  
fuses 17

## G

gateway 10

## I

insulation monitoring 11  
intended use 7  
isolating transformer 19

## L

latching 10  
line 3 10  
load 18  
load current measurement 11  
load groups 18

## M

maintenance 38  
manufacturer's certificate 40

MEDICS® 9  
messages 35  
monitoring 11

## O

operating theatre light 11  
ordering information 44

## P

periodic verification 37  
persons 7  
power supply 12, 19  
preferred supply 11  
protocol converter 10, 27

## R

relay outputs 10  
response time 29

## S

SCADA system 27  
second supply 10  
selective operation 8  
selectivity 17  
service 38  
settings 10, 29  
short-circuit protection 17  
system components 5, 13

## T

technical data 40  
temperature sensor 27  
test report 39  
total off-time 10  
transformers for the IT system 17  
trouble shooting 35

## W

warning label 19

**Dipl.-Ing. W. Bender GmbH & Co.KG**

Londorfer Str. 65 • 35305 Grünberg • Germany  
Postfach 1161 • 35301 Grünberg • Germany

Tel.: +49 6401 807-0

Fax: +49 6401 807-259

E-Mail: [info@bender-de.com](mailto:info@bender-de.com)

Web: <http://www.bender-de.com>





## Steuergerät für Umschalteinrichtungen

Deutsch

### Bestimmungsgemäße Verwendung

Das Steuergerät PRC487 dient zur zentralen Steuerung von Medics-Modulen der Baureihen UMC..., USC... und UFC... Medics-Module sind besonders geeignet zur Überwachung und Umschaltung der Stromversorgung von medizinisch genutzten Räumen nach DIN VDE 0100-710: 2002-11.

Diese Anleitung beschreibt PRC487 mit der eingebauten Softwareversion 1.92.

### Sicherheitshinweise allgemein

Montage, Anschluss und Inbetriebnahme nur durch Elektrofachkraft!

Beachten Sie unbedingt:

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

### Funktionsbeschreibung

Das PRC487 steuert die Schaltorgane und überwacht sie auf Drahtbruch und Schaltzustand.

Die elementaren Funktionen des PRC487 sind doppelt vorhanden: Zum einen als elektronische Schaltung innerhalb der Systemkomponenten und zum anderen als Funktionen der Firmware. Dadurch werden undefinierte Schaltzustände verhindert. Das Steuergerät PRC487 kommuniziert direkt mit dem Spannungsüberwachungsgerät SUE487 (einphasige Systeme) bzw. SUD487 (dreiphasige Systeme).

Status- und Fehlermeldungen des Medics-Moduls werden im Display des PRC487 angezeigt. Diese Meldungen werden über den BMS-Bus zur angeschlossenen Melde- und Prüfkombination MK24.. oder zum TM-Bedientableau übertragen und dort ebenfalls angezeigt.

Über die Bedienmenüs des PRC487 werden alle Parameter für das Medics-Modul eingestellt. Ein Teil der Einstellungen ist mit einem Passwort geschützt.

### Bedienelemente

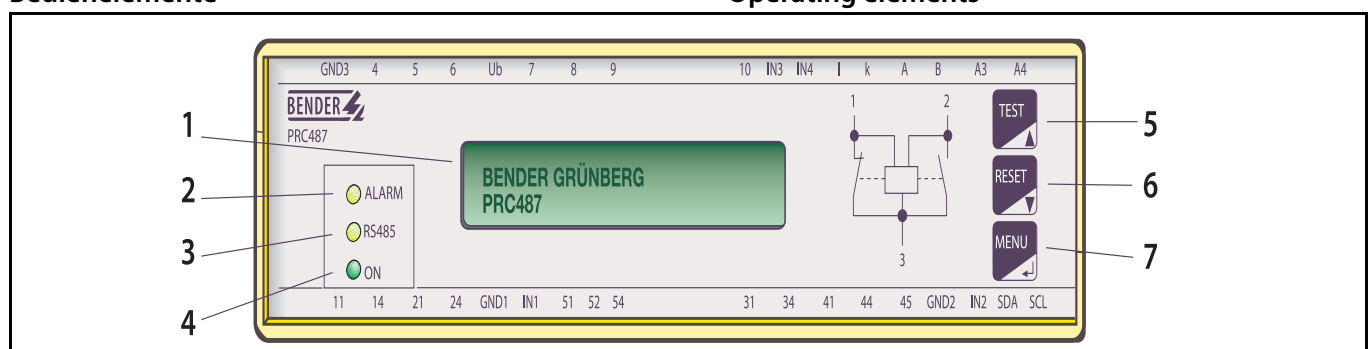


Abb. 1: Bedienelemente

## Control device for switchover modules

English

### Intended use

The intended use of the control device PRC487 is the central control of MEDICS modules, such as UMC..., USC... and UFC... MEDICS modules are designed to monitor and switchover power supplies in medically used rooms according to IEC 60364-7-710.

This instruction leaflet describes the PRC487 with integrated software version 1.92.

### Safety information

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

Particular attention shall be paid to:

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

### Function

The PRC487 controls the switching elements and monitors them for open circuit and switching condition.

The essential functions of the PRC487 are provided within the system components as hard-wired electronic and also as firmware functions. That avoids undefined switching conditions. The control device PRC487 communicates directly with the voltage monitoring device SUE487 (single-phase systems) respectively SUD487 the (three-phase systems).

Status and fault messages from the Medics module are shown on the display of the PRC487. These messages are transmitted to the connected alarm indicator and test combination MK24.. or the TM operator panel via the BMS bus and are also displayed on this.

All the parameters for the Medics module are set via the operating menus on the PRC487. Essential settings are protected by a password.

### Operating elements

Figure 1: Operating elements

### Legende der Bedienelemente

- 1 Beleuchtete Text-Anzeige (2 x 16 Zeichen).
- 2 LED „ALARM“ (gelb) leuchtet wenn ein Ansprechwert überschritten wurde oder ein Fehler erkannt wurde.
- 3 LED „RS485“ (gelb) informiert über Aktivitäten auf dem BMS-Bus.
- 4 LED „ON“ (grün) leuchtet, wenn Gerät im Betrieb ist.
- 5 Im Anzeige-Modus: Öffnet das TEST-Menü, in dem eine Umschaltung von Leitung 1 auf Leitung 2 ausgelöst werden kann.  
Im Menü-Modus: Pfeiltaste zur Navigation innerhalb der Menüs und zum Ändern von Parametern.
- 6 Im Anzeige-Modus: Zum Rücksetzen (RESET) von bestimmten Alarmmeldungen.  
Im Menü-Modus: Pfeiltaste zur Navigation innerhalb der Menüs und zum Ändern von Parametern.
- 7 MENÜ-Taste zum Wechsel vom Anzeige-Modus in den Menü-Modus.  
Im Menü-Modus: ENTER-Taste zur Bestätigung der ausgewählten Menüpunkte bzw. zur Bestätigung der ausgewählten Parameter.

### Legend to operating elements

- 1 Illuminated text display (2 x 16 characters) .
- 2 "ALARM" LED (yellow) lights up when the response value has been exceeded or a fault has been detected.
- 3 LED "RS485" (yellow) signals activities on the BMS bus.
- 4 "ON" LED (green) lights up when the device is in operation.
- 5 In the display mode: to start the TEST menu. Pressing causes a switchover from line 1 to line 2.  
In the Menu mode: arrow key for navigation within the menus and to change the parameters.
- 6 In the display mode: to reset alarm messages.  
In the Menu mode: arrow key for navigation within the menus and to change parameters.
- 7 Menu key to change from the display mode to the Menu mode.  
In the Menu mode: ENTER key to confirm the selected menu items or to confirm the selected parameters.

### Montage und Anschluss



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



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

### Montage

Das Gerät ist für folgende Einbauarten geeignet:

- Installationsverteiler nach DIN 43 871 oder
- Schnellmontage auf Hutprofilschiene nach IEC 60715:1995-10
- oder Schraubmontage.

### Installation

The device is suited for:

- mounting into standard distribution panels acc. to DIN 43 871
- DIN rail mounting in compliance with IEC 60715:1995-10
- or screw mounting.

### Maßbild

### Dimension diagram

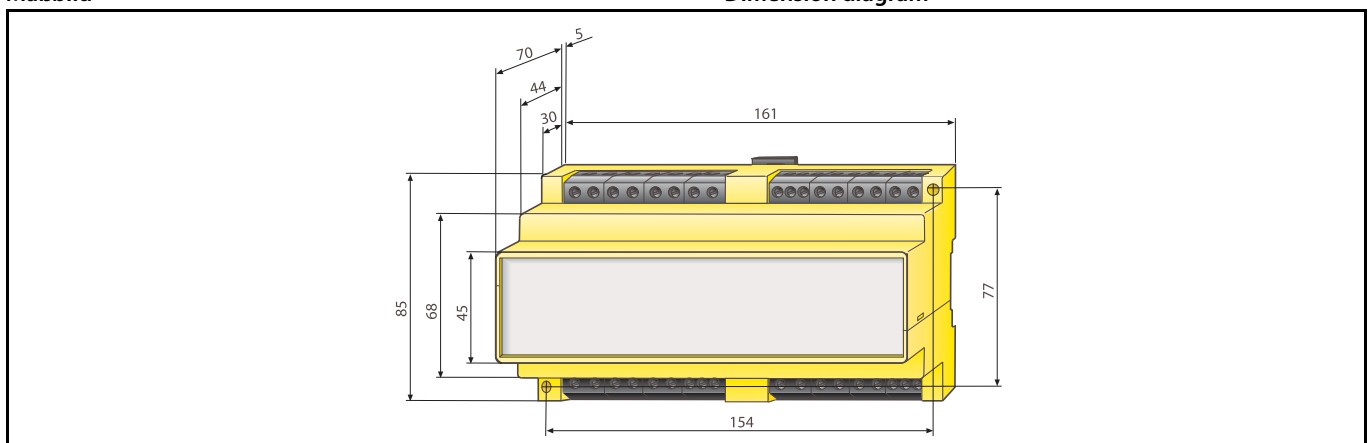


Abb. 2: alle Maße in mm

Figure 2: all dimensions in mm

## Anschluss

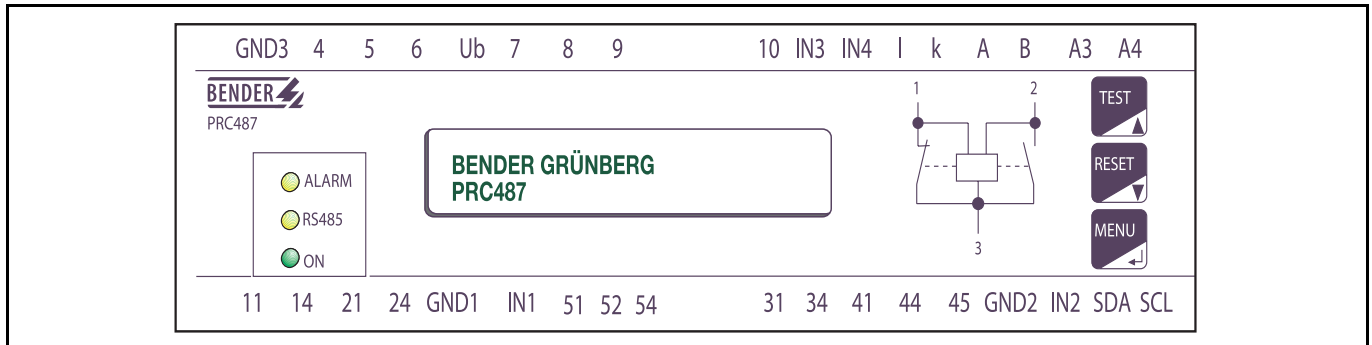
Schließen Sie das Gerät entsprechend dem Anschlussplan in der Anleitung des Medics-Moduls an. Beachten Sie dabei das Anzugsdrehmoment für die Klemmschrauben (siehe Technische Daten).

## Connection

Connect the RCM according to the wiring diagram described in the operating instructions of the Medics module. Please observe the tightening torque for the terminal screws (see technical data).

### Anschlüsse

### Connections



GND3	Masse, gemeinsamer Eingang der Klemmen 4, 5, 6, IN3, IN4, SDA, SCL
4	Eingang Leitung 3 high oder offen = Ausfall Leitung 3
5	Eingang Leitung 2 high oder offen = Ausfall Leitung 2
6	Eingang Leitung 1 high oder offen = Ausfall Leitung 1
Ub	Ausgang + 12 V
7	PWM-Open-Collector Ausgang Ansprechwert Unterspannung Low = oberer Ansprechwert high = unterer Wert
8	Dieser Kontakt hat keine Funktion
9	Open-Collector Ausgang Test-Relais 0V = Relais ein, TEST
10	Dieser Kontakt hat keine Funktion
IN3	Eingang Hilfsschütz: High oder offen = Ausfall K3
IN4	Eingang Handbetrieb: Low = Handbetrieb
k, I	Anschluss Stromwandler für N-Leiterüberwachung
A, B	BMS-Bus
A3, A4	Versorgungsspannung $U_s$
GND1	Masse des Eingangs IN1
IN1	Eingang Schaltzustand Schaltorgan K1: Low = K1 ein
GND2	Masse des Eingangs IN2
IN2	Eingang Schaltzustand Schaltorgan K2: Low = K2 ein
11,14	Relaiskontakt zur Ansteuerung des Einschaltens von K1 (K1on) mit Drahtbruchüberwachung
21, 24	Relaiskontakt zur Ansteuerung des Ausschaltens von K1 (K1off) mit Drahtbruchüberwachung
31,34	Relaiskontakt zur Ansteuerung des Einschaltens von K2 (K2on) mit Drahtbruchüberwachung
41, 44	Relaiskontakt zur Ansteuerung des Ausschaltens von K2 (K2off) mit Drahtbruchüberwachung
51, 52, 54	Potentialfreier Wechsler als Sammelstörmeldung.
45	Drahtbruchüberwachung
SDA, SCL	I <sup>2</sup> C-Bus. Interne serielle Schnittstelle zur Kommunikation mit Drahtbruch-Überwachung CV460 bzw. Relaisbaustein RK4xx.

GND3	Ground, common input for the terminals 4, 5, 6, IN3, IN4, SDA, SCL
4	Input line 3 high or open = failure line 3
5	Input line 2 high or open = failure line 2
6	Input line 1 high or open = failure line 1
Ub	Output + 12 V
7	Analogue output: setpoint selection undervoltage for SUE487/SUD487 Low = upper response value High = lower value
8	Contact without function
9	Open-collector output test relay 0 V = relay On, TEST
10	Contact without function
IN3	Input contactor relay: High or open = failure K3
IN4	Input manual operation: Low = manual operation
k, I	Connection current transformer for N conductor monitoring
A, B	BMS bus
A3, A4	Supply voltage $U_s$
GND1	Ground of the input IN1
IN1	Input state of switching element K1: Low = K1 On
GND2	Ground of the input IN2
IN2	Input status of switching element K2: Low = K2 On
11, 14	Relay contact to activate K1 (K1 on) with open-circuit monitoring.
21, 24	Relay contact to deactivate K1 (K1off) with open-circuit monitoring.
31, 34	Relay contact to activate K2 (K2on) with open-circuit monitoring.
41, 44	Relay contact to deactivate K2 (K2off). with open-circuit monitoring.
51,52,54	Potential free changeover contact for collective alarm message.
45	Open-circuit monitoring
SDA, SCL	PC bus. Internal serial interface for communication with open-circuit monitoring device CV460 or relay module RK4xx.

### Inbetriebnahme

Kontrollieren Sie vor der Inbetriebnahme den ordnungsgemäßen Anschluss des Gerätes.



Das PRC487 ist Bestandteil eines Medics-Moduls. Führen Sie die Inbetriebnahme entsprechend den Hinweisen in der Anleitung des Medics-Moduls durch.

### Commissioning

Prior to commissioning, check proper connection of the device.



The PRC487 is a component of the Medics module. For commissioning please refer to the operating instructions of the Medics module.

### Bedienen und Einstellen

Während des Betriebes befindet sich das PRC487 im Anzeige-Modus. Durch Betätigen der MENU-Taste wird in den Menü-Modus gewechselt. Hier erfolgt die Einstellung aller Parameter für die Umschaltung.

### Meldungen im Anzeigemodus

Im normalen und fehlerfreien Betrieb zeigt die Anzeige:

K1:on K2:off

- K1:on Das Schaltorgan K1 ist angezogen; die Versorgung erfolgt über die bevorzugte Leitung 1.
- K1:off Das Schaltorgan K2 ist abgefallen; es erfolgt keine Versorgung über die zweite Leitung.

### Operation and setting

During operation, the PRC487 is in the display mode. Pressing the MENU key changes to the Menu mode. All the parameters for the switchover can be set in this mode.

### Messages in the display mode

During normal and fault-free operation the display indicates:

- K1:on The switching element K1 is energized; the supply source is the preferred supply (line 1).
- K1:off The switching element K2 is deenergized; no supply from the second supply line.

### Alarmmeldungen

Erkennt das PRC487 einen Alarm, so zeigt es den entsprechenden Alarmtext im Display an. Die Alarmmeldung wird auf dem BMS-Bus gesendet. Dabei können sich mehrere ähnliche Alarmmeldungen einen Kanal teilen.

Die mit \* markierten Alarmmeldungen bleiben erhalten, bis sie mit der Taste „RESET“ gelöscht werden.

### Alarm messages

If a PRC487 recognizes an alarm, the respective alarm message appears on the display. The alarm message is provided at the BMS bus. Several alarm messages of similar type can share in one channel.

The alarm messages marked with \* are retained until they are reset with the RESET button.

Alarmtext-anzeige des PRC487	Bedeutung	Kanal
Ausfall Leitung 1	Spannungsausfall (Unterspannung oder Überspannung) auf Leitung 1	1
Ausfall Leitung 2	Spannungsausfall (Unterspannung oder Überspannung) auf Leitung 2	2
Ausfall Verteiler	Spannungsausfall (Unterspannung oder Überspannung) hinter der Umschalteinrichtung	3
Ausfall N-Leiter	Ausfall oder Unterbrechung des Neutral-Leiters	4
Störung K1 on	Störung in der Ansteuerung von K1	5
Störung K1 off	Störung in der Ansteuerung zum Abfallen von K1	5
Drahtbruch K1 on	Drahtbruch in der Ansteuerung von K1 bzw. K11	5
Drahtbruch K1 off	Drahtbruch in der Ansteuerung zum Abfallen von K1 bzw. K13	5
Drahtbruch K1 ON	Drahtbruch in der Ansteuerung von K1 (Hauptschütz)	5
Drahtbruch K1 OFF	Drahtbruch in der Ansteuerung zum Abfallen von K1 (Hauptschütz)	5
Ausfall K1 *	Ausfall des Schützes für Leitung 1 (Schütz eingeschaltet, dennoch keine Spannung am Verteiler)	5
Störung K2 on	Störung in der Ansteuerung von K2	6
Störung K2 off	Störung in der Ansteuerung zum Abfallen von K2	6
Drahtbruch K2 on	Drahtbruch in der Ansteuerung von K2 bzw. K12	6

Alarm text PRC487	Description	Channel
Failure line 1	Voltage failure (undervoltage or overvoltage) on line 1	1
Failure line 2	Voltage failure (undervoltage or overvoltage) on line 2	2
Failure distribution board	Voltage failure (undervoltage or overvoltage) downstream the switchover module	3
Failure N conductor	Failure or interruption of the neutral conductor	4
Fault K1 on	Fault in control of K1	5
Fault K1 off	Fault in control of K1 latching module	5
Open circuit K1 on	Open circuit in control of K1 respectively K11	5
Open circuit K1 off	Open circuit in control of latching module K1 respectively K13	5
Open circuit K1 ON	Open circuit in control of K1 (main contactor)	5
Open circuit K1 OFF	Open circuit in control of latching module K1 (main contactor)	5
Failure K1 *	Failure of contactor for line 1 (contactor is switched on but no voltage on distribution board)	5
Fault K2 on	Fault in control of K2	6
Fault K2 off	Fault in control of K2 latching module	6
Open circuit K2 on	Open circuit in control of K2 respectively K12	6

Alarmtext-anzeige des PRC487	Bedeutung	Kanal
Drahtbruch K2 off	Drahtbruch in der Ansteuerung zum Abfallen von K2 bzw. K14	6
Drahtbruch K2 ON	Drahtbruch in der Ansteuerung von K2 (Hauptschütz)	6
Drahtbruch K2 OFF	Drahtbruch in der Ansteuerung zum Abfallen von K2 (Hauptschütz)	6
Ausfall K2 *	Ausfall des Schützes für Leitung 2 (Schütz eingeschaltet, dennoch keine Spannung am Verteiler)	6
Ausfall K3	Ausfall des internen Relais K3 im SUE487/SUD487 oder des externen Relais K3	7
Gerätefehler	Interner Fehler PRC487	8
Störung RK464	Einstellungen im Menü SETUP OPTION durchgeführt, obwohl kein RK464 angeschlossen ist	8
Störung CV460	Einstellungen im Menü SETUP OPTION durchgeführt, obwohl kein CV460 angeschlossen ist	8
Störung EEPROM	Defektes EEPROM oder unzulässiger Wert im EEPROM gespeichert	8
K1/2 Handbetrieb	Steuerung der Schütze ist auf Handbetrieb umgestellt. Es erfolgt keine automatische Umschaltung mehr!	9
Kurz. Verteiler	Kurzschluss hinter der Umschalteneinrichtung	10
Alarm 11	ungültig, keine Alarmmeldung zugeordnet	11
Alarm 12	ungültig, keine Alarmmeldung zugeordnet	12
Kein MASTER	auf dem BMS-Bus ist kein MASTER auffindbar	-
Störung RS485	Auf dem BMS-Bus sind Störungen aufgetreten	-
Rückschalt Sperre	Rückschalt Sperre aktiviert. Es erfolgt keine automatische Rückschaltung auf Leitung 1 (außer wenn Leitung 2 ausfällt)	-

Hinweise zur Fehlersuche bieten die Störungshilfen im Bedienungshandbuch des Umschaltmoduls.

Alarm text PRC487	Description	Channel
Open circuit K2 off	Open circuit in control of K2 respectively K14 latching module	6
Open circuit K2 ON	Open circuit in control of K2 (main contactor)	6
Open circuit K2 OFF	Open circuit in control of K2 latching module (main contactor)	6
Failure K2 *	Failure of contactor for line 2 (contactor is switched on but no voltage on distribution board)	6
Failure K3	Failure of the internal relay K3 in SUE487/SUD487 or of the external relay K3	7
Device error	Internal fault PRC487	8
Fault RK464	Settings carried out in the SETUP OPTION menu but no RK464 connected	8
Fault CV460	Settings carried out in the SETUP OPTION menu but no CV460 connected	8
Fault EEPROM	Defective EEPROM or invalid value stored in EEPROM	8
K1/2 manual mode	Control of contactors is switched to manual mode. No automatic changeover takes place!	9
Short circuit distribution board	Short circuit downstream the switchover module	10
Alarm 11	invalid, no alarm message assigned	11
Alarm 12	invalid, no alarm message assigned	12
No MASTER	No Master available in the BMS bus	-
Fault RS485	Faults on the BMS bus	-
Switching back interlocking	Switching back interlocking device is activated. Automatic change-over to line 1 does not take place (except of failure of line 2)	-

Details about fault finding are provided in the operating instructions of the respective switchover module.

### Betriebsmeldungen

Die folgenden Betriebsmeldungen liegen am BMS-Bus des PRC487 an.

Bedeutung	Kanal
Ltg1Betrieb: auf Leitung 1 ist Spannung vorhanden	1
Ltg2Betrieb: auf Leitung 2 ist Spannung vorhanden	2
K1 ein: Schütz K1 ist eingeschaltet	3
K2 ein: Schütz K2 ist eingeschaltet	4
Automatik ein: Automatische Umschaltung ist aktiv	5
Handbetrieb: Steuerung der Schütze ist auf Handbetrieb umgestellt. Es erfolgt keine automatische Umschaltung mehr.	6

### Einstellen im Menü-Modus

#### Erklärung der Bedienschritte

1. Aktivieren Sie den Menü-Modus mit der Taste „MENU/ENTER“.
2. Wählen Sie das gewünschte Untermenü mit den Pfeiltasten und bestätigen Sie Ihre Wahl mit der Taste „MENU/ENTER“. - Das ausgewählte Untermenü wird angezeigt.
3. Einige Menüs enthalten mehrere Parameter. Wählen Sie in diesem Fall mit den Pfeiltasten den gewünschten Parameter und bestätigen Sie Ihre Wahl mit der Taste „MENU/ENTER“.
4. Ändern Sie Parameter mit den Pfeiltasten. Bestätigen Sie die neue Einstellung mit der Taste „MENU/ENTER“. - Die Änderung wird gespeichert und der Cursor springt in zurück in die entsprechende Zeile des Untermenüs.
5. Verlassen Sie das Untermenü und das Hauptmenü über den Menüpunkt „EXIT“.

### Die Untermenüs

Die folgenden Untermenüs dienen der Einstellung des Gerätes:

1. EXIT
  2. SETUP
  3. SETUP K/Q
  4. SETUP OPTION
  5. TEST COM
  6. PASSWORD
  7. INFO

### Operating messages

The following messages are provided at the PRC487 BMS bus.

Meaning	Channel
Line 1 energized: voltage present on line 1	1
Line 2 energized: voltage present on line 2	2
K1 on: contactor K1 is switched on	3
K2 on: contactor K2 is switched on	4
Automatic on: automatic switchover active	5
Manual mode: The control of the contactors is set to manual mode. Automatic switchover will not take place.	6

### Settings in the Menu mode

#### Operating steps:

1. Press "MENU/ENTER" to activate the Menu mode.
2. Select the appropriate submenu with the arrow keys and confirm with "MENU/ENTER". - The selected submenu will be displayed.
3. Some menus offer several parameters. In this case, choose the appropriate parameter with the arrow key and confirm with "MENU/ENTER".
4. Change parameters with the arrow keys. Confirm the new parameter setting with "MENU/ENTER". The new setting will be stored and the cursor returns to the respective line of the submenu.
5. Leave the submenu and the main menu via the "EXIT" option.

### Submenus

The following submenus are provided in the Menu mode:

1. EXIT
  2. SETUP
  3. SETUP K/Q
  4. SETUP OPTION
  5. TEST COM
  6. PASSWORD
  7. INFO



Das Steuergerät PRC487 wird vorwiegend als Teil eines Medics-Moduls mit allen notwendigen Geräteeinstellungen geliefert. Alle werkseitig eingestellten Parameter des Umschaltmoduls sind im Prüfprotokoll dokumentiert. Bis auf die eventuelle Änderung der Adresse des PRC487 sind normalerweise keine Änderungen der voreingestellten Werte notwendig. Änderungen an diesen Parametern können die Funktion des Medics-Moduls beeinträchtigen. Nehmen Sie Änderungen an den Geräteeinstellungen nur nach Rücksprache mit BENDER vor!

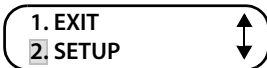


In most cases, the control and indicating device PRC487 is delivered as a component of the Medics module and all necessary parameters are factory set and documented in the test protocol of the switchover module. Except for possible changes to the address of the PRC487, changes to the default values are normally not necessary.

Changing the parameters may impair the function of the Medics module. For that reason, changes should only be made after discussion with BENDER!

**Untermenü SETUP**

Das Untermenü SETUP dient der Einstellung allgemeiner Parameter.



**1.EXIT**

Verlassen des Untermenüs

**2. ADDRESS**

Einstellung der Adresse des PRC487. Eine Änderung der Adresse hat Auswirkungen auf die angeschlossenen Melde- und Prüfkombinationen MK24.. bzw. auf Bedientableaus TM. Eine Adressenänderung des PRC487 muss den entsprechenden Anzeigeeinheiten mitgeteilt werden.

**3. LANGUAGE**

Einstellung, ob die Meldungen am PRC487 in deutscher oder in englischer Sprache angezeigt werden.

**4. N-ALARM**

Einstellung, ob das Umschaltmodul bei Erkennung eines Ausfalls des Neutralleiters von der bevorzugten Einspeisung auf die zweite Leitung umschalten soll (nur mit Passwort zugänglich).

**5. K-TYPE**

Einstellung der Schaltorgane dieses Umschaltmoduls (nur mit Passwort zugänglich).

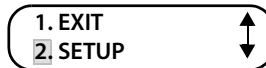
K:V/K	Schaltschütze, wobei K1 mit Verklünnungsbaustein ausgestattet ist.
K: V/V	Schaltschütze, K1 und K2 mit Verklünnungsbaustein.
K: R/K	Schaltschütze, Remanenzschütz für K1
K: R/R	Schaltschütze, Remanenzschütze für K1 und K2.
Q:ICV	Leistungsschalter mit Motorantrieb, per Impuls über Hilfsschütze angesteuert, mit Zusatzbaustein CV460.
Q:DCV	Leistungsschalter mit Motorantrieb, per Dauersignal über Hilfsschütze angesteuert, mit Zusatzbaustein CV460.
Q: D	Leistungsschalter mit Motorantrieb, direkt angesteuert.

**6.Y1**

Ansprechwert der Unterspannung des Spannungsrelais SUE487 bzw. SUD487. Bei diesem Wert erfolgt eine Umschaltung von der bevorzugten Einspeisung auf die zweite Leitung, sofern diese Spannung führt. Der Ansprechwert  $Y_1$  ist im Bereich  $70 \dots 85 \% \times U_n$  einstellbar. Wurde vorher das Passwort eingegeben, so kann der Ansprechwert zwischen  $70 \dots 90 \% \times U_n$  eingestellt werden.

**SETUP submenu**

The SETUP-K/Q menu is used to set the general parameters.



**1.EXIT**

To leave the submenu

**2. ADDRESS**

To set the address of the PRC487. Changing the address has an effect on the connected MK24.. alarm indicator and test combinations or TM operator panels. A change of the address of the PRC487 must be made known to the corresponding display units.

**3. LANGUAGE**

To set whether the messages on the PRC487 are shown in German (factory setting) or in English.

**4. N-ALARM**

To set whether the switchover module should switch over from the preferred supply to the second supply in case of failure of the neutral conductor (only accessible with password).

**5. K-TYPE**

To set the type of switching element of this switchover module (only accessible with password).

K:V/K	Contactors with K1 having a latching module.
K: V/V	Contactors with K1 and K2 having latching modules.
K: R/K	Contactors with K1 remanence contactor.
K: R/R	Contactors with K1 and K2 as remanence contactor.
Q:ICV	Motor-driven circuit breaker, controlled by pulse via contactor relays, with additional module CV460.
Q:DCV	Motor-driven circuit breaker, controlled by maintained contact via auxiliary contactors, with additional module CV460.
Q: D	Motor-driven circuit breaker, directly controlled.

**6.Y1**

Undervoltage response value of the SUE487 respectively SUD487 voltage relay. At this value, switchover from the preferred supply to the second supply takes place, provided that voltage is present on this line. The response value  $Y_1$  is adjustable between  $70 \%$  and  $85 \% \times U_n$ . After entering a password, the response value can be set between  $70 \%$  and  $90 \% \times U_n$ .

7. Y2

Ansprechwert der Überspannung  $Y_2$  des Spannungsrelais SUE487/SUD487. Dieser Wert ist fest auf  $115\% \times U_n$  eingestellt und kann nicht verändert werden. Die Anzeige dient lediglich zur Information.

8. MASTER

Hier kann eingestellt werden, ob eine Alarmmeldung im Display des PRC487 angezeigt wird, wenn auf dem BMS-Bus kein Master (z.B. Melde- und Prüfkombination MK24..) vorhanden ist.  
 on Alarmmeldung wird angezeigt.  
 off Alarmmeldung wird nicht angezeigt.

9. POWER

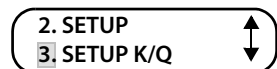
Einstellung der Alarmtexte des Umschaltmoduls.

L1/L2	1: Ausfall Leitung 1	2: Ausfall Leitung 2
L2/L1	1: Ausfall Leitung 2	2: Ausfall Leitung 1
SV/AV	1: Ausfall Ltg. SV	2: Ausfall Ltg. AV
AV/SV	1: Ausfall Ltg. AV	2: Ausfall Ltg. SV
ZSV/SV	1: Ausfall Ltg. ZSV	2: Ausfall Ltg. SV
SV/ZSV	1: Ausfall Ltg. SV	2: Ausfall Ltg. ZSV

Erklärung der Abkürzungen:

- AV = Allgemeine Stromversorgung
- SV = Sicherheitsstromversorgung
- ZSV = Zusätzliche Sicherheitsstromversorgung

Untermenü SETUP-K/Q



Das Untermenü SETUP-K/Q dient der Einstellung der Parameter für die eingesetzten Schaltorgane (K: Schaltschütze; Q: Leistungsschalter). Alle Werte sind werkseitig gesetzt und gelten für den im Untermenü SETUP eingestellten K-TYPE. Wird der K-TYPE verändert, so werden die Einstellungen im Menü SETUP-K/Q auf die Werkseinstellungen zurückgesetzt.

Die Grafik „Zeitlicher Ablauf einer Umschaltung“ verdeutlicht den zeitlichen Ablauf einer Umschaltung. Sie informiert auch über die Wirkung der Parameter dieses Untermenüs auf die Umschaltung.



Die Ansprechzeit  $t_{off}$  die Pausenzeit  $t(K1-2)$  und die Rückschaltzeit  $t_{on}$  sind einstellbar. Die Einstellung muss nach den Anforderungen des spezifischen Anwendungsfalls, der Kurzschlussberechnung und nach DIN VDE 0100-710 (VDE 0100 Teil 710): 2002-11 Abschnitt 710.537.6.2.k) erfolgen. Die maximal auftretende Gesamtausschaltzeit (vom Fehlereintritt bis zur Löschung des Lichtbogens in der Überstrom-Schutzeinrichtung) muss kleiner sein, als die minimale Umschaltverzögerungszeit  $t_{an} + t_{off}$ .



Eine Vergrößerung einer Ansprechzeit  $t_{off}$  oder der Pausenzeit  $t(K1-2)$  kann zur Folge haben, dass die in den Leistungsmerkmalen der Umschalteinrichtung genannte werkseitig eingestellte Gesamtumschaltzeit ( $t < 0,5\text{ s}$ ) überschritten wird.

7. Y2

Overvoltage response value  $Y_2$  of the SUE487/SUD487 voltage relay. This value is fixed at  $115\% \times U_n$  and cannot be changed. This submenu is simply for information.

8. MASTER

To set whether an alarm message is to be displayed at the PRC487 if no master (e.g. alarm indicator and test combination MK24..) is present at the BMS bus.  
 on Alarm message is displayed.  
 off No alarm message is displayed.

9. POWER

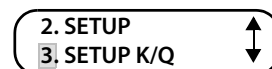
Setting of the alarm text messages of the switchover module.

L1/L2	1: failure Line 1	2: failure Line2
L2/L1	1: failure Line 2	2: failure Line 1
SV/AV	1: failure Line SV	2: failure Line AV
AV/SV	1: failure Line AV	2: failure Line SV
ZSV/SV	1: failure Line ZSV	2: failure Line SV
SV/ZSV	1: failure Line SV	2: failure Line ZSV

Explanation of the abbreviations:

- AV = Normal power supply source
- SV = Safety power supply source
- ZSV = Special safety power supply source

SETUP-K/Q submenu



The SETUP-K/Q menu is used to set special parameters for the switching elements applied (K: contactors; Q: circuit breakers). All values are factory set and are based on the K-TYPE set in the SETUP submenu. If the K-TYPE is changed, all the settings in the SETUP-K/Q menu will be overwritten by factory settings.

The diagram „Time sequence of a switchover process“ shows the time sequence of the individual actions of a switchover process. It informs also about the effect of the parameters of this submenu on the switchover process.



Response time  $t_{off}$  delay time  $t(K1-2)$  and return transfer time  $t_{on}$  are adjustable. The setting shall be according to the requirements of the specific application, the short-circuit calculation and in compliance with DIN VDE 0100-710 (VDE 0100 part 710): 2002-11 section 710.537.6.2.k). Maximum total turn-off time (period between the fault and the cancellation of the arc in the overcurrent protective device) shall be lower than the minimum delay time required for switchover  $t_{an} + t_{off}$ .



An extension of the response time  $t_{off}$  or the off-period  $t(K1-2)$  may result in exceeding the factory-set total switchover time ( $t < 0,5\text{ s}$ ), being a characteristic of the switchover module.



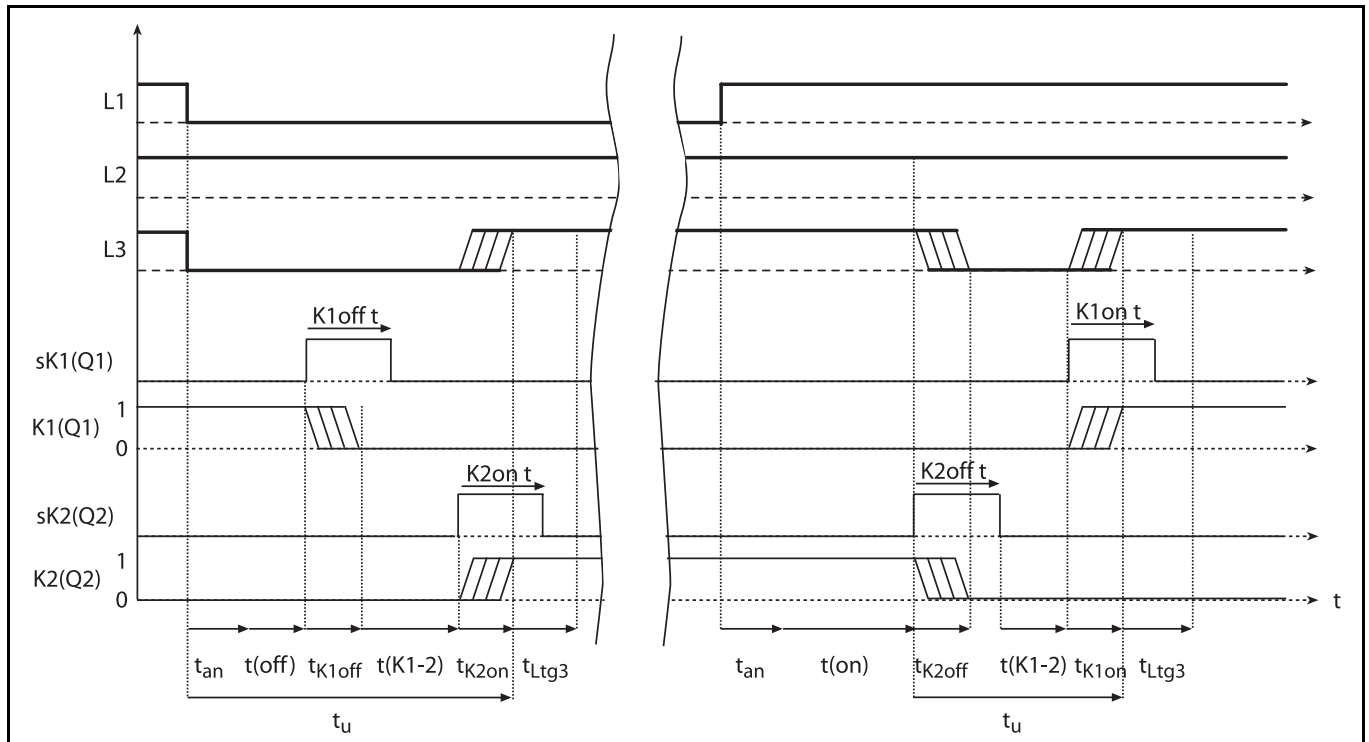


Abb. 3: Zeitlicher Ablauf einer Umschaltung

Figure 3: Time sequence of a switchover process

L1 Leitung 1 (bevorzugte Einspeisung)  
 L2 Leitung 2 (zweite Einspeisung)  
 L3 Leitung 3 (Ausgang der Umschalteneinrichtung)  
 sK1(Q1) / sK2(Q2) Steuersignal für Schaltorgan  
 K1(Q1) / K2(Q2) Leistungskontakt des Schaltorgans  
 K1(Q1) / K2(Q2)

$t_u$  Gesamtumschaltzeit der Umschalteneinrichtung.  
 $t_{an}$  Ansprechzeit (50...250 ms) des Spannungsrelais SUE487/SUD487. Fest vorgegeben und nicht einstellbar.  
 $t(off)$  Ansprechzeit  $t_{off}$ : Einstellbare Ansprechverzögerung von der Meldung des Spannungsausfalls bis zur Ansteuerung des Schaltorgans K1 (Q1). Die Gesamtansprechzeit des Systems ist die Summe aus Ansprechzeit  $t_{an}$  und eingestellten Ansprechzeit  $t_{off}$ .  
 $t_{K1off}$  Ausschaltzeit des Schaltorgans K1(Q1).  
 $t_{K1on}$  Einschaltzeit des Schaltorgans K1(Q1).  
 $t_{K2off}$  Ausschaltzeit des Schaltorgans K2(Q2).  
 $t_{K2on}$  Einschaltzeit des Schaltorgans K2(Q2).  
 $t(K1-2)$  Einstellbare Pausenzeit zwischen dem Abschalten von Leitung 1 und dem Zuschalten von Leitung 2 (und umgekehrt). Die Pausenzeit ist so einzustellen, dass die noch im System vorhandene Energie abgebaut werden kann, bevor die spannungsführende Leitung wieder zugeschaltet wird (Nur mit Passwort zugänglich).  
 $t(on)$  Einstellbare Rückschaltzeit  $t_{on}$ : Verzögerung von der Meldung der Spannungswiederkehr auf Leitung 1 bis zur Ansteuerung des Schaltorgans K2 (Q2).  
 $t_{Ltg3}$  Zeit zur Überprüfung, ob nach einer Umschaltung wieder Spannung hinter der Umschalteneinrichtung ansteht. Fest vorgegeben und nicht einstellbar.

L1 Line 1 (preferred supply)  
 L2 Line 2 (second supply)  
 L3 Line 3 (downstream of the switchover system)  
 sK1(Q1) / sK2(Q2) control signal for switching element  
 K1(Q1) / K2(Q2) Switching element K1(Q1) / K2(Q2): Contact of the power circuit

$t_u$  Total time for switchover module  
 $t_{an}$  Response time (50..250 ms) of the voltage relay SUE487/SUD487. Preset, not adjustable.  
 $t(off)$  Response time  $t_{off}$ : Adjustable response delay: period between alarm message (voltage failure) until the activation of the switching element K1 (Q1). The total response time of the system is the sum of response time  $t_{an}$  and adjusted response time  $t_{off}$ .  
 $t_{K1off}$  Switch-off time of switching element K1(Q1).  
 $t_{K1on}$  Switch-on time of switching element K1(Q1).  
 $t_{K2off}$  Switch-off time of switching element K2(Q2).  
 $t_{K2on}$  Switch-on time of switching element K2(Q2).  
 $t(K1-2)$  Adjustable off-period between switch-off on line 1 and switch-on on line 2 (and vice-versa). The off-period shall be selected in such a way that the energy left in the system can be broken down, before the live line is re-connected (Only accessible with password).  
 $t(on)$  Adjustable return transfer time  $t_{on}$ : time delay between the voltage-restored message on line 1 until switch element K2 (Q2) is triggered.  
 $t_{Ltg3}$  Time to check after the switchover, if voltage is restored downstream of the switchover module. Preset, not adjustable.

**\*\*\*K1on:\*\*\***

dient der Einstellung der Parameter für den Ausgang 11/14 des PRC487.

Fkt: Signal an 11/14. Zur Wahl stehen:

—	Kein Signal
⌋	Dauersignal
⌋⌋	Impuls

t: Die Zeit, für die das Signal an 11/14 anstehen muss. Diese Angabe ist immer notwendig, auch bei der Einstellung Dauersignal. Sie gibt die maximale Anzugszeit des Schaltorgans an.

☐☐☐ Drahtbruchmeldung zur Schützspule aktiviert (on) oder deaktiviert (off).

**\*\*\*K1off:\*\*\***

dient der Einstellung der Parameter für den Ausgang 21/24 des PRC487 (Ausschalten des Verlinkungsbausteins von K1). Einstellbare Parameter: wie bei \*\*\*K1on:\*\*\*.

**\*\*\*K2on:\*\*\***

dient der Einstellung der Parameter für den Ausgang 31/34 des PRC487 (Einschalten von K2).

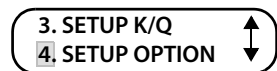
Einstellbare Parameter: wie bei \*\*\*K1on:\*\*\*.

**\*\*\*K2off:\*\*\***

dient der Einstellung der Parameter für den Ausgang 41/44 des PRC487 (Ausschalten von K2).

Einstellbare Parameter: wie bei \*\*\*K1on:\*\*\*.

**Untermenü SETUP OPTION**



Das Menü SETUP OPTION beinhaltet die Einstellung von Parametern für das Drahtbruchüberwachungsgerät CV460 und den Relaisbaustein RK4xx. Diese Einstellungen werden benötigt:

- beim Betrieb eines Umschaltmoduls mit Leistungsschaltern oder Remanenzschützen
- oder bei Ausgabe von Meldungen über Relaisbaustein.

**1.EXIT**

Verlassen des Untermenüs

**\*\*\*K1on:\*\*\***

Allows setting of the parameters for output 11/14 of the PRC487. Function: signal at 11/14.

The parameters are:

—	No signal
⌋	Continuous signal
⌋⌋	Impulse signal

t: The time for which the signal on 11/14 must be present. This input is always required even for "continuous signal" setting. It specifies the maximum On delay of the switching element.

☐☐☐ Contactor coil open circuit alarm activated (on) or deactivated (off).

**\*\*\*K1off:\*\*\***

Allows setting of the parameters for output 21/24 of the PRC487 (switching off the K1 latching module).

Adjustable parameters: the same as \*\*\*K1on:\*\*\*.

**\*\*\*K2on:\*\*\***

Allows setting of the parameters for output 31/34 of the PRC487 (switching on K2).

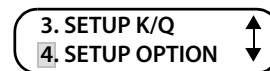
Adjustable parameters: the same as \*\*\*K1on:\*\*\*.

**\*\*\*K2off:\*\*\***

Allows setting of the parameters for output 41/44 of the PRC487 (switching off K2).

Adjustable parameters: the same as \*\*\*K1on:\*\*\*.

**SETUP OPTION submenu**



The SETUP OPTION menu includes the setting of parameters for the open circuit monitoring device CV460 and the relay module RK4xx. These settings are necessary for

- the operation of switchover modules with circuit breakers or remanence contactors
- or for the output of messages via relay modules.

**1.EXIT**

To leave the submenu

**\*\*\* CV460 \*\*\***
**2. IN 10 und**
**3. IN 11**

Für diese beiden Digitaleingänge bestehen jeweils die folgenden Einstellmöglichkeiten:

off	Digitaleingang ohne Funktion,
Q1: >Y	Schaltelement Q1 hat Überstromauslösung *
Q2: >Y	Schaltelement Q2 hat Überstromauslösung *
no2->1	Bei gesetztem Eingang wird im Falle der Spannungsrückkehr auf der bevorzugten Leitung eine zweite, den OP-Betrieb störende Unterbrechung der Spannung durch automatische Rückschaltung verhindert. Die Rückschaltung muss manuell zu einem geeigneten Zeitpunkt durch Öffnen des Eingangs vorgenommen werden oder erfolgt automatisch nach Ausfall der zweiten Leitung.

\* nur für Umschalteinrichtungen mit Leistungsschaltern

**4. 111-4,**
**5. 121-4,**
**6. 131-4 und**
**7. 141-4**

Über diese vier Menüpunkte kann jeweils die Drahtbruchüberwachung an den Schaltelementen wie folgt aktiviert werden:

off	keine Drahtbruchüberwachung,
	Drahtbruchüberwachung eingeschaltet

**\*\*\* RK4xx\*\*\***
**8. IN 10 und**
**9. IN 11**

Für diese beiden Digitaleingänge bestehen jeweils die folgenden Einstellmöglichkeiten:

off	Digitaleingang ohne Funktion
Q1: >Y	Schaltelement Q1 hat Überstromauslösung *
Q2: >Y	Schaltelement Q2 hat Überstromauslösung *
no2->1	Bei gesetztem Eingang wird im Falle der Spannungsrückkehr auf der bevorzugten Leitung eine zweite, den OP-Betrieb störende Unterbrechung der Spannung durch automatische Rückschaltung verhindert. Die Rückschaltung muss manuell zu einem geeigneten Zeitpunkt durch Öffnen des Eingangs vorgenommen werden oder erfolgt automatisch nach Ausfall der zweiten Leitung.

\* nur für Umschalteinrichtungen mit Leistungsschaltern

Das bedeutet, das dem PRC487 alternativ über das RK4xx

- eine Überstromauslösung der Schaltelemente oder
- eine Aktivierung der Rückschaltsperr

gemeldet werden kann.

**\*\*\* CV460 \*\*\***
**2. IN 10 and**
**3. IN 11**

The following settings are possible for these inputs:

off	Digital input without function
Q1: >Y	Switching element Q1 with overcurrent release *
Q2: >Y	Switching element Q2 with overcurrent release *
no2->1	If the input is set and the voltage restored on the preferred supply, a second power supply interruption in the operating theatre can be prevented by automatic switchback.  The reset must be carried out manually at an appropriate time by opening the input or is automatically carried out after failure of the second supply.

\* only valid for switchover modules with circuit breakers

**4. 111-4,**
**5. 121-4,**
**6. 131-4 and**
**7. 141-4**

Open circuit monitoring of the switching elements can be activated via these four menu items.

off	open circuit monitoring switched off
	Open circuit monitoring switched on

**\*\*\* RK4xx\*\*\***
**8. IN 10 and**
**9. IN 11**

The following settings are possible for these digital inputs:

off	Digital input without function
Q1: >Y	Switching element Q1 with overcurrent release *
Q2: >Y	Switching element Q2 with overcurrent release *
no2->1	If the input is set and the voltage restored on the preferred supply, a second power supply interruption in the operating theatre can be prevented by automatic switchback. The reset must be carried out manually at an appropriate time by opening the input or is automatically carried out after failure of the second supply.

\* only valid for switchover modules with circuit breakers

That means that in addition

- an overcurrent release of the switching elements or
- an activation of the latching device

can be signalled to the PRC487 via the RK4xx.

**10. 111-4, 11. 121-4, 12. 131-4 und 13. 141-4**

Über diese vier Menüpunkte kann jeweils für den Fall, dass die betreffende Meldung anliegt, ein Schließen der zugehörigen Kontaktpaare am RK4xx ausgelöst werden:

off	kein Schaltvorgang eingestellt	
A.Ltg1	Alarmmeldung:	Ausfall Leitung 1
B.Ltg1	Betriebsmeldung:	Spannung an Leitung 1 ist in Ordnung
A.Ltg2	Alarmmeldung:	Ausfall Leitung 2
B.Ltg2	Betriebsmeldung:	Spannung an Leitung 2 ist in Ordnung
A.Ltg3	Alarmmeldung:	Spannungsausfall hinter der Umschalteinrichtung
Q1:1>Y	Alarmmeldung:	Q1 ausgelöst *
Q2:1>Y	Alarmmeldung:	Q2 ausgelöst *
B:K/Q1	Betriebsmeldung:	Schaltelement K1/Q1 ist eingeschaltet
B:K/Q2	Betriebsmeldung:	Schaltelement K2/Q2 ist eingeschaltet

\* nur für Umschalteinrichtungen mit Leistungsschaltern

Beispiel:

Im Untermenü 12. 131-4 wird B:K/Q1 eingestellt. Das bedeutet, dass am RK4xx der Kontakt zwischen 131 / 134 geschlossen wird, sobald K1 eingeschaltet ist. Hierdurch kann an einem Meldetableau eine Betriebsleuchte mit der Beschriftung "K1 ein" zum Leuchten gebracht werden.

**Untermenü TEST COM**



Testet die Kommunikation mit angeschlossenen Meldekombinationen MK24.. und/oder TM-Bedientableaus. Die Übertragung einer jeden einzelnen Alarm- und Betriebsmeldung kann getestet werden. Notwendig für den Vergleich mit den frei programmierbaren Texten des TM-Bedientableaus.

**Untermenü PASSWORD**



Zur Eingabe eines voreingestellten Passwortes. Das Passwort wird für einige wichtige Einstellungen in den Menüs SETUP und SETUP K/Q benötigt. Wenn Sie also wichtige Parameter ändern müssen, so muss vorher im Menü PASSWORD das Passwort eingegeben werden (Passwort = 25). Das eingegebene Passwort gilt solange, bis der Menü-Modus verlassen wird.

**Untermenü INFO**



Das Menü INFO informiert Sie über den Gerätetyp und dessen Firmware.

**Werkseinstellungen**

Die Werkseinstellungen sind in dem jeweiligen Protokoll „Messergebnisse und Einstellungen“ des Medics-Moduls dokumentiert.

**10. 111-4, 11. 121-4, 12. 131-4 and 13. 141-4**

If the respective message is provided, these four menu items can be used to activate the closing of the associated contact pairs at the RK4xx:

off	no switching process set	
A.Ltg1	Alarm message:	Failure line 1 1
B.Ltg1	Operating message:	Voltage present on line 1
A.Ltg2	Alarm message:	Failure line 2
B.Ltg2	Operating message:	Voltage present on line 2
A.Ltg3	Alarm message:	Voltage failure downstream the switchover module
Q1:1>Y	Alarm message:	Q1 activated *
Q2:1>Y	Alarm message:	Q2 activated *
B:K/Q1	Operating message:	Switching element Q1 is switched on
B:K/Q2	Operating message:	Switching element Q2 is switched on

\* only for switchover modules with circuit breakers

Example:

B:K/Q1 is set in the submenu 12. 131-4. That means that the contact between 131/134 will be closed at the RK4xx as soon as K1 is switched on. In this way, a status indicator signalling "K1 on" can be illuminated on an alarm indicator and operator panel .

**TEST COM submenu**



Tests the communication with connected alarm indicator and test combinations MK24.. and/or TM operator panels. The transmission of each individual alarm and operating message can be checked. Necessary for comparison with the user-programmable text messages on the TM operator panel.

**PASSWORD submenu**



For entering the preset password. The password is needed for some important settings in the SETUP and SETUP K/Q menus. If you need to change important parameters, the password must first be entered in the PASSWORD menu and remains valid until you quit the Menu mode (Password = 25).

**INFO submenu**



The INFO menu provides information about the type of device and its firmware.

**Factory settings**

The factory settings are documented in the respective protocol "Measuring results and settings" in operating instructions of the Medics module.

## Test

Wird am PRC487 ein "TEST" aktiviert, so löst das PRC487 auch am Spannungsrelais einen TEST aus. Das SUE487 bzw. SUD487 simuliert eine Unterspannung auf Leitung 1. Ein Alarm wird an das PRC487 gemeldet. Das PRC487 steuert die Umschaltung von Leitung 1 auf Leitung 2 und danach wieder zurück auf Leitung 1. Die benötigte Zeit  $t_{1 \rightarrow 2}$  vom Augenblick des (simulierten) Spannungsausfalles bis zum Einschalten von K2 wird im Display des PRC487 angezeigt.

Die Vorgänge bei der Umschaltung beschreibt die Abb. 3:  
So lösen Sie den Test aus:

1. Taste "Test" drücken
2. "Test 1 -> 2" wählen und mit Taste "MENU/ ENTER" bestätigen.

Wählen Sie "EXIT" um das Test-Menü nach der Umschaltung wieder zu verlassen.

## Normen

- DIN VDE 0100-710 (VDE 0100 Teil 710): 2002-11
- ÖVE-EN7/1991
- ÖVE/ÖNORM E8007/A1: 2001-02-01
- ÖVE/ÖNORM E8007/A2: 2002-11-01
- IEC 60364-7-710: 2002-11

## Technische Daten

### Isolationskoordination nach IEC 60664-1

Bemessungsspannung .....	AC 250 V
Bemessungs-Stoßspannung/Verschmutzungsgrad .....	4 kV/3

### Spannungsbereiche

Versorgungsspannung $U_S$ .....	siehe Typenschild
Arbeitsbereich von $U_S$ .....	0,7 ... 1,3 x $U_S$
Eigenverbrauch .....	max. 3 VA

### Ansprechwerte

Unterspannung .....	70 ... 90 % x $U_n$
Überspannung .....	115 % x $U_n$

### Anzeigen

Anzeige (beleuchtet) .....	LC-Display
Zeichen (Anzahl, Höhe) .....	2x16 (4.5 mm)

### Schnittstellen

Schnittstelle / Protokoll .....	RS485/BMS
Max. Leitungslänge .....	≤ 1200 m
Empfohlene Leitung (geschirmt, Schirm einseitig an PE) .....	mindestens J-Y(St)Y 2 x 0,6
Abschlusswiderstand .....	120 $\Omega$ (0,25 W)
Adressbereich .....	2...90

### Schaltglieder

Relaisausgang 51, 52, 54 .....	1 Wechsler
Arbeitsweise .....	Ruhestrom
Relaiskontakte zur Ansteuerung K1on, K1off, K2on, K2off .....	1 Schließer
Arbeitsweise .....	Arbeitsstrom
Elektrische Lebensdauer .....	12000 Schaltspiele
Kontaktklasse .....	IIB (IEC60255-0-20)
Kontaktbemessungsspannung .....	AC 250 V / DC 300 V
Einschaltvermögen .....	AC 5A
Ausschaltvermögen bei AC 230 V, cos phi 0,4 .....	2 A
Ausschaltvermögen bei DC 220 V, L/R=0,04 s .....	0,2 A

### Einstellung der Zeiten

Ansprechzeit $t_{off}$ ; einstellbar in 50 ms Schritten .....	0 ... 9950 ms
Rückschaltzeit $t_{on}$ ; einstellbar in 1 s Schritten .....	0 ... 249 s
Pausenzeit $t_{K1-2}$ ; einstellbar in 50 ms Schritten .....	0 ... 9950 ms

## Test

If a "TEST" is activated at the PRC487, a TEST is also activated at the voltage relay. SUE487 resp. SUD487 is simulating undervoltage at line 1. An alarm is signalled to the PRC487. A switchover from line 1 to line 2 and later back to line 1 is controlled by the PRC487. The display of the PRC487 indicates the time  $t_{1 \rightarrow 2}$  needed from the moment of the (simulated) voltage failure until K2 is activated. Figure 3 "Time sequence of a switchover process" describes the steps of the switchover process.

In this way you execute a Test:

1. Press "Test" button
2. Select "Test 1 -> 2" and confirm with "MENU/ ENTER button."

Select "EXIT" to leave the Test menu after the switchover process.

## Standards

- DIN VDE 0100-710 (VDE 0100 Teil 710): 2002-11
- ÖVE-EN7/1991
- ÖVE/ÖNORM E8007/A1: 2001-02-01
- ÖVE/ÖNORM E8007/A2: 2002-11-01
- IEC 60364-7-710: 2002-11

## Technical data

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

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

### Voltage ranges

Nominal voltage range $U_S$ .....	see nameplate
Operating range of $U_S$ .....	0.7 ... 1.3 x $U_S$
Max. power consumption .....	3 VA

### Response values

Undervoltage .....	70 ... 90 % x $U_n$
Overtoltage .....	115 % x $U_n$

### Displays

Display (illuminated) .....	LC display
Characters .....	2x16 (4.5 mm)

### Interfaces

Interface / protocol .....	RS485/BMS protocol
Max. cable length .....	≤ 1200 m
Recommended cable (screened, screen on one side connected to PE) .....	min. J-Y(St)Y 2 x 0.6
Terminating resistor .....	120 $\Omega$ (0.25 W)
Address range .....	2...90

### Switching elements

Relay output 51, 52, 54 .....	1 changeover contact
Operating mode .....	N/C operation
Relay contacts for control of K1on, K1off, K2on, K2off .....	1 NO contact
Operating mode .....	N/O operation
Electrical endurance .....	12000 switching operations
Contact class .....	IIB (IEC60255-0-20)
Rated contact voltage .....	AC 250 V / DC 300 V
Making capacity .....	AC 5A
Breaking capacity at AC 230 V, cos phi 0.4 .....	2 A
Breaking capacity at DC 220 V, L/R=0.04 s .....	0.2 A

### Setting of the times

Response time $t_{off}$ ; adjustable in steps of 50 ms .....	0 ... 9950 ms
Return transfer time $t_{on}$ ; adjustable in steps of 1 s .....	0 ... 249 s
Delay time $t_{K1-2}$ ; adjustable in steps of 50 ms .....	0 ... 9950 ms

**Allgemeine Daten**

EMV Störfestigkeit .....	nach IEC 61326
EMV Störaussendung .....	nach IEC 61326
Schockfestigkeit IEC60068-2-27 (Gerät in Betrieb) .....	15 g/11 ms
Dauerschöcken IEC60068-2-29 (Transport) .....	40 g/6 ms
Schwingungsbeanspruchung IEC 60068-2-6 (Gerät in Betrieb) .....	1 g / 10 ... 150 Hz
Schwingungsbeanspruchung IEC 60068-2-6 (Transport) .....	2 g / 10 ... 150 Hz
Umgebungstemperatur (bei Betrieb) .....	-10 °C ... +55 °C
Umgebungstemperatur (bei Lagerung) .....	-40 °C ... +70 °C
Klimaklasse nach DIN IEC60721-3-3 .....	3K5
Betriebsart .....	Dauerbetrieb
Einbaulage .....	beliebig
Anschlussart .....	Reihenklennen
Anschlussvermögen Starr / flexibel .....	0,2 ... 4 / 0,2 ... 2,5 mm <sup>2</sup>
Anschlussvermögen flexibel mit Aderendhülse, ohne/mit Kunststoffhülse .....	0,25 ... 2,5 mm <sup>2</sup>
Leitergrößen (AWG) .....	24-12
Anzugsdrehmoment .....	0,5 ... 0,6 Nm (4,3 ... 5,3 lb-in)
Schutzart Einbauten (DIN EN 60529) .....	IP30
Schutzart Klemmen (DIN EN 60529) .....	IP20
Schraubbefestigung .....	2 x M4
Schnellbefestigung auf Hutprofilschiene .....	IEC 60715
Entflammbarkeitsklasse .....	UL94V-0
Gewicht .....	ca. 530 g

**General data**

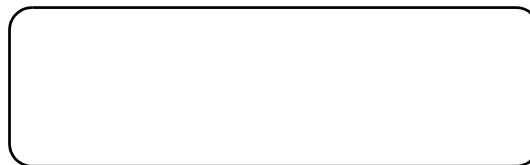
EMC immunity .....	acc. to IEC 61326
EMC emission .....	acc. to IEC 61326
Shock resistance IEC60068-2-27 (device in operation) .....	15 g/11 ms
Bumping IEC60068-2-29 (during transport) .....	40 g/6 ms
Vibration resistance IEC 60068-2-6 (device in operation) .....	1 g / 10 ... 150 Hz
Vibration resistance IEC 60068-2-6 (during transport) .....	2 g / 10 ... 150 Hz
Ambient temperature (during operation) .....	-10 °C ... +55 °C
Storage temperature range .....	-40 °C ... +70 °C
Climatic class acc. to DIN IEC60721-3-3 .....	3K5
Operating mode .....	continuous operation
Mounting .....	any position
Connection .....	screw terminals
Connection, rigid, flexible .....	0.2 ... 4 / 0.2 ... 2.5 mm <sup>2</sup>
Connection, flexible with connector sleeve, without/with plastic sleeve .....	0.25 ... 2.5 mm <sup>2</sup>
Conductor sizes (AWG) .....	24-12
Tightening torque, terminal screws .....	0,5 ... 0,6 Nm (4,3 ... 5,3 lb-in)
Protection class, internal components (DIN EN 60529) .....	IP30
Protection class, terminals (DIN EN 60529) .....	IP20
Screw fixing .....	2 x M4
DIN rail mounting acc. to .....	IEC 60715
Flammability class .....	UL94V-0
Weight .....	approx. 530 g

**Abweichende Ausführungen**

Dieses Feld ist nur beklebt, falls Änderungen gegenüber der Standardausführung des Gerätes vorgenommen wurden.

**Label for modified versions**

There will only be a label in this field if the device is different from the standard version.



**Bestellangaben**

**Ordering details**

Typ / Type	Versorgungsspannung U <sub>s</sub> / Supply voltage U <sub>s</sub>	Art.-Nr. / Art. No.
PRC487	AC 230 V	B 92 042 000
PRC487-133	AC 127 V	B 92 042 002
PRC487-29	DC 110 V	B 92 042 004
PRC487-29	DC 24 V	B 92 042 003
PRC487-9	AC 230 V	B 92 042 005

Alle Rechte vorbehalten.  
 Nachdruck und Vervielfältigung  
 nur mit Genehmigung des Herausgebers.  
 Änderungen vorbehalten!  
 © Dipl.-Ing. W. Bender GmbH & Co.KG



All rights reserved.  
 Reprinting and duplicating  
 only with permission of the publisher.  
 Subject to change!  
 © Dipl.-Ing. W. Bender GmbH & Co.KG



Dipl.-Ing. W. Bender GmbH & Co.KG  
 Londorfer Str. 65 • 35305 Grünberg  
 Postfach 1161 • 35301 Grünberg

Tel.: +49 (0)6401-807-0  
 Fax: +49 (0)6401-807-259

E-Mail: info@bender-de.com  
 Web-Server: http://www.bender-de.com

## Spannungsrelais

Deutsch

### Bestimmungsgemäße Verwendung

Das Spannungsrelais SUE487 bzw. SUD487 dient zur Spannungsüberwachung in MEDICS<sup>®</sup>-Modulen der Baureihen UMC107..., USC107... und UFC107E... Das SUE487 findet Einsatz in einphasigen Systemen. Das SUD487 wird in Drehstromsystemen eingesetzt.

Das Gerät arbeitet grundsätzlich mit einem Steuergerät PRC487 zusammen. MEDICS<sup>®</sup>-Module sind besonders geeignet zur Überwachung und Umschaltung der Stromversorgung von medizinisch genutzten Räumen nach DIN VDE 0100-710:2002-11.

Eine weitere Aufgabe des SUE487 bzw. SUD487 ist das Zuschalten der Spannungsversorgung für die gesamte Umschalteinrichtung.

### Sicherheitshinweise allgemein

Montage, Anschluss und Inbetriebnahme nur durch Elektrofachkraft!

Beachten Sie unbedingt:

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

### Funktionsbeschreibung

SUE487 bzw. SUD487 überwacht jeweils alle Phasen der Leitungen 1, 2 und 3 (Leitung hinter der Umschalteinrichtung) gegen N. Für diese Aufgabe enthält das SUE487 drei Messkreise, das SUD487 neun Messkreise.

Dabei gilt jeweils für die Leitungen 1, 2, und 3 ein gemeinsamer Ansprechwert für Überspannung und ein gemeinsamer Ansprechwert für Unterspannung. Die Ansprechwerte werden über das angeschlossene PRC487 eingestellt.

Über das eingebaute Hilfsschütz K3 wird die Spannungsversorgung für die komplette Umschalteinrichtung zugeschaltet. Ist Leitung 2 eingeschaltet, so ist K3 angezogen und die Umschalteinrichtung wird aus Leitung 2 versorgt. Fällt die Spannung auf Leitung 2 aus, so fällt K3 ab und die Umschalteinrichtung wird aus Leitung 1 versorgt.

### Bedienelemente

## Voltage relay

English

### Intended use

The intended use of the voltage relay SUE487 respectively SUD487 is to monitor the voltage in MEDICS<sup>®</sup> modules of the series UMC107..., USC107... and UFC107E... SUE487 is suitable for use in single phase systems. SUD487 is suitable for use in three-phase systems.

The device can only be used in combination with the control and indicating device PRC487. MEDICS<sup>®</sup> modules are particularly suitable for monitoring and switchover of power supplies in medical locations in accordance with DIN VDE 0100-710:2002-11, IEC 60364-7-710.

Another task of SUE487 respectively SUD487 is the connection of the entire changeover module to the power supply.

### Safety information

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

Particular attention shall be paid to:

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

### Function

The SUE487 respectively SUD487 monitors all phases of the Lines 1, 2 and 3 (Line downstream the changeover module) against N. For this task, the SUE487 is equipped with three, the SUD487 with nine measuring circuits.

The lines 1, 2 and 3 have one common response value for overvoltage and one common response value for undervoltage. The response values are set via the connected PRC487.

The complete changeover module can be connected to the power supply via the integrated contactor relay K3. If Line 2 is switched on, K3 is energized and the changeover module is supplied from Line 2. In the event of a voltage failure on Line 2, K3 deenergizes and the changeover module is supplied from Line 1.

### Operating elements

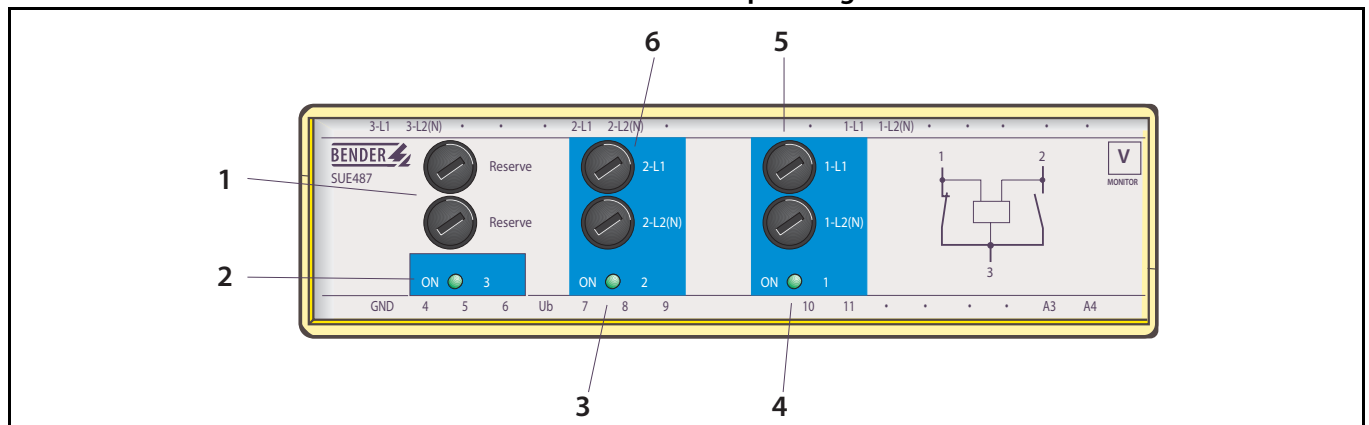


Abb. 1: Bedienelemente SUE487. Das SUD487 hat die gleichen Bedienelemente, jedoch abweichende Anschlüsse.

Fig. 1: Operating elements SUE487. SUD487 is equipped with the same operating elements, but the connections differ.

### Legende der Bedienelemente

- 1 Aufbewahrungsort für Reserve-Sicherungen
  - 2 LED „ON 3“ (grün): Der Wert der Spannung auf Leitung 3 (hinter der Umschalteneinrichtung) liegt innerhalb der eingestellten Grenzwerte.
  - 3 LED "ON 2" (grün): Der Wert der Spannung auf Leitung 2 liegt innerhalb der eingestellten Grenzwerte.
  - 4 LED „ON 1“ (grün): Der Wert der Spannung auf Leitung 1 liegt innerhalb der eingestellten Grenzwerte.
  - 5 Sicherungen für L1 der Leitung 1 (Feinsicherung 2 A mittelträge).
  - 6 Sicherungen für L2 der Leitung 2 (Feinsicherung 2 A mittelträge).
- Bei dem SUD487 werden nur die Leitungen abgesichert, aus denen die Hilfsspannung für die Umschalteneinrichtung entnommen wird. Die anderen Phasen haben elektronische Sicherungen.

### Legend to operating elements

- 1 Place to keep spare fuses
  - 2 LED "ON3" (green): the value of the voltage on Line 3 (downstream the changeover module) is within the preset limiting values.
  - 3 LED "ON2" (green): the value of the voltage on Line 2 is within the preset limiting values.
  - 4 LED "ON 1" (green): the value of the voltage on Line 1 is within the preset thresholds.
  - 5 Fuses for L1 of Line 1 (miniature fuse 2 A, medium time-lag fuse)
  - 6 Fuses for L2 of Line 1 (miniature fuse 2 A, medium time-lag fuse)
- At SUD487 only that wires are protected where the supply voltage for the changeover module is taken from. All other phases are protected by electronics.

### Montage und Anschluss



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



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

### Montage

Das Gerät ist für folgende Einbauarten geeignet:

- Installationsverteiler nach DIN 43 871 oder
- Schnellmontage auf Hutprofilschiene nach IEC 60715
- oder Schraubmontage.

### Installation

The device is suited for:

- mounting into standard distribution panels acc. to DIN 43 871
- DIN rail mounting acc. to IEC 60715
- or screw mounting.

### Maßbild

### Dimension diagram

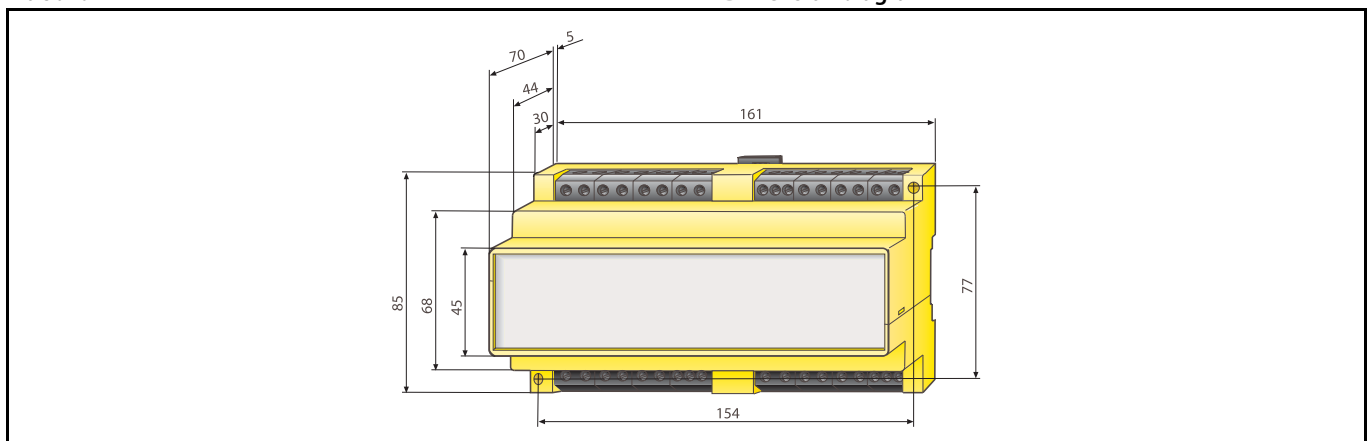


Abb. 2: alle Maße in mm

Fig. 2: all dimensions in mm



**Anschluss**

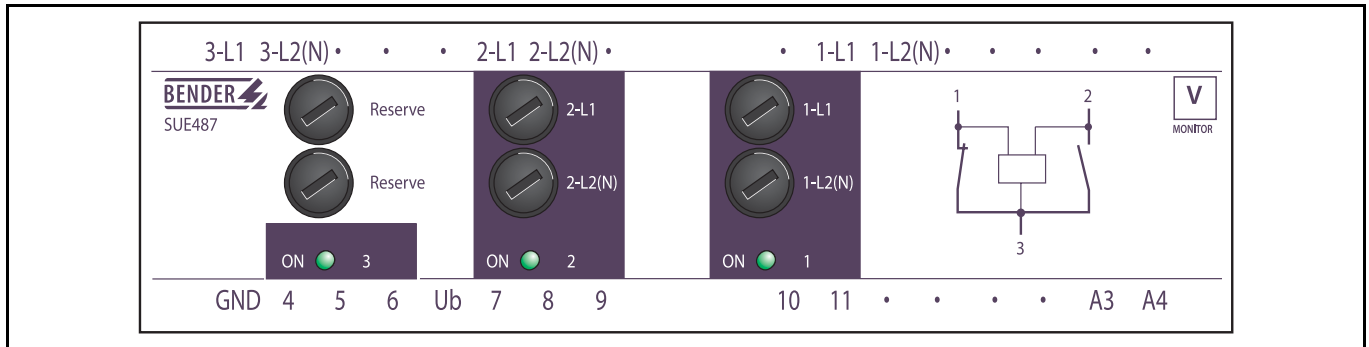
Schließen Sie das Gerät entsprechend dem Anschlussplan in der Anleitung des MEDICS®-Moduls an.

**Connection**

Connect the device according to the wiring diagram described in the operating instructions of the MEDICS® module.

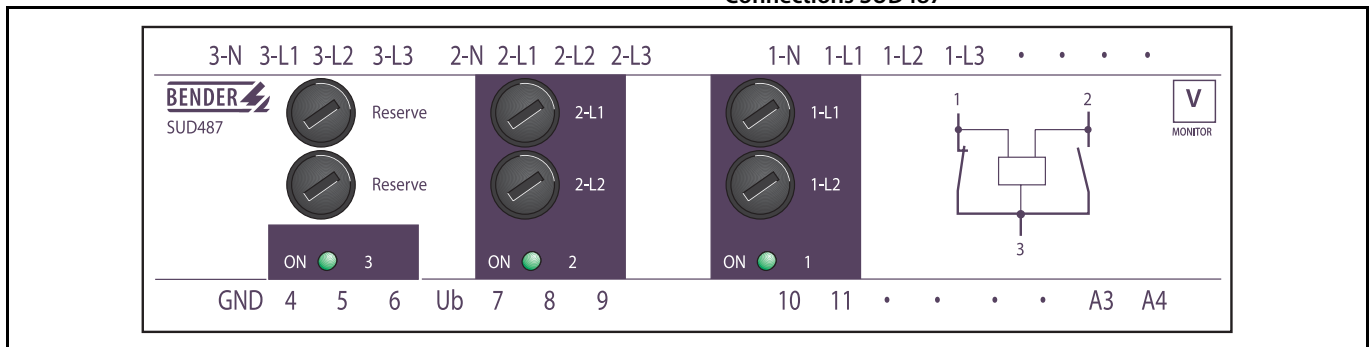
**Anschlüsse SUE487**

**Connections SUE487**



**Anschlüsse SUD487**

**Connections SUD487**



GND	Masse, gemeinsamer Ausgang der Klemmen 4, 5, 6, 11.
4	Ausgang Leitung 3, schaltet gegen GND, wenn Spannung auf Leitung 3 innerhalb der eingestellten Grenzwerte liegt
5	Ausgang Leitung 2, schaltet gegen GND, wenn Spannung auf Leitung 2 innerhalb der eingestellten Grenzwerte liegt
6	Ausgang Leitung 1, schaltet gegen GND, wenn Spannung auf Leitung 1 innerhalb der eingestellten Grenzwerte liegt
Ub	Eingang + 12 V, gemeinsamer Eingang für die Klemmen 7, 8, 9, 10
7	Eingang Ansprechwert Unterspannung, Low = oberer Ansprechwert, high (oder offen) = unterer Wert
8	Eingang Ansprechwert Überspannung, offen = 1,15 x U <sub>n</sub>
9	Eingang Test-Relais, 0V = Relais ein, TEST
10	Dieser Kontakt hat keine Funktion
11	Ausgang Hilfsschutz, schaltet gegen GND, wenn K3 ein.
A3, A4	Spannungsausgang zur Versorgung der Umschalteinrichtung

GND3	Ground, common output for the terminals 4, 5, 6, 11.
4	Output Line 3, switches against GND, if voltage on Line 3 is within the preset limiting values
5	Output line 2, switches against GND, if voltage on Line 2 is within the preset limiting values.
6	Output Line 1, switches against GND, if voltage on Line 1 is within the preset limiting values.
Ub	Input + 12 V, common input for the terminals 7, 8, 9, 10
7	Input response value undervoltage, Low = upper response value, High (or open) = lower value
8	Input response value overvoltage, open = 1.15 x U <sub>n</sub>
9	Input test relay, 0 V = relay on, TEST
10	This contact is not in operation
11	Output auxiliary contactor: switches against GND, if K3 is on
A3, A4	Voltage output to supply the changeover module

Nur SUE487:  
 1-L1, 1-L2(N) Anschluss an Leitung 1 (bevorzugte Leitung)  
 2-L1, 2-L2(N) Anschluss an Leitung 2 (redundante Leitung)  
 3-L1, 3-L2(N) Anschluss an Leitung 3 (Leitung hinter der Umschalteinrichtung)

Nur SUD487:  
 1-N, 1-L1, 1-L2, 1-L3 Anschluss an Leitung 1 (bevorzugte Leitung)  
 2-N, 2-L1, 2-L2, 2-L3 Anschluss an Leitung 2 (redundante Leitung)  
 3-N, 3-L1, 3-L2, 3-L3 Anschluss an Leitung 3 (Leitung hinter der Umschalteinrichtung)

SUE 487 only  
 1-L1, 1-L2(N) Connection to line 1 (preferred line)  
 2-L1, 2-L2(N) Connection to line 2 (redundant line)  
 3-L1, 3-L2(N) Connection to line 3 (line downstream the changeover module)

SUD487 only:  
 1-N, 1-L1, 1-L2, 1-L3 Connection to line 1 (preferred line)  
 2-N, 2-L1, 2-L2, 2-L3 Connection to line 2 (redundant line)  
 3-N, 3-L1, 3-L2, 3-L3 Connection to line 3 (line downstream the changeover module)

## Inbetriebnahme

Kontrollieren Sie vor der Inbetriebnahme den ordnungsgemäßen Anschluss des Gerätes.



*Das Gerät ist Bestandteil eines MEDICS®-Moduls. Führen Sie die Inbetriebnahme entsprechend den Hinweisen in der Anleitung des MEDICS®-Moduls durch.*

## Commissioning

Prior to commissioning, check proper connection of the device.



*The device is a component of the MEDICS® module. For commissioning please refer to the operating instructions of the MEDICS® module.*

## Bedienen und Einstellen

### Grenzwerte

Der Grenzwert der Überspannung ist fest eingestellt auf  $1,15 \times U_n$ . Der Grenzwert der Unterspannung kann im Menü SETUP des PRC487 im Bereich von  $0,7 \dots 0,9 \times U_n$  eingestellt werden.

### Test

Wird am PRC487 ein "TEST" aktiviert, so simuliert das SUE487 bzw. SUD487 über einen Testwiderstand eine Unterspannung auf Leitung L1. Die grüne LED "ON 1" verlöscht und ein Alarm wird an das PRC487 gemeldet. Das PRC487 löst nun eine automatische Umschaltsequenz aus. Am Ende ist wieder Spannung auf Leitung 1 vorhanden und die LED "ON 1" leuchtet wieder.

## Normen

- DIN VDE 0100-710 (VDE 0100 Teil 710): 2002-11
- ÖVE-EN7/1991
- ÖVE/ÖNORM E8007/A1: 2001-02-01
- ÖVE/ÖNORM E8007/A2: 2002-11-01
- IEC 60364-7-710: 2002-11
- DIN VDE 0100-718 (VDE 0100 Teil 718): 2005-10

## Operation and setting

### Response values

The response value of the overvoltage is preset to  $115 \% \times U_n$  and cannot be modified. The undervoltage response value is adjustable between  $70 \%$  and  $85 \% \times U_n$  in the SETUP menu of the PRC487.

### Test

If a "TEST" is activated SUE487 resp. SUD487 is simulating undervoltage at line 1 by means of a test resistor. The green "ON1" LED goes off and an alarm is signalled to the PRC487. A switchover from line 1 to line 2 and later back to line 1 is controlled by the PRC487. Finally line 1 is energized again and the green "ON1" LED lights up again.

## Standards

- DIN VDE 0100-710 (VDE 0100 Teil 710): 2002-11
- ÖVE-EN7/1991
- ÖVE/ÖNORM E8007/A1: 2001-02-01
- ÖVE/ÖNORM E8007/A2: 2002-11-01
- IEC 60364-7-710: 2002-11
- DIN VDE 0100-718 (VDE 0100 Teil 718): 2005-10

**Technische Daten**

**Isolationskoordination nach IEC 60664-1**

Bemessungsspannung ..... AC 400 V  
 Bemessungs-Stoßspannung/Verschmutzungsgrad ..... 4 kV/3

**Spannungsbereiche**

Versorgungsspannung  $U_S$  ..... siehe Typenschild  
 Arbeitsbereich von  $U_S$  ..... 0,7 ... 1,3 x  $U_S$   
 Eigenverbrauch .....  $\leq 9$  VA

**Messkreis**

Netznominalspannung  $U_n$  ..... siehe Typenschild  
 Frequenz  $f_n$  ..... 50...60 Hz  
 Ansprechwerte .....  
 Unterspannung, einstellbar ..... 0,7 ... 0,9 x  $U_n$   
 Überspannung, fest ..... 1,15 x  $U_n$   
 Ansprechzeit  $t_{an}$  ( $t_v = 0$ ) .....  $< 250$  ms  
 Hysterese ..... ca. 3 %  
 Temperatureinfluss .....  $< 0,2$  % / °C

**Allgemeine Daten**

EMV Störfestigkeit ..... nach IEC 61000-6-2  
 EMV Störaussendung ..... nach IEC 61000-6-4  
 Schockfestigkeit IEC60068-2-27 (Gerät in Betrieb) ..... 15 g/11 ms  
 Dauerschocken IEC60068-2-29 (Transport) ..... 40 g/6 ms  
 Schwingungsbeanspruchung IEC 60068-2-6 (Gerät in Betrieb) ..... 1 g / 10 ... 150 Hz  
 Schwingungsbeanspruchung IEC 60068-2-6 (Transport) ..... 2 g / 10 ... 150 Hz  
 Umgebungstemperatur (bei Betrieb) ..... -10 °C ... +55 °C  
 Umgebungstemperatur (bei Lagerung) ..... -40 °C ... +70 °C  
 Klimaklasse nach DIN IEC60721-3-3 ..... 3K5  
 Betriebsart ..... Dauerbetrieb  
 Einbaulage ..... beliebig  
 Anschlussart ..... Reihenklemmen  
 Anzugsdrehmoment ..... 0,5 ... 0,6 Nm (4,3 ... 5,3 lb-in)  
 Anschlussvermögen Starr / flexibel ..... 0,2 ... 4 / 0,2 ... 2,5 mm<sup>2</sup>  
 Anschlussvermögen flexibel mit Aderendhülse, ohne/mit Kunststoffhülse ..... 0,25 ... 2,5 mm<sup>2</sup>  
 Leitergrößen (AWG) ..... 24-12  
 Schutzart Einbauten (DIN EN 60529) ..... IP30  
 Schutzart Klemmen (DIN EN 60529) ..... IP20  
 Schraubbefestigung ..... 2 x M4  
 Schnellbefestigung auf Hutprofilschiene ..... IEC 60715  
 Entflammbarkeitsklasse ..... UL94V-0  
 Gewicht ca. .... 530 g

**Abweichende Ausführungen**

Dieses Feld ist nur beklebt, falls Änderungen gegenüber der Standardausführung des Gerätes vorgenommen wurden.



**Technical data**

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

Rated voltage ..... AC 400 V  
 Rated impulse voltage/pollution degree ..... 4 kV/3

**Voltage ranges**

Nominal voltage range  $U_S$  ..... see nameplate  
 Operating range of  $U_S$  ..... 0.7 ... 1.3 x  $U_S$   
 Power consumption .....  $\leq 9$  VA

**Measuring circuit**

Nominal system voltage  $U_n$  ..... see nameplate  
 Nominal frequency  $f_n$  ..... 50...60 Hz  
 Response values .....  
 Undervoltage, adjustable ..... 0,7 ... 0,9 x  $U_n$   
 Overvoltage, not adjustable ..... 1,15 x  $U_n$   
 Response time  $t_{an}$  ( $t_v = 0$ ) .....  $< 250$  ms  
 Hysteresis ..... ca. 3 %  
 Influence of the temperature .....  $< 0,2$  % / °C

**General data**

EMC immunity ..... acc. to IEC 61000-6-2  
 EMC emission ..... acc. to IEC 61000-6-4  
 Shock resistance IEC60068-2-27 (device in operation) ..... 15 g/11 ms  
 Bumping IEC60068-2-29 (during transport) ..... 40 g/6 ms  
 Vibration resistance IEC 60068-2-6 (device in operation) ..... 1 g / 10 ... 150 Hz  
 Vibration resistance IEC 60068-2-6 (during transport) ..... 2 g / 10 ... 150 Hz  
 Ambient temperature (during operation) ..... -10 °C ... +55 °C  
 Storage temperature range ..... -40 °C ... +70 °C  
 Climatic class acc. to DIN IEC60721-3-3 ..... 3K5  
 Operating mode ..... continuous operation  
 Mounting ..... any position  
 Connection ..... screw terminals  
 Tightening torque, terminal screws ..... 0,5 ... 0,6 Nm (4,3 ... 5,3 lb-in)  
 Connection, rigid, flexible ..... 0,2 ... 4 / 0,2 ... 2,5 mm<sup>2</sup>  
 Connection, flexible with connector sleeve, without/with plastic sleeve ..... 0,25 ... 2,5 mm<sup>2</sup>  
 Conductor sizes (AWG) ..... 24-12  
 Protection class, internal components (DIN EN 60529) ..... IP30  
 Protection class, terminals (DIN EN 60529) ..... IP20  
 Screw fixing ..... 2 x M4  
 DIN rail mounting acc. to ..... IEC 60715  
 Flammability class ..... UL94V-0  
 Weight approx. .... 530 g

**Label for modified versions**

There will only be a label in this field if the device is different from the standard version..

## Bestellangaben

## Ordering details

Typ Type	Netzennspannung $U_n$ Nominal system voltage $U_n$	Versorgungsspannung $U_s$ Supply voltage $U_s$	Art.-Nr. Art. No.
SUE487	AC 230 V, 50 ... 60 Hz	AC 230 V, 50 ... 60 Hz	B 92 046 000
SUE487-133	AC 127 V, 50 ... 60 Hz	AC 127 V, 50 ... 60 Hz	B 92 046 002
SUD487	3NAC 400/230 V, 50 ... 60 Hz	AC 230 V, 50 ... 60 Hz	B 92 046 001

Alle Rechte vorbehalten.  
Nachdruck und Vervielfältigung  
nur mit Genehmigung des Herausgebers.  
Änderungen vorbehalten!  
© Dipl.-Ing. W. Bender GmbH & Co.KG



 BENDER GROUP

All rights reserved.  
Reprinting and duplicating  
only with permission of the publisher.  
Subject to change!  
© Dipl.-Ing. W. Bender GmbH & Co.KG



Dipl.-Ing. W. Bender GmbH & Co.KG  
Londorfer Str. 65 • 35305 Grünberg  
Postfach 1161 • 35301 Grünberg

Tel.: +49 (0)6401-807-0  
Fax: +49 (0)6401-807-259

E-Mail: [info@bender-de.com](mailto:info@bender-de.com)  
Web: <http://www.bender-de.com>

## Isolations-Überwachungsgerät mit Transformatorüberwachung

Deutsch

### Bestimmungsgemäße Verwendung

Das 107TD47 ist ein kombiniertes Überwachungsgerät zur

- Isolationsüberwachung eines AC IT-Systems
- Laststromüberwachung eines IT-System-Transformators bis 50 A
- Überwachung eines IT-System-Transformators auf unzulässige Erwärmung.

Das Gerät ist besonders geeignet zur Überwachung der Stromversorgung von medizinisch genutzten Bereichen nach DIN VDE 0100-710 (VDE 0100 Teil 710): 2002-11 und IEC 60364-7-710:2002-11.

### Sicherheitshinweise allgemein

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

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

### Sicherheitshinweise gerätespezifisch



*In jedem leitend verbundenen System darf nur ein Isolationsüberwachungsgerät angeschlossen sein. Vor Isolations- und Spannungsprüfungen an der Anlage muss das Isolationsüberwachungsgerät für die Dauer der Prüfung vom Netz getrennt sein.*

### Funktionsbeschreibung

#### Isolationsüberwachung

Das Gerät misst den Isolationswiderstand in 1- oder 3-phasigen AC IT-Systemen, die auch Gleichspannungsanteile enthalten dürfen. Die Anpassung an Netzableitkapazitäten (max. 5 µF) erfolgt automatisch.

#### Laststrommessung

Bei AC-Systemen wird der Laststrom über einen Stromwandler STW2 erfasst. Bei 3AC-Systemen wird über drei Stromwandler STW2 und einen Ankoppelbaustein LSD470 der höchste Wert des Laststromes ermittelt.

#### Temperaturmessung

Die Temperatur in der Transformatorwicklung wird über Kaltleiter oder Öffnerkontakte erfasst.

#### Auswertung

Ist einer der erfassten Werte nicht innerhalb der Grenzwerte, so wird ein Alarm (Sammelmeldung) ausgelöst. Die LED „ALARM“ leuchtet, das Alarmrelais schaltet und im LC-Display erscheint eine Meldung. Über den BMS-Bus wird dieser Alarm an andere BENDER-Geräte, wie z.B. eine Melde- und Prüfkombination, weitergegeben.

#### Signalumsetzung (Option)

Der Isolationswiderstand von OP-Leuchten wird oft durch ein weiteres Isometer überwacht, das im Alarmfall einen Relaiskontakt schaltet. Das 107TD47 erfasst die Alarmmeldung dieses Kontakts und gibt sie über BMS-Bus an andere BENDER-Geräte, wie z.B. eine Melde- und Prüfkombination, weiter.

## Insulation Monitoring Device with transformer monitoring

English

### Intended Use

The A-ISOMETER® 107TD47 is a multifunction device for monitoring

- the insulation resistance of AC IT systems;
- the load current of IT system transformers up to 50 A;
- the temperature of the IT system transformers.

The A-ISOMETER is intended to be used for monitoring power supplies in medical locations according to DIN VDE 0100-710 (VDE 0100 part 710): 2002-11 and IEC 60364-7-710:2002-11.

### Safety Information

Installation, connection and commissioning of electrical equipment shall only be carried out by skilled persons!

Particular attention shall be paid to:

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

### Device-specific Safety Information



*Only one insulation monitoring device may be used in each interconnected system.*

*When insulation and voltage tests are to be carried out, the device shall be isolated from the system for the test period.*

### Function

#### Insulation Monitoring:

The A-ISOMETER monitors the insulation resistance in 1 or 3 phase AC IT systems, which may also contain DC components. Automatic adaptation to the system leakage capacitances (max. 5 µF).

#### Load current monitoring:

In AC systems, the load current is monitored by one current transformer, in 3 phase AC systems by three current transformers STW2 and one measuring adapter LSD470. In 3 phase system only the highest value of the load current is evaluated.

#### Temperature Monitoring:

The temperature in the transformer winding is measured via PTC thermistors or NC contacts.

#### Evaluation

If one of the measured values exceeds the limiting value, an alarm is initiated (collective alarm). The ALARM LED lights up, the alarm relay switches and a message appears on the LC display. This alarm message is transferred to other Bender devices, such as an alarm indicator and test combination, via the RS485 interface (BMS protocol).

#### Signal Conversion (Option)

The insulation resistance of operating theatre lamps often is monitored by another A-ISOMETER that activates a relay contact in case of alarm. The alarm message of this contact is recorded by the 107TD47 and transferred via the BMS (Bender Measuring Device Interface) bus to other Bender devices, such as an alarm indicator and test combination.

**Bedienelemente**

**Operating Elements**

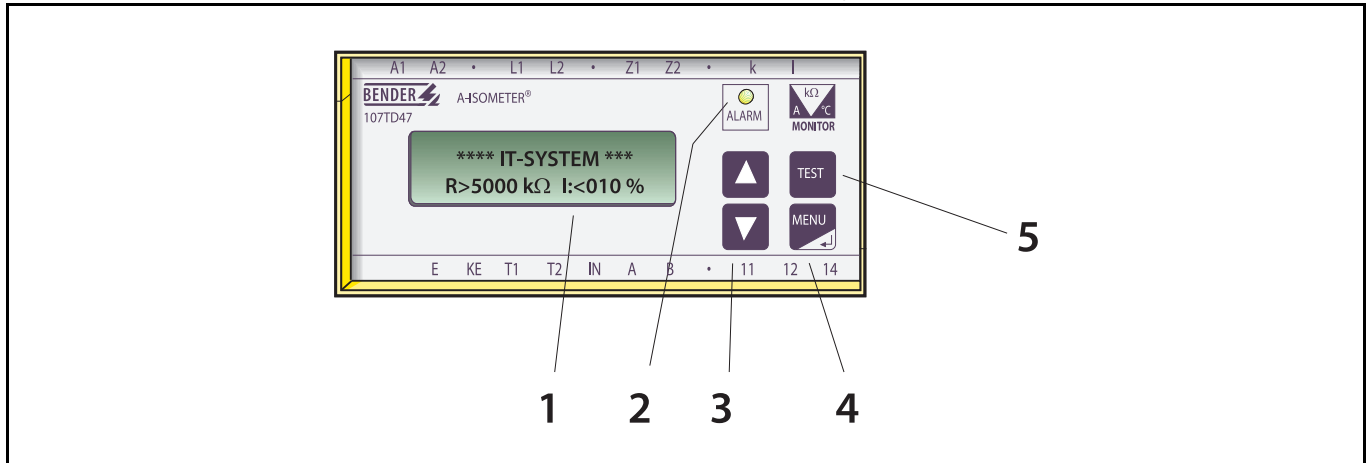


Abb. 1: Bedienelemente

Figure 1: Operating elements

**Legende der Bedienelemente**

- 1 Beleuchtete Text-Anzeige (2 x 16 Zeichen).
- 2 LED „ALARM“ (gelb) leuchtet wenn ein Ansprechwert überschritten wurde.
- 3 Pfeiltasten  
Im Anzeige-Modus: Keine Funktion.  
Im Menü-Modus: Zur Navigation innerhalb der Menüs und zum Ändern von Parametern.
- 4 Taste "MENU/ENTER"  
Im Anzeige-Modus: Zum Wechsel vom Anzeige-Modus in den Menü-Modus.  
Im Menü-Modus: Zur Bestätigung der angewählten Menüpunkte bzw. zur Bestätigung der ausgewählten Parameter.
- 5 Taste "TEST"  
Im Anzeige-Modus: Aktiviert im Anzeige-Modus die TEST-Funktion (Selbsttest).  
Im Menü-Modus: Bewirkt aus jeder Position einen Rücksprung in den Anzeige-Modus. Bei Betätigen während einer Parameteränderung wird die letzte Änderung nicht gespeichert.

**Legend to operating elements**

- 1 Backlit text display (2 x 16 characters) .
- 2 "ALARM" LED (yellow) lights up when the response value is exceeded.
- 3 arrow keys  
In the display mode: no function.  
In the Menu mode: For navigation within the menu and for changing parameters.
- 4 "MENU/ENTER" key  
For changing from the display mode to the Menu mode.  
In the Menu mode: ENTER key for confirming the selected menu point or for confirming the selected parameter.
- 5 "TEST" key  
In the display mode: activates the TEST function (self test).  
In the Menu mode: causes a return to the display mode from any position. If activated during parameter change, the last change will not be stored.

**Montage und Anschluss**



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

**Montage**

Das Gerät ist für folgende Einbauarten geeignet:

- Installationsverteiler nach DIN 43871:1992-11 oder
- Schnellmontage auf Hutprofilschiene nach IEC 60715:1995-10
- oder Schraubmontage.

**Installation and connection**

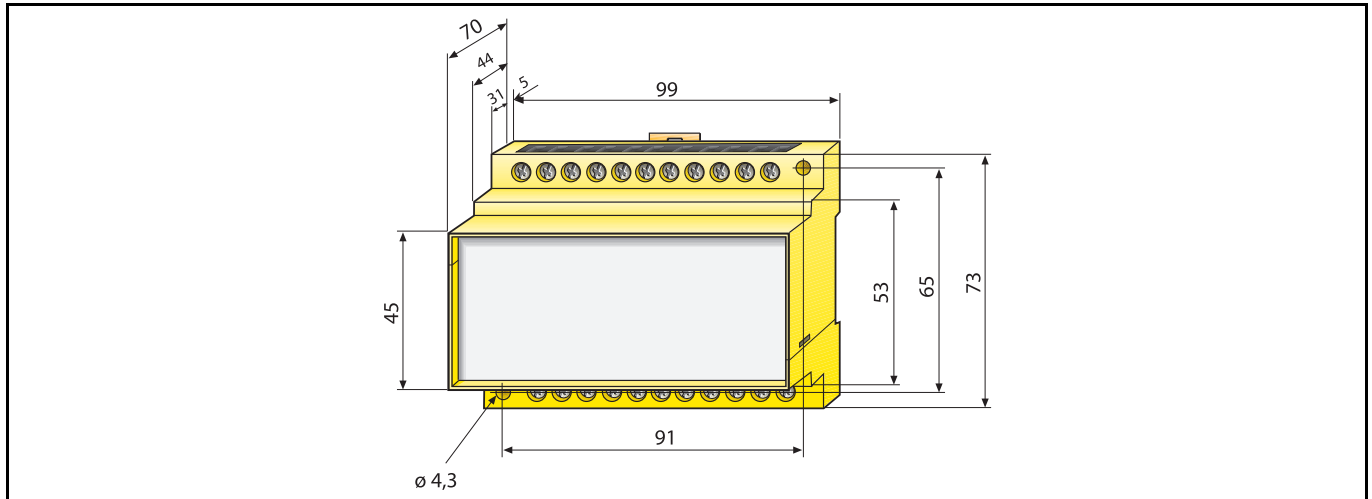


Prior to installation and before any work is carried out on the connecting cables, make sure that the mains power is disconnected. Failure to comply with this safety information may cause electric shock to personnel. Substantial damages to the electrical installation and destruction of the device may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

**Installation**

The device is suited for:

- mounting into standard distribution panels acc. to DIN 43871:1992-11
- DIN rail mounting in compliance with IEC 60715:1995-10
- or screw mounting.

**Maßbild**
**Dimension diagram**

*Abb. 2: Maßbild,  
alle Maße in mm*
*Figure 2: Dimension diagram,  
all dimensions in mm*

## Anschluss

Schließen Sie das Gerät entsprechend dem Anschlussbild an. Beachten Sie dabei das Anzugsdrehmoment für die Klemmschrauben (siehe Technische Daten).

1. **Versorgungsspannung**  
Verbinden Sie das Gerät mit der erforderlichen Versorgungsspannung  $U_S$  (Siehe Typenschild). Sichern Sie die Zuleitung mit Sicherungen ab (allpolig bei Versorgung aus einem IT-System).
2. **Zu überwachendes AC-IT-System**  
Schließen Sie das Gerät an das zu überwachende AC-System an. Wird die Versorgungsspannung aus dem zu überwachenden AC-System entnommen, so werden die entsprechenden Klemmen miteinander verbunden. Schließen Sie die Klemmen E und KE mit zwei getrennten Leitern an PE an.
3. **Temperatur- und Lastüberwachung**  
Schließen Sie die Temperaturüberwachung des Transformators an. Ist **keine** Temperaturüberwachung vorhanden, brücken Sie die Klemmen Z1 und Z2.  
Schließen Sie den Stromwandler STW2 zur Laststromüberwachung an. Zur Laststromüberwachung in Drehstromsystemen benötigen Sie drei Stromwandler STW2 und einen Ankoppelbaustein LSD470. Ist **keine** Laststromüberwachung vorhanden, schließen Sie einen Widerstand 20 ... 50  $\Omega$  (empfohlen: 30  $\Omega$ ) zwischen den Klemmen k und l an.
4. **Schnittstelle**  
Verbinden Sie das Gerät über den BMS-Bus mit anderen busfähigen BENDER-Geräten (z.B. Melde- und Prüfkombination, Melde- und Bedientableau). Beachten Sie dabei den Beipackzettel zum BMS-Bus.
5. **Alarmrelais**  
An die Klemmen des Alarmrelais K schließen Sie Komponenten an, die bei auftretenden Alarmen geschaltet werden sollen.
6. **Weitere Peripherie**  
Falls zutreffend, schließen Sie die externe TEST-Taste und den Alarm-Kontakt zur Überwachung einer OP-Leuchte an das Gerät an. Ist **keine** OP-Leuchten-Überwachung vorhanden, so brücken Sie die Kontakte T1 und IN.

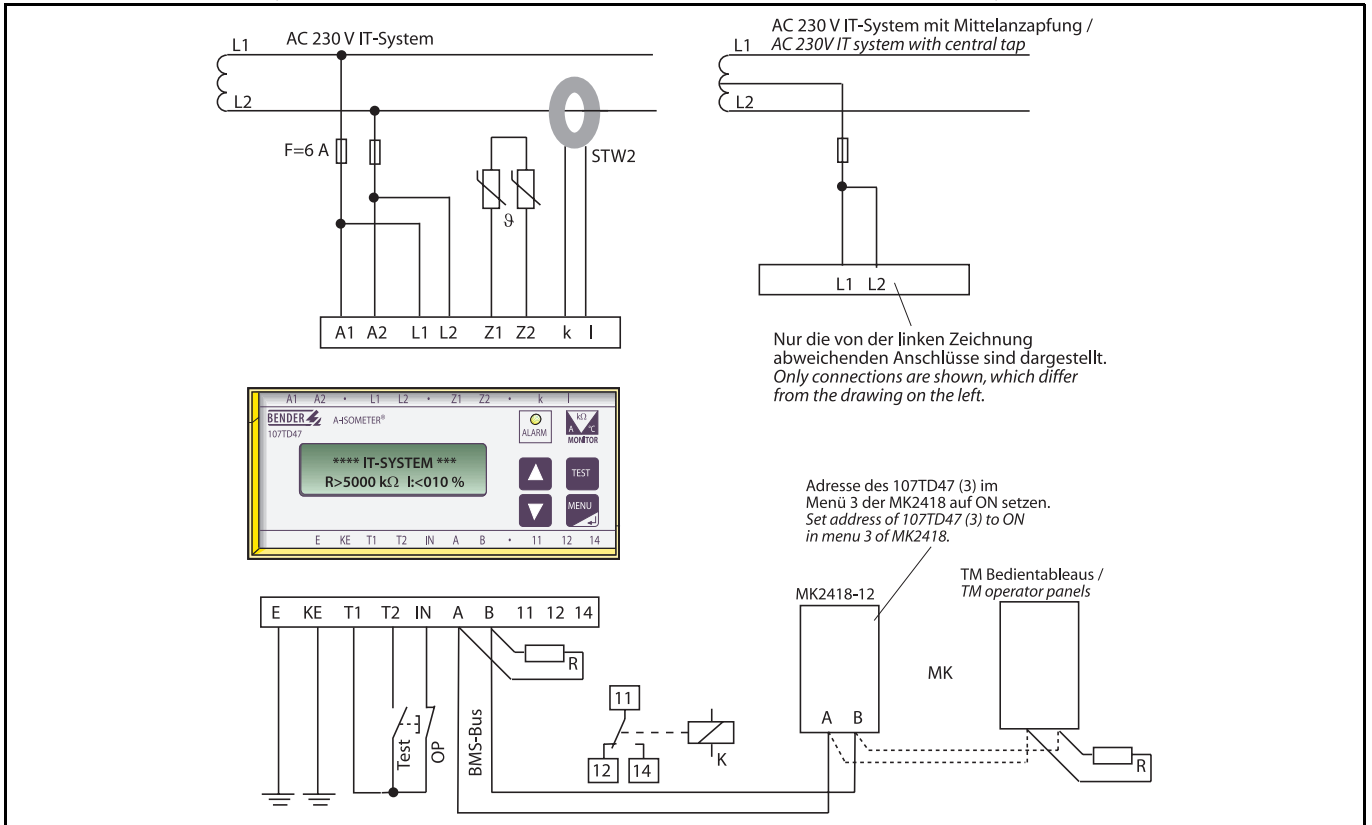
## Connection

Connect the device as described in the wiring diagram. The tightening torque for the terminal screws is: 0.5 ... 0.6 NM (4.3 ... 5.3 lb-in).

1. **Supply voltage**  
Connect the device to the required supply voltage  $U_S$  (see nameplate). Short-circuit protection shall be provided (for all poles if the supply voltage is taken from an IT system).
2. **AC IT system to be monitored**  
Connect the device to the AC system to be monitored. If the supply voltage is taken from the AC system to be monitored, connect the respective terminals with each other. Use two separate wires to PE when connecting the terminals E and KE.
3. **Temperature and load monitoring**  
Connect the temperature monitoring of the transformer. If no temperature monitoring is provided, bridge the terminals Z1 and Z2.  
Connect the current transformer STW2 to load current monitoring. You need three current transformers STW2 and one measuring adapter LSD470 for load current monitoring in three-phase systems. If no load current monitoring is provided, connect a resistor 20 ... 50  $\Omega$  (recommended: 30  $\Omega$ ) between the terminals K and I.
4. **Interface**  
Connect the device to other Bender devices capable of communicating via the bus, such as alarm indicator and test combination considering the BMS bus instructions.
5. **Alarm relay**  
Connect the devices to be activated in the event of alarm to the output terminals of the alarm relay K.
6. **Other peripheral devices**  
If applicable, connect the external TEST button and the alarm contact for monitoring the operating theatre lamp to the device. If **no** operating theatre lamp monitoring is provided, bridge the contacts T1 and IN.

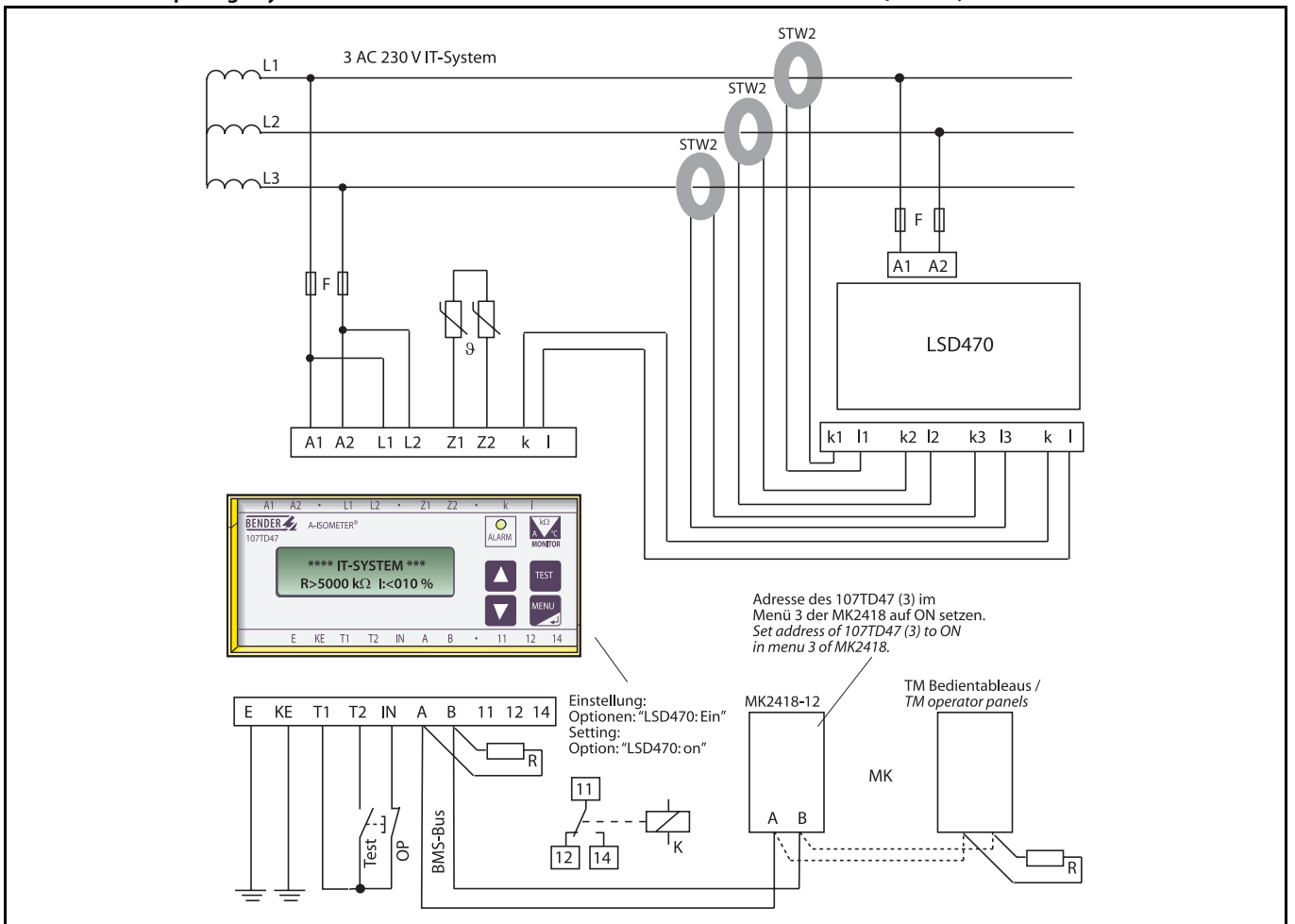
Anschluss an einphasige Systeme

Connection single-phase systems



Anschluss an dreiphasige Systeme

Connection to three-phase systems





**Legende zu den Anschlussbildern**

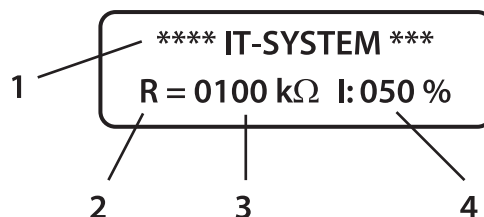
F	Kurzschlusschutz Versorgungsspannung 6 A.
STW2	Stromwandler für Laststromüberwachung (gehört nicht zum Lieferumfang).
δ	Kaltleiter (oder Öffnerkontakte) in der Transformatorwicklung. Sprechen bei Übertemperatur im Transformator an. Max. 6 Kaltleiter in Reihe schalten.
LSD470	Ankoppelbaustein zur Laststromüberwachung in 3 AC- Systemen.
K	Alarmrelais ohne Fehlerspeicher zur Meldung Isolationsfehler, Überstrom, Übertemperatur und Gerätefehler.
MK	Melde- und Prüfkombination MK2418 bzw. TM Bedientableaus.
A1, A2	Anschluss der Versorgungsspannung $U_s$
L1, L2	Anschluss überwachtes System
Z1, Z2	Anschluss Temperaturüberwachung
k, l	Anschluss Laststromüberwachung
E, KE	Doppelter Anschluss an PE
T1	Speisespannung für T1 und IN1
T2	Optionale externe Prüftaste zum Test der Isolationsüberwachung (42 kΩ Prüf Widerstand), sowie zum Test der Messkreise für Laststrom und Temperatur.
IN	Eingang für die Meldung „Isolationsfehler OP-Leuchte“ von einem Öffner des entsprechenden Isolationsüberwachungsgerätes.
A, B	BMS-Bus
11, 12, 14	Anschluss Alarmrelais K

**Inbetriebnahme**

1. Kontrollieren Sie vor der Inbetriebnahme den ordnungsgemäßen Anschluss des Gerätes.
2. Schalten Sie die Netzspannung ein.
3. Passen Sie im Menümodus die Einstellungen den Erfordernissen der Anlage an (z.B. Busadresse, LSD470 ein/aus). Nehmen Sie auch die notwendigen Einstellungen an den am 107TD47 angeschlossenen Geräten vor (z.B. MK2418.: Alarmadresse).
4. Führen Sie eine Funktionsprüfung mittels eines echten Erdschlusses durch, ggf. über einen dafür geeigneten Widerstand.

**Bedienen und Einstellen**

Nach Einschalten der Versorgungsspannung führt das 107TD47 einen Selbsttest durch. Anschließend befindet es sich im Anzeigemodus.



- |   |                        |
|---|------------------------|
| 1 | Statusmeldung          |
| 2 | Fehlerart              |
| 3 | Isolationsfehler in kΩ |
| 4 | Laststrom in %         |

**Legend to wiring diagram**

F	Short circuit protection for supply voltage 6 A.
STW2	Current transformer for load current monitoring (must be ordered separately).
δ	PTC thermistors (or NC contacts) in the transformer windings. Respond in case of transformer core overtemperature. No more than 6 PTC thermistors should be connected in series.
LSD470	Measuring adaptor for load current monitoring in 3 phase AC systems.
K	Alarm relay without fault memory to indicate insulation faults, overcurrent condition, overtemperature and device error.
MK	Remote alarm indicator and test combination MK2418 resp. TM operator panels.
A1, A2	Connection supply voltage $U_s$
L1, L2	Connection system being monitored
Z1, Z2	Connection temperature monitoring
k, l	Connection load current monitoring
E, KE	Two connections to PE
T1	Supply voltage for T1 and IN1
T2	Optional external test button to test insulation monitoring (42 kΩ test resistance) and the measuring circuits for load current and temperature.
IN	Input allowing the message "Insulation fault operating theatre light" to be displayed, initiated by the NC contact of the corresponding insulation monitoring device.
A, B	RS485 interface (BMS protocol)
11, 12, 14	Connection alarm relay K

**Commissioning**

1. Prior to commissioning, check proper connection of the device.
2. Switch on system voltage
3. Adapt the settings in the Menu mode to the conditions in your installation (e.g. bus address, LSD470 on/off). Also carry out the necessary settings at all devices connected to the 107TD47 (e.g. MK2418.: alarm address).
4. It is recommended to carry out a functional test using a genuine earth fault, e.g. via a suitable resistance.

**Operation and setting**

After switching the supply voltage on, the 107TD47 carries out a self test and then changes to the display mode.

- |   |                        |
|---|------------------------|
| 1 | Status message         |
| 2 | Type of fault          |
| 3 | Insulation fault in kΩ |
| 4 | Load current in %      |

## Meldungen im Anzeigemodus

## Statusmeldungen

Statusmeldung	Bemerkung	Kanal *
****IT-SYSTEM****	Normalbetrieb, keine Fehlermeldung	-
Isolation Fehler	Isolationswiderstand < Einstellwert $R_{ALARM}$	1**
Überlast	Laststrom > Einstellwert $I_{ALARM}$	2**
Übertemperatur	Temperatur im Transformator > 120 °C	3**
Anschluss Netz	Anschlussfehler L1/L2 gegen Netz	4**
Anschluss Erde	Anschlussfehler E/KE gegen Schutzleiter	5**
Kurzschl. Wandler	Kurzschluss k/I zum Wandler STW2	6**
Anschluss Wandler	Anschlussfehler k/I zum Wandler STW2	7**
Isol. OP-Leuchte	Isolationsfehler OP Leuchte (T1/IN)	8**
Gerätefehler	Interner Gerätefehler (siehe Fehlertabelle)	9**
Isolation gut	Isolationswiderstand gut	1***
Normallast	Last im Normalbereich	2***
ISO Fehlersuche	Isolationsfehlersuche läuft	-
***Selbsttest***	Selbsttest läuft	-

\* Kanal auf BMS-Bus

\*\* Alarmmeldung auf BMS-Bus

\*\*\* Betriebsmeldung auf BMS-Bus

## Gerätefehler

Die internen Selbsttests des 107TD47 können zu folgenden Anzeigen von Gerätefehlern führen:

Fehler Nr.	Beschreibung
Gerätefehler 1	Fehler nach 42 k $\Omega$ Selbsttest
Gerätefehler 2	Fehler Temperaturmesskreis
Gerätefehler 3	Fehler Isolationsmesskreis
Gerätefehler 4	Strommessung Fehler nach Selbsttest
Gerätefehler 5	Temperaturmessung Fehler nach Selbsttest
Gerätefehler 6	Fehler Speisespannung
Gerätefehler 7	Fehler Parameterspeicher
Gerätefehler 8	Fehler Datenspeicher
Gerätefehler 9	Fehler Programmspeicher

## Fehlerart

Fehlerart	Bedeutung
R	AC- oder symmetrischer DC-Isolationsfehler
R+	Isolationsfehler mit positivem DC-Anteil
R-	Isolationsfehler mit negativem DC-Anteil

## Messages in the display mode

## Status messages

Status line	Description	Cha.*
****IT-SYSTEM****	Normal operation, no fault message	-
Insulation fault	Insulation resistance < response value $R_{ALARM}$	1**
Overload	Load current > response value $I_{ALARM}$	2**
Overtemperature	Temperature transformer core > 120 °C	3**
System connect.	Connection L1/L2 to system interrupted	4**
PE connect.	Connection E/KE to PE interrupted	5**
Short circuit CT	Short circuit k/I to CT STW2	6**
CT connect.	Connection k/I to CT STW2 interrupted	7**
Op. light fault	Insulation fault operating light (T1/IN)	8**
Device error	Internal device error (see table below)	9**
Insulation ok.	Insulation resistance OK	1***
Load ok.	Load current OK	2***
fault location	Insulation fault location running	-
****Self test****	Self test running	-

\* Channel on BMS bus

\*\* Alarm message on BMS bus

\*\*\* Operating message on BMS bus

## Device errors

As a result of the internal self tests of the 107TD47 the following device errors can appear on the display:

Device Error No.	Description
Device error 1	Error after 42 k $\Omega$ self test
Device error 2	Error temperature measuring circuit
Device error 3	Error insulation measuring circuit
Device error 4	Current measuring error following the self test
Device error 5	Temperature measuring error following the self test
Device error 6	Error supply voltage
Device error 7	Error parameter memory
Device error 8	Error data memory
Device error 9	Error program memory

## Type of faults

Type of fault	Description
R	Insulation fault on the AC side or symmetrical DC fault
R+	Insulation fault with positive DC component
R-	Insulation fault with negative DC component

**Einstellen im Menü-Modus**

**Erklärung der Bedienschritte**

1. Aktivieren Sie den Menü-Modus mit der Taste „MENU/ENTER“.
2. Wählen Sie das gewünschte Untermenü mit den Pfeiltasten und bestätigen Sie Ihre Wahl mit der Taste „MENU/ENTER“. - Das ausgewählte Untermenü wird angezeigt.
3. Einige Menüs enthalten mehrere Parameter. Wählen Sie in diesem Fall mit den Pfeiltasten den gewünschten Parameter und bestätigen Sie Ihre Wahl mit der Taste „MENU/ENTER“.
4. Ändern Sie Parameter mit den Pfeiltasten. Bestätigen Sie die neue Einstellung mit der Taste „MENU/ENTER“. - Die Änderung wird gespeichert und der Cursor springt in zurück in die entsprechende Zeile des Untermenüs.
5. Verlassen Sie das Untermenü und das Hauptmenü über den Menüpunkt „ZURÜCK“ oder durch Betätigen der Taste „TEST“.

**Beachten Sie auch:**

- In einem Untermenü kann durch Betätigen der Taste „TEST“ direkt wieder in den Anzeigemodus gesprungen werden. Eine unbestätigte Parameteränderung wird dabei nicht gespeichert.
- Erfolgt innerhalb des Menümodus (außer im Test-Menü) 100 Sekunden kein Tastendruck, so wird automatisch in den Anzeigemodus gewechselt.

**Die Untermenüs**

Die folgenden Untermenüs dienen der Einstellung des Gerätes:

1. ZURÜCK
2. ANSPRECHWERTE
3. MELDERELAIS
4. BUS ADRESSE
5. OPTIONEN
6. SPRACHEN
7. TEST COM
8. INFO

**1. ZURÜCK**  
Zurück in Anzeigemodus

**2. ANSPRECHWERTE**

1. Zurück
2. R alarm: 050 kΩ
3. I alarm: 005 A

1. Zurück ins Hauptmenü
2. R<sub>alarm</sub>: Einstellung Ansprechwert Isolationswiderstand. Einstellbereich: 50 - 500 kΩ.
3. I<sub>alarm</sub>: Einstellung Ansprechwert Laststrom. Einstellbereich: 5 - 50 A.

Einstellwerte Laststrommessung:

Trafo / Transformer	3150 VA	4000 VA	5000 VA	6300 VA	8000 VA	10 000 VA
I <sub>alarm</sub> 1~	14 A	18 A	22 A	28 A	35 A	45 A
I <sub>alarm</sub> 3~	8 A	10 A	13 A	16 A	20 A	25 A

**Settings in the Menu mode**

**Explanation of the operating steps to be taken:**

1. Activate the Menu mode with the MENU/ENTER key.
2. Toggle between the submenus with the arrow keys and confirm with the MENU/ENTER key. - The selected submenu is indicated.
3. Some of the menus offer several setting options. In such cases select the parameter with the arrow keys and confirm with the MENU/ENTER key.
4. Change the parameters with the arrow keys and confirm the new setting with the MENU/ENTER key. After storing the changed parameter, the cursor returns to the respective line of the submenu.
5. Leave the submenu and the main menu via the EXIT option or by pressing the TEST key.

**Other points to be considered:**

- Pressing the TEST key allows returning directly to the display mode from any submenu. Unconfirmed parameter changes will not be stored.
- If no key is pressed for 100 seconds in the Menu Mode (with the exception of the test mode), the 107TD47 automatically changes to the display mode.

**Submenus**

The following submenus are provided for setting the device:

1. EXIT
2. ALARM VALUE
3. RELAY MODE
4. BUS ADDRESS
5. OPTION
6. LANGUAGE
7. TEST COM
8. INFO

**1. EXIT**  
Exit to the display mode

**2. ALARM VALUE**

1. Exit
2. R alarm: 050 kΩ
3. I alarm: 005 A

1. Exit to the main menu
2. R<sub>alarm</sub>: Setting response value for the insulation resistance. Setting range: 50 - 500 kΩ.
3. I<sub>alarm</sub>: Setting the response value for the load current. Setting range: 5 - 50 A.

Settings for load current measurement:

*Beispiel: Ändern des Ansprechwertes  $R_{alarm}$  von 50 k $\Omega$  auf 100 k $\Omega$ .*

1. Aktivieren Sie den Menü-Modus mit der Taste „MENU/ENTER“.
2. Wählen Sie das Untermenü „ANSPRECHWERTE“ mit den Pfeiltasten und bestätigen Sie Ihre Wahl mit der Taste „MENU/ENTER“. - Das ausgewählte Untermenü wird angezeigt.
3. Wählen Sie mit den Pfeiltasten den Parameter „R alarm“ und bestätigen Sie Ihre Wahl mit der Taste „MENU/ENTER“.
4. Ändern Sie den Ansprechwert mit den Pfeiltasten von 50 k $\Omega$  auf 100 k $\Omega$ . Bestätigen Sie die neue Einstellung mit der Taste „MENU/ENTER“. - Die Änderung wird gespeichert und der Cursor springt in zurück in die Zeile „R Alarm“ des Untermenüs.
5. Verlassen Sie das Untermenü und das Hauptmenü über den Menüpunkt „ZURÜCK“ oder durch Betätigen der Taste „TEST“.

### 3. MELDERELAIS

1. Zurück  
2. Kontakt: 12-11 14

1. Zurück ins Hauptmenü
2. Einstellung Arbeitsweise Melderelais.  
12-11 14: Arbeitsstrom  
12 11-14: Ruhestrom

### 4. BUS ADRESSE

1. Zurück  
2. Busadr. : 03

1. Zurück ins Hauptmenü
2. Einstellung der Busadresse. Adressen niemals doppelt vergeben!

### 5. OPTIONEN

1. Zurück  
2. LSD470 : Aus  
3. EDS-Modus: Aus

1. Zurück ins Hauptmenü
2. Einstellung, ob der Messvorsatz LSD470 angeschlossen ist oder nicht.
3. EDS-Modus: Ausgangsrelais schaltet nur bei Isolationsfehler.

### 6. SPRACHEN

1. Zurück  
2. Text: Deutsch

1. Zurück ins Hauptmenü
2. Einstellung, ob die Menüs und die Meldungen in deutscher oder englischer Sprache gezeigt werden.

*Example: Changing the response value  $R_{alarm}$  from 50 k $\Omega$  to 100 k $\Omega$ .*

1. Activate the Menu mode with the MENU/ENTER key.
2. Select the sub menu ALARM VALUE with the arrow keys. Confirm with the MENU/ENTER key. - The selected submenu is displayed.
3. Select the parameter Ralarm with the arrow keys. Confirm with the MENU/ENTER key.
4. Change the alarm value with the arrow keys from 50 k $\Omega$  to 100 k $\Omega$ . Confirm the new setting with the MENU/ENTER key. The new value is stored and the cursor returns to the line "R Alarm" in the submenu.
5. Leave the sub menu and the main menu via the EXIT option or by pressing the TEST key.

### 3. RELAY MODE

1. Exit  
2. Contact: 12-11 14

1. Exit to the main menu
2. Setting the operation mode of the alarm relay.  
12-11 14: N/O operation  
12 11-14: N/C operation

### 4. BUS ADDRESS

1. Exit  
2. Busaddr.: 03

1. Exit to the main menu
2. Bus address setting. Make sure not to assign the same address twice.

### 5. OPTION

1. Exit  
2. LSD470 : Off  
3. EDS-Mode : Off

1. Exit to the main menu
2. Choose "On" when the measuring adapter LSD470 is connected or "Off" when it is not connected.
3. EDS mode: output relay switches only in case of insulation fault.

### 6. LANGUAGE

1. Exit  
2. Text: English

1. Exit to the main menu
2. Choose whether the menus and alarm messages are to be displayed in German or English.

**7. TEST COM**

1. Zurück  
2. Meldungen : 1

- Zurück ins Hauptmenü
- Vom 107TD47 erkannte Meldungen (siehe Tabelle "Meldungen im Anzeigemodus" werden auf dem BMS-Bus bereitgestellt. Um die korrekte Reaktion aller am BMS-Bus angeschlossenen Geräte zu testen, kann das 107TD47 diese Meldungen simulieren. Wird mit der Taste "MENU/ENTER" die erste Meldung aufgerufen, so simuliert das 107TD47 zunächst einen Isolationsfehler. Angeschlossene Geräte (z.B. MK2418) müssen diesen Fehler melden. Weitere Meldungen können mit den Pfeiltasten ausgewählt werden. Während der Tests sind alle Messfunktionen deaktiviert. Betätigen Sie die Taste "MENU/ENTER" zum Verlassen des Menüs.

**8. INFO**

Zurück  
\*\*\*107 TD 47\*\*\*  
BENDER GRÜNBERG  
\* Softw. V2.53 \*  
Datum: 18.11.05  
Busadr.: 03

Informationen zum Gerätetyp, zur Version der Firmware, zum letzten Update und zur Busadresse.

**Werkseinstellungen**

Menü	Parameter	Einstellung
ANSPRECHWERTE	R <sub>alarm</sub> I <sub>alarm</sub>	50 KΩ 5 A
MELDERELAIS	Kontakt	12-11 14 (Arbeitsstrom)
BUS ADRESSE	Busadr.	3
OPTIONEN	LSD470 EDS-Modus	Aus Aus
SPRACHEN	Text	Deutsch

**Prüfung**

Führen Sie regelmäßig eine Funktionsprüfung mit der Taste „TEST“ durch. Beachten Sie dabei die in den geltenden Normen und Vorschriften genannten Fristen.

**Normen**

- DIN EN 61557-8 (VDE 0413 Teil 8):1998-05
- IEC 61557-8:1997-02
- EN 61557-8:1997-03
- DIN VDE 0100-710 (VDE 0100 Teil 710): 2002-11
- ÖVE-EN7-1991
- ASTM F 1207 1996-00
- IEC 60364-7-710:2002-11

**7. TEST COM**

1. Exit  
2. Indication: 1

- Exit to the main menu
- Messages, which are detected by the 107TD47 (see table "Messages in the display mode"), are available on the BMS bus. The 107TD47 can simulate these messages in order to test the correct reaction of all devices, which are connected with the BMS bus. The 107TD47 simulates an insulation fault, if the first message is activated by pressing the button "MENU/ENTER". This message must be signalled by the connected devices (e.g. MK2418). Other messages could be selected by the arrow keys. During tests all measuring functions are disabled. Exit the menu by pressing the button "MENU/ENTER".

**8. INFO**

Exit  
\*\*\*107 TD 47\*\*\*  
BENDER GRÜNBERG  
\* Softw. V2.53 \*  
Update:18.11.05  
Busaddr.: 03

Information about the type, the manufacturer, the firmware version, the last update and the bus address.

**Factory settings**

Menu	Parameter	Setting
ALARM VALUE	R <sub>alarm</sub> I <sub>alarm</sub>	50 KΩ 5 A
RELAY MODE	Contact	12-11 14 (N/O operation)
BUS ADDRESS	Bus addr.	3
OPTION	LSD470 EDS-Mode	Off Off
LANGUAGE	Text	German

**Test**

Carry out periodic function test by pressing the "TEST" key, considering the intervals indicated in the respective current standards and regulations.

**Standards**

- DIN EN 61557-8 (VDE 0413 Teil 8):1998-05
- IEC 61557-8:1997-02
- EN 61557-8:1997-03
- DIN VDE 0100-710 (VDE 0100 Teil 710): 2002-11
- ÖVE-EN7-1991
- ASTM F 1207 1996-00
- IEC 60364-7-710: 2002-11

## Technische Daten

### Isolationskoordination nach IEC 60664-1

Bemessungsspannung .....	AC 250 V
Bemessungs-Stoßspannung/Verschmutzungsgrad .....	4 kV/3

### Spannungsbereiche

Netzennennspannung $U_n$ .....	siehe Bestellangaben
Nennfrequenz $f_n$ .....	siehe Bestellangaben
Versorgungsspannung $U_S$ .....	siehe Bestellangaben
Arbeitsbereich von $U_S$ .....	0,85 ... 1,15 x $U_S$
Eigenverbrauch max. ....	3 VA

### Messkreis

#### Isolationsüberwachung:

Ansprechwert $R_{an}$ .....	50 ... 500 k $\Omega$
Ansprechabweichung .....	0 ... +10 %
Ansprechzeit $t_{an}$ bei $R_F = 0,5 \times R_{an}$ und $C_e = 1 \mu F$ .....	3 s
Hysterese .....	25 %
Messspannung $U_m$ .....	$\leq 12$ V
Messstrom $I_m$ max. (bei $R_F = 0 \Omega$ ) .....	$\leq 50 \mu A$
Innenwiderstand DC $R_i$ .....	$\geq 240$ k $\Omega$
Impedanz $Z_i$ bei 50 Hz .....	$\geq 200$ k $\Omega$
Zulässige Fremdgleichspannung $U_{fg}$ .....	$\leq$ DC 375 V
Zulässige Netzableitkapazität $C_e$ .....	$\leq 5 \mu F$

#### Laststromüberwachung:

Ansprechwert .....	5 ... 50 A
Hysterese .....	4 %
Temperatureinfluss .....	< 0.15 % / °C

#### Temperaturüberwachung:

Ansprechwert .....	4 k $\Omega$
Rückfallwert .....	1.6 k $\Omega$
Kaltleiter nach DIN 44081 .....	max. 6 in Reihe

### Anzeigen

Anzeige (beleuchtet) .....	LC-Display
Zeichen (Anzahl, Höhe) .....	2 x 16 (3,5 mm)
Anzeigebereich Messwert .....	10 k $\Omega$ ... 5000 k $\Omega$
Betriebsmessabweichung .....	nach IEC 61557-8

### Eingänge

Taste "TEST" .....	Schließer
Meldung "Isolationsfehler OP-Leuchte" .....	Öffner
Leitungslänge Eingänge max. ....	10 m

### Schnittstellen

Schnittstelle / Protokoll .....	RS485/BMS
Max. Leitungslänge .....	1200 m
Empfohlene Leitung (geschirmt, Schirm einseitig an PE) .....	J(Y)STY 2 x 0,6
Abschlusswiderstand .....	120 $\Omega$ (0,25 W)
Adressbereich .....	2...90

### Schaltglieder

Alarmrelais .....	1 Wechsler
Arbeitsweise .....	einstellbar, Ruhestrom oder Arbeitsstrom
Werkseitige Einstellung .....	Arbeitsstrom
Elektrische Lebensdauer .....	12000 Schaltspiele
Kontaktklasse .....	IIB (IEC60255-0-20)
Kontaktbemessungsspannung .....	AC 250 V / DC 300 V
Einschaltvermögen .....	AC/DC 5 A
Ausschaltvermögen bei AC 230 V, cos phi 0,4 .....	2 A
Ausschaltvermögen bei DC 220 V, L/R=0,04 s .....	0,2 A

### Allgemeine Daten

EMV Störfestigkeit .....	nach EN 61326
EMV Störaussendung .....	nach EN 61326
Schockfestigkeit IEC60068-2-27 (Gerät in Betrieb) .....	15 g/11 ms

## Technical data

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

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

### Voltage ranges

Nominal voltage range $U_n$ .....	see ordering details
Nominal frequency $f_n$ .....	see ordering details
Supply voltage $U_S$ .....	see ordering details
Operating range of $U_S$ .....	0.85 ... 1.15 x $U_S$
Max. power consumption .....	3 VA

### Measuring circuit

#### Insulation monitoring:

Response value $R_{an}$ .....	50 ... 500 k $\Omega$
Relative percentage error .....	0 ... +10 %
Response time $t_{an}$ at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$ .....	3 s
Hysteresis .....	25 %
Measuring voltage $U_m$ .....	$\leq 12$ V
Measuring current $I_m$ max. (at $R_F = 0 \Omega$ ) .....	$\leq 50 \mu A$
Internal DC resistance $R_i$ .....	$\geq 240$ k $\Omega$
Impedance $Z_i$ at 50 Hz .....	$\geq 200$ k $\Omega$
Permissible extraneous DC voltage $U_{fg}$ .....	$\leq$ DC 375 V
Permissible system leakage capacitance $C_e$ .....	$\leq 5 \mu F$

#### Load current monitoring:

Response value .....	5 ... 50 A
Hysteresis .....	4 %
Influence of temperature .....	< 0.15 % / °C

#### Temperature monitoring:

Response value .....	4 k $\Omega$
Release value .....	1.6 k $\Omega$
PTC thermistors acc. to DIN 44081 .....	max. 6 in series

### Displays

Display (illuminated) .....	LC-Display
Characters .....	2 x 16 (3,5 mm)
Display range, measuring range .....	10 k $\Omega$ ... 5000 k $\Omega$
Operating error .....	according IEC 61557-8

### Inputs

"TEST" key .....	NO contact
Alarm message "Insulation fault operating theatre light" .....	NC contact
Cable length inputs max. ....	10 m

### Interfaces

Interface/protocol .....	RS485/BMS
Max. cable length .....	1200 m
Recommended cable (screened, screen on one side connected to PE) .....	J(Y)STY 2 x 0.6
Terminating resistor .....	120 $\Omega$ (0.25 W)
Address range .....	2...90

### Switching components

Alarm relay .....	1 changeover contact
Operating mode .....	adjustable, N/C or N/O operation
Factory setting .....	N/O operation
Electrical endurance .....	12000 switching operations
Contact class .....	IIB (IEC60255-0-20)
Rated contact voltage .....	AC 250 V / DC 300 V
Making capacity .....	AC/DC 5 A
Breaking capacity at AC 230 V, cos phi 0.4 .....	2 A
Breaking capacity at DC 220 V, L/R=0.04 s .....	0.2 A

### General data

EMC immunity .....	acc. to EN 61326
EMC emission .....	acc. to EN 61326
Shock resistance IEC60068-2-27 (device in operation) .....	15 g/11 ms

Dauerschocken IEC60068-2-29 (Transport).....	40 g/6 ms
Schwingungsbeanspruchung IEC 60068-2-6 (Gerät in Betrieb).....	1 g / 10 ... 150 Hz
Schwingungsbeanspruchung IEC 60068-2-6 (Transport).....	2 g / 10 ... 150 Hz
Umgebungstemperatur (bei Betrieb).....	-10 °C ... +55 °C
Umgebungstemperatur (bei Lagerung).....	-40 °C ... +70 °C
Klimaklasse nach DIN IEC60721-3-3 .....	3K5
Betriebsart .....	Dauerbetrieb
Einbaulage .....	beliebig
Anschlussart.....	Reihenklemmen
Anzugsdrehmoment .....	0,5 ... 0,6 Nm (4,3 ... 5,3 lb-in)
Anschlussvermögen Starr / flexibel .....	0,2 ... 4 / 0,2 ... 2,5 mm <sup>2</sup>
Anschlussvermögen Flexibel mit Aderendhülse, ohne/mit Kunststoffhülse.....	0,25 ... 2,5 mm <sup>2</sup>
Leitergrößen (AWG).....	24-12
Schutzart Einbauten (DIN EN 60529) .....	IP30
Schutzart Klemmen (DIN EN 60529) .....	IP20
Schraubbefestigung.....	2 x M4
Schnellbefestigung auf Hutprofilschiene.....	IEC 60715
Entflammbarkeitsklasse.....	UL94V-0
Gewicht ca. ....	400 g

Bumping IEC60068-2-29 (during transport) .....	40 g/6 ms
Vibration resistance IEC 60068-2-6 (device in operation).....	1 g / 10 ... 150 Hz
Vibration resistance IEC 60068-2-6 (during transport).....	2 g / 10 ... 150 Hz
Ambient temperature (during operation).....	-10 °C ... +55 °C
Storage temperature range.....	-40 °C ... +70 °C
Climatic class acc. to DIN IEC60721-3-3 .....	3K5
Operating mode .....	continuous operation
Mounting.....	any position
Connection.....	screw terminals
Tightening torque, terminal screws .....	0.5 ... 0.6 NM (4.3 ... 5.3 lb-in)
Connection rigid, flexible.....	0.2 ... 4 / 0.2 ... 2.5 mm <sup>2</sup>
Connection flexible with connector sleeve, without/with plastic sleeve .....	0.25 ... 2.5 mm <sup>2</sup>
Conductor sizes (AWG).....	24-12
Protection class, internal components (DIN EN 60529) .....	IP30
Protection class, terminals (DIN EN 60529).....	IP20
Screw fixing.....	2 x M4
DIN rail mounting acc. to.....	IEC 60715
Flammability class.....	UL94V-0
Weight approx.....	400 g

**Abweichende Ausführungen**

Das folgende Feld ist nur beklebt, falls Änderungen gegenüber der Standardausführung des Gerätes vorgenommen wurden.


**Modified versions**

There will only be a label in this field, if the A-ISOMETER is different from the standard version.

**Bestellangaben**
**Ordering details**

Typ Type	Netzennspannung U <sub>n</sub> Nominal system voltage U <sub>n</sub>	Versorgungsspannung U <sub>s</sub> Supply voltage U <sub>s</sub>	Art.-Nr. Art. No.
107TD47	AC 230 V, 50 ... 60 Hz	AC 230 V, 50 ... 60 Hz	B 92 016 003
107TD47-133	AC 127 V, 50 ... 60 Hz	AC 127 V, 50 ... 60 Hz	B 92 016 004

**Zubehör**
**Accessories**

Typ Type	Beschreibung Description	Art.-Nr. Art. No.
LSD470	Messvorsatz für 3-Phasen- Lastüberwachung Measuring adapter for 3 ph load monitoring	B92016001
STW2	Stromwandler/current transformer AC 50 A/50 mA	B942709

Alle Rechte vorbehalten.  
Nachdruck und Vervielfältigung  
nur mit Genehmigung des Herausgebers.  
Änderungen vorbehalten!  
© 2005 BENDER Germany



 BENDER GROUP

All rights reserved.  
Reprinting and duplicating  
only with permission of the publisher.  
Subject to change!  
© 2005 BENDER Germany





## Bender-Messgeräte-Schnittstelle

Deutsch

### Bestimmungsgemäße Verwendung

Der BMS-Bus dient zur Kommunikation von Bender-Geräten untereinander. BMS steht für Bender Messgeräte Schnittstelle. Dabei handelt es sich um eine RS-485-Schnittstelle mit einem speziell für Bender-Geräte entwickelten Protokoll.

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

### Sicherheitshinweise allgemein

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

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

### Sicherheitshinweise, spezifisch



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

### Weitere Informationen

Wenn Sie Informationen zur Kanalbelegung oder weitere Informationen zu den betreffenden Geräten benötigen, lesen Sie das Dokument „Kanalbelegung BMS-Geräte“ oder die Bedienungshandbücher und Beipackzettel der betreffenden Geräte.

### Funktionsbeschreibung

#### Master-Slave-Prinzip

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

Alle am BMS-Bus angeschlossenen Geräte benötigen eindeutige Adressen. Ein Gerät erhält die Masterfunktion, wenn es die Adresse 1 hat. Ausnahmen sind die Geräte PGH47x, PRC470(E), EDS47x-12 und RCMS470-12.

#### Interner und externer Bus

Mehrere BMS-Bus-Systeme können zu einem übergreifenden System verbunden werden. Hierzu wird für jedes der „internen“ BMS-Bus-Systeme ein Gerät benötigt, das über zwei BMS-Bus-Schnittstellen verfügt. Solche Geräte sind TM-Bedientableaus, DI400, DI500, PRC1470 oder MK800.

## Bender Measuring Device Interface

English

### Intended use

The BMS bus provides communication between the various pieces of Bender equipment. BMS stands for Bender Measuring Interface. It therefore pertains to an RS-485 interface with a specially developed protocol for Bender equipment.

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

### Safety instructions

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

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

### Device-specific safety instructions



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

### Details

If you require details about channel assignment or the respective devices, refer to the document "Channel assignment BMS devices" or the operating manuals and instruction leaflets for the respective devices.

### Function

#### Master-Slave principle

The BMS bus operates according to the Master-Slave principle. That means, that one device operates as the master and all other devices function as slaves. The master cyclically scans all devices on the bus on a cyclic basis, listens for the devices' signals and then carries out the respective actions. There can only be one master per BMS bus; During operation, a slave may take over as temporary master.

All devices connected to the BMS bus require a unique address. A device takes over the master function, if it has address 1. Exceptions to this include PGH47x, PRC470(E), EDS47x-12 and RCMS470-12.

#### Internal and external bus

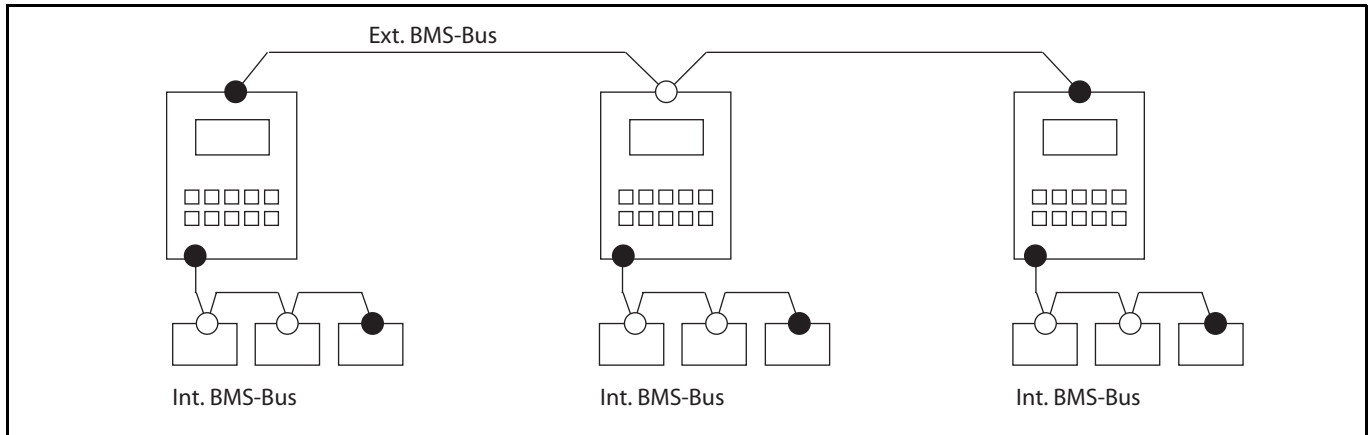
Several BMS bus systems can be interconnected to one common system. A device providing two bus interfaces is needed for each of the "internal" BMS bus systems. Such devices are TM operator panels, DI400, DI500, PRC1470 or MK800.

Die BMS-Bus-Schnittstelle, an die die Geräte angeschlossen sind, wird als interne BMS-Bus-Schnittstelle bezeichnet, die BMS-Bus-Schnittstelle, die zur Verbindung der einzelnen Systeme dient, als externe BMS-Bus-Schnittstelle.

The BMS bus the devices are connected to is the internal BMS bus and the BMS bus the individual systems are connected to is the external BMS bus.

**BMS-Bus-Struktur**

**BMS bus structure**



**Legende zur BMS-Bus-Struktur**

- Bus-Schnittstelle mit Abschlusswiderstand
- Bus-Schnittstelle
- Bus-Gerät

**Legend to BMS bus structure**

- Bus interface with terminating resistor
- Bus interface
- Bus device

Die Geräte am externen BMS-Bus erhalten fortlaufende Adressen. Sie bilden einen Token-Ring, das bedeutet, dass die Masterfunktion nacheinander jedem Gerät für eine gewisse Zeit zugewiesen wird. An ihrem internen Bus haben diese Geräte die Adresse 1 und steuern als Master die Kommunikation der angeschlossenen Geräte.

The devices on the external BMS bus receive consecutive addresses. According to the so-called Passing Token procedure, the master function is assigned to each device in succession for a certain period of time. The devices on the internal bus have address 1 and control the communication of the connected devices as a master.

**Montage und Anschluss**

**Installation and connection**



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



*Prior to installation and before work activities are carried out on the connecting cables, make sure that the installation is de-energized. Failure to comply with this safety information may cause electric shock to personnel. In addition, there is the danger of property damage to the electrical installation and destruction of the equipment.*

**RS-485-Spezifikation / Leitungen**

Die RS-485-Spezifikation beschränkt die Leitungslänge auf 1200 m, die Anzahl der Geräte am Bus auf 32 und schreibt eine linienartige Leitungsführung (Daisy Chain) vor. Als Busleitung ist eine geschirmte Leitung einzusetzen. Geeignet ist beispielsweise der Leitungstyp J-Y(St)Y 2 x 0,8. Der Schirm ist einseitig mit PE zu verbinden. Die Busleitung muss an beiden Enden mit Widerständen (120 Ω, 0,25 W) abgeschlossen (terminiert) werden. Die Abschlusswiderstände werden parallel zu den Klemmen A und B angeschlossen. In einige Geräte sind bereits Abschlusswiderstände eingebaut und können über Schalter aktiviert werden.

**RS-485 specification / cables**

The specification of the RS-485 interface restricts the length of the cable to 1200 m, the number of devices on the bus to 32, and requires a daisy chain connection. A shielded cable must be used for interface cabling. One type of suitable cable is type J-Y(St)Y 2 x 0,8. The shield must have a single-ended connection to ground. The BMS bus must be terminated at both ends with terminating resistors (120 Ω, 0.25 W). The terminating resistors are connected parallel to terminals A and B. Some of the devices already contain terminating resistors which can be activated via a switch.

**Leitungsführung**

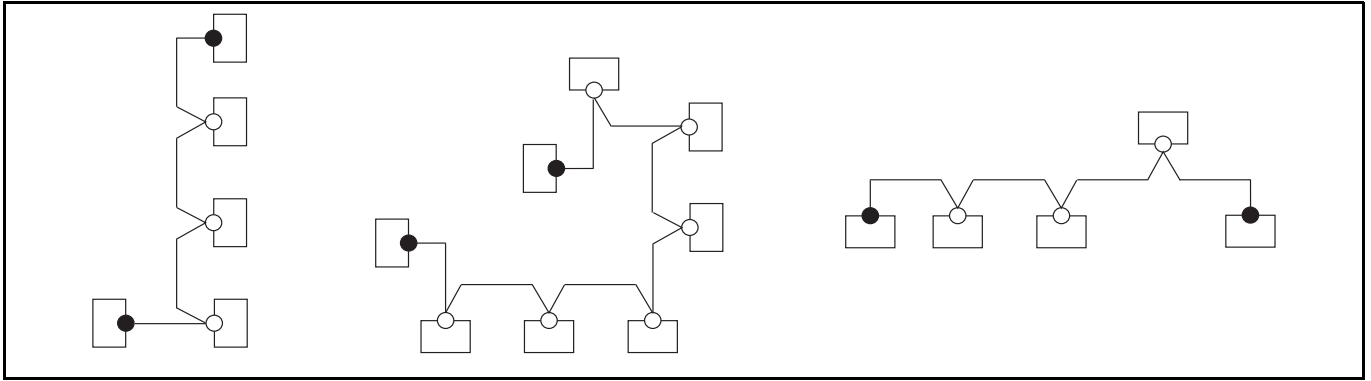
Die optimale Leitungsführung für den BMS-Bus ist die reine Linienstruktur. Stichleitungen zu einzelnen Geräten von maximal 1 m Länge sind zulässig. Diese Stichleitungen werden nicht terminiert.

**Laying of cables**

The optimum laying of cables is a double-terminated bus topology. The length of the branch line is limited to 1 m. These branch lines will not be terminated.

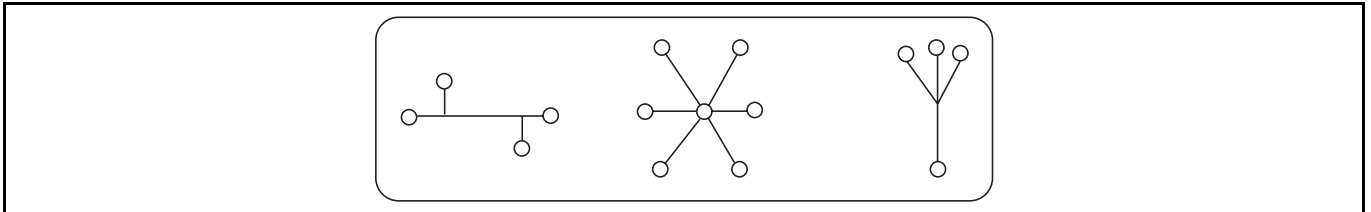
Beispiele für Linienstrukturen:

Bus topology example:



Beispiele für unzulässige Verlegung:

Impermissible laying of cables, example:



*Ausschließlich das erste und das letzte Gerät ist zu terminieren. Überprüfen Sie deshalb alle Geräte.*



*Check all devices that only the first and the last device is terminated.*

**Schnittstellenverstärker**

Der Einsatz von Schnittstellenverstärkern (z. B. DI-1PSM) wird notwendig, wenn Leitungslängen von mehr als 1200 m, mehr als 32 Teilnehmer an einem BMS-Bus oder Abweichungen von der Linienstruktur eingesetzt werden müssen.

**Interface repeater**

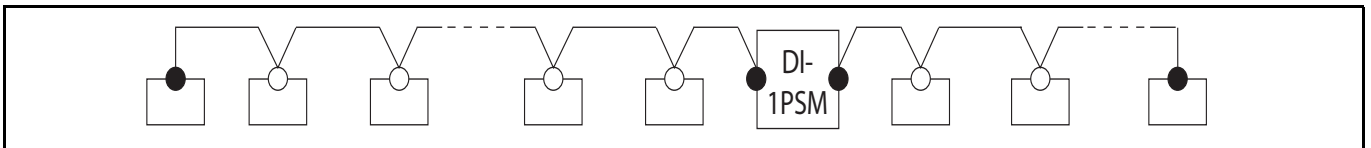
The use of interface repeaters (e.g. DI-1PSM) will be required when the cable lengths exceed 1200 m, when more than 32 nodes are connected to a BMS bus or when deviations with respect to the bus topology have to be realized.

**Verwendung von Schnittstellenverstärkern:**

a) zur Verlängerung des BMS-Busses >1200 m und/oder ≥ 32 Geräte:

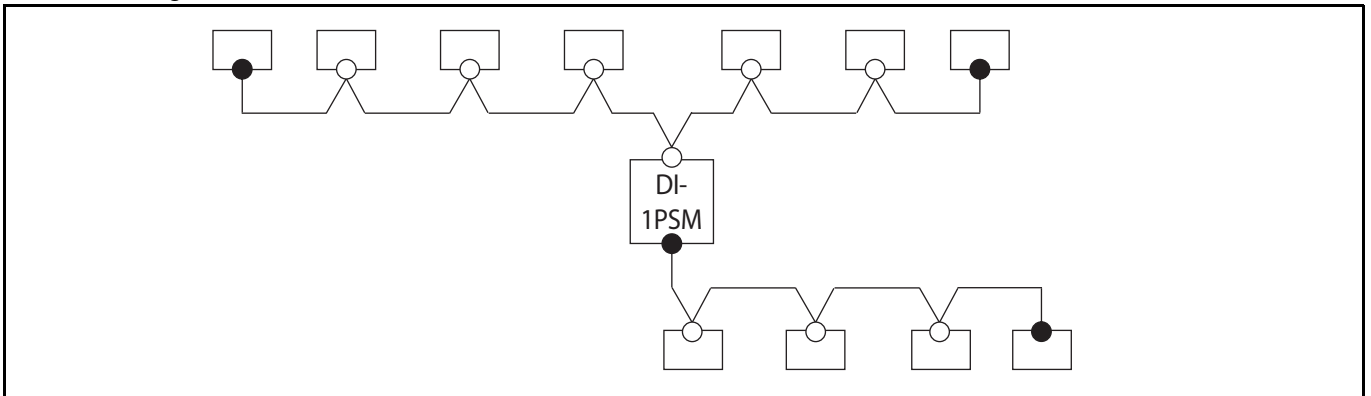
**Use of interface repeaters:**

a) to extend the BMS bus >1200 m and/or ≥ 32 devices:



b) für Stichleitungen:

b) for branch lines:



**Alarm- und Betriebsmeldungen**

Alarmmeldungen informieren über gefährliche Zustände (z.B.: Alarmer, Warnungen, Störungen, Ausfälle). Der BMS-Bus überträgt Alarmmeldungen vorrangig gegenüber anderen Mel-

**Alarm and operating messages**

Alarm messages provide information about hazardous conditions (e.g.: alarms, warnings, faults, failures). On the BMS bus, the transmission of alarm messages takes priority over the transmis-

dungen. Die Meldungen werden zyklisch in einem engen Zeitraster von 1...2 s abgefragt.

Betriebsmeldungen dienen der Übertragung von Zustandsinformationen und Messwerten mit geringer Priorität. In Bus-Systemen mit vielen Teilnehmern kann die Aktualisierung von Betriebsmeldungen mehrere Sekunden dauern.

## Einstellen und Bedienen

### BMS-Bus-Adressen

Voraussetzung zur Kommunikation ist die korrekte Vergabe von eindeutigen Adressen für alle Geräte im BMS-Bus-System. Die Einstellung der BMS-Bus-Adresse wird je nach Bauweise des Gerätes über ein Einstellmenü oder mittels DIP-Schalter vorgenommen.

Zur Festlegung der System-Funktionen sind in vielen Geräten Einstellungen erforderlich, die sich auf diese Adressen beziehen. Diese Einstellungen können über Einstellmenüs am Gerät, über PC-Programme (z.B. TMK-Set) oder über Geräte wie TM-Tableau, MK800, MK2430 oder FTC470XET vorgenommen werden.

### Adressen und Adressbereiche am internen Bus

Von den theoretisch verfügbaren 256 Adressen (1 byte Adresse, also  $2^8 = 256$ ) wird der Bereich bis 150 genutzt. Dieser Adressbereich ist in Segmente, beginnend bei den Adressen 2, 31, 61, 91, 111, 121 aufgeteilt, die für bestimmte Gerätegruppen definiert wurden. Für den Master ist die Adresse 1 reserviert. Alle weiteren Geräte erhalten eindeutige Adressen, die beginnend bei der ersten Adresse im Segment, fortlaufend und lückenlos vergeben werden. Die Adresse 0 ist als "Broadcast-Adresse" definiert, über die alle Geräte gleichzeitig angesprochen werden können.

### Masterfunktion am internen BMS-Bus

Der Master fragt in jedem Segment nacheinander alle Geräte nach Alarmmeldungen ab, beginnend bei der kleinsten Adresse. Anschließend werden die Betriebsmeldungen abgefragt. Zusätzlich werden alle 1..2 Sekunden über die Broadcast-Adresse alle Slaves gefragt, ob neue Alarmmeldungen anstehen, um diese sofort zu behandeln. So werden neue Alarmmeldungen nach spätestens 2 Sekunden übertragen. Stößt der Master bei der Abfrage auf eine Lücke von 5 nicht vergebenen Adressen, so endet möglicherweise die Abfrage in diesem Segment und wird im nächsten fortgesetzt.

### Master-Redundanz am internen BMS-Bus

Einige BMS Geräte wie FTC470X..., MK800, MK2430, EDS460/490, EDS461/491, RCMS460/490, TM800, DI400 können als redundante Master arbeiten. Solche Geräte übernehmen, bei Ausfall des regulären Masters (mit der Adresse 1), nach ca. 60 Sekunden die Masterfunktion und steuern den BMS-Bus. Wird der reguläre Master wieder verfügbar, so gibt der redundante Master die Masterfunktion zurück.

### Adressen und Masterfunktion am externen BMS-Bus

Am externen BMS-Bus erhalten alle Geräte, bei 1 beginnend, fortlaufende Adressen bis 99. Sie bilden einen Token-Ring und geben die Masterfunktion zyklisch weiter. Das erste Gerät am externen BMS-Bus gibt Uhrzeit und Datum für das gesamte System vor. Die maximal zulässige Adresslücke am externen Bus ist auf 3 Adressen eingestellt. Das Verfahren zur Übertragung von Alarmen und Betriebsmeldungen ist ähnlich dem am internen BMS-Bus.

tion of all other messages. The messages are cyclically scanned every 1...2 s.

Operational status messages are intended to transmit status indications and measured values of low priority. In bus systems with many bus devices, the update of operational status messages may take several seconds.

## Settings and operation

### BMS bus addresses

Precondition for communication is the correct assignment of unique addresses to all devices in the BMS bus system. Depending on the construction of the particular device, the BMS addresses are set via the setting menu or using the DIP switch.

In order to specify the system functions, many devices require settings referring to their addresses. These settings can be carried out via the setting menus at the device, PC programs (e.g. TMK-Set) or devices such as TM operator panels, MK800, MK2430 or FTC470XET.

### Addresses and address ranges on the internal bus

Of the 256 addresses that theoretically can be assigned (1 byte address, also  $2^8 = 256$ ), there are currently 150 in use. This address range is classified into segments, starting with the addresses 2, 31, 61, 91, 111, 121, which are defined for specific device groups. Address one is assigned to the master. All other devices receive unique addresses starting with the first address in the segment, assigned in consecutive order without gaps. Address 0 is a "broadcast address" which can be used to address all the devices at the same time.

### Master function on the internal BMS bus

The master scans all devices one after the other in each segment for alarm messages, starting with the lowest address. Then the operational status messages are queried. In addition, every 1...2 seconds all slaves are queried via the broadcast address, to see whether new alarm messages are available, in order to transfer them immediately. In this way, alarm messages are transmitted after at least 2 seconds. If the master comes across a gap of 5 non-assigned addresses, then the scan will possibly be stopped in this segment and the master will begin to scan the next address segment.

### Master redundancy on the internal BMS bus

Some BMS devices, such as FTC470X..., MK800, MK2430, EDS460/490, EDS461/491, RCMS460/490, TM800, DI400 are capable of operating as a redundant master. In case of failure of the regular master (address 1), these devices take over the master function after approx. 60 seconds and control the BMS bus. If the regular master becomes active again, the redundant master will return the master function.

### Addresses and master function on the external BMS bus

On the external BMS bus, all devices receive a consecutive address between 1 and 99. The devices form a so-called Token Ring, this means that the master function is passed on cyclically. The first device on the external BMS bus determines time and date for the whole system. The maximum admissible address gap on the external bus is set to 3. The procedure for transmitting alarms and operational status messages is similar to that on the internal BMS bus.

## Geräteadressen und Funktionen

## Device addresses and functions

Gerät/Device	Funktion	Function	Adresse interner Bus/ Address internal Bus		Master für/for
			Master	Slave	
107TD47/ 107TD47 (Version ≥ 2.53)	Isolationsüberwachungsgerät mit Überlast/Übertemperatur	Insulation monitoring device with transformer overload and temperature monitoring	-	2 ... 90	-
EDS460/490 EDS461/491	Isolationsfehler-Auswertegerät	Insulation fault evaluator	1	2 ... 90	MEDICS <sup>1</sup> , EDS <sup>2</sup> , RCMS <sup>3</sup>
EDS47x-12**	Isolationsfehler-Auswertegerät	Insulation fault evaluator	1 ... 30	1 ... 30	1xSMO480-12
EDS47xE-12**	Isolationsfehler-Auswertegerät	Insulation fault evaluator	-	61 ... 90	-
EDS47xE2-12**	Isolationsfehler-Auswertegerät	Insulation fault evaluator	-	31 ... 60	-
FTC470XDP, FTC470XMB	Gateway zu Profibus-DP, Modbus	Gateway to PROFIBUS-DP, Modbus	1	2 ... 30	MEDICS <sup>1</sup> , EDS <sup>2</sup> , RCMS <sup>3</sup>
FTC470XET	Gateway zu TCP/IP	Gateway to TCP/IP	1	2 ... 30	MEDICS <sup>1</sup> , EDS <sup>2</sup> , RCMS <sup>3</sup>
IMS480**	Scanning System für LIM2000-1NL	Scanning system for LIM2000-1NL	-	2 ... 30	-
IRDH275B	Isolationsüberwachungsgerät	Insulation monitoring device	1	2 ... 30	MEDICS <sup>1</sup> , RCMS <sup>3</sup> ISOnet <sup>4</sup>
IRDH375B	Isolationsüberwachungsgerät	Insulation monitoring device	1	2 ... 30	MEDICS <sup>1</sup> , RCMS <sup>3</sup> ISOnet <sup>4*</sup>
IRDH575	Isolationsüberwachungsgerät mit Prüfgerät	Insulation monitoring device with test device	1	2 ... 30	MEDICS <sup>1</sup> , EDS <sup>2</sup> , RCMS <sup>3</sup> , ISOnet <sup>4</sup> (≥ Version 1.6)
LIM2000**	Line Isolation Monitor	Line Isolation Monitor	1	-	MK2000
MK2000/ MK2007CB2	Melde- und Prüfkombination	Remote alarm indicator and operator panel	1	2 ... 30	MEDICS <sup>1</sup> , RCMS <sup>3</sup>
MK2007CBM	Melde- und Prüfkombination	Remote alarm indicator and operator panel	1	2 ... 90	MEDICS <sup>1</sup> , RCMS <sup>3</sup>
MK2418(C)**	Melde- und Prüfkombination	Remote alarm indicator and operator panel	1	2 ... 30	MEDICS <sup>1</sup> , RCMS <sup>3</sup>
MK2430	Melde- und Prüfkombination	Remote alarm indicator and operator panel	1	2 ... 150	MEDICS <sup>1</sup> , EDS <sup>2</sup> , RCMS <sup>3</sup>
MK800*	Melde- und Prüfkombination	Remote alarm indicator and operator panel	int. BUS: 1 ext. BUS: 1 ... 99	(2 ... 150)**	MEDICS <sup>1</sup> , EDS <sup>2</sup> , RCMS <sup>3</sup>
PC	PC zur Parametrierung, Diagnose oder Visualisierung	PC for parameterization, diagnosis or visualization	101...103	101...103	-
PGH47x	Isolationsfehlerprüfgerät	Insulation fault test device	111..119	111..119	MEDICS <sup>1</sup> , EDS <sup>2</sup> (für 1 IT-Netz), RCMS <sup>3</sup>
PGH47xE	Isolationsfehlerprüfgerät	Insulation fault test device	-	121..150	-
PRC470** PRC470E**	Steuer- und Anzeigegerät	Control and indicating device	100	-	MEDICS <sup>1</sup> , EDS <sup>2</sup> , RCMS <sup>3</sup>
PRC487 (Version ≥ 1.92)	Steuergerät für Umschalt-einrichtungen	Control device changeover modules	-	2 ... 30 2 ... 90	-
RCMS460/490	Differenzstrom-Auswertegerät	Residual current evaluator	1	2 ... 90	-
RCMS470-12**	Differenzstrom-Auswertegerät	Residual current evaluator	1 ... 30	1 ... 30	1xSMO480-12
RCMS470E-12**	Differenzstrom-Auswertegerät	Residual current evaluator	-	61 ... 90	-

Gerät/Device	Funktion	Function	Adresse interner Bus/ Address internal Bus		Master für/for
			Master	Slave	
SMI470**	Umsetzer Digitaleingänge auf BMS für Umschalteneinrichtungen mit Kontakten	Converter digital inputs to BMS	-	2 ... 30	
SMI471-12**	Umsetzer Digitaleingänge auf BMS	Converter digital inputs to BMS	-	3 ... 30	-
SMI472-12	Umsetzer Digitaleingänge auf BMS, am internen oder externen BMS-Bus einsetzbar	Converter digital inputs to BMS	-	2 ... 30	-
SMO480-12	Umsetzer BMS auf Relaisausgänge	Converter BMS to relay outputs	-	31 ... 60	-
SMO481-12	Umsetzer BMS auf Relaisausgänge	Converter BMS to relay outputs	-	31 ... 60	-
SMO482-12	Umsetzer BMS auf Relaisausgänge	Converter BMS to relay outputs	-	31 ... 60	-
TM Tableau und PRC1470*,**	Anzeigetableau	Indication panel	int. BUS: 1 ext. BUS: 1 ... 99	-	MEDICS <sup>1</sup> , EDS <sup>2</sup> , RCMS <sup>3</sup>
TM800*	Anzeigetableau	Indicator and operator panel	int. BUS: 1 ext. BUS: 1 ... 99	(2 ... 150)***	MEDICS <sup>1</sup> , EDS <sup>2</sup> , RCMS <sup>3</sup>

\* Geräte am externen BMS-Bus erhalten zusätzlich die Adressen 1 ... 99 am externen Bus.

\*\* Nicht für zukünftige Anwendungen

\*\*\* Nur einstellbar, falls ext. BMS-Bus abgeschaltet ist

\* Devices on the external BMS bus additionally receive the addresses 1 ... 99.

\*\* Not for future applications

\*\*\* Only adjustable, if the external BMS bus has been switched off

#### Begriffserklärung

- <sup>1</sup> MEDICS: BMS-Bus-fähige Geräte für den Einsatz im medizinischen Bereich
- <sup>2</sup> EDS: Isolationsfehlersuchsystem für IT-System
- <sup>3</sup> RCMS: Differenzstrom-Überwachungssystem
- <sup>4</sup> ISOnet: Funktion zur Kopplung mehrerer IT-Systeme mit Überwachung durch Isometer

#### Definitions

- <sup>1</sup> MEDICS: Devices with BMS bus capability for use in medical locations
- <sup>2</sup> EDS: Insulation fault location system for IT system
- <sup>3</sup> RCMS: Residual current monitoring system
- <sup>4</sup> ISOnet: Coupling of several IT systems monitored by an Isometer

#### Überwachung von Geräteausfällen

Einige BMS-Geräte, wie TM-Tableaus, PRC1470, MK2418, MK2430, MK800, EDS460/490, EDS461/491, RCMS460/490 und FTC470-XET können andere BMS-Busteilnehmer auf Geräteausfall überwachen. An dem überwachenden Gerät wird dazu eingestellt, welche Geräteadressen überwacht werden sollen.

#### Monitoring of device failures

Some BMS devices, such as TM operator panels, PRC1470, MK2418, MK2430, MK800, EDS460/490, EDS461/491, RCMS460/490 and FTC470XET can monitor other BMS devices for device failure. In addition, the addresses of the device to be monitored can be set at the monitoring device.

#### Grundregeln für den Aufbau des BMS-Busses

1. Jeder BMS-Bus muss von einem MASTER geführt werden.
2. In jedem BMS-Bus-System darf nur ein MASTER vorhanden sein.
3. Jedem Busteilnehmer muss eine eindeutige Adresse zugewiesen werden.
4. Adressen dürfen niemals doppelt vergeben werden.
5. Der BMS-Bus muss an seinen beiden Enden mit 120 Ω/0,25 W Abschlusswiderständen terminiert werden.
6. Der BMS-Bus darf eine maximale Leitungslänge von 1200 m nicht überschreiten, sofern keine Schnittstellenverstärker eingesetzt sind.
7. Die Anzahl der Geräte innerhalb eines BMS-Busses darf 32 nicht übersteigen, sofern keine Schnittstellenverstärker eingesetzt sind.

#### Basic rules for the design of a BMS bus

1. Every BMS bus must be controlled by a master.
2. Only one master may exist in each BMS bus system.
3. A unique address must be assigned to each bus node.
4. Never assign one address twice.
5. The BMS bus must be terminated at both ends with terminating resistors of 120 Ω/0,25 W.
6. The cable length must not exceed 1200 m, but can be extended by an interface repeater.
7. The number of devices on a BMS bus must not exceed 32, but the bus reach can be extended by interface repeaters.
8. The BMS bus must provide a favourable topology (without branch circuits), unless interface repeaters are used.

8. Der BMS-Bus muss einen günstigen Aufbau (ohne Verzweigungen) Aufweisen, sofern keine Schnittstellenverstärker eingesetzt sind.
9. Die Busleitung (J-Y(St)Y min. 2 x 0,6 - besser 2 x 0,8) muss abgeschirmt und einseitig geerdet sein.
10. Niemals Busklemmen A und B vertauschen.

9. The bus cable (J-Y(St)Y must be shielded at least 2 x 0.6 - better 2 x 0.8) and earthed at one side.
10. Take care not to mix up bus terminal A and B.

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

Only if these basic rules are carefully observed you can guarantee a safe function of the BMS bus.

## Störungshilfen

Im Falle von Fehlfunktionen empfehlen wir folgende Vorgehensweise:

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

Um den Datenverkehr aufzuzeichnen benötigen Sie:

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

Führen Sie nun die folgenden Schritte aus:

- Verbinden Sie den PC über den Schnittstellenumsetzer DI-2... mit dem BMS-Bus (intern oder extern)
- Starten Sie ein Terminalprogramm (z.B. HyperTerminal)
- Stellen Sie die Schnittstellenparameter zum BMS-Bus passend ein: 7 Datenbits, gerade Parität, 1 Stoppbit, keine Flusssteuerung.
- Die Baudrate am internen BMS-Bus beträgt 9.600 Baud, am externen BMS-Bus 9.600 Baud bis 57.600 Baud. Stellen Sie im Terminalprogramm dieselbe Baudrate ein, die in dem zu prüfenden BMS-Bus verwendet wird.
- Damit ist die Verbindung hergestellt. Auf dem Bildschirm des PCs werden nun kontinuierlich die auf dem BMS-Bus übertragenen Daten dargestellt.
- Stellen Sie das Terminalprogramm so ein, dass die Daten mitgeschrieben und gespeichert werden.

Für die Darstellung der aufgezeichneten Daten kann ein Editor verwendet werden. Die Auswertung setzt eine grundlegende Kenntnis des Befehlssatzes des BMS-Busses voraus.

## Zubehör

Typ	Art.-Nr.
DI-1PSM	B95012044
DI-2	B95012022
DI-2USB	B95012045

## Trouble shooting

In case of malfunctions we recommend to proceed as follows:

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

To record the data communication, you will need:

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

Now proceed as follows:

- Connect the PC to the BMS bus (internal or external) via the DI-2... converter
- Start up a terminal program (e.g. HyperTerminal)
- Set the interface parameters so that they are compatible with the BMS bus: 7 data bits, even parity, 1 stop bit, no flow control.
- The baud rate on the internal BMS bus is 9,600 baud. On the external BMS bus it is 9,600 baud to 57,600 baud. In the terminal program select the same baud rate that is used on the BMS bus to be tested.
- The connection is thus established. The data being transmitted on the BMS bus is now continuously displayed on the PC screen.
- Set the terminal program so that the data is also written up and saved.

Any type of editor can be used for the representation of the recorded data. A basic knowledge of the command set of the BMS bus is required for carrying out the evaluation.

## Accessories

Type	Art. No.
DI-1PSM	B95012044
DI-2	B95012022
DI-2USB	B95012045

## Technische Daten

### Hardwareeigenschaften

Verbindung .....	Halb-Duplex
Kommunikation .....	Master/Slave
Teilnehmer am internen BMS-Bus .....	≤ 32 (150*)
Teilnehmer am externen BMS-Bus .....	≤ 32 (99*)

### Schnittstellenparameter

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

### Interner BMS-Bus

Schnittstelle / Protokoll .....	RS485/BMS
Anschluss .....	Klemmen IA/IB
Max. Leitungslänge .....	≤ 1200 m (n x ≤ 1200 m*)
Empfohlene Leitung (geschirmt, Schirm einseitig an PE) .....	J-Y(St)Y min. 2 x 0,8
Abschlusswiderstand .....	120 Ω (0,25 W)
Baudrate .....	9600 Baud

### Externer BMS-Bus

Schnittstelle / Protokoll .....	RS485/BMS extern
Anschluss .....	Klemmen EA/EB
Max. Leitungslänge .....	≤ 1200 m
Empfohlene Leitung (geschirmt, Schirm einseitig an PE) .....	J-Y(St)Y min. 2 x 0,8
Abschlusswiderstand .....	120 Ω (0,25 W)
Baudrate .....	19200 ... 57600 Baud

\* mit Zwischenverstärkern DI-1PSM (n ≤ 9)

## Technical data

### Hardware characteristics

Connection .....	Half duplex
Communication .....	Master/Slave
Devices on the internal BMS bus .....	≤ 32 (150*)
Devices on the external BMS bus .....	≤ 32 (99*)

### Interface parameters

Transmission .....	1 start bit, 7 data bits, 1 parity bit, 1 stop bit
Parity .....	even
Check sum / total bytes transmitted .....	0 (without CR and LF)
Data transfer .....	7 Bit ASCII-Code, but not all the characters are permissible

### Internal BMS bus

Interface / protocol .....	RS-485 / BMS
Connection .....	terminals IA/IB
Max. cable length .....	≤ 1200 m (n x ≤ 1200 m*)
Recommended cable (shielded, shield connected to PE) .....	J-Y(St)Y min. 2 x 0.8
Terminating resistor .....	120 Ω (0.25 W)
Baud rate .....	9600 baud

### External BMS bus

Interface/ protocol .....	RS485/BMS external
Connection .....	terminals EA/EB
Max. cable length .....	≤ 1200 m
Recommended cable (shielded, shield connected to PE) .....	J-Y(St)Y min. 2 x 0.8
Terminating resistor .....	120 Ω (0.25 W)
Baud rate .....	19200 ... 57600 baud

\* with interface repeaters DI-1PSM (n ≤ 9)

Alle Rechte vorbehalten.  
Nachdruck und Vervielfältigung  
nur mit Genehmigung des Herausgebers.  
Änderungen vorbehalten!  
© Dipl.-Ing. W. Bender GmbH & Co.KG



BENDER Group

All rights reserved.  
Reprinting and duplicating  
only with permission of the publisher.  
Subject to change!  
© Dipl.-Ing. W. Bender GmbH & Co.KG



Dipl.-Ing. W. Bender GmbH & Co.KG  
Londorfer Str. 65 • 35305 Grünberg  
Postfach 1161 • 35301 Grünberg

Tel.: +49 (0)6401-807-0  
Fax: +49 (0)6401-807-259

E-Mail: [info@bender-de.com](mailto:info@bender-de.com)  
Web: <http://www.bender-de.com>



## Netzteil

Deutsch

### Bestimmungsgemäße Verwendung

Das Netzteil AN450 dient zur Spannungsversorgung von BENDER-Geräten mit einer Versorgungsspannung von AC 20 V und einer Gesamtleistungsaufnahme von maximal 9 VA.

AN450 ist besonders geeignet zur Spannungsversorgung von Melde- und Prüfkombinationen, wie z.B. MK2418, MK2007, MK2430, MK800.

### Sicherheitshinweise allgemein

Montage, Anschluss und Inbetriebnahme nur durch Elektrofachkraft!

Beachten Sie unbedingt:

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

### Funktionsbeschreibung

Die Versorgungsspannung AC 230 V wird an die Klemmen A1/A2 angeschlossen. Die Ausgangsspannung von AC 20 V steht an den Klemmen U2/V2 zur Verfügung. Eingangs- und Ausgangsklemmen sind doppelt vorhanden, so dass darüber bei Bedarf mehrere AN450 parallel geschaltet werden können. Dabei dürfen A1/A2 und U2/V2 untereinander nicht vertauscht werden.



#### **Gefahr eines elektrischen Schlages bei parallel geschalteten AN450.**

Wird ein zweites AN450 nur auf der Sekundärseite parallel geschaltet, so liegt an der nicht parallel geschalteten Primärseite (durch Rücktransformation) Netzspannung an.

Stellen Sie sicher, dass immer Primär- **und** Sekundärseite parallel geschaltet sind.

## Power supply unit

English

### Intended Use

The power supply AN450 supplies BENDER devices with a supply voltage of AC 20 V. The maximum power is 9 VA.

AN450 is particularly well suited for the voltage supply of remote alarm indicator and test combinations, as e.g. MK2418, MK2007, MK2430, MK800.

### Safety Information

Installation, connection and commissioning of electrical equipment shall only be carried out by skilled persons:

Particular attention shall be paid to:

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

### Function

The supply voltage of AC 230 V is connected to the terminals A1/A2. The output voltage of AC 20 V is present at the terminals U2/V2. Input- and output terminals are double terminals to allow an easy parallel connection of several AN450. It is not allowed to exchange terminals A1/A2 and U2/V2.



#### **AN450 devices connected in parallel involve the risk of electrical shock.**

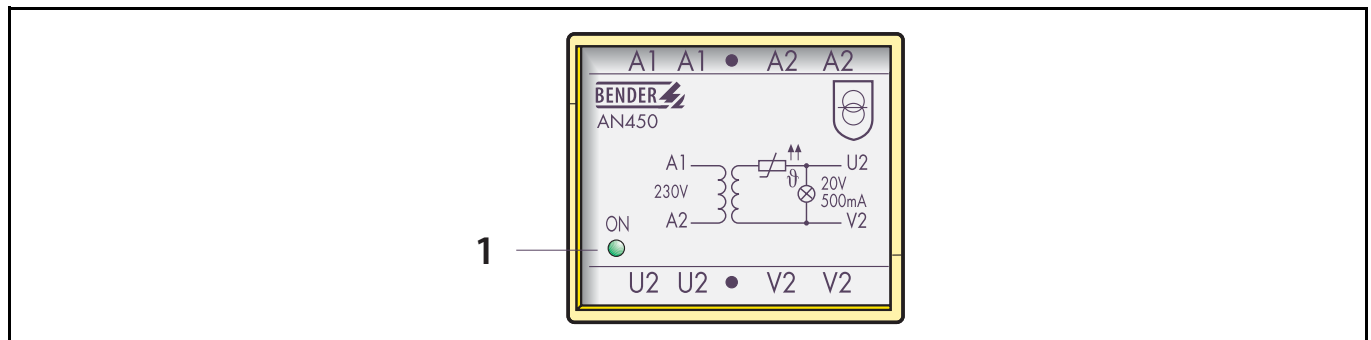
If a second AN450 is connected in parallel on the secondary side, mains voltage will be present on the primary side not connected in parallel (caused by inverse transform). Make sure that both primary and secondary side are connected in parallel.

Der Sekundärkreis des eingebauten Sicherheitstransformators ist mit einem Kaltleiter abgesichert.

The secondary circuit of the AN450 is protected with an internal PTC.

## Bedienelemente

## Operating Elements



1 LED „ON“ (grün) leuchtet, wenn Gerät im Betrieb ist.

1 "ON" LED (green) lights up when the device is in operation.

## Montage und Anschluss



Stellen Sie vor Einbau des Gerätes und vor Arbeiten an den Anschlüssen des Gerätes sicher, dass die Anlage spannungsfrei ist.

Wird dies nicht beachtet, so besteht für das Personal die Gefahr eines elektrischen Schlages.

Außerdem drohen Sachschäden an der elektrischen Anlage und die Zerstörung des Gerätes.

### Montage

Das Gerät ist für folgende Einbauarten geeignet:

- Installationsverteiler nach DIN 43871 oder
- Schnellmontage auf Hutprofilschiene nach DIN EN / IEC 60715
- oder Schraubmontage.

## Installation and Connection



Prior to installation and before any work is carried out on the connecting cables, make sure that the mains power is disconnected.

Failure to comply with this safety information may cause electric shock to personnel.

Substantial damages to the electrical installation and destruction of the device may occur.

### Installation

The device is suited for:

- Mounting into standard distribution panels acc. to DIN 43871
- DIN rail mounting in compliance with IEC 60715
- or screw mounting.

### Maßbild

### Dimension Diagram

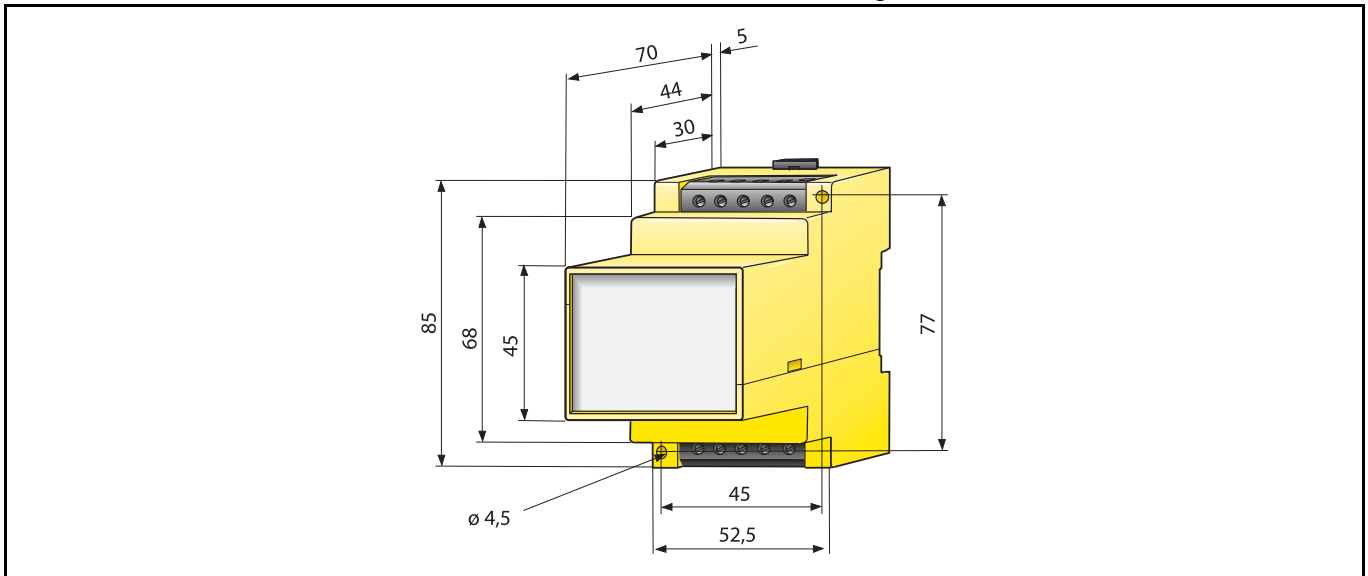


Abb. 1: alle Maße in mm

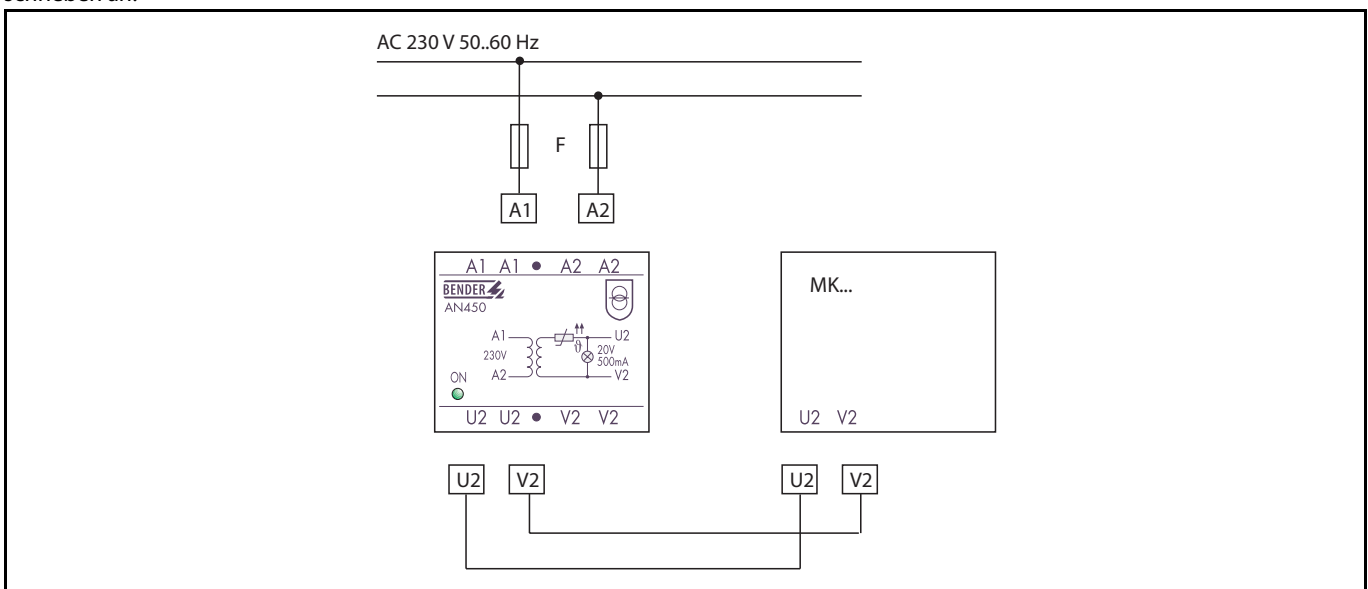
Fig. 1: Figure 1: all dimensions in mm

### Anschluss

Schließen Sie das Gerät wie im folgenden Anschlussbeispiel beschrieben an.

### Connection

Connect the device as shown in the example below.



**Legende zum Anschlussschaltbild**

A1, A2	Versorgungsspannung $U_5$
U2, V2	Ausgangsspannung. Achtung: U2, V2 <b>nicht</b> mit PE bzw. PA verbinden.
F	Kurzschlusschutz Speisespannung. Empfehlung: 6 A Sicherung

**Hinweise zur Leitungslänge**

Die maximal mögliche Anzahl anschließbarer Geräte hängt vom Spannungsverlust auf der Leitung zwischen AN450 und dem Gerät ab.

- Beachten Sie dazu die Angaben in der Anleitung des angeschlossenen Gerätes (MK...).
- Überprüfen Sie den Wert der Versorgungsspannung an den Klemmen des angeschlossenen Gerätes (MK...). Beachten Sie dabei:
  - die Versorgungsspannungstoleranzen
  - und den Spannungsabfall auf der Leitung.
- Bei Anschluss mehrerer Geräte ist eine sternförmige Leitungsführung vorteilhaft.

**Inbetriebnahme**

Kontrollieren Sie vor der Inbetriebnahme den ordnungsgemäßen Anschluss des Gerätes.

**Technische Daten**
**Isolationskoordination nach IEC 60664-1**

Bemessungsspannung .....	AC 250 V
Bemessungs-Stoßspannung / Verschmutzungsgrad .....	4 kV / III

**Versorgungsspannung**

Versorgungsspannung $U_5$ .....	siehe Bestellangaben
Frequenzbereich $U_5$ .....	siehe Bestellangaben
Arbeitsbereich $U_5$ .....	0,85 ... 1,1 x $U_5$
Ausgangsspannung .....	AC 20 V, 50 ... 60 Hz
Ausgangs-Nennleistung .....	≤ 9 VA
Sekundäre Sicherung .....	Kaltleiter

**Umwelt / EMC**

EMV Störfestigkeit .....	nach EN 61000-6-2
EMV Störaussendung .....	nach EN 61000-6-4
Klimaklassen nach IEC 60721	
Ortsfester Einsatz / Transport / Langzeitlagerung .....	3K5 / 2K3 / 1K4
Arbeitstemperatur .....	- 10 °C ... + 55 °C
Mechanische Beanspruchung nach IEC 60721	
Ortsfester Einsatz / Transport / Langzeitlagerung .....	3M4 / 2M2 / 1M3

**Anschluss**

Anschlussart .....	Schraubklemmen
Anschlussvermögen	
starr / flexibel / Leitergrößen .....	0,2 ... 4 / 0,2 ... 2,5 mm <sup>2</sup> / AWG 24-12
flexibel mit Aderendhülse, ohne / mit Kunststoffhülse .....	0,25 ... 2 mm <sup>2</sup>
Abisolierlänge .....	8 mm

**Allgemeine Daten**

Anzugsmoment .....	0,5 Nm
Betriebsart .....	Dauerbetrieb
Einbaulage .....	beliebig
Schutzart Einbauten / Klemmen (DIN EN 60529) .....	IP30 / IP20
Gehäusetyp / Maßbild .....	X440
Schraubbefestigung .....	2 x M4
Schnellbefestigung auf Hutprofilschiene .....	DIN EN 60715 / IEC 60715
Entflammbarkeitsklasse .....	UL94V-0

**Legend to wiring diagram**

A1, A2	supply voltage $U_5$
U2, V2	Output voltage. Attention: U2, V2 must <b>not</b> connected to PE resp. PA.
F	Short-circuit protection supply voltage: a 6 A fuse is re-commended.

**Remarks about the wire length**

The max. number of devices connected depends on the line volt drop between AN450 and device.

- Consider in addition the data in the operator's manual of the connected equipment (MK...).
- Please check the correct supply voltage at the terminals of the connected device (MK...). Consider thereby:
  - the tolerances of the supply voltage
  - and the voltage drop on the line.
- When connecting several devices a point-to-point connection from AN450 to the devices is favourable.

**Commissioning**

Prior to commissioning, check proper connection of the device.

**Technical Data**
**Insulation coordination acc. to IEC 60664-1**

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

**Voltage ranges**

Supply voltage $U_5$ .....	see ordering details
Frequency range of $U_5$ .....	see ordering details
Operating range of $U_5$ .....	0.85 ... 1.1 x $U_5$
Secondary voltage .....	AC 20 V, 50 ... 60 Hz
Nominal secondary load .....	≤ 9 VA
Internal secondary fuse .....	PTC

**Environment / EMC**

EMC immunity .....	acc. to EN 61000-6-2
EMC emission .....	acc. to EN 61000-6-4
Classification of climatic conditions acc. to IEC 60721	
Stationary use / Transport / Storage.....	3K5 / 2K3 / 1K4
Operating temperature .....	- 10 °C ... + 55 °C
Classification of mechanical conditions acc. to IEC 60721	
Stationary use / Transport / Storage.....	3M4 / 2M2 / 1M3

**Connection**

Connection.....	screw terminals
Connection properties	
rigid / flexible / Conductor sizes .....	0,2 ... 4 / 0,2 ... 2,5 mm <sup>2</sup> / AWG 24-12
Connection, flexible with connector sleeve, without/with plastic sleeve.....	0.25 ... 2 mm <sup>2</sup>
Stripping length .....	8 mm

**General data**

Tightening torque, terminal screws .....	0.5 Nm
Operating mode .....	continuous operation
Mounting.....	any position
Protection class internal components / terminals (DIN EN 60529) .....	IP30 / IP20
Type of housing / Dimension diagram .....	X440
Screw fixing .....	2 x M4
DIN rail mounting acc. to .....	DIN EN 60715 / IEC 60715
Flammability class.....	UL94V-0

Produktnormen ..... DIN EN 61558-1: 2006-07; IEC 61558-1: 2005-09  
 Gewicht ..... ≤ 400 g

Standards ..... DIN EN 61558-1: 2006-07; IEC 61558-1: 2005-09  
 Weight ..... ≤ 400 g

#### Abweichende Ausführungen

Dieses Feld ist nur beklebt, falls Änderungen gegenüber der Standardausführung des Gerätes vorgenommen wurden.

#### Label for modified versions

There will only be a label in this field if the device is different from the standard version.



#### Bestellangaben

#### Ordering details

Typ Type	Versorgungsspannung $U_s$ Supply voltage $U_s$	Ausgangsspannung Output voltage	Art.-Nr. Art. No.
AN450	AC 230 V, 50 ... 60 Hz	AC 20 V, 50 ... 60 Hz	B 924 201
AN450-133	AC 127 V, 50 ... 60 Hz	AC 20 V, 50 ... 60 Hz	B 924 203

Alle Rechte vorbehalten.  
 Nachdruck und Vervielfältigung  
 nur mit Genehmigung des Herausgebers.  
 Änderungen vorbehalten!  
 © Dipl.-Ing. W. Bender GmbH & Co.KG



 BENDER GROUP

All rights reserved.  
 Reprinting and duplicating  
 only with permission of the publisher.  
 Subject to change!  
 © Dipl.-Ing. W. Bender GmbH & Co.KG



Dipl.-Ing. W. Bender GmbH & Co.KG  
 Londorfer Str. 65 • 35305 Grünberg  
 Postfach 1161 • 35301 Grünberg

Tel.: +49 (0)6401-807-0  
 Fax: +49 (0)6401-807-259

E-Mail: [info@bender-de.com](mailto:info@bender-de.com)  
 Web: <http://www.bender-de.com>

## Messstromwandler

Deutsch

### Bestimmungsgemäße Verwendung

Messstromwandler STW2, STW3 und STW4 werden vorzugsweise zur Überwachung der Spannungsversorgung in medizinisch genutzten Räumen eingesetzt. Dort erfassen sie den Laststrom und setzen ihn in ein für auswertende Geräte nutzbares Signal um.

### Sicherheitshinweise allgemein

Montage, Anschluss und Inbetriebnahme nur durch Elektrofachkraft!

Beachten Sie unbedingt:

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

### Funktionsbeschreibung

Messstromwandler STW2, STW3 und STW4 überwachen den Laststrom einer Phase zur Speisung von medizinisch genutzten Räumen. Sind mehrere Phasen vorhanden, so wird für jede Phase ein Messstromwandler benötigt.

Auswertende Geräte für STW2 sind beispielsweise:

- A-Isometer® 107TD47; in Drehstromsystemen in Verbindung mit dem Ankoppelbaustein LSD470 zur Laststromüberwachung.

Auswertende Geräte für STW3 und STW4 sind beispielsweise:

- Isolationsüberwachungsgerät LIM2000

## Montage und Anschluss



*Stellen Sie vor Einbau des Gerätes und vor Arbeiten an den Anschlüssen des Gerätes sicher, dass die Anlage spannungsfrei ist.*

*Wird dies nicht beachtet, so besteht für das Personal die Gefahr eines elektrischen Schlages. Außerdem drohen Sachschäden an der elektrischen Anlage und die Zerstörung des Gerätes.*

### Montage

Alle Messstromwandler sind zur Schraubbefestigung vorgesehen. Montieren Sie den Messstromwandler mittels Schrauben M3 an einen geeigneten Ort. Vermeiden Sie eine Montage in der Nähe von starken Magnetfeldern.

Für den Messstromwandler STW2 besteht wahlweise auch die Möglichkeit zur Befestigung auf Hutschiene:

1. Montieren Sie zuerst den zugehörigen Montagewinkel an den Rastfuß.
2. Schrauben Sie dann den Messstromwandler STW2 an den Montagewinkel.
3. Klemmen Sie den Rastfuß auf die Hutschiene.

Beachten Sie auch das Handbuch oder den Beipackzettel des auswertenden Gerätes (z.B. Beipack 107TD47).

## Measuring current transformer

English

### Intended use

Measuring current transformers STW2, STW3 and STW4 are preferably used for the monitoring of power supply in medically used areas. There they measure the load current and convert it into a signal usable for evaluating devices.

### Safety information

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

Particular attention shall be paid to:

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

### Function

Measuring current transformers STW2, STW3 and STW4 measure the load current of a phase for the supply of medically used areas. If several phases are present, then for each phase a measuring current transformer is needed.

Evaluating devices for STW2 are for example :

- A-Isometer® 107TD47; in three-phase systems in connection with the measuring adapter LSD470 for the load current monitoring .

Evaluating devices for STW3 and STW4 are for example.

- Line isolation monitor LIM2000

## Installation and connection



*Prior to installation and before work activities are carried out on the connecting cables, make sure that the mains power is disconnected.*

*Failure to comply with this safety information may cause electric shock to personnel. Furthermore, substantial damage to the electrical installation and destruction of the device might occur.*

### Installation

All measuring current transformers are intended for screw fixing. Install the measuring current transformer by means of screws M3 to a suitable place. Avoid an installation in the proximity of strong magnetic fields.

For the measuring current transformer STW2 alternatively also DIN rail mounting acc. to IEC 60715 is possible. :

1. Install first the associated mounting angle to the adapter for DIN rail.
2. Screw then the measuring current transformer STW2 to the mounting angle.
3. Mount the adapter on the DIN rail.

Consider also the manual or the instruction leaflet of the evaluating device (e.g. instruction leaflet 107TD47).

Maßbild STW2

Dimension diagram STW2

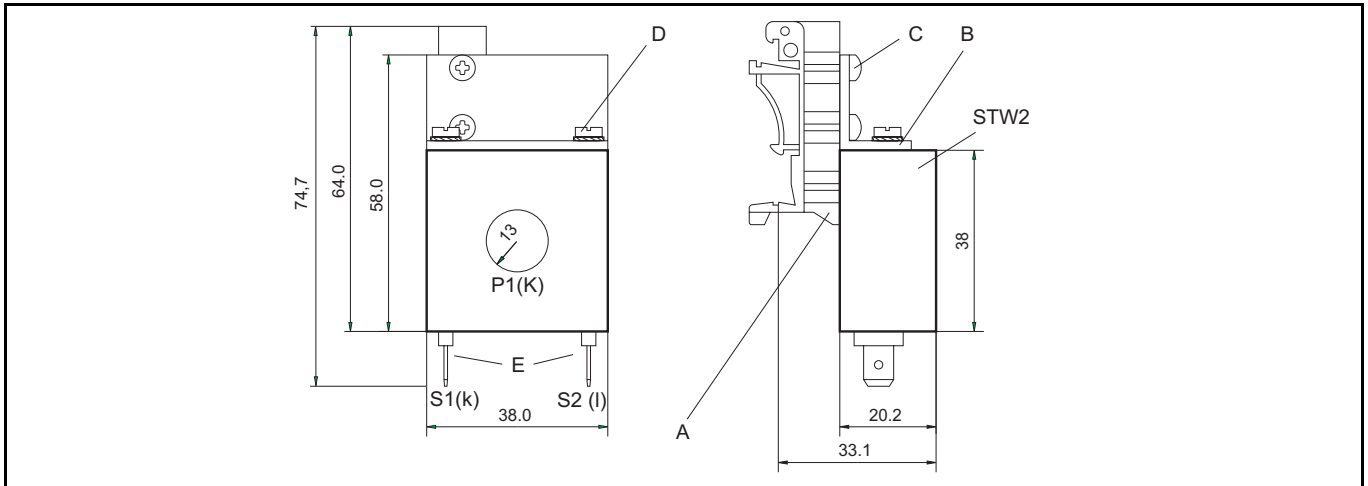


Abb. 1: Montagevariante 1 (alle Maße in mm)

Figure 1: Way of mounting 1 (all dimensions in mm)

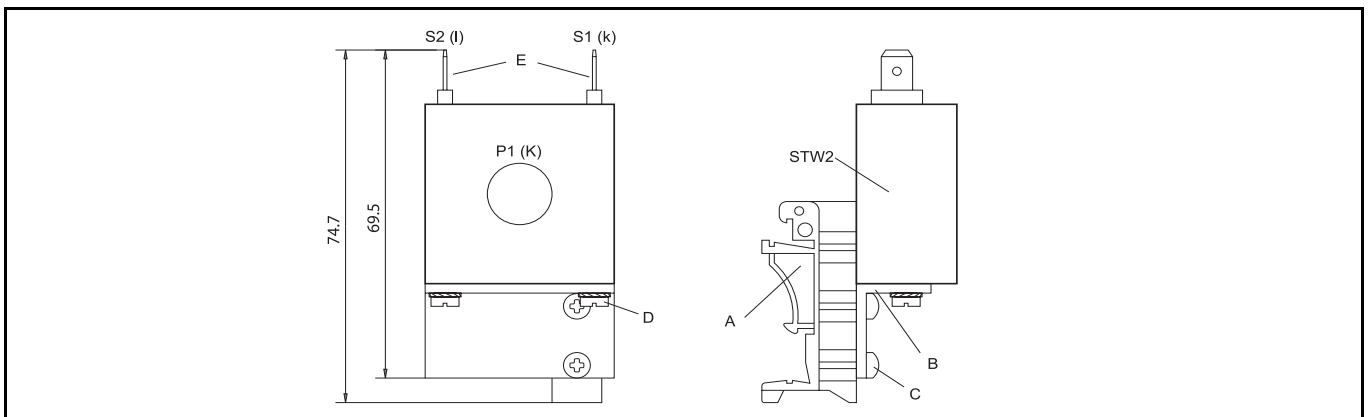


Abb. 2: Montagevariante 2 (alle Maße in mm)

Figure 2: Way of mounting 2 (all dimensions in mm)

- A Rastfuß
- B Montagewinkel
- C Blechschraube 3x8
- D Zylinderschraube M3x6
- E Anschlussstecker

- A adapter for DIN rail
- B mounting angle
- C Sheet metal screw 3x8
- D Cylinder head screw M3x6
- E Connecting plug

Maßbild STW3 und STW4

Dimension diagram STW3 and STW4

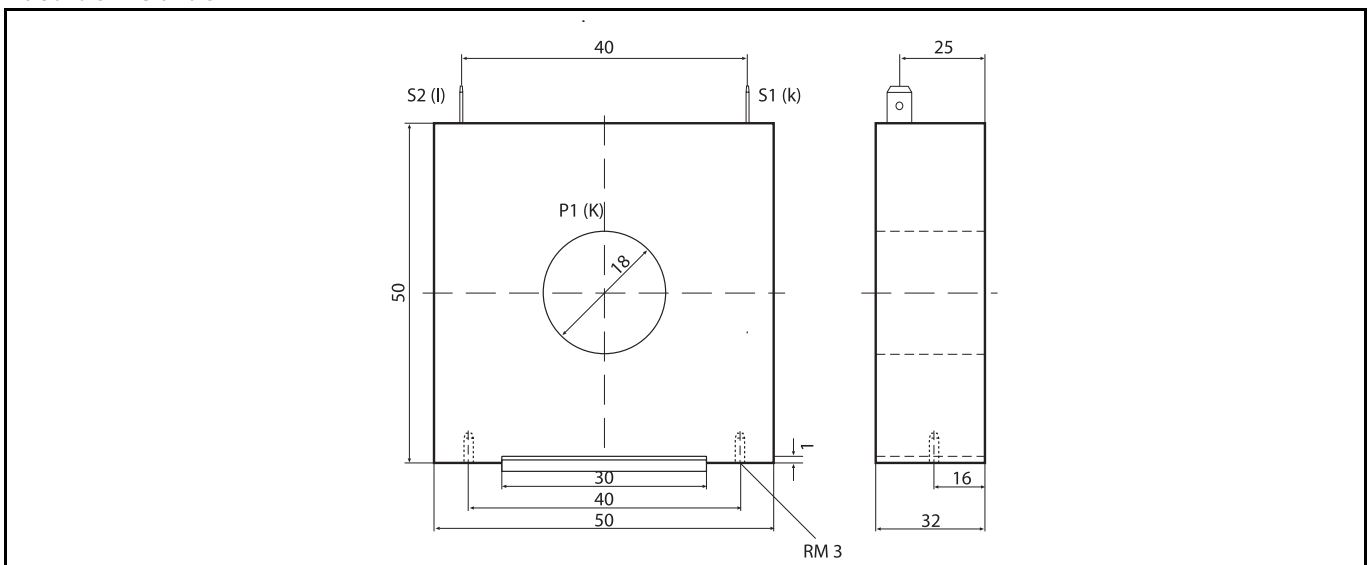


Abb. 3: Alle Maße in mm

Figure 3: All dimensions in mm

**Anschluss**

1. Schließen Sie die Messstromwandler mit zwei Anschlussdrähten an das auswertende Gerät an. Beachten Sie dabei die Angaben in dem Beipackzettel des auswertenden Gerätes und die technischen Daten (insbesondere die Leitungslängen) dieses Beipackzettels.
2. Schließen Sie nicht benutzte Messstromwandler kurz. Verbinden Sie dazu die Kontakte S1 (k) und S2 (l) mit PE.
3. Führen Sie den zu überwachenden Leiter möglichst symmetrisch und rechtwinklig durch den Messstromwandler.

**Connection**

1. Install the measuring current transformer by connecting the two wires to the evaluating device under consideration of information in the instruction leaflet of the evaluating device and the technical data (in particular the cable lengths) in this instruction leaflet.
2. Short-circuit the transformers which are not being used by connecting the contacts S1 (k) and S2 (l) to PE.
3. Pass the conductors to be monitored at a right angle through the measuring current transformer.

**Mögliche Leitungsführung durch den Messstromwandler**

**Cable routing through the measuring current transformer**

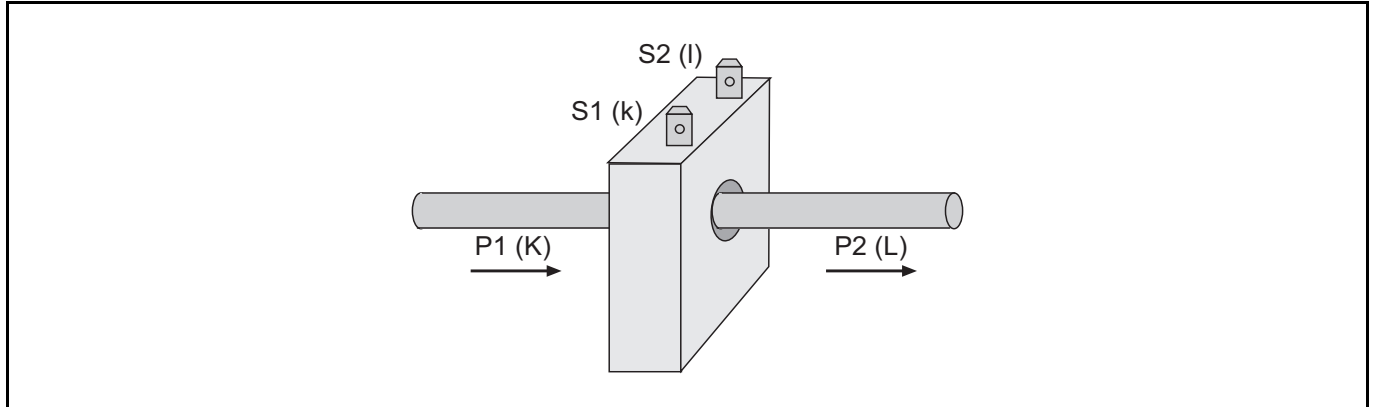


Abb. 4: Leitungsführung

Figure 4: Cable routing

P1 (K) von Spannungsversorgung  
 P2 (L) zur Last  
 S1 (k), S2 (l) Messstromwandler-Anschlüsse

P1 (K) from power supply  
 P2 (L) to the load  
 S1 (k), S2 (l) Connections of measuring current transformer

**Inbetriebnahme**

Kontrollieren Sie vor der Inbetriebnahme den ordnungsgemäßen Anschluss des Messstromwandlers.

**Commissioning**

Prior to commissioning, check proper connection of the transformer



Beachten Sie die Stromanzeige der auswertenden Geräte.



Consider the current indication of the evaluating devices.

**Normen**

DIN EN 60044-1:2001-11  
 Messwandler - Teil 1: Stromwandler (IEC 60044-1:1999 + A1:2000); Deutsche Fassung DIN EN 60044-1:2001-11

**Standards**

DIN EN 60044-1:2001-11  
 Measuring current transformers - Part 1: Current transformers (IEC 60044-1:1999 + A1:2000); German version DIN EN 60044-1:2001-11

**Technische Daten STW2, STW3, STW4**

**Isolationskoordination nach IEC 60044-1**

Bemessungsspannung  $U_m$  AC 720 V  
 Bemessungs-Stoßspannung  $U_{isol}$  2,5 kV / 4 kV / 4 kV

**Messkreis**

Nennübersetzungsverhältnis  $k_n$  50/0,05 A, 100/0,1 A, 200/0,1 A  
 Nennbürde 65  $\Omega$ , 200  $\Omega$ , 200  $\Omega$   
 Primärmenstrom max 50 / 100 / 200 A  
 Primärmenstrom min. 0,5 A, 1 A, 2 A  
 Nennleistung 2 VA  
 Nennfrequenz 50 ... 400 Hz

**Technical data STW2, STW3, STW4**

**Insulation coordination according to IEC 60664-1:**

Rated voltage  $U_m$  AC 720 V  
 Rated impulse voltage  $U_{isol}$  2,5 kV / 4 kV / 4 kV

**Measuring circuit**

Rated transformation ratio  $k_n$  50/0.05 A, 100/0.1 A, 200/0.1 A  
 Rated burden 65  $\Omega$ , 200  $\Omega$ , 200  $\Omega$   
 Max. rated primary current 50 / 100 / 200 A  
 Min. rated primary current 0.5 A, 1 A, 2 A  
 Nominal power 2 VA  
 Nominal frequency 50 ... 400 Hz

Innenwiderstand 23 Ω, 17 Ω, 40 Ω  
 Genauigkeitsklasse 1  
 Thermischer Bemessungs Dauerstrom 60 A, 120 A, 240 A  
 Thermischer Bemessungs Kurzzeitstrom (1 s) 300 A, 1000 A, 2000 A  
 Dynamischer Bemessungsstrom (30 s) 600 A, 2500 A, 5000 A

Internal resistance 23 Ω, 17 Ω, 40 Ω  
 Accuracy class 1  
 Rated continuous thermal current 60 A, 120 A, 240 A  
 Rated short-time thermal current (1 s) 300 A, 1000 A, 2000 A  
 Dynamic rated current (30 s) 600 A, 2500 A, 5000 A

**Allgemeine Daten**

Norm IEC60044-1  
 Schockfestigkeit IEC60068-2-27 (Eingebaut) 15 g / 11 ms  
 Dauerschocken IEC60068-2-29 (Transport) 40 g / 6 ms  
 Schwingungsbeanspruchung IEC 60068-2-6 (Eingebaut) 1 g / 10 ... 150 Hz  
 Schwingungsbeanspruchung IEC 60068-2-6 (Gerät außer Betrieb) 2g / 10 ... 150 Hz  
 Umgebungstemperatur, bei Betrieb 0 °C ... +85 °C  
 Umgebungstemperatur, bei Lagerung -40 °C ... +85 °C  
 Klimaklasse nach DIN IEC60721-3-3 3K5  
 Betriebsart Dauerbetrieb  
 Einbaulage beliebig  
 Anschlussart Fastonstecker 6,3 x 0,8 mm  
 Anschlussleitung zum Messstromwandler  
 Einzeldrähte ≥ 0,75 mm<sup>2</sup> bis 1 m  
 Einzeldrähte verdreht ≥ 0,75 mm<sup>2</sup> bis 10 m  
 Schirmleitung ≥ 0,6 mm<sup>2</sup> (Schirm einseitig an PE) z.B. J-Y(ST)Y 2 x 0,6 bis 40 m  
 Schraubbefestigung M3  
 Entflammbarkeitsklasse UL94V-0

**General data**

Standard IEC60044-1  
 Shock resistance acc. to IEC 60068-2-27 (built-in) 15 g / 11 ms  
 Bumping IEC60068-2-29 (during transport) 40 g / 6 ms  
 Vibration resistance IEC 60068-2-6 (built-in) 1 g / 10 ... 150 Hz  
 Vibration resistance IEC 60068-2-6 (Device out of service) 2g / 10 ... 150 Hz  
 Ambient temperature, during operation 0 °C ... +85 °C  
 Ambient temperature, during storage -40 °C ... +85 °C  
 Climatic category acc. to DIN IEC60721-3-3 3K5  
 Operating mode continuous operation  
 Position any position  
 Connection Faston plug 6.3 x 0.8 mm  
 Type of connection to the measuring current transformer  
 Single wires ≥ 0.75 mm<sup>2</sup> up to 1 m  
 Single wires, twisted ≥ 0.75 mm<sup>2</sup> up to 10 m  
 Screened cable ≥ 0.6 mm<sup>2</sup> (single-ended connection to PE) e.g. J-Y(ST)Y 2 x 0.6 up to 40 m  
 Screw mounting M3  
 Flammability class UL94V-0

**Bestellangaben**

**Ordering details**

Typ /Type	Innendurchmesser Internal diameter (mm)	Art.-Nr. / Art. No.
STW2	13	B 942 709
STW3	18	B 980 21000
STW4	18	B 980 21001

Alle Rechte vorbehalten.  
 Nachdruck und Vervielfältigung  
 nur mit Genehmigung des Herausgebers.  
 Technische Änderungen vorbehalten!



All rights reserved.  
 Reprinting and duplicating  
 only by permission of publisher.  
 Right to technical modifications reserved!



© 2004 BENDER Germany

Dipl.-Ing. W. Bender GmbH & Co.KG  
 Londorfer Str. 65 • 35305 Grünberg  
 Postfach 1161 • 35301 Grünberg

Tel.: +49 (0)6401-807-0  
 Fax: +49 (0)6401-807-259

E-Mail: info@bender-de.com  
 Internet: http://www.bender-de.com



## Isolationsfehler-Prüfgerät

Deutsch

### Bestimmungsgemäße Verwendung

Das Isolationsfehler-Prüfgerät PGH474(E) wird innerhalb einer Isolationsfehler-Suchsystemes EDS474 eingesetzt, die zur Lokalisierung von Isolationsfehlern in IT-Systemen von medizinisch genutzten Räumen dient. Aufgaben des PGH474(E):

- Erzeugung des Prüfstromes
- Begrenzung des Prüfstromes auf 1 mA
- Synchronisation mit Isolationsfehlerauswertegeräten EDS474-12
- Steuerung der Isolationsfehlersuche bei Systemen ohne Texttafel TM..

Synchronisation und Steuerung: Über die RS485-Schnittstelle. Die Ausführung PGH474E wird benötigt, wenn mehr als 9 Isolationsfehler-Prüfgeräte an einer Schnittstelle angeschlossen werden.

### Sicherheitshinweise allgemein

Montage, Anschluss und Inbetriebnahme nur durch Elektrofachkraft!

Beachten Sie unbedingt:

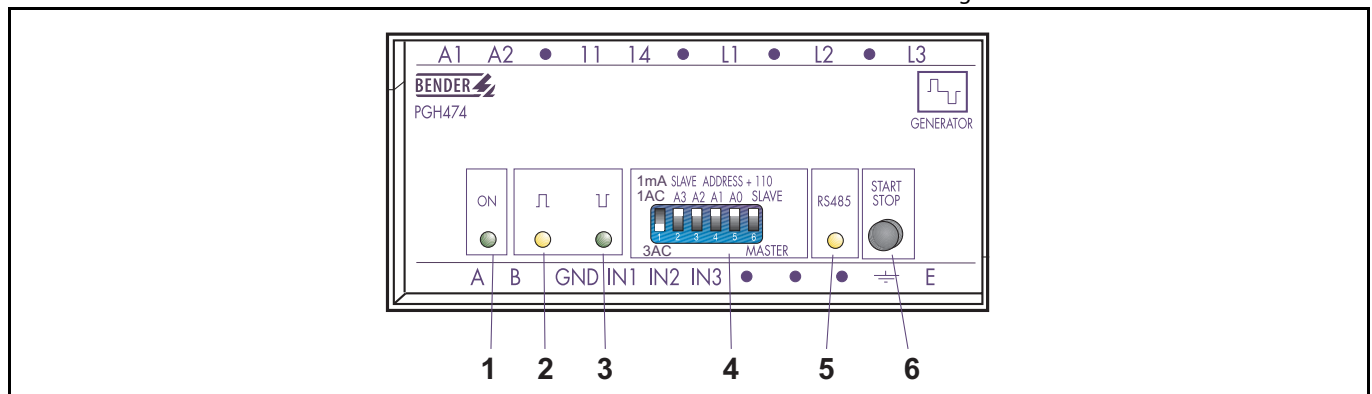
- die bestehenden Sicherheitsvorschriften und
- das beiliegende Blatt "Wichtige sicherheitstechnische Hinweise für BENDER-Produkte".

### Funktionsbeschreibung

Das Isolationsfehler-Prüfgerät PGH474(E) erzeugt (bei vorhandenem Isolationsfehler) in einem IT-System ein definiertes Prüfstromsignal. Der Prüfstrom ist begrenzt auf max. 1 mA und muss per DIP-Schalter auf ein- bzw. dreiphasige Netze angepasst werden. Das Prüfstromsignal wird von den im Fehlerstromkreis liegenden Messwandlern erfasst und die fehlerbehafteten Abgänge werden von den Auswertegeräten EDS474-12 angezeigt.

### Bedienelemente

Dargestellt ist das PGH474. Beim PGH474E haben die DIP-Schalter abweichende Funktionen.



- |      |   |
|------|---|
| 1    | LED „ON“ leuchtet, wenn Gerät eingeschaltet ist                               |
| 2, 3 | LEDs: Prüftakt des Prüfstromes  |
| 4    | DIP-Schalter für Geräteeinstellungen (Details siehe Kapitel „Inbetriebnahme“) |
| 5    | LED zeigt Aktivitäten auf dem BMS-Bus (BMS=Bender Messgeräte Schnittstelle).  |
| 6    | Taste für Start bzw. Stop der Isolationsfehlersuche                           |

## Insulation fault test device

English

### Intended use

The insulation fault test device PGH474(E) is used within an insulation fault location system EDS474. This systems locates insulation faults in IT systems of medically used rooms. The PGH474(E) has the following tasks:

- Generation of the test current
- Limitation of the test current to 1 mA
- Synchronization of the test pulse with evaluators EDS474-12
- Control of the insulation fault test in systems without tableau series TM..

Synchronization, control and communication: via the RS485 interface.

Version PGH474E is necessary when more than 9 test devices are connected at only one interface.

### Safety information

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

Particular attention shall be paid to:

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

### Function

The PGH474(E) generates a defined current signal flowing via an insulation fault. The test current is limited to 1 mA max. and must be set for AC or 3AC systems via the DIP switch. The test current signal is sensed by the measuring current transformers lying within the fault current path and the faulty branches are indicated by LEDs on the evaluators EDS474-12.

### Operating elements

The following figure shows the PGH474. The DIP switches of the PGH474E have deviating functions.

- |     |  |
|-----|--|
| 1   | LED „ON“ lights up when the device is switched on                          |
| 2,3 | LED: test pulse of the test current  |
| 4   | DIP switch for device settings (for details refer chapter „Commissioning“) |
| 5   | LED signals activities on the BMS bus (BMS=Bender Measuring Interface).    |
| 6   | Button starts resp. stopps insulation fault location                       |

### Montage und Anschluss

### Installation and connection



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



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

### Montage

Das Gerät ist für folgende Einbauarten geeignet:

- Installationsverteiler nach DIN 43 871 oder
- Schnellmontage auf Hutprofilschiene nach IEC 60715
- oder Schraubmontage.

### Installation

The device is suited for:

- mounting into standard distribution panels acc. to DIN 43 871
- DIN rail mounting acc. to IEC 60715
- or screw mounting.

### Maßbild

### Dimension diagram

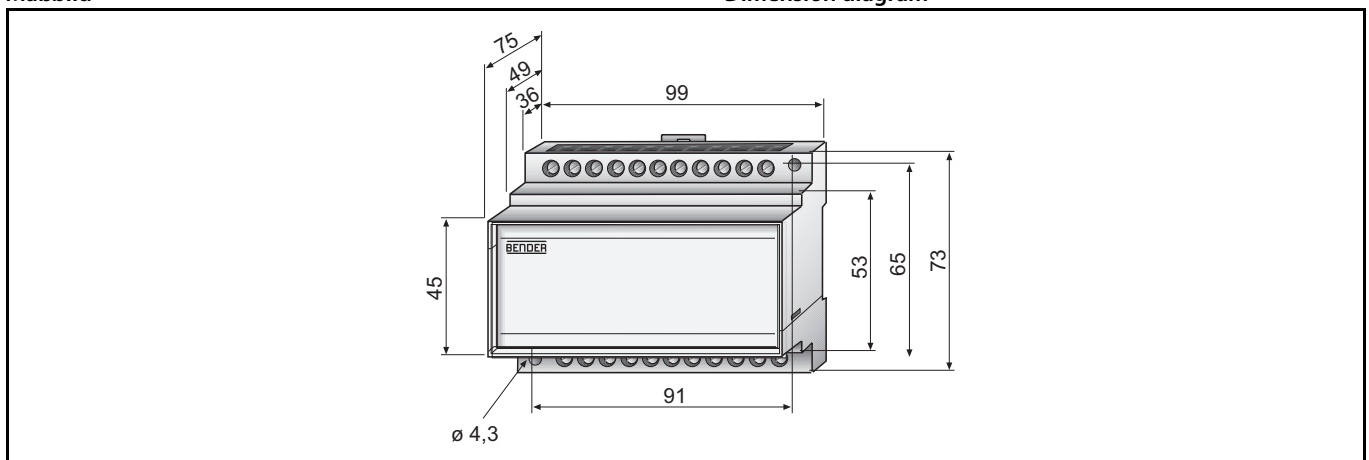


Abb. 1: alle Maße in mm

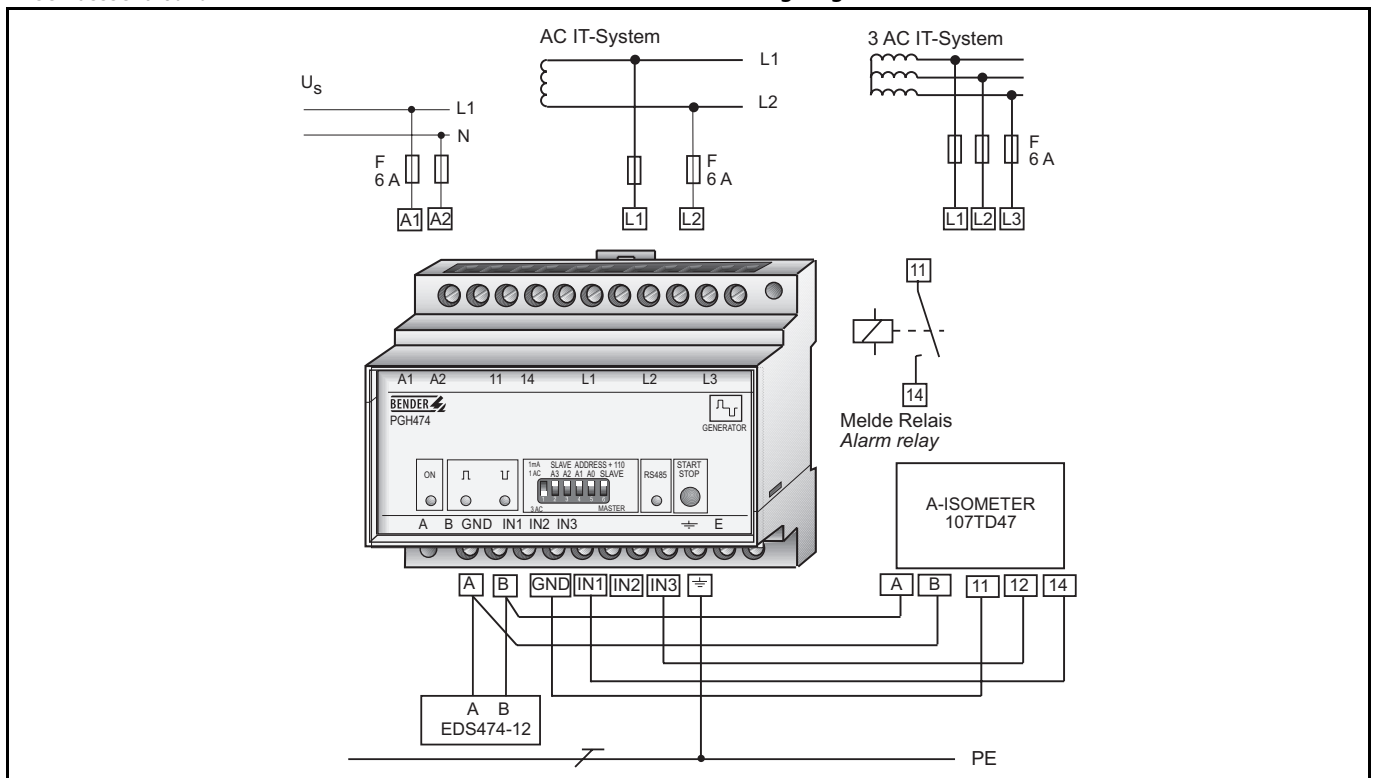
Figure 1: all dimensions in mm

### Anschluss

### Connection

### Anschlusschaltbild

### Wiring diagram



**Legende zum Anschlussbild**

A1, A2	Anschluss der Speisespannung $U_s$
11,14	Melderelais, ist für die Dauer der Isolationsfehlersuche geschlossen
L1, L2, L3	Anschluss an das zu überwachende AC- oder 3 AC IT-System
A, B	BMS-Bus
IN1, IN2, IN3, GND	Steuereingänge zum Start der Isolationsfehlersuche

**Funktion der Steuereingänge IN1, IN2, IN3**

Der Start des Isolationsfehler-Suchsystems wird durch einen potentialfreien Schließerkontakt des Isolations-Überwachungsgerätes bewirkt. Dabei sind, je nach Anschluss, folgende Funktionen möglich:

- IN1/GND ist an Schließerkontakte (11/14) des Isolations-Überwachungsgerätes angeschlossen:  
Die Isolationsfehlersuche läuft solange, wie der Kontakt geschlossen ist.  
Ist der Isolationswert des Systems wieder innerhalb der Grenzwerte, so meldet das Isolations-Überwachungsgerät keinen Alarm mehr. Der Kontakt 11/14 öffnet und die Isolationsfehlersuche wird beendet.
- IN2/GND ist an Schließerkontakte (11/14) des Isolations-Überwachungsgerätes angeschlossen:  
Die Isolationsfehlersuche wird für einen Durchlauf gestartet und danach gestoppt. Damit das EDS-System starten kann, muss der Eingang für ca. 6 Sekunden geschlossen sein. Für MEDICS®-Systeme wird diese Funktion nicht empfohlen.
- IN3/GND ist an Öffnerkontakte (11/12) des Isolations-Überwachungsgerätes angeschlossen: Prüftaktunterdrückung.  
Es wird kein Prüftakt ausgegeben. Diese Funktion wird benötigt, wenn mehrere getrennte IT-Systeme überwacht und zentral von einem Melde- und Bedientableau TM1000 gesteuert werden. In diesem Fall darf nur das Prüfgerät PGH474 einen Prüftakt ausgeben, in dessen IT-System der Isolationsfehler aufgetreten ist.  
Hinweis: Diese Art des Systemstarts ist nur in gekoppelten IT-Systemen erforderlich!

**Legend to wiring diagram**

A1, A2	Connection of supply voltage $U_s$
11,14	Relay. Contact is closes for the duration of the insulation fault location
L1, L2, L3	Connection to the monitored AC or 3 AC IT system
A, B	BMS Bus
IN1, IN2, IN3, GND	Control inputs to start the insulation fault location

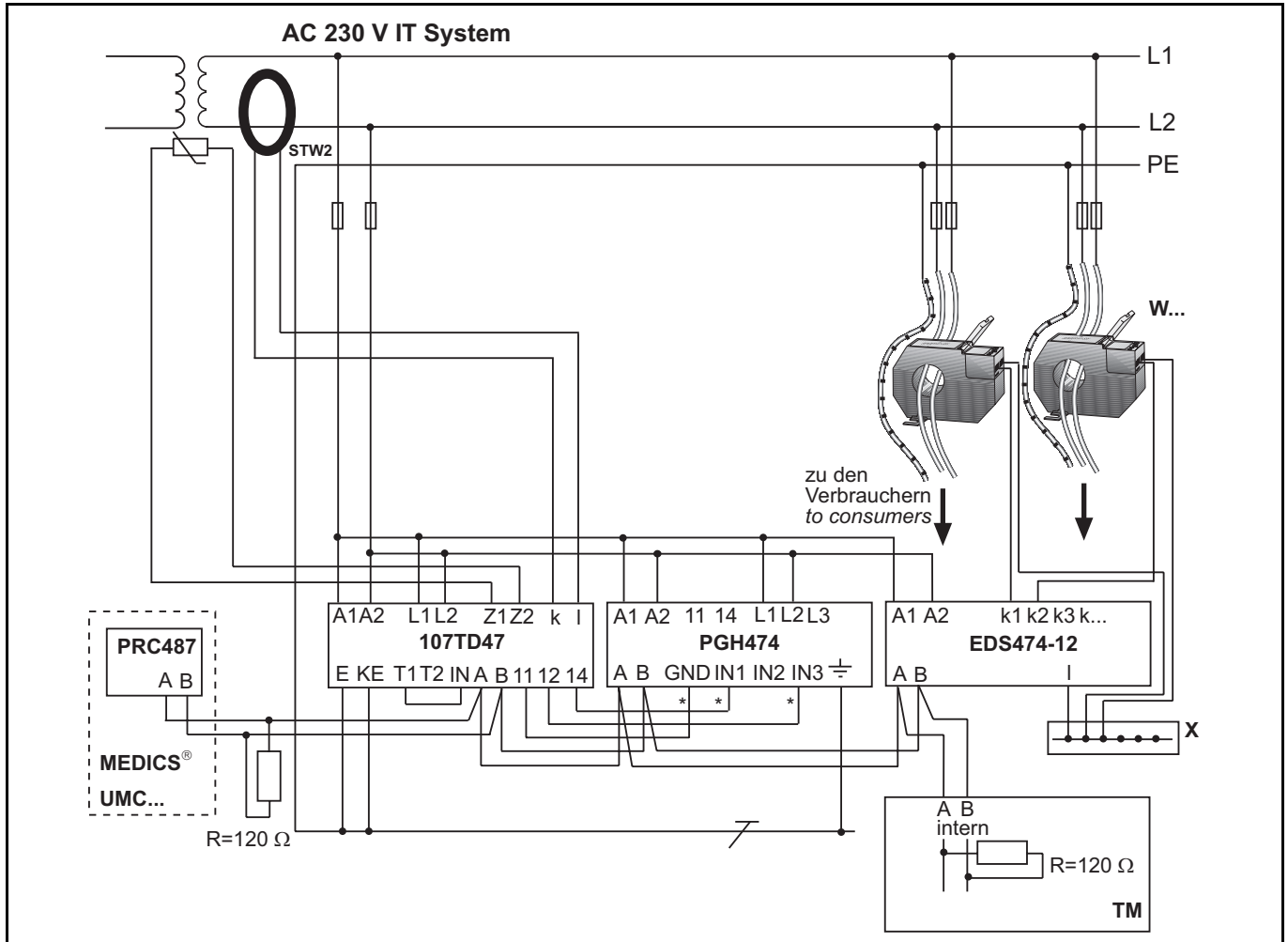
**Function of control inputs IN1, IN2, IN3**

The insulation fault location system is started by a potential-free NO contact on the insulation monitoring device. The following functions are possible in this case, depending on the particular connection:

- IN1/GND is connected to the NO contact (11/14) of the insulation monitoring device:  
The insulation fault location runs as long as the contact is closed. If the insulation value of the system is again within the limit values, then no more alarm message is signalled by the insulation monitoring device. The contact 11/14 opens and the insulation fault location is terminated.
- IN2/GND is connected to the NO contact (11/14) of the insulation monitoring device:  
The insulation fault location is started for one pass after which it is stopped. To be able to start the EDS system again, the input must be closed for approximately 6 seconds. This function is not recommended for MEDICS® systems.
- IN3/GND is connected to the NC contact (11/12) of the insulation monitoring device: Suppression of the test cycle. No test cycle is emitted. This function is required, if several separate IT systems are monitored and controlled centrally by an indicator and operator panel TM1000. In this case, a test cycle can only be emitted by the PGH471 insulation fault test device in the IT system where the insulation fault has occurred.  
Note: this kind of connection is exclusively required in coupled IT systems.

Schaltungsbeispiel

Wiring diagram (Example)



Legende zum Schaltungsbeispiel

- STW2 Messstromwandler zum Anschluss an 107TD47
- W... Messstromwandler zum Anschluss an EDS474-12
- 107TD47 Isolationsüberwachungsgerät mit Transformatorüberwachung
- PGH474 Isolationsfehler-Prüfgerät
- EDS474-12 Isolationsfehler-Auswertegerät
- TM... Melde- und Bedientableau
- PRC487 Steuergerät für Umschalteinrichtungen
- X Klemmleiste für die gemeinsamen I-Anschlüsse der Messwandler.
- R Abschlusswiderstand für BMS-Bus
- \* Diese Verbindungen entfallen, wenn die Isolationsfehlersuche nicht automatisch durch das A-ISOMETER gestartet wird, sondern statt dessen manuell über die Tasten des TM Bedientableau.

Legend to wiring diagram (Example)

- STW2 Measuring current transformer for the connection at 107TD47
- W... Measuring current transformer for the connection at EDS474-12
- 107TD47 Insulation monitoring device with transformer monitoring
- PGH474 Insulation fault test device
- EDS474-12 Insulation fault evaluator
- TM... Indicator and operator panel
- PRC487 Control device for switchover units
- X Terminal block for common I connections of the CTs.
- R Terminating resistor for the BMS bus
- \* Don't install this connections in case of starting the insulation fault location manually via the TM tableau keys instead of an automatic start via insulation monitoring device.

Geräteeinstellungen für dieses Schaltungsbeispiel

Device settings for above example

Gerät Device	Adresse Address	Modus Mode	Besondere Einstellung Special settings
PRC487	4	Slave	siehe Gerätehandbuch zur Umschalteinrichtung Refer manual of the switchover modules
PGH474	111	Slave	System: 1 AC
EDS474-12	2	Slave	-----
107TD47	3	-----	Option: EDS Modus EIN / EDS Mode ON
TM...	1	Master	-----

**Inbetriebnahme**

Kontrollieren Sie vor der Inbetriebnahme den ordnungsgemäßen Anschluss des Gerätes.

**Einstellungen PGH 474**



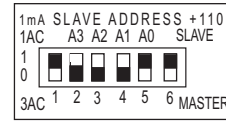
Hinweis: schwarz = Schalterstellung

DIP Schalter	Beschreibung	Werkseinstellung
1	AC /3 AC Netz	1 AC
2-5	Geräteadresse	111
6	Master/Slave Modus	Slave

**Commissioning**

Prior to commissioning, check proper connection of the device.

**Settings PGH 474**



Note: black = switch position

DIP switch	Description	Factory settings
1	AC/3AC system	1 AC
2-5	Address of device	111
6	Master/Slave mode	Slave

**Adress-Einstellung PGH474**

Addr.	A3	A2	A1	A0
(110+) 1 *	0	0	0	1
(110+) 2	0	0	1	0
(110+) 3	0	0	1	1
(110+) 4	0	1	0	0
(110+) 5	0	1	0	1
(110+) 6	0	1	1	0
(110+) 7	0	1	1	1
(110+) 8	1	0	0	0
(110+) 9	1	0	0	1

\* Werkseinstellung

**Master/Slave-Modus**

**Master** Das PGH474 wird in Kombination mit einem EDS474 eingesetzt. Auf dem BMS-Bus ist das PGH474 Master. Es steuert die Isolationsfehlersuche.

**Slave** Das PGH474 wird zusammen mit einem EDS474 und einem BMS-Master (PRC470, PRC1470, TM-Tableau, FTC470...) eingesetzt.

**Address setting PGH474**

\* Factory setting

**Master/slave mode**

**Master** The PGH474 is used in combination with an EDS474. PGH474 is master of the BMS bus. Insulation fault location is controlled by the PGH474.

**Slave** The PGH474 is used in combination with an EDS474 and a BMS device with master function (PRC470, PRC1470, TM-Tableau, FTC470...).

**Einstellungen PGH 474E**



Hinweis: schwarz = Schalterstellung

DIP Schalter	Beschreibung	Werkseinstellung
1	AC /3 AC Netz	1 AC
2-6	Geräteadresse	121

**Settings PGH 474E**



Note: black = switch position

DIP switch	Description	Factory settings
1	AC/3AC system	1 AC
2-6	Address of device	121

## Adress-Einstellung PGH474E

## Address setting PGH474E

Addr.	A4	A3	A2	A1	A0
(120+) 1 *	0	0	0	0	1
(120+) 2	0	0	0	1	0
(120+) 3	0	0	0	1	1
(120+) 4	0	0	1	0	0
(120+) 5	0	0	1	0	1
(120+) 6	0	0	1	1	0
(120+) 7	0	0	1	1	1
(120+) 8	0	1	0	0	0
(120+) 9	0	1	0	0	1
(120+) 10	0	1	0	1	0
(120+) 11	0	1	0	1	1
(120+) 12	0	1	1	0	0
(120+) 13	0	1	1	0	1
(120+) 14	0	1	1	1	0
(120+) 15	0	1	1	1	1
(120+) 16	1	0	0	0	0
(120+) 17	1	0	0	0	1
(120+) 18	1	0	0	1	0
(120+) 19	1	0	0	1	1
(120+) 20	1	0	1	0	0
(120+) 21	1	0	1	0	1
(120+) 22	1	0	1	1	0
(120+) 23	1	0	1	1	1
(120+) 24	1	1	0	0	0
(120+) 25	1	1	0	0	1
(120+) 26	1	1	0	1	0
(120+) 27	1	1	0	1	1
(120+) 28	1	1	1	0	0
(120+) 29	1	1	1	0	1
(120+) 30	1	1	1	1	0

\* Werkseinstellung

\*Factory setting

**Bedienung****Start/Stop-Taste**

Durch Betätigen der Start/Stop-Taste kann die Isolationsfehlersuche manuell gestartet und gestoppt werden. Sind die Kontakte des Steuereingangs IN3/GND geschlossen, so ist kein manuelles Starten der Isolationsfehlersuche möglich.

**Meldungen auf dem BMS-Bus**

Alarmmeldungen können auf anderen BENDER-Geräten (z.B. PRC1470, TM-Bedientableau) dargestellt werden.

Eingang	Bedeutung	Kanal
IN1/GND	Wenn Eingang IN1 gesetzt: Start Isolationsfehlersuche bis IN1 zurückgesetzt wird	1
IN2/GND	Wenn Eingang IN2 gesetzt: Start Isolationsfehlersuche für 1 Durchlauf (ca. 5 Minuten)	2
IN3/GND	Funktion des Gerätes abgeschaltet (Unterdrückung)	3

**Operation****Start/Stop button**

The insulation fault location can be started and stopped manually by means of the Start/Stop pushbutton. If the contacts of the control input IN3/GND are closed, then no manual starting of the insulation fault location is possible.

**BMS bus messages**

Alarm messages can be displayed at other BENDER devices (e.g. PRC1470, TM operator panel).

Input	Bedeutung	Chanal
IN1/GND	When input IN1 is set: Start of insulation fault location until IN1 is reset	1
IN2/GND	When input IN2 is set: Start of insulation fault location for 1 cycle (approx. 5 Minutes)	2
IN3/GND	Operation of the device switched down (rejection)	3

Eingang	Bedeutung	Kanal
	Start/Stop Isolationsfehlersuche über Taster	4
	Interner Gerätefehler	5

Input	Bedeutung	Chanal
	Start/stop insulation fault location via pushbutton	4
	Internal device error	5

## Normen

- DIN EN 61557-9
- DIN VDE 0100-410 (VDE 0100 Teil 410):1997-01

## Technische Daten

### Isolationskoordination nach IEC 60664-1

Bemessungsspannung .....	AC 500 V
Bemessungs-Stoßspannung/Verschmutzungsgrad .....	4 kV/3

### Überwachtes System

Netzennspannung .....	20...265 V
Nennfrequenz .....	45...400 Hz

### Spannungsbereiche

Versorgungsspannung $U_S$ .....	siehe Typenschild bzw. Bestellangaben
Arbeitsbereich von $U_S$ .....	0,85 ... 1,15 x $U_S$
Eigenverbrauch .....	≤ 3 VA

### Messtakt

Prüfstrom .....	1 mA
Prüftakt/Pause .....	2 s / 4 s

### Eingänge

Steuereingänge .....	3 (IN1, IN2, IN3)
----------------------	-------------------

### Schnittstelle

Schnittstelle .....	RS485
Protokoll .....	BMS
Anschluss .....	Klemmen A/B
Max. Leitungslänge .....	1200 m
Empfohlene Leitung (geschirmt, Schirm einseitig an PE) .....	J(Y)STY 2 x 0,6
Abschlusswiderstand .....	120 $\Omega$ (0,25 W)

### Schaltglieder

Schaltelemente .....	1 Relais mit 1 Schließer
Kontaktbemessungsspannung .....	AC 250 V/DC 300 V
Elektrische Lebensdauer (AC 220V /60 Hz) .....	12 000 Schaltspiele
Kontaktklasse .....	IIB (IEC60255-0-20)
Einschaltvermögen AC/DC .....	5 A
Ausschaltvermögen bei AC 230 V, cos phi 0,4 .....	2 A
Ausschaltvermögen bei DC 24 V, L/R=0 s .....	0,2 A

### Allgemeine Daten

EMV Störfestigkeit .....	nach EN 61000-6-2
EMV Störaussendung .....	nach EN 61000-6-4
Schockfestigkeit IEC60068-2-27 (Gerät in Betrieb) .....	15 g/11 ms
Dauerschöcken IEC60068-2-29 (Transport) .....	40 g/6 ms
Schwingungsbeanspruchung IEC 60068-2-6 (Gerät in Betrieb) .....	1 g / 10 ... 150 Hz
Schwingungsbeanspruchung IEC 60068-2-6 (Transport) .....	2 g / 10 ... 150 Hz
Umgebungstemperatur (bei Betrieb) .....	-10 °C ... +55 °C
Umgebungstemperatur (bei Lagerung) .....	-40 °C ... +70 °C
Klimaklasse nach DIN IEC60721-3-3 .....	3K5
Betriebsart .....	Dauerbetrieb
Einbaulage .....	beliebig
Anschlussart .....	Reihenklammern
Anzugsdrehmoment .....	0,5 ... 0,6 Nm (4,3 ... 5,3 lb-in)
Anschlussvermögen Starr / flexibel .....	0,2 ... 4 / 0,2 ... 2,5 mm <sup>2</sup>

## Standards

- DIN EN 61557-9
- DIN VDE 0100-410 (VDE 0100 Teil 410):1997-01

## Technical data

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

Rated voltage .....	AC 500 V
Rated impulse voltage/pollution degree .....	4 kV/3

### System being monitored

Rated system voltage .....	20...265 V
Rated system frequency .....	45...400 Hz

### Voltage ranges

Supply voltage $U_S$ .....	see nameplate resp. ordering details
Operating range of $U_S$ .....	0.85 ... 1.15 x $U_S$
Power consumption .....	≤ 3 VA

### Test current

Max. test current .....	1 mA
Test pulse/pause .....	2 s / 4 s

### Inputs

Control inputs .....	3 (IN1, IN2, IN3)
----------------------	-------------------

### Interface

Interface .....	RS485
Protocol .....	BMS
Connection .....	Terminals A/B
Max. cable length .....	1200 m
Recommended cable (screened, screen single-ended at PE) .....	J(Y)STY 2 x 0,6
Terminating resistor .....	120 $\Omega$ (0,25 W)

### Switching elements

Switching elements .....	1 Relay with 1 N/O contact
Rated contact voltage .....	AC 250 V/DC 300 V
Electrical endurance (AC 220V /60 Hz) .....	12 000 switching operations
Contact class .....	IIB (IEC60255-0-20)
Making capacity AC/DC .....	5 A
Breaking capacity at AC 230 V, cos phi 0,4 .....	2 A
Breaking capacity at DC 24 V, L/R=0 s .....	0,2 A

### General data

EMC immunity .....	acc. to EN 61000-6-2
EMC emission .....	acc. to EN 61000-6-4
Shock resistance IEC60068-2-27 (device in operation) .....	15 g/11 ms
Bumping IEC60068-2-29 (during transport) .....	40 g/6 ms
Vibration resistance IEC 60068-2-6 (device in operation) .....	1 g / 10 ... 150 Hz
Vibration resistance IEC 60068-2-6 (during transport) .....	2 g / 10 ... 150 Hz
Ambient temperature (during operation) .....	-10 °C ... +55 °C
Storage temperature range .....	-40 °C ... +70 °C
Climatic class acc. to DIN IEC60721-3-3 .....	3K5
Operating mode .....	continuous operation
Mounting .....	any position
Connection .....	screw terminals
Tightening torque, terminal screws .....	0,5 ... 0,6 NM (4,3 ... 5,3 lb-in)
Connection rigid, flexible .....	0,2 ... 4 / 0,2 ... 2,5 mm <sup>2</sup>

Anschlussvermögen Flexibel mit Aderendhülse, ohne/mit Kunststoffhülse..... 0,25 ... 2,5 mm<sup>2</sup>  
 Leitergrößen (AWG) ..... 24-12  
 Schutzart Einbauten (DIN EN 60529) ..... IP30  
 Schutzart Klemmen (DIN EN 60529) ..... IP20  
 Schraubbefestigung..... 2 x M4  
 Schnellbefestigung auf Hutprofilschiene ..... IEC 60715  
 Entflammbarkeitsklasse..... UL94V-0  
 Gewicht ..... ≤ 350 g

Connection flexible with connector sleeve, without/with plastic sleeve ..... 0.25 ... 2.5 mm<sup>2</sup>  
 Conductor sizes (AWG) ..... 24-12  
 Protection class, internal components (DIN EN 60529) ..... IP30  
 Protection class, terminals (DIN EN 60529) ..... IP20  
 Screw fixing ..... 2 x M4  
 DIN rail mounting acc. to ..... IEC 60715  
 Flammability class ..... UL94V-0  
 Weight ..... ≤ 350 g

**Abweichende Ausführungen**

Dieses Feld ist nur beklebt, falls Änderungen gegenüber der Standardausführung des Gerätes vorgenommen wurden.

**Label for modified versions**

There will only be a label in this field if the device is different from the standard version..



**Bestellangaben**

**Ordering details**

Typ / Type	Us	Art.No.
PGH474	AC 230 V	B95 018 012
PGH474E	AC 230 V	B95 018 013

Alle Rechte vorbehalten.  
 Nachdruck und Vervielfältigung  
 nur mit Genehmigung des Herausgebers.  
 Änderungen vorbehalten!



All rights reserved.  
 Reprinting and duplicating  
 only with permission of the publisher.  
 Subject to change!



© 2004 BENDER Germany

Dipl.-Ing. W. Bender GmbH & Co.KG  
 Londerfer Str. 65 • 35305 Grünberg  
 Postfach 1161 • 35301 Grünberg

Tel.: +49 (0)6401-807-0  
 Fax: +49 (0)6401-807-259

E-Mail: info@bender-de.com  
 Internet: http://www.bender-de.com



## Operating Manual



# EDS460/490 and EDS461/491

Insulation fault evaluators  
Software version: EDS...-D: D234 V2.1 / D256 V2.2  
EDS...-L: D234 V2.1 / D216 V2.2



Dipl.-Ing. W. Bender GmbH & Co.KG  
Londorfer Str. 65 • 35305 Grünberg • Germany  
Postfach 1161 • 35301 Grünberg • Germany

Tel.: +49 (0)6401-807-0

Fax: +49 (0)6401-807-259

E-Mail: [info@bender-de.com](mailto:info@bender-de.com)

Web: <http://www.bender-de.com>



© Dipl.-Ing. W. Bender GmbH & Co.KG

All rights reserved.

Reprinting only with permission  
of the publisher.

Subject to change!

---

# Table of Contents

<b>1. How to get the most out of this manual</b> .....	<b>7</b>
1.1 How to use this manual .....	7
1.2 Explanation of symbols and notes .....	7
<b>2. Safety instructions</b> .....	<b>9</b>
2.1 Intended use .....	9
2.2 Qualified personnel .....	10
2.3 Safety information .....	10
2.4 Delivery conditions, guarantee, warranty and liability .....	11
<b>3. System description</b> .....	<b>13</b>
3.1 Features .....	13
3.1.1 Areas of application .....	13
3.1.2 Standards .....	13
3.1.3 System versions .....	13
3.1.4 System features .....	13
3.2 Function of the EDS system .....	14
3.2.1 Block diagram EDS system .....	15
3.2.2 Test cycle .....	16
3.2.3 Currents in the EDS system .....	17
3.2.4 Requirements for reliable insulation fault location .....	18
<b>4. Installation and connection</b> .....	<b>21</b>
4.1 Unpacking .....	21
4.2 Fuses, max. voltage, cable lengths .....	21
4.3 Notes on mounting .....	22
4.3.1 Dimension diagram EDS460/461-D/-L .....	22
4.3.2 Dimension diagram EDS490/491-D/-L .....	23
4.4 Connection .....	23

4.4.1	Wiring diagram EDS460/461-D / -L .....	24
4.4.2	Wiring diagram EDS490/491-D / -L .....	26
4.4.3	Connection of W..., WR..., WS...-series measuring current transformers .....	28
4.4.4	Connection example EDS standard system with FTC470XET .....	29
<b>5.</b>	<b>Commissioning .....</b>	<b>31</b>
5.1	Before switching on .....	31
5.2	Switching on .....	32
<b>6.</b>	<b>Operation .....</b>	<b>33</b>
6.1	EDS...-D operating and display elements .....	33
6.2	EDS...-L operating and display elements .....	34
6.3	Working in operating mode .....	35
6.3.1	Standard display .....	35
6.3.2	Alarms and their effects .....	35
6.3.3	Carrying out a test .....	37
6.3.4	Resetting saved alarm messages (RESET) .....	38
6.3.5	Displaying standard information .....	39
6.4	Setting the EDS...-L .....	40
6.5	Operating and setting the EDS...-D .....	40
6.5.1	Opening the main menu .....	41
6.5.2	Menu overview diagram .....	42
6.5.3	Main menu functions .....	43
6.6	The main menu .....	44
6.6.1	Menu 1: Alarm/meas. values .....	44
6.6.2	Menu 2: History .....	46
6.6.3	Menu 3: Settings .....	47
6.6.3.1	Settings menu 1: General .....	48
6.6.3.2	Settings menu 2: Channel .....	49
6.6.3.3	Settings menu 3: Relay .....	53
6.6.3.4	Settings menu 4: History .....	54
6.6.3.5	Settings menu 5: Language .....	54

6.6.3.6	Settings menu 6: Interface .....	54
6.6.3.7	Settings menu 7: Alarm addresses .....	54
6.6.3.8	Settings menu 8: Clock .....	55
6.6.3.9	Settings menu 9: Password .....	56
6.6.3.10	Settings menu 10: Factory settings .....	56
6.6.3.11	Settings menu 11: Service .....	56
6.6.4	Menu 4: Control .....	57
6.6.4.1	Control menu 1: TEST .....	57
6.6.4.2	Control menu 2: RESET .....	57
6.6.4.3	Control menu 3: Test communication .....	57
6.6.5	Menu 5: External devices .....	59
6.6.6	Menu 6: Info .....	62
<b>7.</b>	<b>Tests and service .....</b>	<b>63</b>
7.1	Periodic tests .....	63
7.2	Maintenance .....	63
7.3	Service .....	63
7.4	Troubleshooting .....	64
7.4.1	Display device error .....	64
7.4.2	Device error display (channel-related) .....	65
7.4.3	CT connection fault display (channel-related) .....	66
7.4.4	Display "peak" .....	66
7.4.5	External alarm .....	66
<b>8.</b>	<b>Data .....</b>	<b>67</b>
8.1	Standards .....	67
8.2	Approvals .....	67
8.3	Technical data EDS460/490 / EDS461/491 .....	68
8.4	Response sensitivity characteristics .....	72
8.4.1	Characteristic curves EDS460/490 .....	74
8.4.1.1	EDS460/490 characteristics for 3AC systems .....	74
8.4.1.2	EDS460/490 characteristics for AC systems .....	76
8.4.1.3	EDS460/490 characteristics for DC systems .....	78

8.4.2	Characteristic curves EDS461/491 .....	80
8.4.2.1	EDS461/491 characteristics for AC systems .....	80
8.4.2.2	EDS461/491 characteristics for DC systems .....	82
8.5	Ordering information .....	84

# 1. How to get the most out of this manual

## 1.1 How to use this manual

This operating manual describes EDS460/490 resp. EDS461/491 insulation fault evaluators. It is designed for skilled personnel working in electrical engineering and electronics and in particular for those designing, installing and operating electrical systems.

Before using the equipment, please read this operating manual, the supplement entitled "Important safety instructions for BENDER products", the "BMS bus" instruction leaflet, as well as the instruction leaflets supplied with the individual system components. Please keep this documentation close at hand near to the equipment.

Should you have any questions, please do not hesitate to contact our technical sales team. We are also happy to provide on-site services. Please contact our Service Department for more information.

Service-Hotline: 0700-BenderHelp (telephone and fax)

Carl-Benz-Straße 10 • 35305 Grünberg • Germany

Tel: +49(0)64 01-807 760 • Fax: +49(0)64 01- 807 629

E-mail: [info@bender-service.com](mailto:info@bender-service.com) • [www.bender-de.com](http://www.bender-de.com)

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

## 1.2 Explanation of symbols and notes

The following terms and symbols are used to denote hazards and instructions in BENDER documentation:



Danger!

---

*This symbol indicates an immediate risk to life and limb. Failure to observe these warnings means that death, severe bodily injury or substantial damage to property will occur if the corresponding precautions are not taken.*

---



Warning

---

*This symbol indicates a potential danger to the life and limb. Failure to observe these warnings means that death, severe bodily injury or substantial damage to property may occur if the corresponding precautions are not taken.*

---



Caution

---

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

---



---

*This symbol gives important information about the correct handling of the equipment. Failure to comply with this information can lead to malfunctions in the equipment or in its environment.*

---



---

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

---



## 2. Safety instructions

### 2.1 Intended use

EDS... insulation fault location systems have been designed to monitor unearthed DC, AC and three-phase power supply systems (IT systems) for insulation faults. Alternating and three-phase systems in the range of AC 24 to 690 V and DC systems in the range of DC 24 to 500 V can be monitored. The operating frequency is optionally DC, 50, 60 or 400 Hz. The nominal system voltage varies with the type of insulation fault test device used (PGH47., IRDH575).



Caution

---

*If the test current is too high, IRDH575 or PGH... may damage sensitive loads (e.g. in control circuits) or may accidentally activate switching operations. Therefore, it is recommended to use a PGH... with a low test current or to set a low test current at the IRDH575. The response sensitivity of EDS461/491 insulation fault evaluators is higher and hence they are capable of evaluating this low test current.*

*In case of doubt, please contact a BENDER product manager.*

---

An EDS system consists of the insulation fault evaluators EDS460/490 or EDS461/491 and either the A-ISOMETER® IRDH575 or insulation fault test device PGH. Using measuring current transformers EDS460/490 or EDS461/491 insulation fault evaluators detect test current signals generated by the IRDH575 insulation monitoring device or PGH... insulation fault test device and evaluate them.

Up to 12 measuring current transformers can be connected to one EDS.... Up to 90 EDS... evaluators can be connected via a BMS bus (RS-485 interface with BMS protocol), thereby up to 1080 measuring chan-

nels (sub-circuits) can be monitored. The scanning time for all channels is approximately 4...10 s.

The individual parameterisation, necessary to adjust the evaluator to the existing system and utilisation conditions, must be carried out at the place of utilisation in order to meet the requirements laid down in the standards.

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

### **Use for the intended purpose also includes:**

- The observation of all information in this operating manual.
- and the compliance with test intervals.

## **2.2 Qualified personnel**

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

## **2.3 Safety information**

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

- Only use BENDER devices:
  - for the purpose for which it is intended;
  - when it is in perfect condition as far as safety is concerned;
  - in compliance with the accident prevention regulations and guidelines applicable in the location of use.

- Any faults which may impair safety must be eliminated immediately.
- Do not make any unauthorised changes and only use replacement parts and optional accessories purchased from or recommended by the manufacturer of the equipment. Failure to observe this requirement can result in fire, electric shock and injury.
- Warning signs must always be easily legible. Damaged or illegible signs must be replaced immediately.

## **2.4 Delivery conditions, guarantee, warranty and liability**

The conditions of sale and delivery set out by BENDER shall apply. The conditions of sale and delivery can be obtained from BENDER in printed or electronic format.



## 3. System description

### 3.1 Features

#### 3.1.1 Areas of application

- Insulation fault location in AC, AC / DC and DC IT systems
- Main and control circuits in industrial installations and ships
- Diode-decoupled DC IT systems in power stations
- Systems for medical locations

#### 3.1.2 Standards

The standard IEC 60364-4-41:1992 requires for unearthed power supply systems (IT systems) that a first fault is to be eliminated with the shortest practicable delay. Fast insulation fault location is possible with EDS systems.

#### 3.1.3 System versions

EDS460, EDS461, EDS490 or EDS491 differ in their response sensitivity and/or number of alarm relays.

#### 3.1.4 System features

- Universal system concept;
- Modular design, hence easily adaptable to the individual conditions of the system;
- Measuring current transformers in various sizes and types of construction;
- Communication between the components via BMS bus (two-wire);
- All measuring current transformers are scanned simultaneously;
- Central indication of faulty sub-circuits;
- Various setting options allow individual adjustments;
- Connection to higher level control and visualisation systems can easily be established.

### 3.2 Function of the EDS system

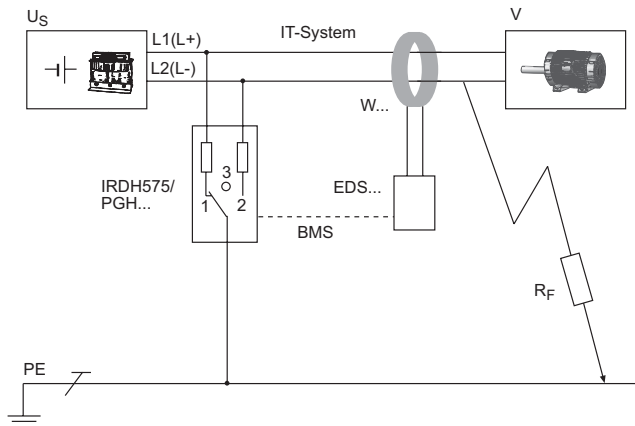
When an insulation fault is detected by the insulation monitoring device in the IT system, the insulation fault location process will be started.

On the occurrence of a first insulation fault, a fault current essentially determined by the system leakage capacitances flows in the IT system. The fundamental idea in fault location is therefore to close the fault current loop for a short period via a defined resistance. As a result of this principle, the system voltage itself drives a test current containing a signal that can be evaluated.

The test current signals are generated periodically by the IRDH575 respectively the PGH... . The test current is limited in amplitude and time. As this happens, the system conductors are connected alternately to earth via a defined resistance. The test current generated in this manner depends on the size of the present insulation fault and the system voltage. It is limited according to the setting of the IRDH575 respectively the PGH... . For planning purposes, it should be noted that no system components are present in which this test current can bring about a damaging reaction, even in unfavourable cases.

The test current pulse flows from the test device via the live parts, taking the shortest path to the location of the insulation fault. From there, it flows via the insulation fault and the PE back to the IRDH575 respectively PGH... . This test current pulse is then detected by the measuring current transformers located in the insulation fault path, and is signalled by the connected insulation fault evaluator.

### 3.2.1 Block diagram EDS system

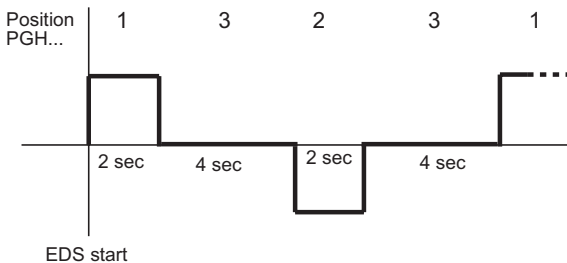


#### Key:

EDS...	Insulation fault evaluator
PGH...	Insulation fault test device
IRDH575	A-ISOMETER® IRDH575 with integrated test current generator.
$U_s$	Current source IT system
$W$	Measuring current transformer
$V$	Electrical load
$R_F$	Insulation fault
$PE$	Protective conductor respectively equipotential bonding conductor.
BMS	BMS bus

### 3.2.2 Test cycle

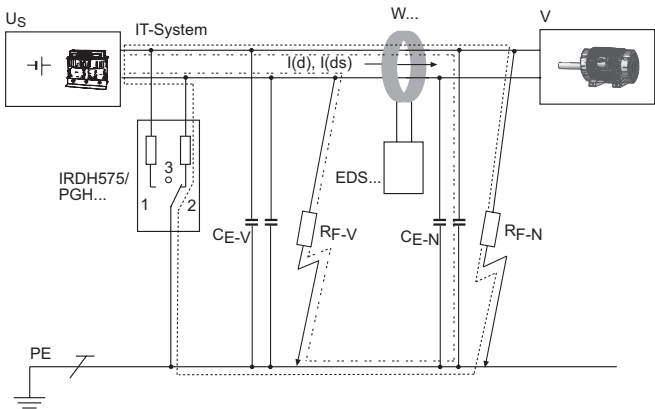
The duration of a test current pulse cycle is 6 seconds. The IRDH575 or PGH... alternatively sends positive or negative test current pulses. The test cycle of the IRDH575 or PGH... is shown in different switch positions (1,2,3) in the block diagram below, ("Block diagram EDS system" on page 15).





### 3.2.3 Currents in the EDS system

In addition to the block diagram on page 15, the path of the residual currents and the test current is shown in the diagram below:



#### Key:

.....	Test current loop $I(ds)$
.. . . .	Residual currents $I(d)$ (example)
$C_{E-V}$	Upstream capacitances, system leakage capacitances upstream the measuring current transformer.
$C_{E-N}$	Downstream capacitances, system leakage capacitances downstream the measuring current transformer.
$R_{F-V}$	Insulation fault upstream the measuring current transformer.
$R_{F-N}$	Insulation fault downstream the measuring current transformer.

The following residual currents flow through the measuring current transformer of the EDS... :

- the test current  $I(ds)$  caused by the insulation fault  $R_{F-N}$ ,
- residual currents  $I(d)$  flowing through the system leakage capacitances  $C_{E-V}$ ,  $C_{E-N}$ ,  $R_{F-V}$  and  $R_{F-N}$ ,
- transient leakage currents caused by switching and control activities in the system,
- low-frequency leakage currents caused by the use of converters.

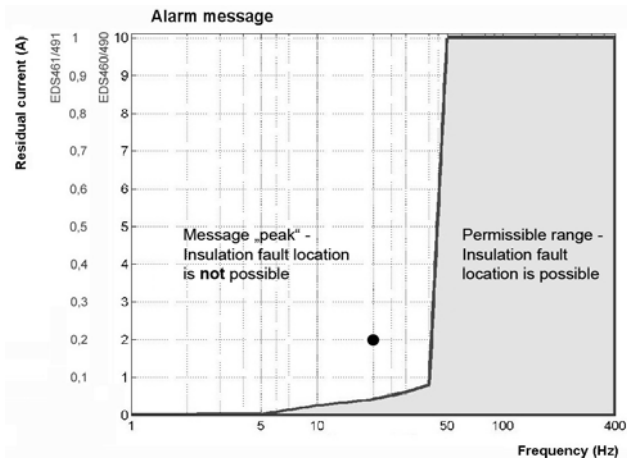
### 3.2.4 Requirements for reliable insulation fault location

The EDS... is intended to detect insulation faults downstream of the measuring current transformer  $R_{F-N}$ . For this purpose, the test current caused by the insulation fault has to be detected reliably, subject to the condition that:

- The test current  $I(ds)$  for the EDS460/490 is more than 1.5 mA and less than 50 mA.
- The test current  $I(ds)$  for the EDS461/491 is more than 0.15 mA and less than 5 mA.
- The upstream capacitances  $C_{E-V}$  must be at least as large as the downstream capacitances  $C_{E-N}$ .
- The system leakage capacitance does not have to be too large (see "Response sensitivity characteristics" on page 72).
- The total residual current through the measuring current transformer (test current and residual currents etc.) may be a maximum of 10 A (EDS460/490) respectively 1 A (EDS461/491).
- Not only does the amplitude influence the reliable detection of the test current but also the residual current frequency. This effect is illustrated in the following fault curve.

## Fault curve

Safe insulation fault location is only possible in the grey-shaded area.



Measuring channels where insulation fault location is not possible, are marked with "peak" in the „Alarm/meas. values“ menu.

Example: A residual current of 2 A/20 Hz (marked with a point (•) in the diagram) would be outside the permissible range.



*Symmetrical insulation faults downstream of the measuring current transformer are not recognised under certain circumstances.*

*Low-frequency residual currents (caused by converters, for example) may have the effect that insulation faults cannot be found when their frequency is equal or nearly equal the text cycle frequency of the IRDH575 respectively PGH... .*



## 4. Installation and connection

### 4.1 Unpacking

- Unpack all the parts supplied with the system. Do not use tools with sharp edges which might damage the content of the package.
- Compare your order with our delivery note to check that you have received all products in full. The article numbers printed on the nameplates simplifies the identification of the devices.
- Check all parts supplied for any evidence of damage in transit. Equipment damaged in transit must not be used. If a device has sustained damage, please contact BENDER. Details of who to contact are indicated on the delivery documents.
- When storing the devices in a cold environment as it is in winter the following is to be considered: Leave the devices to stand for 3 to 4 hours at room temperature before connecting the power supply. When the devices are moved from a cold to a warm environment, condensation will be evident on all parts. Putting damp devices into operation risks damaging electrical components and there is a danger of electric shock on contact.

### 4.2 Fuses, max. voltage, cable lengths

- Equip the supply voltage of all system components with fuses so that they are protected in the event of a short circuit. We recommend that you use 6 A fuses.
- Please note: The maximum voltage of the monitored system must not exceed the rated insulation voltage of the measuring current transformer used in the EDS system and the IRDH575 or PGH...
- Select the cables and cable lengths in accordance with the technical data on page 68. If you use cables that are longer than those specified here, BENDER cannot guarantee that the equipment will function safely.

### 4.3 Notes on mounting



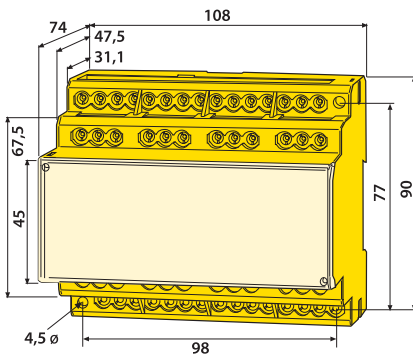
*Before mounting the device and working on the device connections, make sure that the power supply voltage has been disconnected. Failure to comply with this requirement will expose personnel to the risk of electric shock. Furthermore, the electrical installation may sustain damage and the device may be destroyed beyond repair.*

The devices are suitable for the following types of installation:

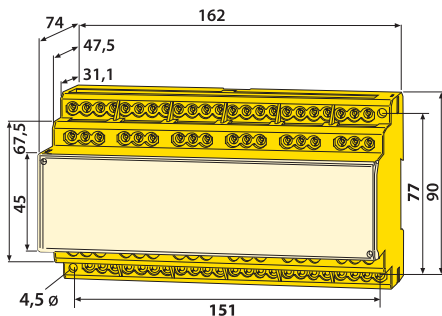
- standard distribution panels according to DIN 43 871 or
- DIN rail mounting according to IEC 60715 or
- screw mounting using M4 screws.

Mount the measuring current transformers in accordance with the notes in the "Transformer installation" technical information. When connecting the measuring current transformers, it is essential that you observe the maximum cable lengths.

#### 4.3.1 Dimension diagram EDS460/461-D/-L



### 4.3.2 Dimension diagram EDS490/491-D/-L

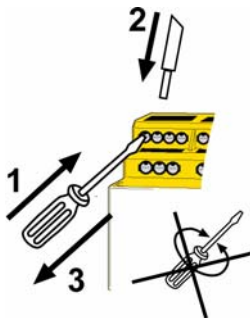


*Dimensions in mm*

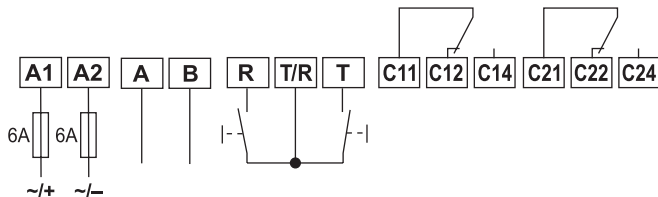
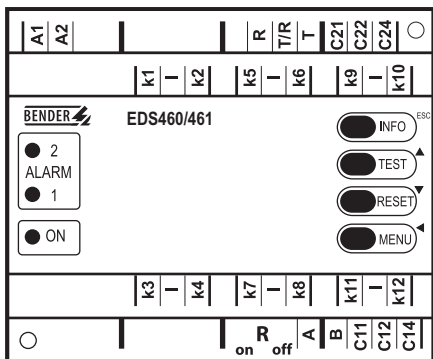
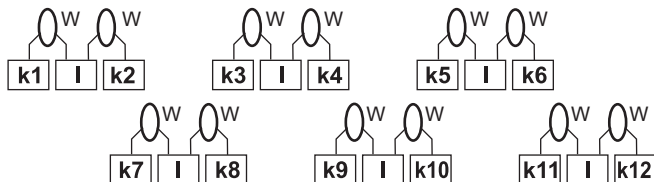
## 4.4 Connection

EDS... is optionally available with screw-type terminals or with spring-loaded terminals. Please refer to the technical data (page 68).

Connect the EDS... with spring-loaded terminals as follows:



#### 4.4.1 Wiring diagram EDS460/461-D / -L



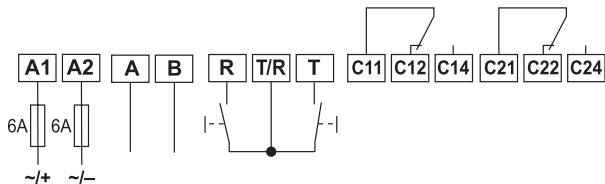
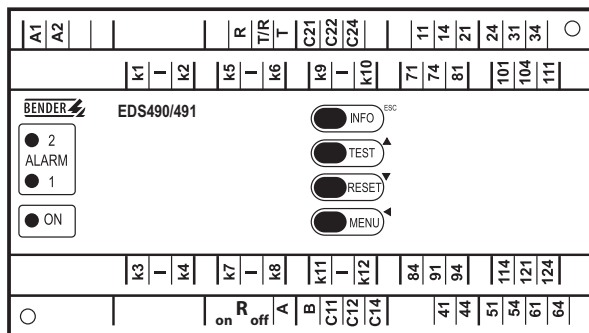
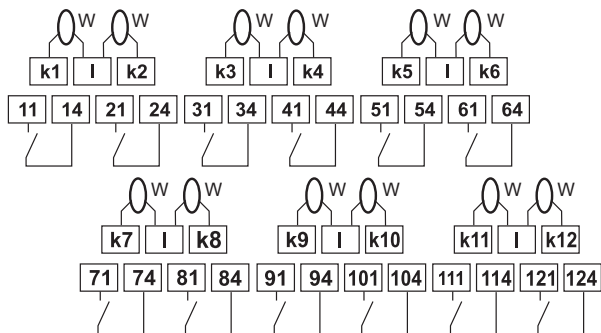


## Legend to wiring diagram

A1, A2	Supply voltage $U_S$ (see ordering information), 6 A fuse recommended; two-pole fuses should be used on IT systems.
k1, l ... k12, l	Connection of measuring current transformers 1...12.
A, B	BMS bus (RS-485 interface with BMS protocol)
R, R/T	External RESET button (N/O contact)*
T, R/T	External TEST button (N/O contact)*
C11, C12, C14	Common alarm relay K1: Alarm 1, common alarm for alarm or device error.
C21, C22, C24	Common alarm relay K2: Alarm 2, common alarm for alarm or device error.
$R_{on/off}$	Activate or deactivate the BMS bus terminating resistor (120 $\Omega$ ).
W	Measuring current transformer

\* *The external TEST/RESET buttons of several devices must not be connected to one another.*

#### 4.4.2 Wiring diagram EDS490/491-D / -L

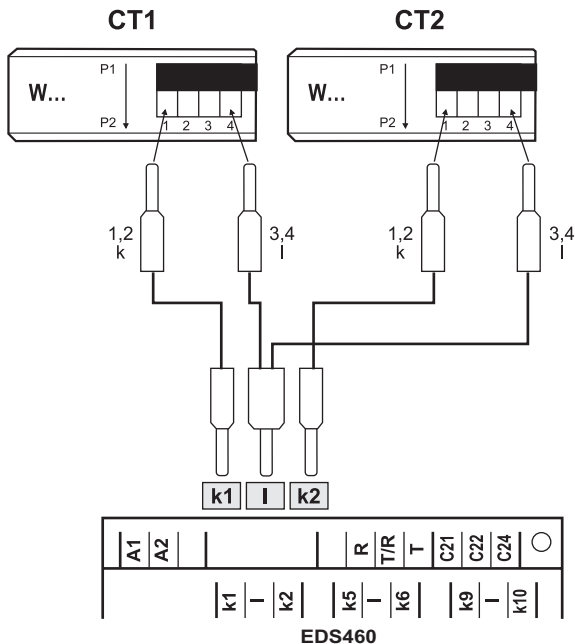


## Legend to wiring diagram

A1, A2	Supply voltage $U_S$ (see ordering details), 6 A fuse recommended; two-pole fuses should be used on IT systems.
k1, I ... k12, I	Connection of measuring current transformers 1...12.
A, B	BMS bus (RS-485 interface with BMS protocol)
R, R/T	External RESET button (N/O contact)*
T, R/T	External TEST button (N/O contact)*
C11, C12, C14	Common alarm relay K1: Alarm 1, common alarm for alarm or device error.
C21, C22, C24	Common alarm relay K2: Alarm 2, common alarm for alarm or device error.
$R_{\text{on/off}}$	Activate or deactivate the BMS bus terminating resistor (120 $\Omega$ ).
11, 14 ... 121, 124	Alarm relay per channel: One N/O contact per channel (e.g. N/O contacts 11,14 for channel 1).
W	Measuring current transformer

\* *The external TEST/RESET buttons of several devices must not be connected to one another.*

### 4.4.3 Connection of W..., WR..., WS...-series measuring current transformers



The terminals 1 and 2 as well as the terminals 3 and 4 are bridged internally.

The connections k and I at the EDS... must not be interchanged.



*You must ensure that all live conductors are routed through the measuring current transformer. Do not route any PE conductors or shields of shielded conductors through the measuring current transformer! Commercial measuring current transformers are not suitable for EDS460/461 or EDS490/491 systems and must not be used.*

*Only if these notes are observed will you obtain a true measurement result.*

*Additional information is available in our "Transformer installation" technical information.*

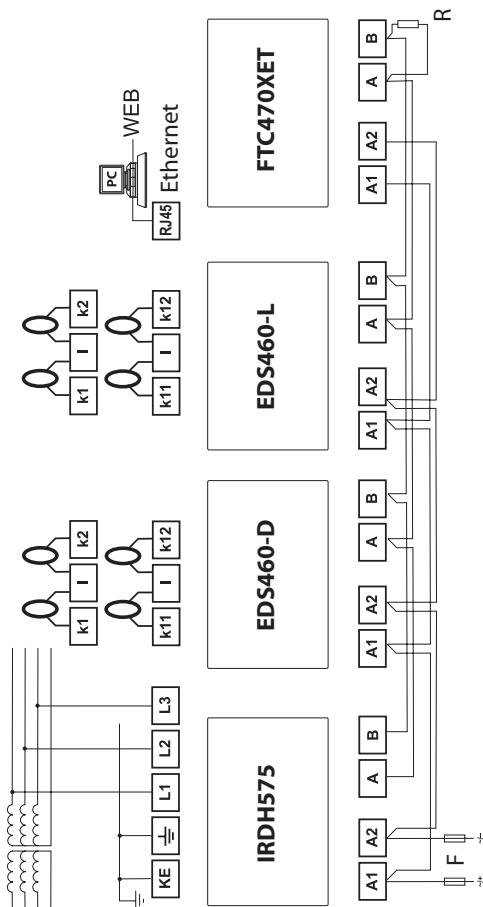
#### 4.4.4 Connection example EDS standard system with FTC470XET

See the next page for this example.

##### Key for connection example:

IRDH575	Insulation monitoring device with integrated test current generator.
EDS...	Insulation fault evaluators
FTC470XET	Protocol converter for connecting the BMS (BMS = Bender-Messgeräte-Schnittstelle or Bender measuring device interface in English) bus with a TCP/IP (Transmission Control Protocol / Internet Protocol) network via Ethernet.

## Connection example



## 5. Commissioning



*Note on opening the transparent front panel cover:  
Take hold of the cover at the bottom edge and swivel it upwards. The cover can also be removed completely. Once the adjustments have been completed, the front panel cover must be refitted.*

### 5.1 Before switching on

1. Does the connected supply voltage  $U_S$  match the information on the device nameplates?
2. Has the maximum permissible rated insulation voltage of the measuring current transformers and IRDH575 or PGH... been observed?
3. Are you sure that the PE conductor has not been routed through the measuring current transformer at any point?
4. In mounting the measuring current transformers, have any magnetic fields that are nearby and could cause interference been taken into account?
5. Has the maximum permissible cable length for the measuring current transformers been observed?
6. Is a 120  $\Omega$  resistor connected at the beginning and end of the BMS bus?
7. Have the maximum permissible interface cable length (1200 m) and number of BMS bus nodes (32) been observed?
8. In respect of the BMS bus node address settings, has each address only been assigned once? Is address 001 and therefore the master function, assigned?

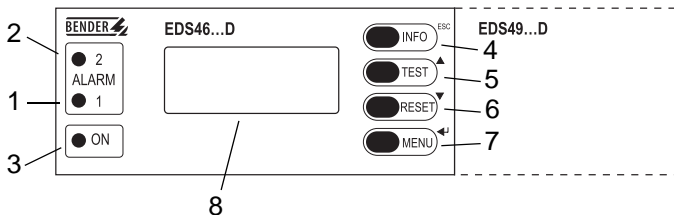
## 5.2 Switching on

1. Connect the supply voltage of all devices connected to the BMS bus. Initially, the "ON" LED flashes on the EDS... and the EDS...-D graphic display shows the (BENDER) welcome screen. The "ON" LED then lights up permanently.
2. Eliminate insulation and device errors. If a response value is exceeded or device error messages occur, this is indicated on the EDS... by means of the alarm LED lighting up and an associated message appearing on the graphic display (EDS...-D only).
  - You can find information about the alarms on the EDS...-D in the "Alarm/Meas. values" menu. Information on the EDS...-L can be displayed via the BMS master.
  - Eliminate the insulation faults detected by the EDS...
  - The EDS...-D indicates any device errors that have occurred on its display, the EDS...-L displays an error code.
  - Device errors may be caused by measuring current transformers not being connected. Check the measuring current transformer connections. Disable transformer monitoring for measuring channels that are not required (refer to "chapter 6.6.3.2 Settings menu 2: Channel", submenu "2.CT" on page 50).



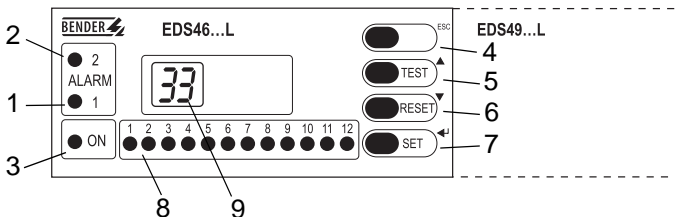
## 6. Operation

### 6.1 EDS...-D operating and display elements



1	Alarm LED 1 lights up in the event of the following types of device errors: -when the residual current is: > 10 A for EDS460 / 490 or > 1 A for EDS461 / EDS491 (RCM function); -when there is a loss of power or short circuit in a measuring current transformer circuit (this function can be deactivated).
2	Alarm LED 2 lights up if an insulation fault is detected on a measuring channel (EDS function).
3	The "ON" LED lights up when the device is switched on and flashes during power on until the device is ready for operation.
4	INFO key: Calls up standard information. ESC key: Exits the menu function without changing parameters.
5	TEST button: Calls up the self test. UP key: Parameter change, scroll.
6	RESET button: Acknowledges alarm and fault messages. DOWN key: Parameter change, scroll.
7	MENU key: Toggles between the standard display, MENU and alarm display. ENTER key: Confirms parameter changes.
8	Backlit graphical LC display ( refresh every 20 seconds)

## 6.2 EDS...-L operating and display elements

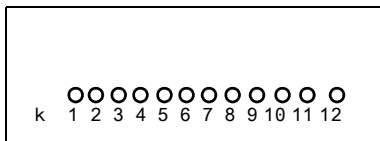


1	Alarm LED 1 lights up in the event of the following types of device error: -when the residual current is: > 10 A for EDS460 / 490 or > 1 A for EDS461 / EDS491 (RCM function); -when there is a loss of power or short circuit in a measuring current transformer circuit (this function can be deactivated).
2	Alarm LED 2 lights up if an insulation fault is detected on a measuring channel (EDS function).
3	The "ON" LED lights up when the device is switched on and flashes during power on until the device is ready for operation.
4	ESC key: Exits the menu function without changing parameters.
5	TEST button: Calls up the self test. UP key: Parameter change, scroll.
6	RESET button: Acknowledges alarm and fault messages. DOWN key: Parameter change, scroll.
7	SET key: Sets the BMS address. ENTER key: Confirms parameter changes.
8	Alarm-LEDs "1...12" light up if an insulation fault has been detected in the relevant measuring channel. They flash in case of interruption of a CT circuit or in case of a short circuit in a CT circuit.
9	Digital display for device address and error codes.

## 6.3 Working in operating mode

### 6.3.1 Standard display

In operating mode, the EDS... waits for insulation fault location to begin. The schematic representation shows that no alarm message exist on all of the 12 channels(O).



The EDS...-L displays its BMS bus address (e.g. 02). Only the green "Power ON" LED lights.

### 6.3.2 Alarms and their effects

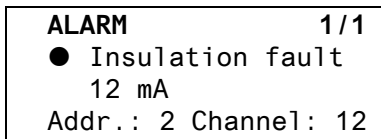
Possible causes of alarm messages include:

- Insulation faults or residual currents > 10 A (EDS460/490) or > 1A (EDS461/491).
- A measuring current transformer or measuring current transformer connection fault.
- Device error

The EDS... signals alarm or device error:

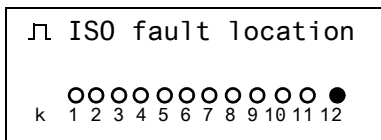
- "ALARM 1" LED lights up if the residual current is: > 10 A (EDS460/490) or > 1 A (EDS461/491) or in the event of a CT connection fault.
- "ALARM 2" LED lights up when an insulation fault is located.
- Assigned common alarm relays switch.
- An alarm message is being sent to the BMS bus.
- EDS...-D: An alarm message is shown on the display. An entry is made in the history memory.
- EDS...-L: The alarm LED of the affected measuring channel lights up or flashes.

- EDS...-D: An alarm message is shown on the display.

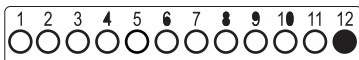


- Line 1: ALARM,  
 Alarm 1 of 1 pending alarm
- Line 2: Alarm status and alarm text  
 ○ No alarm  
 ● ALARM
- Line 3: Currently measured mean value of the residual current.
- Line 4: BMS bus address of the EDS and measuring channel on which the alarm has occurred.

Press the "INFO" key to display the schematic representation for this alarm message. Channels where an alarm exists are marked with the ● symbol.



- EDS...-L: The alarm LED of the affected channel lights or flashes in case of a device error.



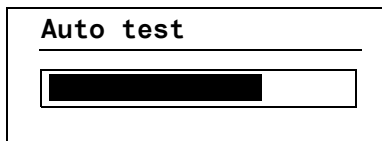
### 6.3.3 Carrying out a test

A test serves to check the device function (hardware components) of the EDS. A test can be called in the following ways:

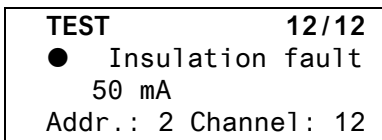
- press the "TEST" button on the front panel of the EDS.,
- press an external TEST button connected to the EDS...,
- send a TEST command via the BMS bus.
- EDS...-D only: Call the "TEST" function in the Control menu.

The EDS... responds as follows:

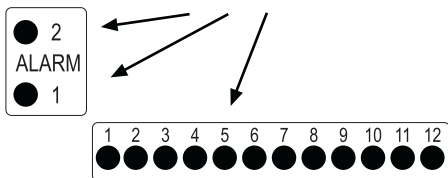
- LED "ALARM 1" and LED "ALARM 2" light.
- All alarm relays switch (function can be deactivated, see page 53).
- An alarm message is being sent to the BMS bus.
- An entry is made in the history memory with the suffix "TEST".
- EDS...-D: The progress of the test is shown on the display.
- EDS...-L: All alarm LEDs light up.
- EDS...-D: An alarm message is shown on the display.



The EDS...-D will now display the maximum measured value that can be detected (provided that the measuring channel is functioning correctly). Press the "▼" arrow key several times to show that the other channels are functioning correctly.



- EDS...-L: All alarm LEDs light up.



Once the test has been completed, all LEDs must go out again, with the exception of the "ON" LED.

### 6.3.4 Resetting saved alarm messages (RESET)

If the fault memory is enabled, the alarm status will remain, even after the cause of the fault has been eliminated, until a "RESET" is carried out. Press the "ESC" key to exit the display of the current alarm message. To carry out a RESET:

- press the "RESET" button on the front panel of the EDS... ,
- press the external RESET button connected to the EDS... ,
- send a RESET command via the BMS bus.
- EDS...-D only: calling the "RESET" function in the Control menu.

Stored alarm messages that are no longer pending are reset, the alarm relay drops out, the ALARM LEDs go out and there are no longer any alarm messages on the BMS bus. The EDS...-D shows the progress of the reset operation.

### 6.3.5 Displaying standard information

This function is only available in EDS...-D. Press the "INFO" key. You will now see information relating to the device and software on the EDS...-D display. Press the "▼" arrow key several times to display all the information. Please have this information to hand if you should need to contact us for assistance by telephone.

<p>■ <b>EDS460-D</b> 02.01.07 14:59 Address:2 Software: D234V2.1x</p>
---

- |              |  |
|--------------|--|
| Line 1:      | Device type  |
| Line 2:      | Date, time   |
| Line 3:      | Address set on the BMS bus                         |
| Line 4:      | Software version of measurement technique          |
| Line 5:      | Date of the measurement technique software version |
| Line 6:      | Communication software version                     |
| Line 7:      | Date of communication software version             |
| Line 8...10: | Bender address, homepage                           |
| Line 11:     | Exit. Exit standard information.                   |

## 6.4 Setting the EDS...-L

EDS...-L has a 7-segment LED display only. It can be operated and set via an EDS...-D or via the following devices: IRDH575 (V1.5 or higher), PRC1470, MK2430 or FTC470XET. Only the BMS bus address can be set directly on the EDS...-L.

The following functions and settings are **not** included in the EDS...-L :

- Displaying standard information	- Time of day/ date
- Language	- Interface menu
- History memory	- Password

### Setting the BMS bus address of the EDS...-L

1. Press the "SET" key for approximately two seconds to open the main menu. The BMS bus address flashes.
2. Use the "▲, ▼" arrow keys to select the required address.
3. Press the "↵" enter key to confirm this setting.
4. If you wish to exit the setting without making a change, press the "ESC" key.

## 6.5 Operating and setting the EDS...-D

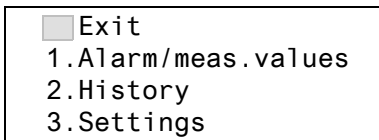
This chapter describes the EDS...-D menu mode.

The EDS...-L only has some of these functions available (see "Setting the EDS...-L" on page 40). This also applies if an EDS...-D is used to operate and set an EDS...-L.



### 6.5.1 Opening the main menu

Press the "MENU" key to open the main menu.



The following keys are used in the main menu:

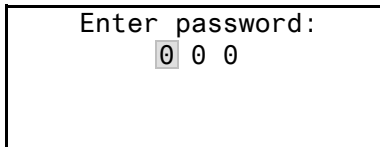
- ESC Exit function or go up one menu level.  
▲, ▼ Select menu items.  
↵ Confirm selected menu item (Enter).



*Menu mode is exited if no key is pressed for longer than five minutes. Exceptions: The "Test" and "Test communication" functions.*

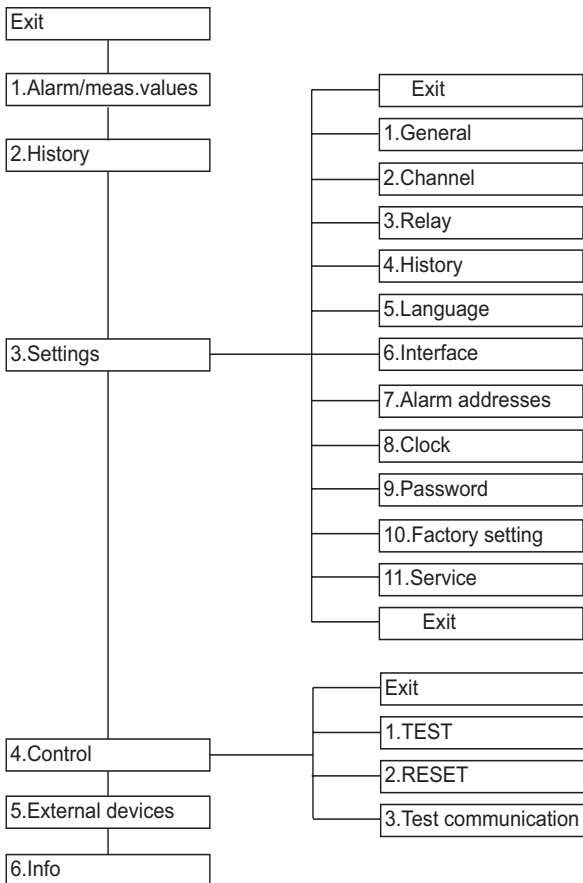


*Settings can be password protected. When an attempt is made to change settings, the password entry screen appears automatically:*



*For details see "Settings menu 9: Password" on page 56. If you can't remember your password, contact the BENDER Service.*

## 6.5.2 Menu overview diagram



### 6.5.3 Main menu functions

Menu item	Function	Page
Exit	Exit menu mode	-
1.Alarm/meas. values	Displays the following for each measuring channel: Alarm status, test current I(ds), residual current I(d)	44
2.History	Displays the history (300 data records) with information about messages, acknowledgements and associated times. Displays the minimum and maximum I(ds) measured value, with address and channel.	46
3.Settings	Settings for EDS... are made here.	47
4.Control	This menu offers various control options, such as TEST, RESET, etc.	57
5.External devices	Settings on devices externally connected to the BMS bus (e.g. EDS460-D/-L, EDS490-D/-L).	59
6.Info	Information on the device. The same display is obtained by pressing the INFO key in the operating mode (refer to "Displaying standard information" on page 39).	62

## 6.6 The main menu

### 6.6.1 Menu 1: Alarm/meas. values

EDS... displays the following for each measuring channel: Alarm status, test current I(ds), residual current I(d).

	I (ds)	I (d)
1.	●6mA	120mA
2.	○ --	<100mA
3.	○Channel disabled	

Column 1: Channel number 1...12

Column 2: Alarm status:

○ No alarm

● Alarm

Column 3: I(ds): Currently measured test current.

Column 4: I(d): Currently measured residual current.




---

*The accuracy of the displayed test current depends on the system leakage capacitances.*

*The IRDH575/PGH... test current is limited. Consequently, the insulation fault resistance may in fact be lower than the displayed test current suggests.*

---

## Residual current

The residual current flowing through the measuring current transformer is continually measured and displayed.

- If the residual current exceeds 100 mA (EDS460/490) or 10 mA (EDS461/491), this information is displayed.
- If the residual current exceeds 10 A (EDS460/490) 1 A (EDS461/491), this information is displayed. Once the residual current reaches values of this magnitude, reliable insulation fault location becomes impossible.

<b>ALARM</b>	<b>1 / 1</b>
● Residual current	
> 10 A	
Addr.: 2 Channel: 1	

## 6.6.2 Menu 2: History

The non-volatile history memory saves up to 300 data records (alarms, device errors). If the history memory is full, the oldest entry will be deleted in the event of an alarm to create space for the new entry. For details about erasing the entire history memory refer to "chapter 6.6.3.4 Settings menu 4: History".

```

History no. 297
Start:21.11.2005 / 15:57:00
Quit:
End: 21.11.2005 / 16:07:03
    
```

Line 1: Event number (if applicable): TEST.

Line 2: Event start: Date / time

Line 3: Event acknowledgement (e.g. alarm deleted at IRDH575, PRC1470, MK2430, FTC470...):  
Date / time

Line 4: Event end: Date / time

1. If you are searching for an event that occurred at a specific time, use the arrow keys to scroll to the required entry.
2. Use the "↵" key to call up details about the current history memory entry.

```

History no. 297
● Insulation fault
Min. 2mA/Max.50mA
Addr.:2 Channel:1
    
```

Line 1: Data record number.

Line 2: Alarm/device error designation.

Line 3: Minimum and maximum measured value.

Line 4: Address and measuring channel of device sending the message

### 6.6.3 Menu 3: Settings

The following menu items are available for configuring the EDS...:

Menu item	Function	Page
Exit	Exit Settings	-
1.General	Configure the fault memory, trigger, rated frequency and type of system.	48
2.Channel	Configure the following in respect of each measuring channel: Response value, measuring transformer type, response delay, delay on release, measuring transformer monitoring, filters for systems with converters, and alarm when the residual current has been exceeded.	49
3.Relay	Set the mode of operation and type of fault that you wish to cause a switching operation for common alarm relay.	53
4.History	Erasing the history memory	54
5.Language	Select the language for menu and alarm texts.	54
6.Interface	Configure the BMS bus address of the EDS...	54
7.Alarm-addresses	Setting of bus addresses for devices whose alarm messages are to be displayed on this EDS...-D.	54
8.Clock	Configure the time, date, date format and summer time changeover.	55
9.Password	Changing and activating the password.	56
10.Factory setting	Resets every setting to its factory setting.	56
11.Service	For Bender service staff only.	56

### 6.6.3.1 Settings menu 1: General

Use this menu to make settings that apply to the whole device and therefore to all channels.

#### 1. Fault memory

Faults that only occur temporarily can be saved.

- |     |   |
|-----|---|
| ON  | After the cause of fault has been eliminated, all alarm messages remain saved until a RESET is carried out. This function relates to alarm and device error messages. |
| OFF | EDS... exits the alarm status as soon as the cause of the error is eliminated.  |

#### 2. Trigger

The IRDH575 / PGH... test current pulse is synchronised with the EDS... measurement technique. The EDS... is told when to expect a test current pulse. This means that test current pulses can still be reliably detected in the event of interference. Sources for interference include, for example, variable-speed drives, power converters, actuators, suppressor filters, PLCs or control electronics.

Select:

- |      |   |
|------|---|
| Com  | Synchronisation via BMS bus. The EDS... will begin searching for insulation faults as soon as insulation fault location is started. It knows when to expect the test current pulse. Insulation fault location is performed more quickly than with the "auto" setting. |
| auto | No synchronisation (e.g. if there is no BMS bus). The EDS searches continually for insulation faults.   |

#### 3. Rated frequency

Select the rated frequency of the monitored system. This must be set correctly, otherwise the EDS... will not be able to evaluate the test current pulse accurately.

Configurable values: DC, 50 Hz, 60 Hz, 400 Hz.



## 4.Type of system

Select the type of distribution system for the system being monitored.  
Configurable values: DC, AC, 3 AC.

### 6.6.3.2 Settings menu 2: Channel

You make the measuring channel settings in this menu (either individually or for all channels simultaneously). Selecting a measuring channel:

1. Use the "▲" key to go to the measuring channel setting. Press "↵".
2. Use the UP/DOWN keys to select a single measuring channel or all measuring channels (1...12). Press "↵" to confirm your selection.

Setting  
a single  
measuring channel:

Channel:	1
<input type="checkbox"/> Exit	
1.Resp.value:	4mA
2.CT:	W/WR

Setting  
all measuring channels:

Channel:	1..12
<input type="checkbox"/> Exit	
1.Resp.value:	4mA
2.CT:	W/WR



*If the measuring channel settings only differ slightly, we recommend to proceed as follows:*

- First set all the channels (1...12) to the same value.
- Then modify the settings of individual channels.

## 1.Resp. value

An alarm is output when the measured value reaches the response value. Response ranges:

EDS460/490 2...10 mA

EDS461/491 0.2...1 mA

Please also heed the characteristics for a reliable response on page 72.

## 2.CT

Set the transformer type.

W/WR Bender standard measuring current transformers, circular and rectangular W... and WR... series designs.

WS Split-core type WS... series measuring current transformers.

off measuring channel is deactivated

The following measuring current transformer types can be used:

EDS460, EDS490: W..., WR..., WS...

EDS461, EDS491: W.../8000, WS.../8000

## 3.Response delay T(on)

This is the response delay before the alarm is activated. This time delay is necessary in cases where the monitored system is subject to interference.

The duration of a test current pulse cycle is 6 seconds. Consequently, the response delay can only be adjusted in increments of 6 seconds..

0s An alarm is triggered when the first test current pulse is detected.

6s Two test current pulses must be detected before an alarm is triggered.

12s Three test current pulses must be detected before an alarm is triggered.

Configurable values: 0s, 6s, 12s, 18s, 24s

#### 4. Release delay T(off)

This function is only effective when the fault memory is deactivated (see "1. Fault memory" on page 48).

If the status that triggered the alarm no longer applies, the EDS... will terminate its alarm once the release delay has expired.

Configurable values: 0s, 6s, 12s, 18s, 24s

- |     |   |
|-----|---|
| 0s  | The alarm is terminated when the EDS... has not recognised an insulation fault for the duration of a test current pulse.      |
| 6s  | The alarm is terminated when the EDS... has not recognised an insulation fault for the duration of two test current pulses.   |
| 12s | The alarm is terminated when the EDS... has not recognised an insulation fault for the duration of three test current pulses. |




---

*In the case of DC systems, a release delay of at least 6 seconds must be set in order for a pending fault to be permanently signalled.*

*IRDH575 / PGH... sends alternate positive and negative test current pulses. However, in a DC system, test current pulses must either be all positive or all negative. As only every second test current pulse counts, the system must wait for a further test current pulse to be sent (6 seconds) before it can be certain that this measuring channel is free from insulation faults.*

---

#### 5. CT monitor

Enable or disable monitoring of the measuring current transformers.

- |     |  |
|-----|--|
| ON  | Measuring current transformers are monitored.<br>Open circuit, short circuit or missing measuring current transformers generate an alarm message. The "ALARM 1" LED lights up. |
| OFF | Measuring current transformers are not monitored.  |

## 6. Converters

Converters are a major source of interference for the monitored system.

ON	Channel is optimised for converters. Insulation fault location takes longer in this sub-circuit.
OFF	Channel is not optimised for converters. Insulation faults cannot be reliably detected in circuits containing converters.

## 7. Alarm I(d)

If the residual current exceeds  $> 10 \text{ A}$  (EDS460/490) resp.  $> 1 \text{ A}$  (EDS461/491), an alarm message is displayed (Alarm 1). This alarm message can be deactivated.

ON	Alarm when the residual current response value is exceeded.
OFF	No alarm when the residual current response value is exceeded (for specific applications only).

## 8. Operating principle (EDS490/491 only)

The EDS490-D/-L resp. the EDS491-D/-L has an alarm relay for each measuring channel. Set the operating principle for each relay.

N/O-T	N/O operation. Relay switches in the event of an alarm or a test.
N/C-T	N/C operation. Relay switches in the event of an alarm or a test.
N/O	N/O operation. Relay only switches in the event of an alarm.
N/C	N/C operation. Relay only switches in the event of an alarm.




---

*If the relay settings only differ slightly, we recommend the following procedure for the EDS490:*

- first set all the relays (1...12) to the same value;
  - then modify the settings of individual relays.
-

### 6.6.3.3 Settings menu 3: Relay

You make the settings for the common alarm relays K1 and K2 in this menu (either individually or common to all alarm relays). Selecting a relay

1. Use the "▲" key to go to the relay channel setting. Press "↵".
2. Use the UP/DOWN keys to select a relay (1, 2) or for both relays (1...2). Press "↵" to confirm your selection.

Setting  
a single relay:

Relay:	1
<input type="checkbox"/> Exit	
1. Relay mode:	N/O-T
2. Alarm:	on

Setting  
both relays:

Relay:	1...2
<input type="checkbox"/> Exit	
1. Relay mode:	N/O-T
2. Alarm:	on

#### 1. Relay mode

Set the relay mode of operation:

N/O-T	N/O operation. Relay switches in the event of an alarm or a test.
N/C-T	N/C operation. Relay switches in the event of an alarm or a test.
N/O	N/O operation. Relay only switches in the event of an alarm.
N/C	N/C operation. Relay only switches in the event of an alarm.

#### 2. Alarm

ON	Relay switches in the event of an alarm.
OFF	Relay does not switch in the event of an alarm.

### 3. Device error

on	Relay switches in the event of a device error.
off	Relay does not switch in the event of a device error.

### 4. Ext. alarm

on	Relay switches in the event of an external alarm.*
off	Relay does not switch in the event of an external alarm.*

\* *Alarm on an external device the address of which has been set to "on" in the "Alarm addresses" menu. (see "Settings menu 7: Alarm addresses" on page 54).*

#### 6.6.3.4 Settings menu 4: History

Here the entire history memory can be deleted. Use the "↵" key to confirm that the memory is to be deleted.

#### 6.6.3.5 Settings menu 5: Language

Select the language for menu and alarm texts.  
Setting options: English, Deutsch or Français.

#### 6.6.3.6 Settings menu 6: Interface

Set the BMS bus address of the EDS... .

Setting range:	EDS...-D	Address 1...90
	EDS...-L	Address 1...90

#### 6.6.3.7 Settings menu 7: Alarm addresses

Setting of the bus addresses (1...150) externally connected to the BMS bus, the alarm messages of which are to be displayed on this EDS...-D. Set the addresses of devices whose messages are to be displayed to "on". Addresses set to "on" are monitored for presence on the BMS bus; if a device cannot be found on the bus, a corresponding message will appear. The address of this EDS is set to "on" automatically.

<input type="checkbox"/>	Exit	
1.Address:		on
2.Address:		off
3.Address:		off

on

Messages of this device will be displayed.

off

Messages of this device will not be displayed.

### 6.6.3.8 Settings menu 8: Clock

Set the date format, date, time, and summer time changeover.




---

*Set the time and date on the BMS bus master. All slaves adopt this setting. The setting is synchronised every hour. The "Clock" menu setting remain stored for approx. 2 h after power supply failure.*

---

#### 1.Format

Set the German or American format.

d.m.y

German format (day.month.year)

m-d-y

American format (month-day-year)

#### 2.Date

Set the date (e.g. 20.07.2006).

#### 3.Time

Set the time (e.g. 16:44).

#### 4.CEST

Setting for automatic switchover to central European summer time.

AUTO

Automatic switchover

OFF

No switchover (winter time is retained).

### 6.6.3.9 Settings menu 9: Password

Change password, activate/deactivate password.

#### 1.Password

Change password. Factory setting: 000

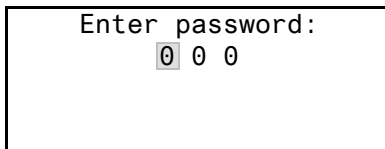
#### 2.Status

Activate or deactivate password protection.



---

*Settings can be password protected. If the password is activated (enabled), all settings can be displayed. When an attempt is made to change settings, the password entry screen appears automatically:*



*Once a valid password has been entered, access will be granted to settings in all menus (except the Service menu) until menu mode is exited.*

*If you can't remember your password, contact the BENDER Service.*

---

### 6.6.3.10 Settings menu 10: Factory settings

Resets every setting to its factory setting. Factory settings are given in parentheses "( )\*" in the technical data.

### 6.6.3.11 Settings menu 11: Service

This menu is intended for Bender service employees only.



## 6.6.4 Menu 4: Control

This menu offers various options for controlling the EDS:

Exit	Exit Settings
1.TEST	Call up a test
2.RESET	Initiate a reset (see "Resetting saved alarm messages (RESET)" on page 38")
3.Test communication	Test communication between the EDS... and other BMS equipment.

### 6.6.4.1 Control menu 1: TEST

Call up a test (see also "Carrying out a test" on page 37). To prevent this function being carried out inadvertently, the operator must once again confirm this entry.

### 6.6.4.2 Control menu 2: RESET

Call up a reset (see also "Resetting saved alarm messages (RESET)" on page 38). To prevent this function being carried out inadvertently, the operator must once again confirm this entry.

### 6.6.4.3 Control menu 3: Test communication

This function enables you to test the communication between the EDS... and other BMS equipment. This involves the EDS... sending an alarm message via the BMS bus until the "Test communication" function is exited. A connected evaluation device (IRDH575, PRC1470, MK2430, FTC470...) must process this alarm. Select a channel for this alarm message.

Example: Alarm "insulation fault" on channel 1.

1. Select channel 1.

○ Channel disabled
Exit
1.Chan.: 1

2. Once the "↵" key is pressed, the alarm is transmitted on the BMS bus. This is indicated by the alarm display ●.

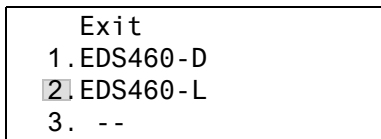
● Insulation fault
Exit
1.Chan.: 1

### 6.6.5 Menu 5: External devices

This menu can be used for setting and operating external devices connected via the BMS bus to this EDS...-D. In this way, settings at EDS...-L or other EDS...-D, for example, can be carried out.

The menu items of the external devices available via this function are displayed on the EDS...-D. Modifications of the settings of the external device are stored automatically in the external device.

After calling up this menu, the address and type of devices already stored will be displayed. The display will be updated every five minutes.



Use the Up/Down keys to set the address of the external device and confirm with the "↵" key.

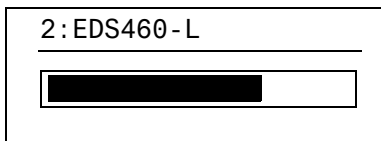


---

*External devices connected to the BMS bus or switched on for the first time are displayed by the EDS...-D not until a few minutes later in the external devices list. You don't need to wait for the list to appear. You can select and set the external device immediately via the address.*

---

The device is being searched:



If "no access to the menu" appears, press the "ESC" key to exit the display. Possible causes are:

- No device with this address available.
- Connected device does not support this programming function.
- Access not possible at the moment.



---

*The "External devices" menu is not suitable for programming this EDS... If you otherwise try to program it, the error message "Own address" will appear.*

---

When the device has been recognised, the EDS...-D reads the current settings of the connected device. The address and the device type will be displayed in the first line.

2:EDS460-L

---

Exit

1.Alarm/meas.values

2.Settings

The following menu items are displayed for the EDS...-L:

Menu item	Function	Page
Exit	Exit menu mode	-
1.Alarm/meas. values	Displays the following for each measuring channel: Alarm status, test current I(ds), residual current I(d)	44
2.Settings	Settings for EDS... are made here.	47
3.Control	This menu offers various control options, such as TEST, RESET.	57
4.Info	Information on the device. The same display is obtained by pressing the INFO key in the operating mode (refer to "Displaying standard information" on page 39).	62

Use the Up/Down keys to select the appropriate function or device setting and confirm with the "↵" key.

The "Settings" menu displays the following settings:

Menu item	Function	Page
Exit	Exit Settings	-
1.General	Configure the fault memory, trigger, rated frequency and type of system.	48
2.Channel	Configure the following in respect of each measuring channel: Response value, measuring transformer type, response delay, delay on release, measuring transformer monitoring, filters for systems with converters, and alarm when the residual current has been exceeded.	49
3.Relay	Set the mode of operation and type of fault that you wish to cause a switching operation for common alarm relay.	53
4.Factory setting	Resets every setting to its factory setting.	56
5.Service	For Bender service staff only.	56

### 6.6.6 Menu 6: Info

This menu displays standard information on the EDS...-D (for details refer to "Displaying standard information" on page 39).

## 7. Tests and service

### 7.1 Periodic tests

The EDS system monitors itself during operation.

We recommend that the test function is called on each connected EDS... at regular intervals. You call a test by:

- pressing the "TEST" button on the front panel of the EDS...,
- pressing an external test button or
- calling the "TEST" function in the Control menu.

Observe the applicable national and international standards which require regular testing of electrical equipment.

### 7.2 Maintenance

The EDS system does not contain any parts that require maintenance.

### 7.3 Service

BENDER is happy to provide on-site service in respect of commissioning and periodic testing.

## 7.4 Troubleshooting

### 7.4.1 Display device error

An "error code" is displayed if a fault occurs. Please have this device information to hand if you should need to contact us for assistance by telephone.

Error code	Description
1	Measurement technique: Fault parameter memory (EEPROM/FLASH)
2	Measurement technique: Fault data memory (RAM)
4	Measurement technique: No boot loader available.
11	Measurement technique: Device not calibrated.
12	Measurement technique: Wrong measurement p.c.b., incorrect mounting
13	Measurement technique: Hardware error after performing a self test
71	BMS interface: No master available resp. has not been queried by a master for five minutes
72	BMS interface: Fault RS-485 interface

### Display in the event of a fault

EDS...-D	EDS...-L
Device error: xx	Er xx (alternately displayed)

xx = Error code



## 7.4.2 Device error display (channel-related)

LED "Alarm 1" lights up. The common alarm relay switches. The EDS...-D displays:

<b>Fault</b> <span style="float: right;"><b>1/1</b></span>
● Device error
11
Addr.: 2 Channel: 4

- Line 1:           FAULT,  
                  Alarm 1 of 1 pending alarm
- Line 2:           Alarm status and alarm text
- No alarm
- Alarm
- Line 3:           Error code (refer to "Display device error" on page 64)
- Line 4:           BMS bus address of the EDS and the measuring channel  
                  on which the alarm has occurred.

Possible causes:

- Incorrect basic programming of the EDS.
- Wrong p.c.b. assembly at four consecutive channels.
- Internal memory fault.
- Faulty channels after test.

### 7.4.3 CT connection fault display (channel-related)

LED "Alarm 1" lights up. The common alarm relay switches. The EDS...-D displays:

<b>Fault</b>	<b>1/1</b>
● CT fault	
Addr.: 2	Channel: 4

The "CT fault" is displayed in the same way as "Display device error" on page 64.

Possible causes:

- Measuring current transformer defective
- Power supply cable interrupted
- Power supply cable short-circuited

### 7.4.4 Display "peak"

System-related faults may impair the insulation fault location process. The EDS... marks the faulty channels in the "Alarm/meas.values" menu with "peak".

I (ds)	I (d)
1. Opeak	<100mA

### 7.4.5 External alarm

LED "Alarm 2" lights up. The common alarm relay switches.

Possible causes:

- Alarm message from an external device
- Device failure

## 8. Data

### 8.1 Standards

Observe the applicable national and international standards. The EDS... series meets the requirements of the following equipment standards:

- IEC 60364-4-41:1992, modified:  
Erection of power installations with nominal voltages up to 1000 V - Part 4: Protection for safety; Chapter 41: Protection against electric shock;
- IEC 61557-9:1999:  
Electrical safety in low voltage distribution systems up to AC 1 kV and DC 1.5 kV - Equipment for testing, measuring or monitoring of protective measures- Part 9: Equipment for insulation fault location in IT systems

The operating manuals for the individual system components provide you with information about the standards that apply to that particular device.

### 8.2 Approvals



## 8.3 Technical data EDS460/490 / EDS461/491

### Insulation coordination acc. to IEC 60664-1 / IEC 60664-3

Rated insulation voltage .....	AC 250 V
Rated impulse voltage/pollution degree .....	4 kV / III
Protective separation (reinforced insulation) between:	
..... (A1, A2) - (K1, L...K12, R / RT / T, AB) - (11, 12, 14) - (21, 22, 24)	
Voltage test acc. to IEC 61010-1 .....	2.21 kV

### Supply voltage

Supply voltage $U_S$ .....	see ordering information
Frequency range $U_S$ .....	AC 42...460 Hz
Power consumption .....	≤ 10 VA (EDS460 / 461)
.....	≤ 14 VA (EDS490 / 491)

### Measuring circuit

Nominal system voltage $U_n$ .....	refer to IRDH575, PGH47x... (EDS460, EDS490)
.....	AC 20...276 V, DC 20...308 V (EDS461, EDS491)

External measuring current transformer type .....	W..., WR..., WS... (EDS460, EDS490)
.....	W.../8000, WS.../8000 (EDS461, EDS491)
CT monitoring .....	on/off (on)*
Load .....	10 $\Omega$
Rated insulation voltage (measuring current transformer) .....	800 V
Response sensitivity .....	2...10 mA (EDS460 / EDS490)
.....	0.2...1 mA (EDS461 / EDS491)
Rated frequency .....	50 / 60 / 400 Hz
EDS function measuring range .....	2...50 mA (EDS460 / EDS490)
.....	0.2...5 mA (EDS461 / EDS491)
RCM function measuring range .....	100 mA...10 A (EDS460 / EDS490)
.....	10 mA...1 A (EDS461 / EDS491)
Number of measuring channels (per device/system) .....	12 / 1080

### Specified time

Response delay $t_{on}$ .....	0...24s
Release delay $t_{off}$ .....	0...24s
Scanning time for all channels .....	approx. 4...10 s

## Displays, memory

LEDs.....	ON / ALARM (EDS4...-D)
.....	ON / ALARM / measuring channel 1...12 (EDS4...-L)
LC display .....	backlit graphical display (EDS4...-D)
7-segment display.....	2 x 7.62 mm (EDS4...-L)
History memory .....	300 data records (EDS4...-D)
Password .....	off / 0...999 (off)*
Language .....	D, GB, F (GB)*
Fault memory alarm relay .....	on / off (off)*

## Inputs/outputs

TEST/RESET button .....	internal/external
Cable length for external test / reset button.....	0...10 m

## Interface

Interface/protocol .....	RS-485 / BMS
Baud rate .....	9.6 kbit / s
Cable length .....	0...1200 m
Recommended cable (shielded, shield on one side connected to PE) .....	J-Y(ST)Y min. 2 x 0.8
Terminating resistor .....	120 $\Omega$ (0.25 W) can be connected via DIP switch
Device address, BMS bus .....	EDS...-D: 1...90 (2)*
.....	EDS...-L: 1...90 (2)*

## EDS - measuring current transformer connection

Single wire $\geq 0.75 \text{ mm}^2$ .....	0...1 m
Single wire, twisted $\geq 0.75 \text{ mm}^2$ .....	1...10 m
Shielded cable $\geq 0.5 \text{ mm}^2$ .....	10...40 m
Recommended cable (shielded, shield connected to I conductor at one end, not earthed) .....	J-Y(ST)Y min. 2x0.8

## Switching elements

Number .....	two relays, each with one changeover contact (EDS460)
.....	two relays, each with one changeover contact; 12 relays, each with one N/O contact (EDS490)
Operating principle .....	N/C operation / N/O operation (N/O operation)*
Electrical service life under rated operating conditions.....	10.000 switching operations
Contact data acc. to IEC 60947-5-1	

Utilisation category .....	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage .....	230 V	230 V	24 V	110 V	220 V
Rated operational current .....	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact load .....	1 mA at AC / DC $\geq$ 10 V				

## Environment / EMC

EMC .....	IEC 61326
Operating temperature .....	-25 °C ... +55 °C
Classification of climatic conditions IEC 60721	
Stationary use (IEC 60721-3-3) .....	3K5 (except condensation and formation of ice)
Transportation (IEC 69721-3-2) .....	2K3 (except condensation and formation of ice)
Storage (IEC 60721-3-1) .....	1K4 (except condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3) .....	3M4
Transportation (IEC 60721-3-2) .....	2M2
Storage (IEC 60721-3-1) .....	1M3

## Connection screw-type terminals

Conductor sizes:	
rigid / flexible .....	0.2...4 / 0.2...2.5 mm <sup>2</sup> (AWG 24...12)
Multi-conductor connection (2 conductors with the same cross section):	
rigid/flexible .....	0.2...1.5 / 0.2...1.5 mm <sup>2</sup>
Stripping length .....	8...9 mm
Tightening torque .....	0.5...0.6 Nm

## Connection spring-loaded terminals

Conductor sizes:	
rigid/flexible .....	0.2...2.5 mm <sup>2</sup> (AWG 24...14)
Flexibel mit Aderendhülse .....	0.2...1.5 mm <sup>2</sup> (AWG 24...16)
Multi-conductor connection (2 conductors):	
rigid/flexible .....	0.2...2.5 mm <sup>2</sup> (AWG 24...14)
Flexible with ferrules .....	0.2...1.5 mm <sup>2</sup> (AWG 24...16)
Stripping length .....	10 mm
Opening force .....	50 N
Test opening, diameter .....	2.1 mm

**Other**

Operating mode .....	continuous operation
Position of normal use .....	any
Degree of protection DIN EN 60529, terminals.....	IP20
Enclosure material .....	polycarbonate
Flammability class .....	UL94V-0
Screw fixing.....	2 x M4
DIN rail mounting acc. to.....	IEC 60715
Weight .....	< 360 g (EDS460)
.....	< 510 g (EDS490)

( ) \* factory setting

## 8.4 Response sensitivity characteristics

The type of distribution system, system voltage, system frequency, leakage capacitance and test current all affect the EDS system's response sensitivity.



---

*The value of the test current can be set at the IRDH575 insulation monitoring device and at the PGH... insulation fault test device. Resulting from the type of supply system, the real test current in AC systems is lower than the setting. The reduction factor is 0.5 in AC systems and 0.67 in 3AC systems.*

For application in AC and 3AC systems, the response value at the EDS... has to be set as follows:

<b>Test current</b>	<b>EDS</b>	<b>response value</b>
10 mA	EDS460/490	< 5 mA
1 mA	EDS461/491	< 0.5 mA

*For setting the response value refer to "Settings menu 2: Channel" on page 49.*

---



---

*The response values are displayed as characteristic curves. The maximum deviation can be +/- 30 %, including the tolerances of the measuring current transformers. The characteristic curves apply to the respective nominal voltage indicated in the diagram. If the nominal voltage of the system being monitored is different from the nominal voltage shown in the diagram, the response values may change proportionally. Nominal voltages changing dynamically during operation or in case of superimposed alternating currents that deviate from the system frequency (e.g. caused by frequency converters) or superimposed direct currents may result in response values that are outside the range displayed in the diagram.*

---

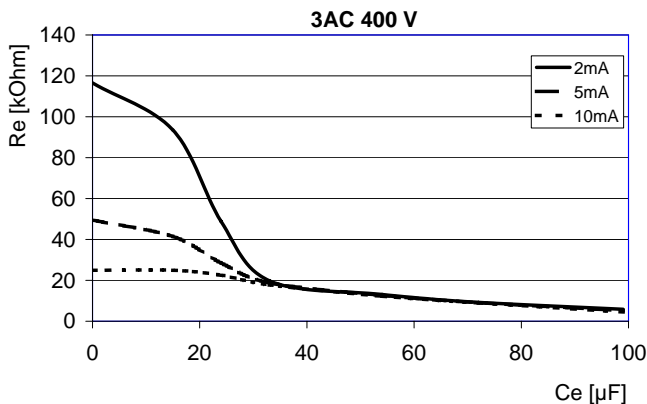
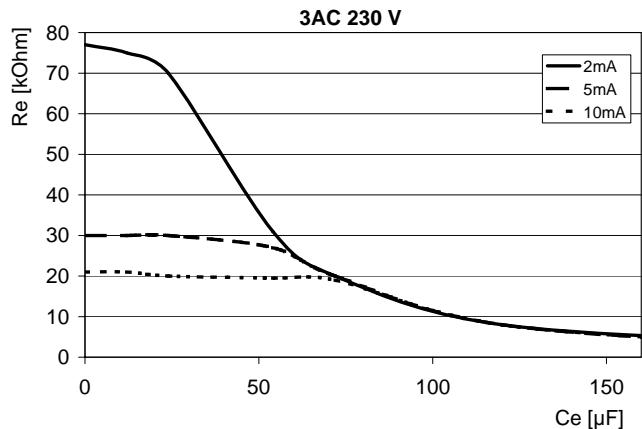


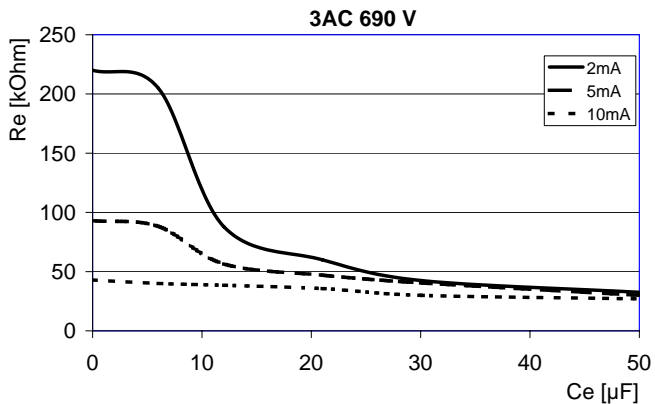
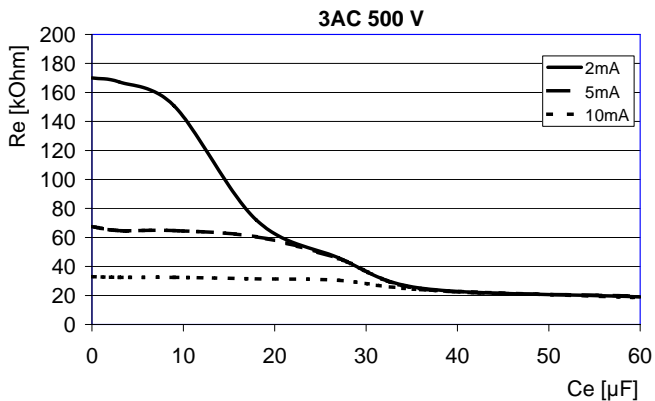
The following characteristics are an easy way of determining a suitable response value for the insulation monitoring device and the EDS... . Proceed as follows:

1. Select the characteristics (3 AC, AC, DC) that are appropriate for your type of distribution system.
2. From these, select the diagram that best matches the desired system voltage.
3. Calculate the anticipated leakage capacitance of the system being monitored. The IRDH575 displays the system leakage capacitance (press the INFO key). Apply this value to the diagram in the form of a vertical line.
4. The characteristics provided indicate the EDS system's response sensitivity when the EDS response value is set to 2 mA, 5 mA and 10 mA. Values above the relevant curve cannot be detected.
5. Select the middle characteristic for an EDS... response value of 5 mA (factory setting). Mark the system leakage capacitance  $C_e$  on the characteristic. Read off the relevant resistance  $R_e$  from the characteristic. The resistance  $R_e$  thus calculated indicates the maximum response value that can be set on the insulation monitoring device (e.g. IRDH575). If higher response values than this are set, insulation fault detection becomes unreliable. A reliable response on the part of the insulation monitoring device must be ensured before the EDS system can be started.
6. If you wish to set a higher or lower response value for the insulation monitoring device, you will need to calculate the resistance ( $R_e$ ) for the top and bottom characteristics as described under point 5. Values and characteristics that fall between the top and bottom characteristics can be roughly determined on the basis of those actually provided.
7. Set the calculated response values on the insulation monitoring device and the EDS... .

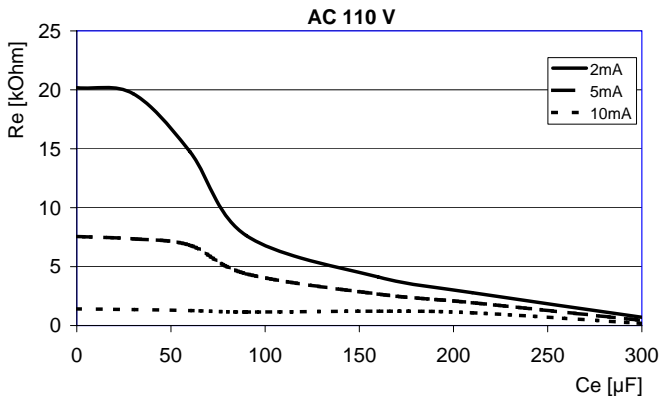
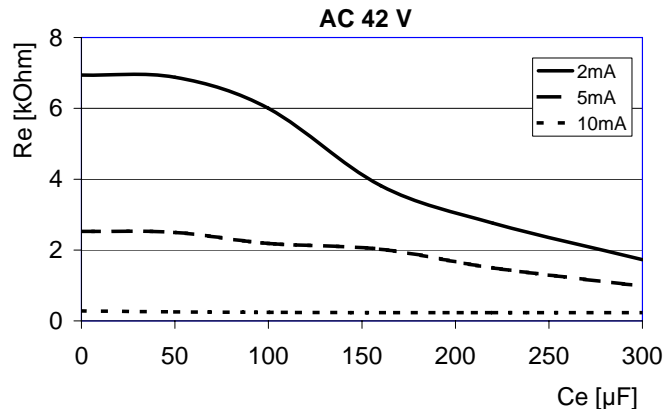
## 8.4.1 Characteristic curves EDS460/490

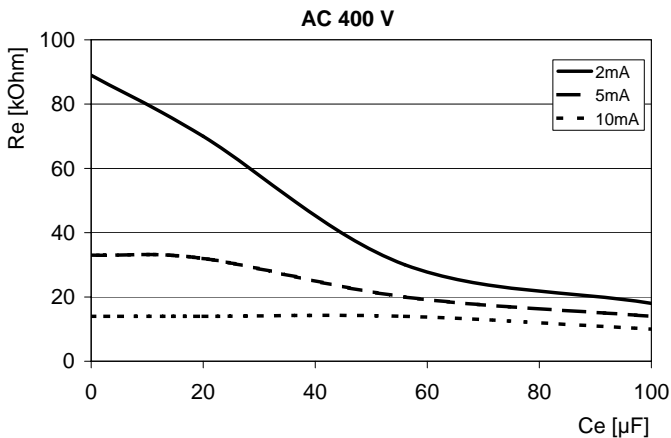
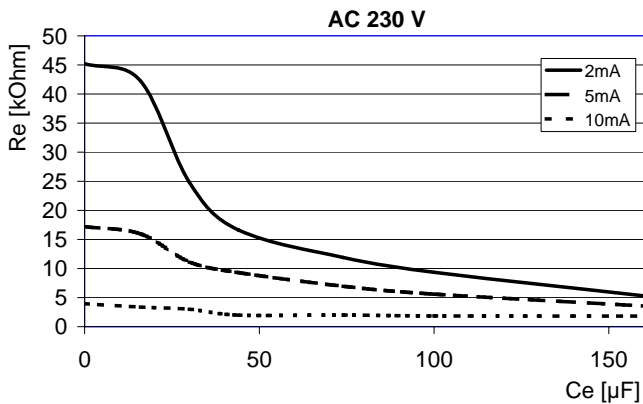
### 8.4.1.1 EDS460/490 characteristics for 3AC systems



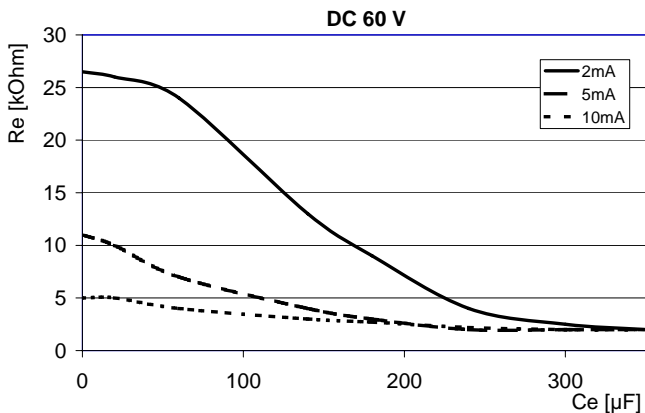
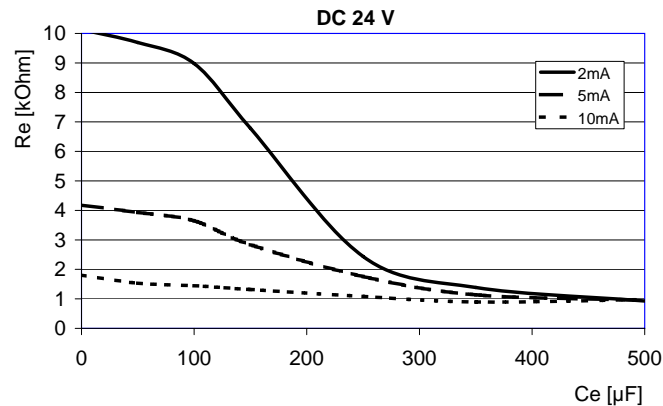


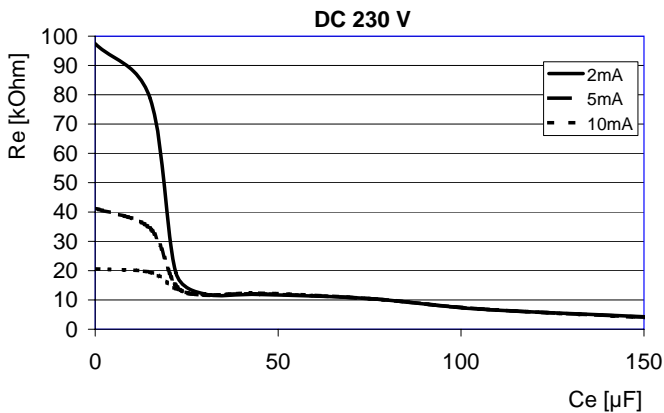
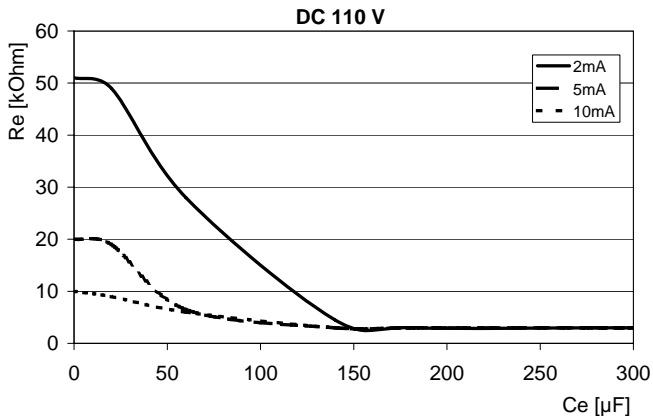
## 8.4.1.2 EDS460/490 characteristics for AC systems





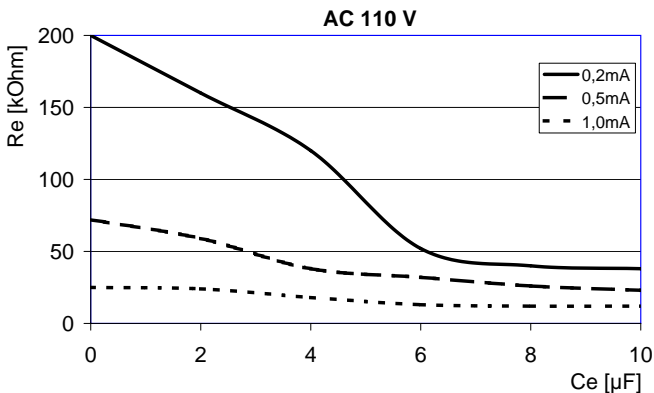
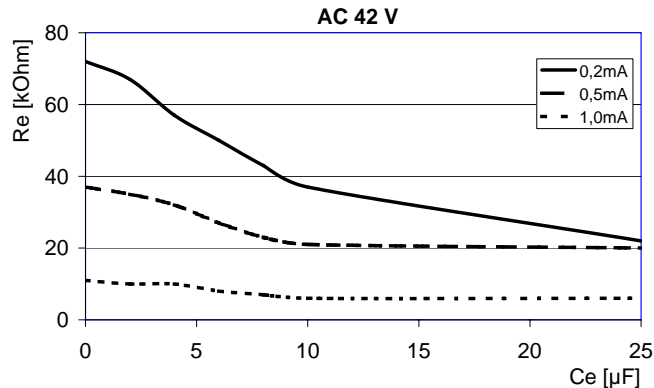
### 8.4.1.3 EDS460/490 characteristics for DC systems



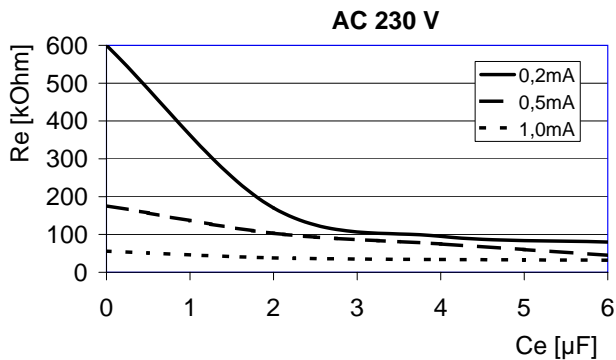


## 8.4.2 Characteristic curves EDS461/491

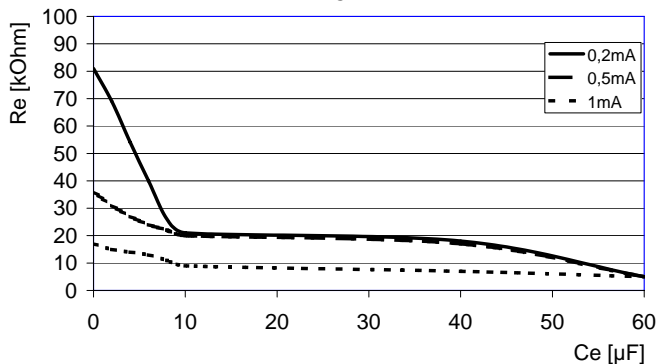
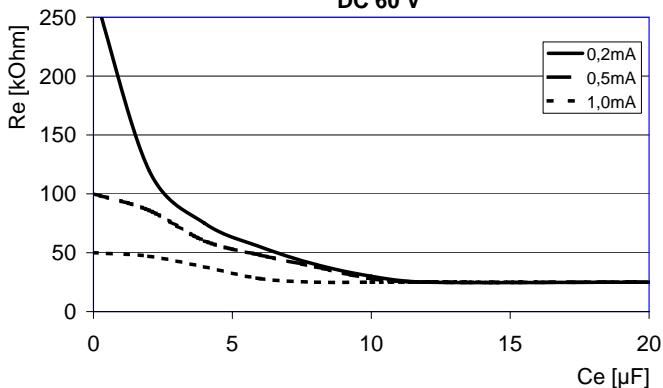
### 8.4.2.1 EDS461/491 characteristics for AC systems

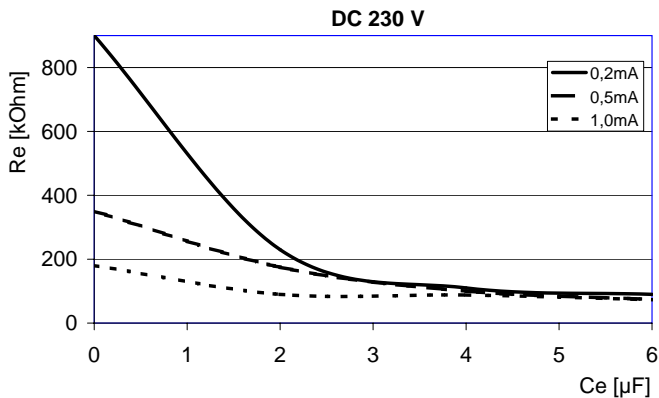
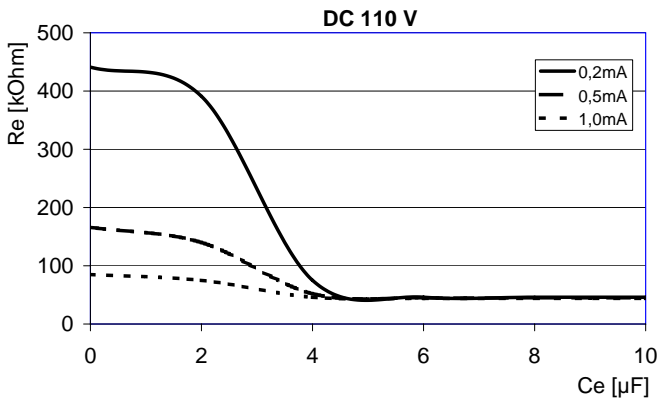






### 8.4.2.2 EDS461/491 characteristics for DC systems

**DC 24 V**

**DC 60 V**




## 8.5 Ordering information

### Insulation fault evaluators

The devices are optionally available with screw-type terminals (Art. No. B 9...) or with spring-loaded terminals (Art. No. B 7...).

Type	Supply voltage $U_5^*$	Response value	Art. No.
EDS460-D-1	DC 16...94 V AC 42...460 Hz 16...72 V	2...10 mA	B 9108 0001 B 7108 0001
EDS460-D-2	AC / DC 70...276 V AC 42...460 Hz	2...10 mA	B 9108 0002 B 7108 0002
EDS460-L-1	DC 16...94 V AC 42...460 Hz 16...72 V	2...10 mA	B 9108 0003 B 7108 0003
EDS460-L-2	AC / DC 70...276 V AC 42...460 Hz	2...10 mA	B 9108 0004 B 7108 0004
EDS461-D-1	DC 16...94 V AC 42...460 Hz 16...72 V	0,2...1 mA	B 9108 0005 B 7108 0005
EDS461-D-2	AC / DC 70...276 V AC 425...460 Hz	0,2...1 mA	B 9108 0006 B 7108 0006
EDS461-L-1	DC 16...94 V AC 42...460 Hz 16...72 V	0,2...1 mA	B 9108 0007 B 7108 0007
EDS461-L-2	AC / DC 70...276 V AC 42...460 Hz	0,2...1 mA	B 9108 0008 B 7108 0008
EDS490-D-1	DC 16...94 V AC 42...460 Hz 16...72 V	2...10 mA	B 9108 0009 B 7108 0009

Type	Supply voltage $U_S^*$	Response value	Art. No.
EDS490-D-2	AC / DC 70...276 V AC 42...460 Hz	2...10 mA	B 9108 0010 B 7108 0010
EDS490-L-1	DC 16...94 V AC 42...460 Hz 16...72 V	2...10 mA	B 9108 0011 B 7108 0011
EDS490-L-2	AC / DC 70...276 V AC 42...460 Hz	2...10 mA	B 9108 0012 B 7108 0012
EDS491-D-1	DC 16...94 V AC 42...460 Hz 16...72 V	0,2...1 mA	B 9108 0013 B 7108 0013
EDS491-D-2	AC / DC 70...276 V AC 42...460 Hz	0,2...1 mA	B 9108 0014 B 7108 0014
EDS491-L-1	DC 16...94 V AC 42...460 Hz 16...72 V	0,2...1 mA	B 9108 0015 B 7108 0015
EDS491-L-2	AC / DC 70...276 V AC 42...460 Hz	0,2...1 mA	B 9108 0016 B 7108 0016

\* Absolute values

## Accessories

Type	Supply voltage $U_S$	Art. No.
DI-1PSM (RS-485 interface repeater)	AC/DC 24 V $\pm 20 \%$	B 9501 2044
DI-2USB (interface converter RS-485/USB)	supplied by the USB port, no additional power supply required.	B 9501 2045
AN471 (power supply unit for DI-1 or DI-2)	AC 230 V 50/60 Hz/ AC, DC 20 V	B 924 189
Snap-on mounting W20.../35...		B 9808 0501
Snap-on mounting W60...		B 9808 0502

## Protocol converters

Type	Supply voltage $U_S$	Art. No.
FTC470XDP	AC / DC 85...276 V*	B 9506 1000
FTC470XMB	AC / DC 85...276 V*	B 9506 1002
FTC470XET	AC / DC 85...276 V*	B 9506 1001

\* Absolute values

## Measuring current transformers for EDS460/490

Bender measuring current transformers

Type	Inside diameter/mm	Type of construction	Art. No.
W20	20	circular-type	B 9808 0003
W35	35	circular-type	B 9808 0010
W60	60	circular-type	B 9808 0018
W120	120	circular-type	B 9808 0028
W210	210	circular-type	B 9808 0034
WR70x175	70 x 175	rectangular	B 9808 0609
WR115x305	115 x 305	rectangular	B 9808 0610
WS20x30	20 x 30	split-core	B 9808 0601
WS50x80	50 x 80	split-core	B 9808 0603
WS80x80	80 x 80	split-core	B 9808 0605
WS80x120	80 x 120	split-core	B 9808 0606
WS80x160	80 x 160	split-core	B 9808 0608

## Alternative measuring current transformers from the Bender range

Type	Inside diameter/mm	Type of construction	Art. No.
W10/600	10	circular-type	B 911 761
W0-S20	20	circular-type	B 911 787
W1-S35	35	circular-type	B 911 731
W2-S70	70	circular-type	B 911 732
W3-S105	105	circular-type	B 911 733
W4-S140	140	circular-type	B 911 734
W5-S210	210	circular-type	B 911 735
WR 70x175S	70x175	rectangular	B 911 738
WR 115x305S	115x305	rectangular	B 911 739
WR 150x350S	150x350	rectangular	B 911 740
WR 200x500S	200x500	rectangular	B 911 763
WS 50x80S	50x80	split-core	B 911 741
WS 80x80S	80x80	split-core	B 911 742
WS 80x120S	80x120	split-core	B 911 743
WS 80x160S	80x160	split-core	B 911 755



## Measuring current transformers for EDS461/491

Bender measuring current transformers

Type	Inside diameter/mm	Type of construction	Art. No.
W20-8000	20	circular-type	B 9808 0009
W35-8000	35	circular-type	B 9808 0017
W60-8000	60	circular-type	B 9808 0027
WS20x30-8000	20 x 30	split-core	B 9808 0602
WS50x80-8000	50 x 80	split-core	B 9808 0604

Alternative measuring current transformers from the Bender range

Type	Inside diameter/mm	Type of construction	Art. No.
W10/8000	10	circular-type	B 911 759
W1-35/8000	35	circular-type	B 911 756
WS20x30/8000	20 x 30	split-core	B 911 764
WS50x80/8000	50 x 80	split-core	B 911 757
W10/8000-6	10	circular, 6x	B 911 900

For further information about measuring current transformers, please refer to the relevant instruction leaflet supplied with the product.

# INDEX

- A**  
ALARM 35  
Alarm status 36, 44, 65  
Areas 13
- B**  
Bender service 56  
bus address 54
- C**  
Checking the device function 37  
Commissioning 31, 63  
connection example 29  
Control 57  
CT monitoring 51  
CT type 50
- D**  
damage in transit 21  
Date 55
- E**  
environment  
- cold 21  
Error code 64
- F**  
Factory settings 56
- Fault memory 48  
fuses 21
- H**  
History memory 46
- I**  
Intended use 9
- L**  
Language 54
- M**  
main menu 40, 41  
Maintenance 63  
menu mode 40
- N**  
nominal insulation voltage 21
- O**  
operating mode 35  
Ordering information 84  
overview diagram 42
- P**  
Password 56  
peak 66  
Personnel 10

## **R**

rated frequency 48

Relay mode of operation 53

release delay 51

RESET 38

Residual current 44

response delay 50

## **S**

Service 63

shielded conductors 29

standard information 39, 62

Standards 63

Summer time 55

switching on 31, 32

System components 7

## **T**

Test communication 57

test function 63

Time 55

## **U**

Unpacking 21

## **W**

Wiring diagram 25, 27



**Dipl.-Ing. W. Bender GmbH & Co.KG**

Londorfer Str. 65 • 35305 Grünberg • Germany

Postfach 1161 • 35301 Grünberg • Germany

Tel.: +49 (0)6401-807-0

Fax: +49 (0)6401-807-259

E-Mail: [info@bender-de.com](mailto:info@bender-de.com)

Web: <http://www.bender-de.com>

---

## Messstromwandler

Deutsch

### Bestimmungsgemäße Verwendung

Messstromwandler der Serie **W10/600...** sind bestimmt für den Einsatz in Verbindung mit:

- Differenzstrom-Überwachungssystemen der Serie RCMS460/490 und RCMS470,
- Differenzstrom-Überwachungsgeräten der Serie RCM420, RCM460 und RCM470,
- Isolationsfehler-Suchsystemen der Serie EDS460/490 und EDS470.

Messstromwandler **W10/8000...** sind bestimmt für den Einsatz in Verbindung mit

- Isolationsfehler-Auswertegeräten EDS473(E)-12, EDS474(E)-12, EDS461 und EDS491.

### Sicherheitshinweise allgemein

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

- die bestehenden Sicherheitsvorschriften,
- das beiliegende Blatt "Wichtige sicherheitstechnische Hinweise für BENDER-Produkte",
- die Technische Information „Wandlerinstallation“,
- die Bedienungsanleitung des verwendeten RCM(S) bzw. EDS.

### Funktionsbeschreibung

Die Messstromwandler der Serie W10/600... und W10/8000... sind hochempfindliche Wandler, die AC-Ströme in Verbindung mit Differenzstrom-Überwachungs- und Auswertegeräten der Serie RCM bzw. RCMS in ein auswertbares Messsignal umsetzen.

Weiterhin sind sie für den Einsatz mit Isolationsfehler-Suchsystemen für IT-Systeme EDS geeignet. Sie dienen zur Erfassung des von einem Isolationsfehler-Prüfgerät PGH oder A-ISOMETER® IRDH generierten Prüfstromes. Der Prüfstrom wird in Verbindung mit Isolationsfehler-Auswertegeräten der Serie EDS in ein auswertbares Messsignal umgesetzt.

Die Verbindung zu den jeweiligen Geräten erfolgt über eine zweiadrige Leitung.

### Montage und Anschluss



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

## Measuring current transformer

English

### Intended use

The measuring current transformers of the **W10/600...** series are used in combination with

- residual current monitoring systems of the RCMS460/490 and RCMS470 series,
- residual current monitors of the RCM420, RCM460 and RCM470 series,
- insulation fault location systems of the EDS460/490 and EDS470 series.

The measuring current transformers of the **W10/8000...** series are used in combination with

- insulation fault evaluators EDS473(E)-12, EDS474(E)-12, EDS461 and EDS491.

### General safety information

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

- the current safety regulations,
- the enclosed sheet „Important safety instructions for BENDER products“,
- the technical information „Installation instructions for BENDER measuring current transformers“,
- the operating manual of the connected RCM(S) or EDS.

### Function

The measuring current transformers of the W10/600... and W10/8000... series are high-sensitive transformers which in combination with residual current monitoring devices and evaluators of the RCM or RCMS series convert AC currents into evaluable measurement signals.

In combination with insulation fault location systems, the current transformers are suitable for insulation fault location in IT systems. The current transformers measure the test current generated by the insulation fault test device PGH or by an A-ISOMETER IRDH. In combination with insulation fault evaluators of the EDS series, the test current is converted into evaluable measurement signals.

The connection to the respective devices is via a two-wire cable.

### Installation and connection



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

**Maße und Gewichte**

Alle folgenden Maße sind in mm angegeben.

**Dimensions and weights**

All dimensions given in mm.

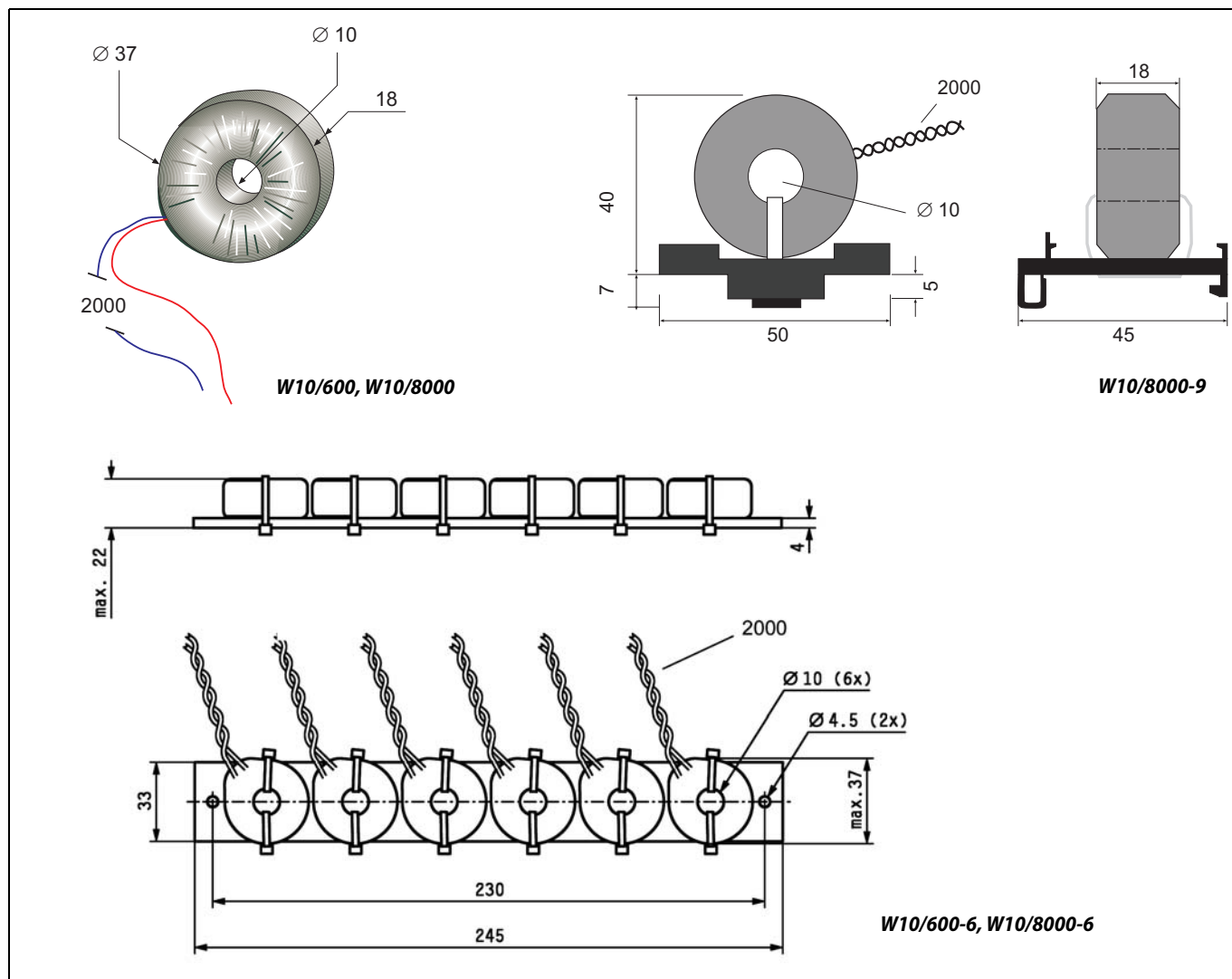


Abb. 1: Maßbilder, alle Maße in mm; Anschlusskabel ca. 2 m lang, verdreht

Figure 1: Dimension diagrams, dimensions in mm; Connecting cable, length approx. 2 m, twisted conductors

**Gewichte**

Typ	Gewicht
W10/600	90 g
W10/600-6	600 g
W10/8000	90 g
W10/8000-6	600 g
W10/8000-9	100 g

**Weight**

Type	Weight
W10/600	90 g
W10/600-6	600 g
W10/8000	90 g
W10/8000-6	600 g
W10/8000-9	100 g

**Installationshinweise**

- Es ist darauf zu achten, dass alle stromführenden Leitungen durch den Messstromwandler geführt werden.
- Keine abgeschirmten Leitungen durch den Messstromwandler führen.
- Ein vorhandener Schutzleiter darf grundsätzlich nicht durch den Wandler geführt werden!

**Installation instruction**

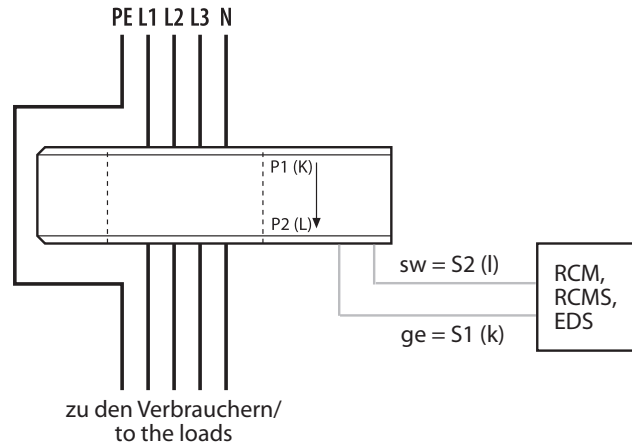
- Make sure that all current-carrying leads are passed through the measuring current transformer.
- Do not pass shielded conductors through the measuring current transformer.
- Never pass a PE conductor through the measuring current transformer!

**Anschlusschaltbild**

- W10/600... Anschluss an jeweiliges Differenzstrom-Überwachungssystem der Serie RCMS, Differenzstrom-Überwachungsgeräte der Serie RCM oder Isolationsfehler-Suchsysteme der Serie EDS
- W10/8000... Anschluss an jeweilige Isolationsfehler-Auswertegeräte EDS473(E)-12, EDS474(E)-12, EDS461 und EDS491

**Wiring diagram**

- W10/600... Connection to the respective residual current monitoring system of the RCMS series, residual current monitors of the RCM series or insulation fault location systems of the EDS series
- W10/8000... Connection to the respective insulation fault evaluator EDS473(E)-12, EDS474(E)-12, EDS461 and EDS491



**Technische Daten**

**Isolationskoordination nach IEC 60664-1 / IEC 60664-3**

Bemessungsspannung .....	800 V
Bemessungs-Stoßspannung / Verschmutzungsgrad .....	8 kV/III

**Wandlerkreis W10/600...**

Primärer Bemessungs-Differenzstrom .....	10 A
Sekundärer Bemessungs-Differenzstrom .....	0,0167 A
Bemessungsübersetzung $K_n$ .....	10 / 0,0167 A
Bemessungsbürde .....	max. 180 $\Omega$
Bemessungsleistung .....	0,05 VA
Frequenzbereich .....	42 Hz ... 3 kHz
Thermischer Bemessungs-Dauerdifferenzstrom $I_{cth}$ .....	40 A
Thermischer Bemessungs-Kurzzeitstrom $I_{tth}$ .....	$60 \times I_{cth} = 2,4 \text{ kA} / 1 \text{ s}$
Bemessungs-Stoßstrom $I_{dyn}$ .....	$2,5 \times I_{tth} = 6,0 \text{ kA} / 40 \text{ ms}$

**Wandlerkreis W10/8000...**

Primärer Bemessungs-Differenzstrom .....	1 A
Sekundärer Bemessungs-Differenzstrom .....	0,125 mA
Bemessungsübersetzung $K_n$ .....	1 A / 0,125 mA
Frequenzbereich .....	42 Hz ... 3 kHz
Thermischer Bemessungs-Dauerdifferenzstrom $I_{cth}$ .....	6 A
Thermischer Bemessungs-Kurzzeitstrom $I_{tth}$ .....	$60 \times I_{cth} = 0,36 \text{ kA} / 1 \text{ s}$
Bemessungs-Stoßstrom $I_{dyn}$ .....	$2,5 \times I_{tth} = 0,9 \text{ kA} / 40 \text{ ms}$

**Umwelt**

Arbeitstemperatur .....	-25 °C ... +70 °C
Klimaklassen nach IEC 60721	
Ortsfester Einsatz (IEC 60721-3-3) .....	3K5 (ohne Betauung und Eisbildung)
Transport (IEC 60721-3-2) .....	2K5 (ohne Betauung und Eisbildung)
Langzeitlagerung (IEC 60721-3-1) .....	1K5 (ohne Betauung und Eisbildung)
Mechanische Beanspruchung nach IEC 60721	
Ortsfester Einsatz (IEC 60721-3-3) .....	3M4
Transport (IEC 60721-3-2) .....	2M2
Langzeitlagerung (IEC 60721-3-1) .....	1M3

**Anschluss**

Anschlussleitung .....	Einzeldraht, verdreht
Länge .....	2 m

**Technical data**

**Insulation coordination acc. to IEC 60664-1 / IEC 60664-3**

Rated voltage .....	800 V
Rated impulse voltage / pollution degree .....	8 kV / III

**CT circuit W10/600...**

Rated primary residual current .....	10 A
Rated secondary residual current .....	0.0167 A
Rated transformation ratio $K_n$ .....	10 / 0.0167 A
Rated burden .....	max. 180 $\Omega$
Rated output .....	0.05 VA
Frequency range .....	42 Hz ... 3 kHz
Rated continuous thermal current $I_{cth}$ .....	40 A
Rated short-time thermal current $I_{tth}$ .....	$60 \times I_{cth} = 2.4 \text{ kA} / 1 \text{ s}$
Rated dynamic current $I_{dyn}$ .....	$2.5 \times I_{tth} = 6.0 \text{ kA} / 40 \text{ ms}$

**CT circuit W10/8000...**

Rated primary residual current .....	1 A
Rated secondary residual current .....	0.125 A
Rated transformation ratio $K_n$ .....	1 A / 0.125 mA
Frequency range .....	42 Hz ... 3 kHz
Rated continuous thermal current $I_{cth}$ .....	6 A
Rated short-time thermal current $I_{tth}$ .....	$60 \times I_{cth} = 0.36 \text{ kA} / 1 \text{ s}$
Rated dynamic current $I_{dyn}$ .....	$2.5 \times I_{tth} = 0.9 \text{ kA} / 40 \text{ ms}$

**Environment**

Operating temperature .....	-25 °C ... +70 °C
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3) .....	3K5 (except condensation and formation of ice)
Transportation (IEC 60721-3-2) .....	2K5 (except condensation and formation of ice)
Storage (IEC 60721-3-1) .....	1K5 (except condensation and formation of ice)
Classification of mechanical conditions .....	
Stationary use (IEC 60721-3-3) .....	3M4
Transportation (IEC 60721-3-2) .....	2M2
Storage (IEC 60721-3-1) .....	1M3

**Connection**

Connecting cable .....	single wire, twisted conductors
Length .....	2 m

**Verbindung EDS, RCM(S)-Messstromwandler**

Einzeldraht $\geq 0,75 \text{ mm}^2$ .....	0...1 m
Einzeldraht verdreht $\geq 0,75 \text{ mm}^2$ .....	0...10 m
Schirmleitung $\geq 0,5 \text{ mm}^2$ .....	0...40 m
Empfohlene Leitung (geschirmt) .....	J-Y(ST)Y min. 2 x 0,8

**Sonstiges**

Zulassung ..... UL in Vorbereitung

**Normen**

Die Messstromwandler der Serie W10/600..., W10/8000... entsprechen IEC 60044-1.

**Bestellangaben**

Typ	Befestigung			Art.-Nr.
	Hut-schiene	Schraub-befesti-gung	Kabel-binder	
W10/600	--	--	×	B 911 761
W10/600-6	--	×	--	B 911 901
W10/8000	--	--	×	B 911 759
W10/8000-6	--	×	--	B 911 900
W10/8000-9	×	--	--	B 911 786

**Auswahltabelle**

Typ /Type	RCM420	RCM470	RCMS460/490	EDS460/490	EDS461/491	EDS470	EDS473	EDS474
W10/600	×	×	×	×	--	×	--	--
W10/600-6	×	×	×	×	--	×	--	--
W10/8000	--	--	--	--	×	--	×	×
W10/8000-6	--	--	--	--	×	--	×	×
W10/8000-9	--	--	--	--	×	--	×	×

**Connection EDS, RCM(S), CT**

Single wire $\geq 0,75 \text{ mm}^2$ .....	0...1 m
Single wire, twisted $\geq 0,75 \text{ mm}^2$ .....	0...10 m
Shielded cable $\geq 0,5 \text{ mm}^2$ .....	0...40 m
Recommended cable (shielded) .....	J-Y(ST)Y min. 2 x 0,8

**Other**

Approval ..... UL (under consideration)

**Standards**

The measuring current transformers of the W10/600..., W10/8000... series comply with the requirements of IEC 60044-1.

**Ordering details**

Type	Fixing			Art. No.
	DIN rail	Screw fixing	cable tie	
W10/600	--	--	×	B 911 761
W10/600-6	--	×	--	B 911 901
W10/8000	--	--	×	B 911 759
W10/8000-6	--	×	--	B 911 900
W10/8000-9	×	--	--	B 911 786

**Selection table**

Alle Rechte vorbehalten.  
Nachdruck und Vervielfältigung  
nur mit Genehmigung des Herausgebers.  
Änderungen vorbehalten!  
© Dipl.-Ing. W. Bender GmbH & Co.KG



**BENDER GROUP**

All rights reserved.  
Reprinting and duplicating  
only with permission of the publisher.  
Subject to change!  
© Dipl.-Ing. W. Bender GmbH & Co.KG

