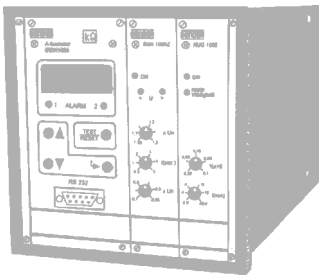
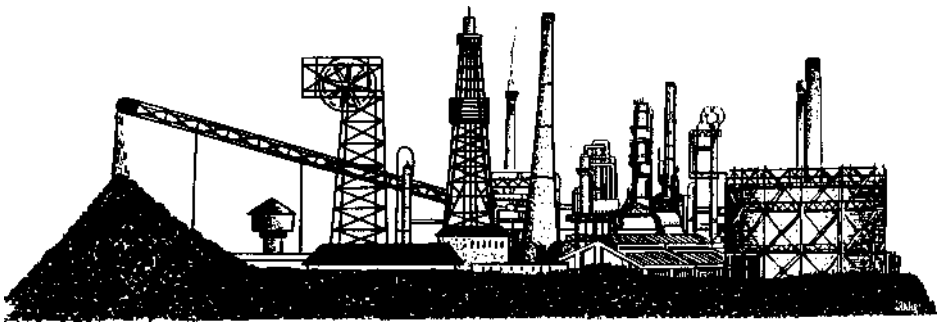
BENDER





Insulation and voltage monitoring of DC systems

RGG 804

Operating Manual

Quality System Certified ISO 9001

CE

TGH 1289E

Insulation and voltage montoring of DC systems - Operating manual
TGH 1289E

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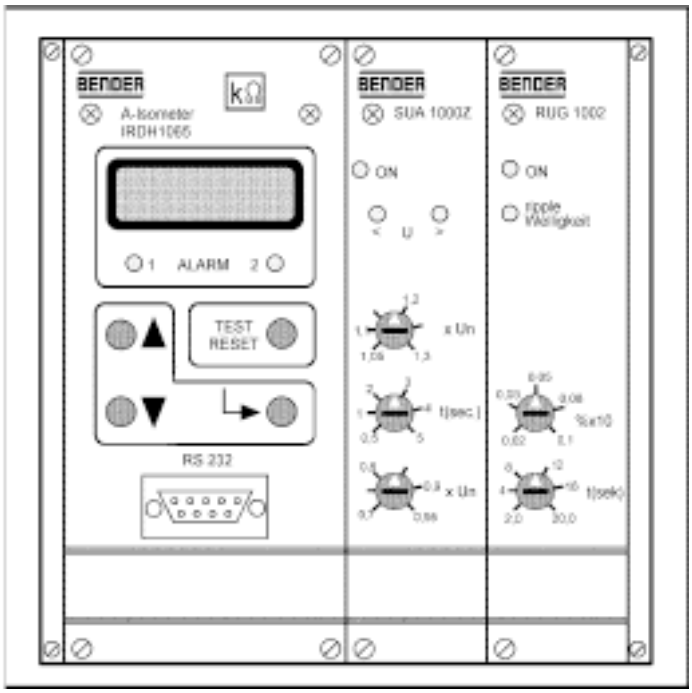

Insulation monitor IRDH1065B-4..

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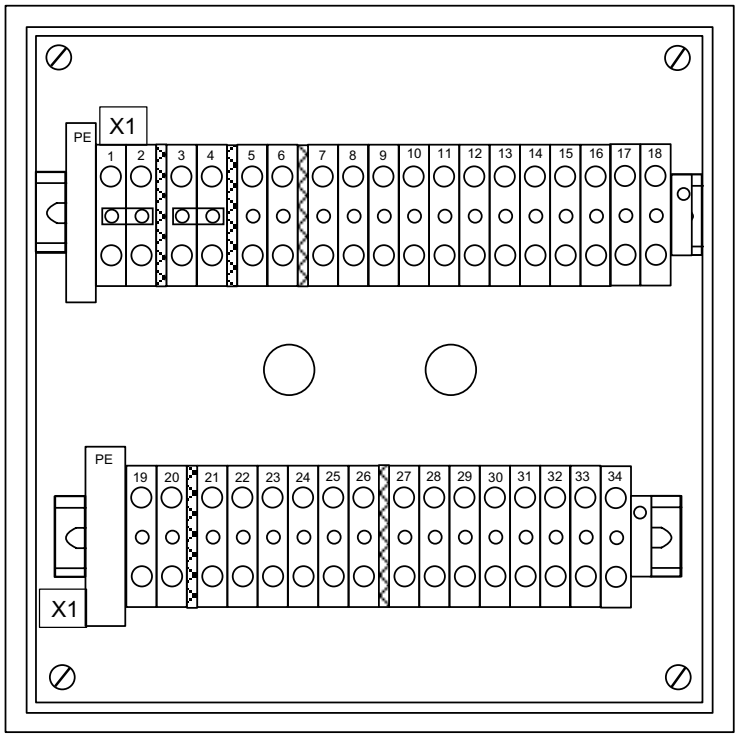
Rearview



Description

The system monitoring unit RGG804 is used for monitoring unearthed DC circuits - especially battery circuits - for under / over voltage, ripple and insulation. RGG804 is available for different DC system voltages (please refer to the units type plate).

This unit is especially used for the monitoring of shaft and mining equipment corresponding to VDE 0118, section 3, paragraph 13.4.4 of the TAS Standard, Technical Requirements on shaft and lateral slope conveyor equipment.

The TAS - Standard requires:

4.2.4:
Siagnalling installations must be additionally monitored for insulation fault and DC under voltage.

4.2.5:
The monitoring device of DC signalling installations must switch off the signalling installation immedietaly in case of a voltage drop of more than 10 % of the nominal voltage and in case of a decrease of the insulation value of a core below 250 Ω/v within the last 45 s after occurence of the fault. If one of these faults occurs during driving, disconnection may only rsult after termination of driving. An optical or an acoustic sign must be issued at the operator´s station of the driving machine.

The equipment shold not be put into operation until the fault is removed. The only exception is described below:

4.2.6:
Different from item 4.2.5 signalling installations without relay - expect for the alarm signal expansion relay - do not have to be switched off automatically. If the insulation value drops below 100 Ω/V, an optical or an acoustic sign has to be released at the operator´s station of the driving machine.

Safety instructions

Intended usage

RGG804 is exclusively to be used for measuring and evaluating the insulation resistance and the system voltage in IT d.c. systems 60, 125 or 220 V.

Using RGG804 for other purposes relieves Bender group from any liability for damages resulting thereof.

In principle, the BENDER "General Terms of Sale and Delivery" apply. These will be available to the user by the contract completion date, at the latest.

Guarantee and liability

Guarantee and liability claims in case of damages to persons or property are not granted if they can be traced back to one or more of the following reasons:

- Usage of the RGG804 not for the intended purpose
- Improper set-up, commissioning, operation and maintenance of the RGG804
- Non-observance of the manual instructions concerning transportation, storage, set-up, commissioning, operation and maintenance of RGG804
- Unauthorized modifications
- Non-observance of the technical data
- Improper repairs and the use of spare parts or accessories not recommended by the manufacturer
- Catastrophes and events caused by external influences and factors beyond normal control, e.g. acts of God
- Set-up or installation of the RGG804 in combination with devices not recommended by Bender.

Originator rights

The originator right to the RGG804 manual remains with the BENDER Group. Usage is restricted to the owner and his employees. This manual contains regulations and instructions that may neither be duplicated completely or partly, nor distributed or made known to other parties in any other form.
Violations may be subject to criminal prosecution.

A basic requisite for the handling and fault-free operation of the RGG804 is the knowledge of the basic safety instructions and regulations.

This manual and in particular the safety instructions have to be observed by all operators of the RGG804.

In addition, the valid rules and regulations for the prevention of accidents at the testing location have to be observed.

Only qualified personnel may work with the RGG804. By qualified is meant that the person operating the RGG804 is acquainted with its set-up, commissioning, and operation, and that the personnel has been trained accordingly to accomplish the intended task. The personal must have read and understood the chapter on safety and the warning instructions.

Safety instructions

Significance of symbols

The following symbols and instructions are used in BENDER documentation to instruct the person handling the equipment on its use and operation:

This symbol indicates that the life and health of involved personnel is jeopardized to a high degree. Disregarding this warnings **will** cause **fatal** accidents, serious bodily injuries, or considerable material damage unless relevant precautions are taken.

This symbol stands for possible danger to the life and health of persons.
Death to persons, serious personal injuries or serious damage **may** occur unless the relevant precautions are taken.

This symbol stands for a possible dangerous situation.
Minor personal injuries or material damage may occur unless the relevant precautions are taken.

This symbol stands for important notes concerning the proper use of the RGG804.
Disregarding of these notes may lead to malfunctions at the RGG804 or in its environment.

The notes besides this symbol provide tips on use and especially useful information.
They help to use all functions of the RGG804 at an optimum.

Dangers when operating the system

RGG804 incorporates the latest technology in circuit design, material, components, and manufacturing techniques. BENDER have ISO9001 certification which exerts both a direct and indirect influence on the product from concept to production. Even so, there is always the danger that RGG804 and/or connected equipment may be damaged during use or worse that it may endanger the life of the operator or technician and other persons involved with during the test. For this reason, the RGG804 is only to be used:

- for the intended purpose
- in a perfectly safe condition

Malfunctions that may impair safety must be eliminated immediately. Unauthorized modifications and the use of spare parts and accessories that are not sold or recommended by the manufacturer may cause fires, electric shocks, and injuries.

Note

Please check for correct supply voltage !
Unauthorized persons must not be given access to the RGG804.
Warning signs must always be legible. Damaged or unreadable signs have to be replaced immediately.

Check, transportation and storage

Check the shipping container and the packing for damages and compare the contents of the packing with the shipping documents. In case of damages in transit, please inform BENDER Group or its representatives immediately.
RGG804 may only be stored in places that are protected against dust, humidity, water jets and dripping water and where the specified storing temperatures are observed.

Guarantee

BENDER Group warrants RGG804 and its components to be free from defects in materials and workmanship for a period of 12 months from the date of delivery, as long as it is used and maintained per the guidelines and constraints in this manual.
This warranty does not apply to any kind of maintenance works.

The remedies provided herein are the buyer's sole and exclusive remedies. This warranty does not include products or parts of it that have been used improperly or that have been modified. This warranty becomes void when operating RGG804 under abnormal conditions.

The warranty obligation is limited to repairs or to exchange of a product that has been returned to BENDER within the period covered by the warranty. As a prerequisite, BENDER must agree that the product is faulty, and that the faults cannot be traced back to improper handling or modifications of the device or abnormal operating conditions.

Any warranty obligation becomes void if repairs of RGG804 were undertaken by persons not authorized by BENDER. The before-mentioned warranty terms are valid exclusively, and instead of all other contractual or legal guarantee obligations, including, but not limited to the legal guarantee of market capability, the service usability and the usefulness for a certain application.

BENDER does not assume liability for directly or indirectly accompanying or resulting damages, no matter whether they can be traced back to proper, improper, or other actions.

The monitor RGG804 is a compact modular unit fitted in a panel mounting standard housing of 144 x 144 mm. The front panel is covered by a lockable plexiglass door. Behind the door, the replacable electronic boards are complete with control elements and indicators.

The following electronic cards are built in:

Insulation monitoring device IRDH1065B-4..

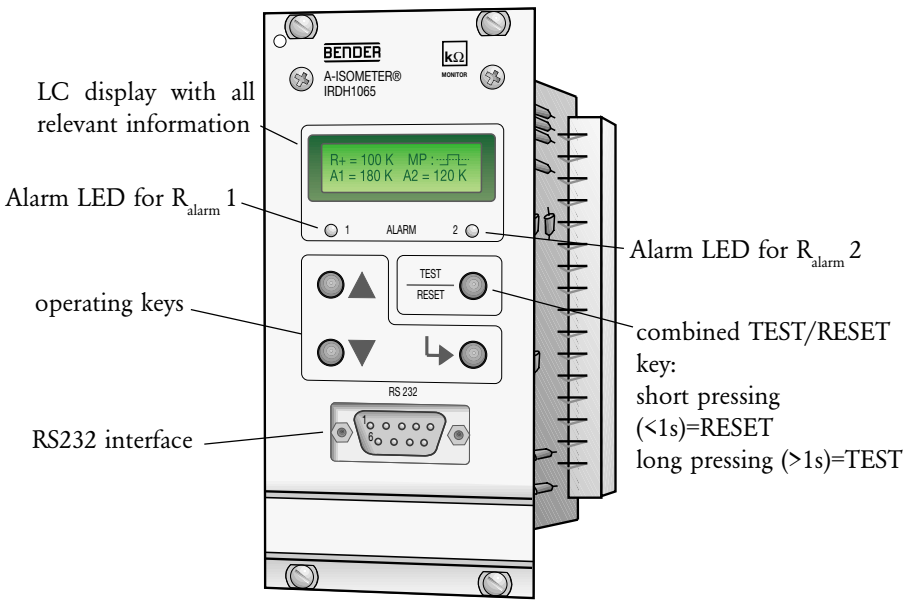
The IRDH1065B-4.. insulation monitor is used for the constant monitoring of unearthed DC or AC systems.

The respective insulation value of the total system is shown through an integrated LC display and can be set to 2 response values i.e., the prewarning and the second for the main alarm.

The alarm relays can operate in either NC or NO operation (Factory set to NC operation). A free changeover contact is included for remote signalling.

The remote signal is saved and the relays can be reset upon removal of the fault.
The insulation monitoring device has a RS485 and a RS232 serial interface for communication.

An additional feature is the integrated connection monitoring. If the connection to the system to be monitored is high ohmic (interrupted) this will be indicated on the LC display.



Construction

Here are the main features of IRDH1065B-4:

- suitable for AC, 3 AC and DC IT systems up to 500 V
- for higher voltages special coupling devices are available
- automatic adaptation to system leakage capacitances up to 150 µF (500µF)
- AMP measuring principle
- two adjustable set points (Al1 and Al2) 10 ... 990 kΩ
- LC display
- RS485 and RS232 interface
- 0/4 ... 20 mA current output or 0 ... 400 µA
- connection monitoring function
- automatic self-test

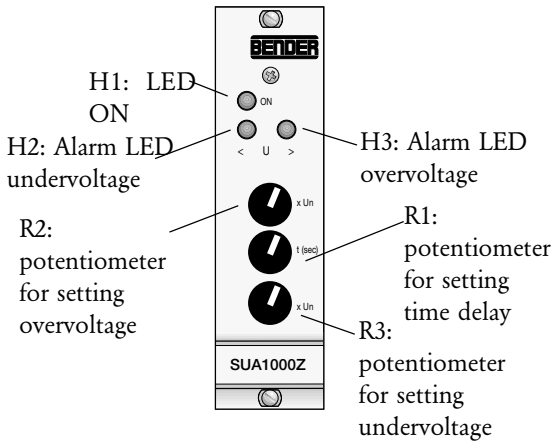
For detailled information about the insulation monitoring device IRDH1065B-4 please refer to the operating manual TGH1264.

Combined undervoltage and overvoltage relay SUA1000Z-...

The combined under/overvoltage relay SUA1000Z monitors the voltage in DC systems (see data sheet 3.4.17).

The response values for under/overvoltage can be set independently of each other; the adjustment is infinitely variable. An adjustable response delay enables the response to be delayed in case of short- term voltage fluctuations.

The unit does not need an external power supply. For this reason, a voltage relay designed for the circuit voltage is required.



When the circuit voltage U_N is switched on, the green LED H1 illuminates. Within the normal voltage range, the K1 and K2 relays are energised and the red LEDs H2 and H3 do not light up. The response values for over or undervoltage are set using the potentiometers R2, R3. Depending on system conditions, a response delay may be preset using the potentiometer R1. As soon as the under/overvoltage threshold value is reached, this status is indicated immediately by the red LEDs H2 or H3.

The alarm relays K1H and K2H do not drop out until the set delay of 0.5 sec. $\leq t_V \leq$ 5 sec. has expired. The alarm relay´s contacts are connected to terminal X1.21 ... 25.

This delay allows short term voltage changes to be suppressed. The delay is also effective for 100 % voltage drops.

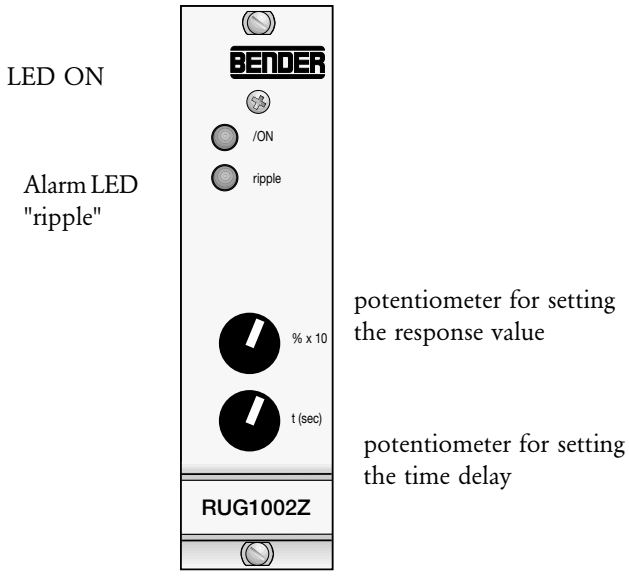
As soon as the monitored voltage returns to the normal range the relays K1H and K2H become energised without delay, the contacts close and the red indicators H2 and H3 extinguish.

Ripple Detector RUG1002Z-...

The ripple detector is used for continuous monitoring of the ripple component of a DC voltage. The ripple detector´s response values can be set on the front panel (externally).
A visual indication is given when the set value is exceeded and the set response delay is expired. A potential free alarm contact in NC operation is also available.

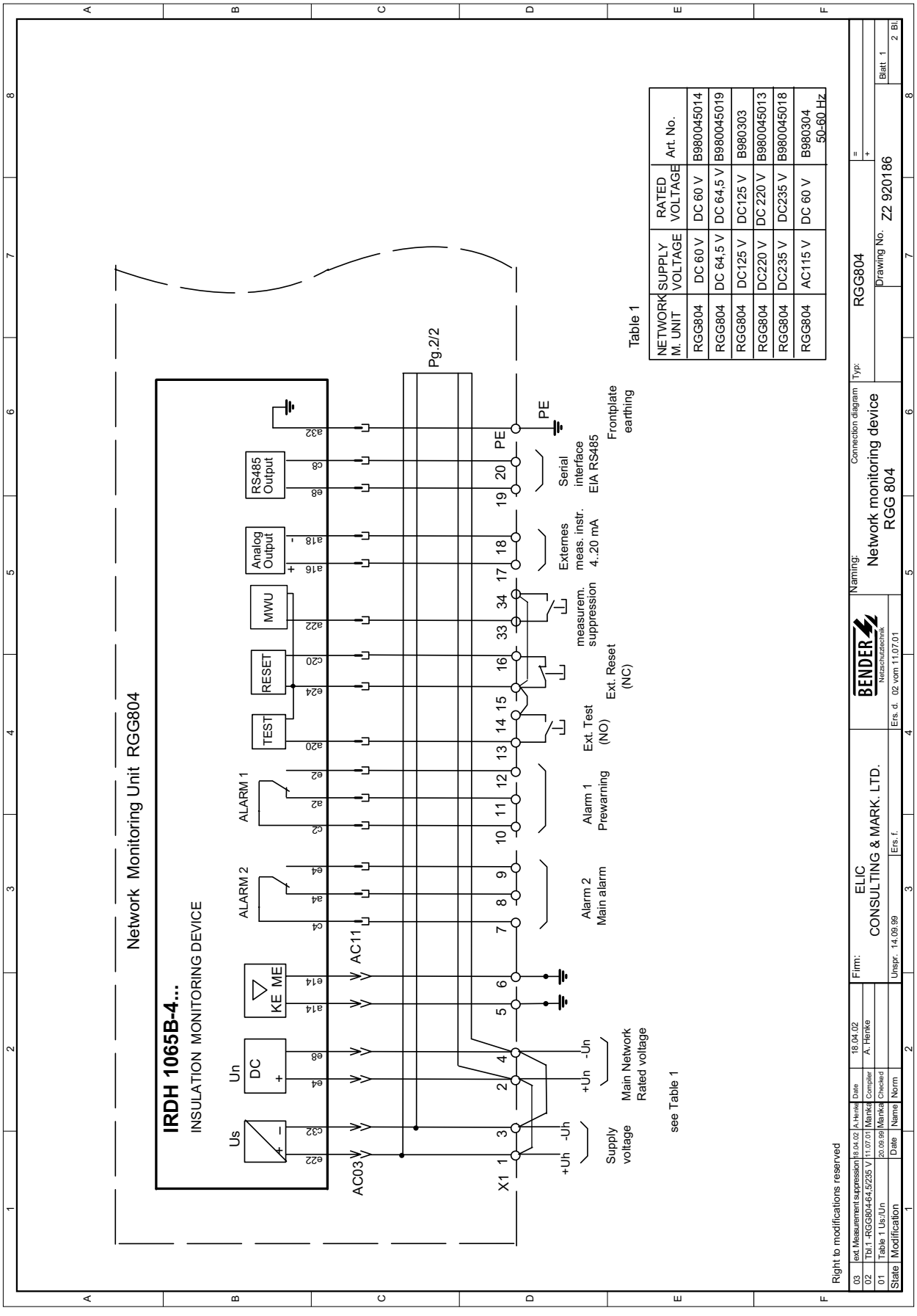
The response threshold of the RUG1002Z can be set from 0.2 ... 1% to 0.02 ... 0.1% U_N.

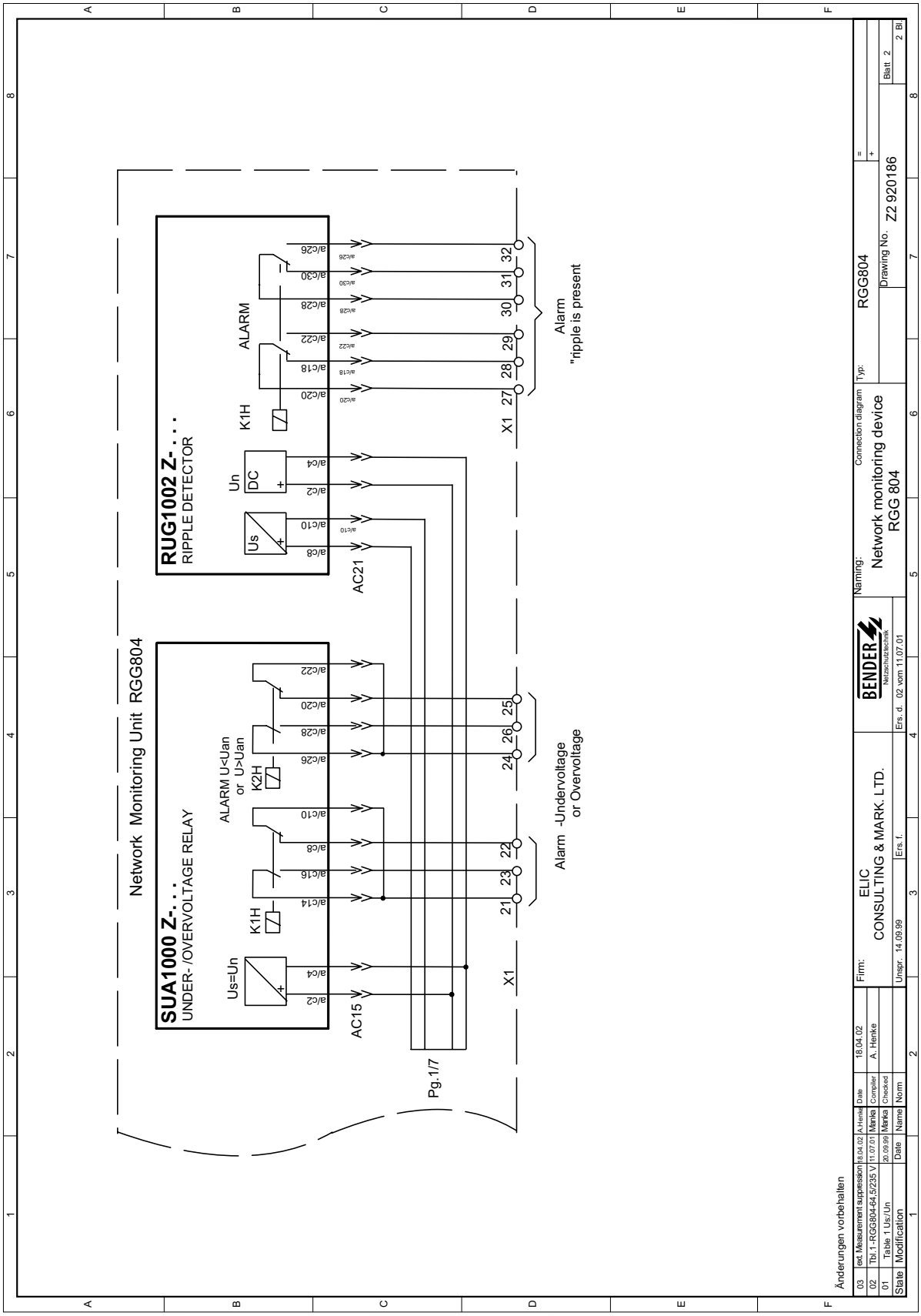
The ripple detector is supplied externally via terminals. The supply voltage can, however, be the same as the voltage of the system to be monitored (in the RGG804 unit, the supply voltage terminals are bridged on the terminal strip (X1.2 ... X1.4).



When the supply voltage US is present, the green LED H1 illuminates (supply "ON"). The internal power supply is galvanically separated from the supply voltage by the input DC/DC transducer and is stabilized.

If the response values set by R10 are exceeded, the LED H2 lights up via the time delay circuit and relay K1 is activated. The alarm is not stored in the memory. It resets automatically as soon as the fault has been removed.
The alarm relay´s contacts are connected to terminals X1.27 ... 32.


Network Monitoring Unit RGG804
IRDH 1065B-4...
INSULATION MONITORING DEVICE
Us
Un
DC
KE ME
ALARM 1
ALARM 2
TEST
RESET
MWU
Analog Output
RS485 Output
AC03
AC11
X1
Pg.2/2
PE
Frontplate earthing
Serial interface EIA RS485
Externes meas. instr. 4..20 mA
measurem. suppression
Ext. Reset (NC)
Ext. Test (NO)
Alarm 1 Prewarning
Alarm 2 Main alarm
Supply voltage
Main Network Rated voltage
see Table 1
Table 1
NETWORK M. UNIT | SUPPLY VOLTAGE | RATED VOLTAGE | Art. No.
RGG804 | DC 60 V | DC 60 V | B980045014
RGG804 | DC 64.5 V | DC 64.5 V | B980045019
RGG804 | DC125 V | DC125 V | B980303
RGG804 | DC220 V | DC 220 V | B980045013
RGG804 | DC235 V | DC235 V | B980045018
RGG804 | AC115 V | DC 60 V | B980304 50-60 Hz
Right to modifications reserved
Firm: ELIC CONSULTING & MARK. LTD.
BENDER Netzschutztechnik
Naming: Network monitoring device RGG 804
Connection diagram
Typ: RGG804
Drawing No. Z2 920186
Blatt 1 2 Bl.
03 ext.Measurement suppression 18.04.02 A.Henke
02 Tbl.1 -RGG804-64,5/235 V 11.07.01 Manke
01 Table 1 Us/Un 20.09.99 Manke
State Modification Date Name
Date 18.04.02
Compiler A. Henke
Checked
Norm
Unspr. 14.09.99
Ers. f.
Ers. d. 02 vom 11.07.01


Network Monitoring Unit RGG804
SUA1000 Z-...
UNDER- /OVERVOLTAGE RELAY
Us=Un
K1H
ALARM U<Uan
or U>Uan
K2H
AC15
X1
21
23
22
24
26
25
Alarm -Undervoltage
or Overvoltage
RUG1002 Z-...
RIPPLE DETECTOR
Un
DC
Us
K1H
ALARM
AC21
X1
27
28
29
30
31
32
Alarm
"ripple is present
Pg.1/7
Änderungen vorbehalten
Firm: ELIC CONSULTING & MARK. LTD.
BENDER Netzschutztechnik
Naming: Network monitoring device RGG 804
Connection diagram
Typ: RGG804
Drawing No. Z2 920186
Blatt 2
2 Bl.
Ers. d. 02 vom 11.07.01
Ers. f.
Unspr. 14.09.99
Norm
Checked
Compiler A. Henke
Date 18.04.02
03 ext. Measurement suppression 18.04.02 A.Henke
02 Tbl.1-RGG804-64,5/235 V 11.07.01 Mahlke
01 Table 1 Us/Un 20.09.99 Mahlke
State Modification Date Name

Wiring, Commissioning

First of all please check for correct system voltage and supply voltage !

The system monitoring unit is wired acc. to the wiring diagram afore.

The screw terminals are available for connection leads up to max. 2.5 mm^2.

Ensure that all boards are put in their correct slots!

Terminals 1 and 2, resp., 3 and 4, are already bridged by factory if supply voltage and rated voltage are identical. These links should not be removed unless the RUG1002Z and the IRDH1065B-4 are to be supplied separately. In this case, the operating voltage should be connected to terminals 1 and 3 (please observe correct polarity). Terminals 5 and 6 should be connected to earth. This terminal serves as a test point for the earth fault monitor. For insulation testing, the earth conductor should be disconnected from this terminal for the duration of the test.

The response values are set in accordance with the operational requirements.

For short circuit protection the connections to the supply voltage and the system connection of SUA1000Z and RUG1002Z have to be equipped with protective devices according IEC 364-4-473. Recommendation: 6 A fuses.

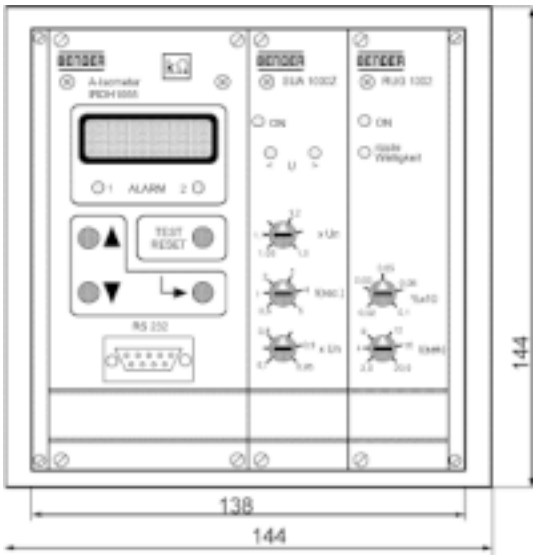
For the system coupling, safety devices to provide protection in case of short-circuit can only be omitted if the possibility of a short-circuit is reduced to a minimum (on this subject, see IEC 364-4-473). In these cases, cabling which is proof against short-circuits and short-circuits to earth is advisable as the minimum.

Only one insulation monitoring device may be used in each interconnected system. Two or more insulation monitoring devices in one system will inevitably lead to measuring faults due to their parallel connection.

When insulation and voltage test are to be carried out, the RGG804 must be isolated from the system during the test period.

Note: All plug-in cards and the corresponding slots are coded. Therefore it is impossible to plug a card into a wrong slot or to plug a card for a wrong voltage into a rack.

Dimensions



All dimensions in mm.

Panel cut-out is 138 x 138 mm

Technical data

General technical specifications RGG804

Nominal insulation voltage	250V
Insulation group acc. to VDE 0110, 11/79	C
Test voltage	2000 V
Operation class	permanent operation
Rated voltage U_n	Versions available for DC 60; 64,5; 125; 220 or 235 V **please see type plate**
Operating range of U_n	0.8 - 1.2 U_N
Max. system leakage capacitance C_E	150 µF
Supply voltage U_s	Versions available for DC 60; 64,5; 125; 220 or 235 V or AC 50-60 Hz 115 V **please see type plate**
Operating range of Us	0.7 - 1.3 Us
Self consumption	10 VA

Response values

Insulation monitoring device IRDH1065B-4..	10 ... 990 kΩ for alarm1 and alarm2
Voltage monitoring device SUA1000Z-...:	
Overvoltage	1.05 ... 1.3 x Un
Undervoltage	0.7 ... 0.95 x Un
Time delay	0.5 ... 5 seconds
Ripple monitoring device RUG1002Z-...	0.02 ... 0.1 % Un or 0.2 ... 1 % Un
Time delay	2 ... 20 seconds

Switching components

IRDH1065B-...	2 alarm relays, adjustable NC/NO
SUA1000Z-...	2 NC and 2 NO contacts
RUG1002-Z-...	2 change over contacts NC/NO
Contact class according to IEC 255	IIB
Rated contact voltage	AC 250 V / DC 300 V
Admissible number of operations	12 000 cycles
Making capacity	UC 5 A
Breaking capacity at AC 230 V cos phi 0.4	2A
Breaking capacity at DC 220 V L/R=0.04 s	0.2 A

General data

Admisseble ambient temperature	
when operating	-10°C ... +55°C 263 K ... 328 K
when stored	-20°C ... +60°C 253 K ... 333 K
Mounting	panel mounting enclosure 144x144x185 mm
Panel cutout	138x138 mm
Type of connection	screw terminal strip
Wire cross section	0.2 ... 2.5 mm^2
Protection class acc. to IEC 529	
Internal components	IP 42
Terminals	IP 20
Weight	2.5 kg

SUA1000Z

The response values can be set using potentiometer R2 (undervoltage) and potentiometer R3 (overvoltage). The adjustment is infinitely variable. Set the thresholds using a suitable screwdriver. Depending on the system conditions and the required degree of protection, the user must select the required response values. In battery circuits, the thresholds are determined by the charging and discharging characteristivs of the batteries used.

Setting the response values for over and undervoltage

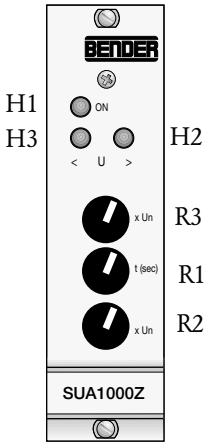
The potentiometer scales are marked 0.7 - 0.95 and 1.05 - 1.3. Example: If the potentiometer is set to an overvoltage factor of 1.15, an overvoltage will be indicated (alarmrelay drops out and LED illuminates) when the voltage rises to 1.15 x rated circuit voltage.
Example:
220 V = UN, setting R1 = 1.15. An overvoltage will be indicated at 220 V x 1.15 = 253 V.

The undervoltage threshold is set in the same way..
The setting may be carried out during circuit operation.

Setting the response delay

The response delay of the under/overvoltage relay SUA1000Z can be set using the potentiometer R1 on the front panel; the adjustment is infinitely variable. This allows unwanted indications to be suppressed, i.e. short term voltage drops.

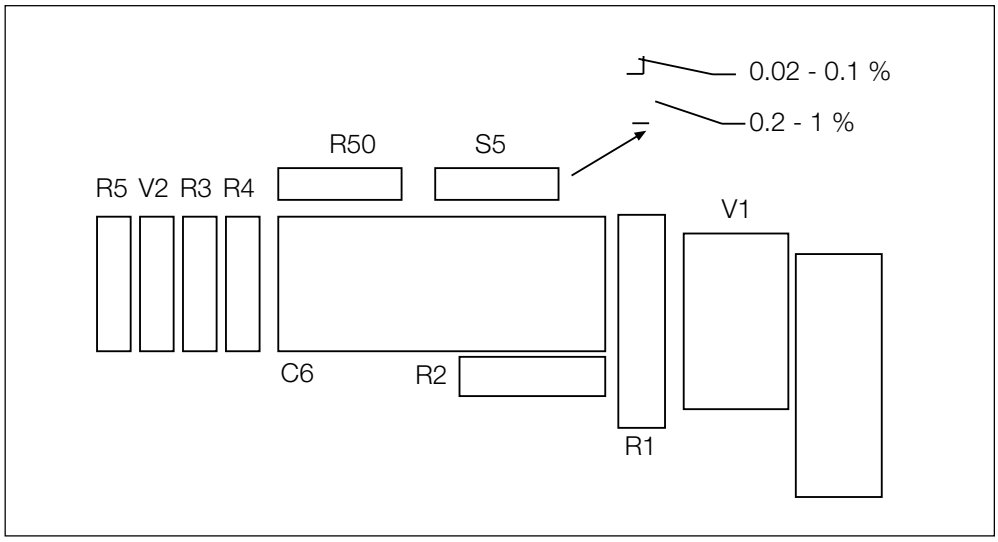
The setting may be altered during operation.



RUG1002Z

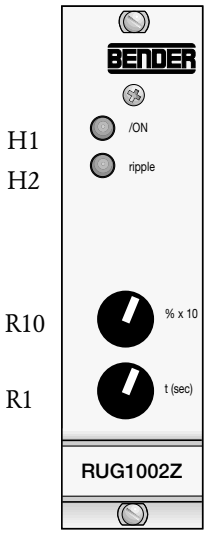
The ripple detector response can be set between 0.02% and 0.1% using a suitable screwdriver; the adjustment is infinitely variable (potentiometer R10 on the front plate).

The setting range can be selected between 0.02 to 0.1 % and 0.2 to 1 % with a code switch on the pcb.



The required response response depends on the system conditions. The percentages given represent the ratio between the average ripple voltage and the DC system voltage.

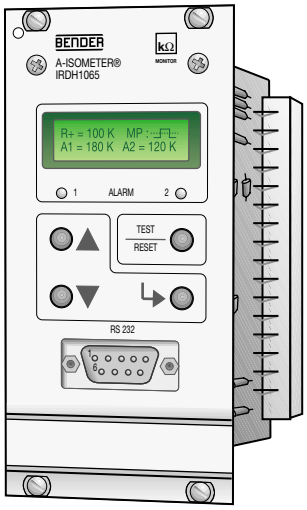
The response delay of the ripple detector may be steplessly adjusted using the potentiometer R1 on the front plate.



H1
H2
R10
R1

IRDH1065B-4

The fundamental functions



- For IT AC systems with galvanically connected rectifiers and IT DC systems (isolated power).
- Universal for 3(N)AC systems, AC systems up to 500 V and DC systems up to 500 V.
- Extended voltage range with coupling devices.
- Automatic adaptation to the existing system leakage capacitance up to 150 µF (500 µF).
- AMP measuring principle (patent pending).
- Two adjustable response ranges 10 ... 990 kΩ.
- LC display.
- Connection monitoring.
- Automatic self-test.

Product description

The A-ISOMETER IRDH1065 monitors the insulation resistance of IT systems. It is universally suitable for 3(N) AC systems, AC/DC systems as well as DC systems. The AC system may include extensive DC-supplied loads (such as rectifiers, converters, thyristor-controlled DC drives). The device automatically matches to the system leakage capacitance.
Coupling devices are available to extend the working to voltages above 500 V.
The A-ISOMETER IRDH1065 is built onto a plug-in p.c.b. in Eurocard format, 100 x 160 mm. The controls and displays are integrated in the frontplate, width 60.96 mm (12 TE). The device can be connected via plug-in connectors according to DIN 41 612, design E 48.

Function

The A-ISOMETER IRDH1065 is connected between the unearthed system and the protective conductor (PE).
The response values and parameters can be set by using the operator buttons. The parameters will be indicated on the LC display and stored in a non-volatile memory (EEPROM) after completing the setting.
A pulsating AC measuring voltage is superimposed on the system (AMP measuring principle*). The measuring pulse consists of positive and negative pulses of the same amplitude. The period depends on the respective leakage capacitances and the insulation resistance of the system being monitored. An insulation fault between system and earth closes the measuring circuit. An electronic evaluation circuit calculates the insulation resistance which is indicated on a LC display or an external kΩ meter after the measuring time.

The measuring time depends on the system leakage capacitance, the insulation resistance, as well as the system-related interference. System leakage capacitances do not influence the measuring accuracy.

If the reading is below the selected response values ALARM1/ALARM2, the respective alarm relays will be activated, the alarm LEDs "ALARM1/2" light and the measuring value is indicated on the LC display (in the event of DC insulation faults, the faulty supply line is indicated too). If the terminals e28 and e30 (reset button) are bridged (external RESET button [N/C contact] or wire jumper), the fault indication will be stored.

By pushing the test button, the function of the A-ISOMETER IRDH1065 can be tested. After pushing the test button (>2s), the display indicates "SYSTEM TEST". If no fault is found, the display will indicate "TEST OK (SET)", the alarm relays switch and both alarm LEDs light after the expiry of the delay time.If a fault is found during the test, the LC display will indicate "ALARM NO...". The fault indications can be reset by pushing the SET button.

The measurement suppression can be activated by closing the contacts X1.a22 and X1.e24. The internal resistance Ri changes >2MOhm and no measuring voltage is output. The current measuring value is stored. The LC display indicates "OFFLINE".

*) Measuring principle "adaptive measuring pulse“, developed by BENDER, patent pending.

Self test

If the insulation resistance of the system exceeds 20 MΩ, respectively every 24 hours, the A-ISOMETER IRDH1065 automatically carries out a self-test, provided that the alarm relay has been set to system fault alarm.

Connection monitoring

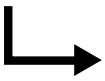
The connections to the IT system are monitored continuously. If a connection is broken or not connected, the LC display indicates "ALARM L1-L3".
In this case, please check the connecting leads immediately as otherwise the insulation resistance will not be measured correctly.
If the insulation resistance exceeds 20 MΩ, which may be the case in new or small systems, an alarm will be initiated, too. In this case, switch the connection monitoring (TEST L1-L3: OFF) off in the ADVANCED SETUP menu (sub menu: COUPLING TEST).

System fault

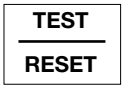
If a system fault occurs, the alarm message "ALARM NO ..." appears on the LC display. In this case, switch the supply voltage of the A-ISOMETER off for a short time and then switch it on again.
If the alarm message is still indicated after the expiry of the response time, there is a device error (see diagram "Test sequence and fault description" in the appendix).

Operator buttons

Press the <UP> and <DOWN> buttons to change the parameters or the adjustment within the respective menu.



Press the <SET> button to select the next sub menu or to store a parameter modification.

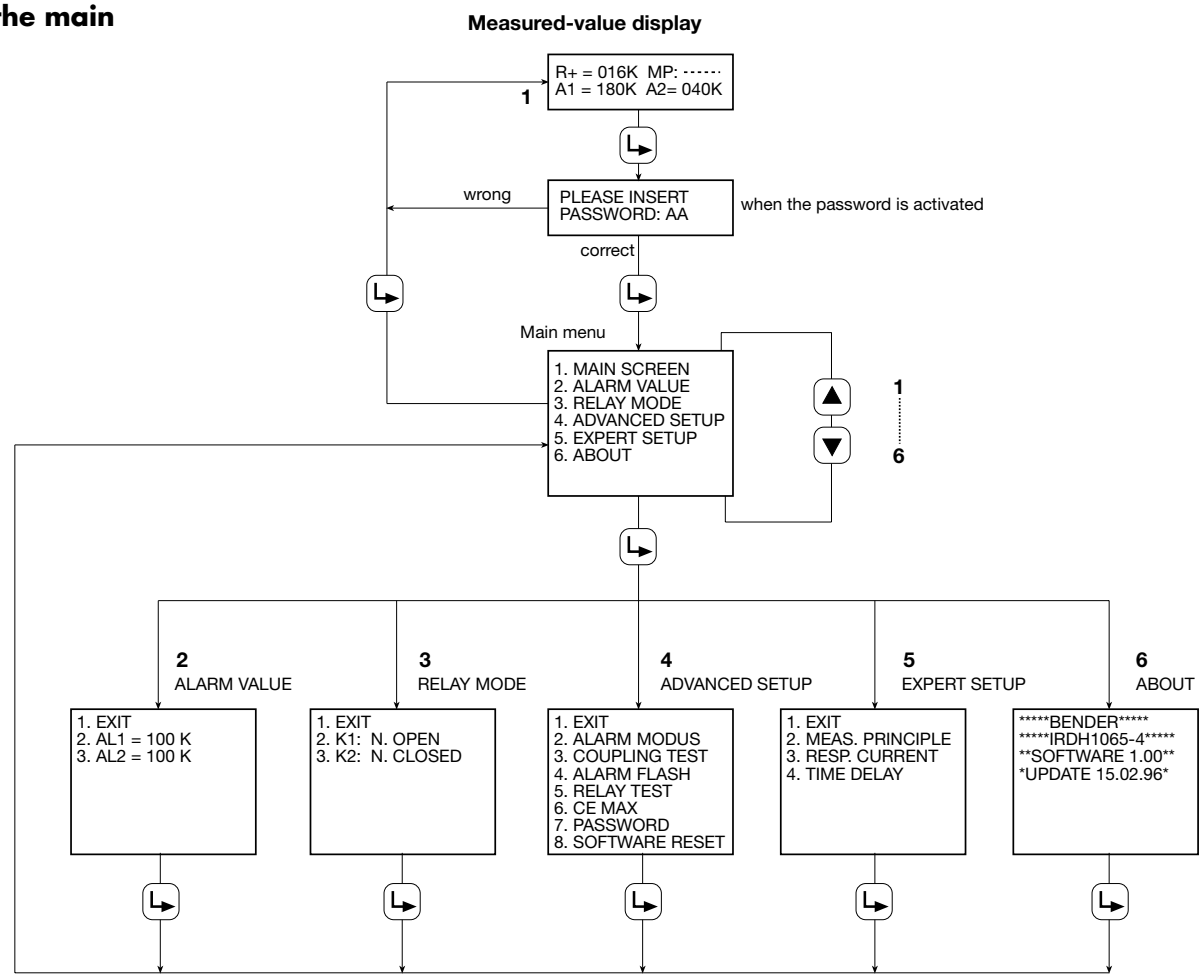


Press the <TEST/RESET> button to return to the previous menu.

During all set-up functions, insulation monitoring is not interrupted.

After commissioning, the actual measuring values and alarm values are displayed.
Press the <SET> button to get to the main menu.

Settings in the main menu



For more information and detailled description of the menus please refer to the operating manual of IRDH1065B-4 (TGH 1264).

Maintenance

The IRDH1065B-4, SUA1000Z and RUG1002Z must not be calibrated. It is recommended, however, to carry out a function test at least twice every year. A real earth fault test on the earth fault monitor should be carried out at least at the point of commissioning.

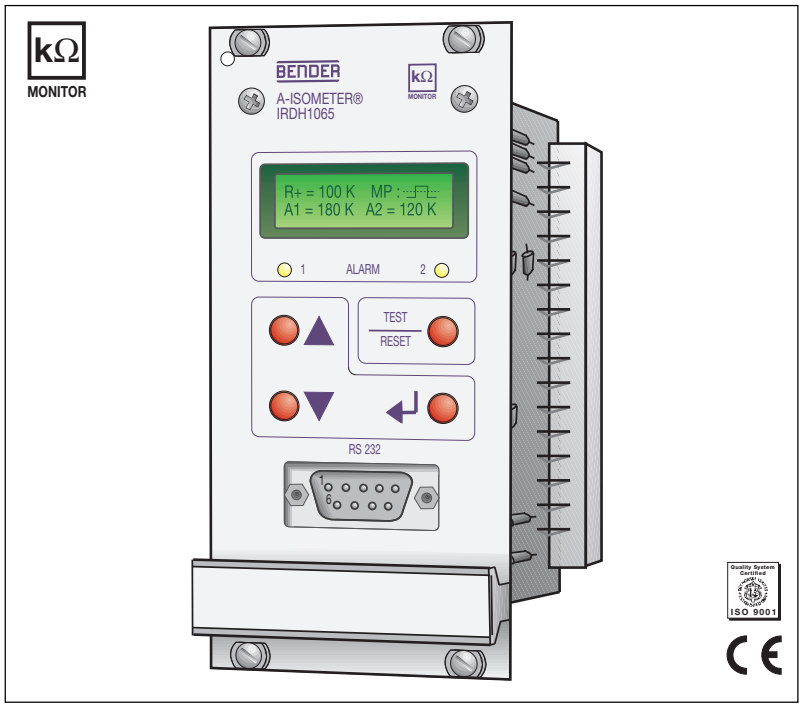
Ordering informations

Different version of RGG804 are available:

Type	Art. No.
System Monitoring Unit RGG804	
U_n DC 125 V, U_S DC 125 V	B980 303
with:	
Insulation monitoring device IRDH1065B-424	
U_n DC 0 ... 500 V, U_S DC 88...264 V	B910 680 61
Under / Overvoltage relays SUA1000Z-125V	
U_n DC 125 V	B932 263
Ripple detector **RUG1002Z-24**	
U_n DC 24-220 V, U_S DC 77-286 V	B980 190
System Monitoring Unit RGG804	
U_n DC 220 V, U_S DC 220 V	B980 045 013
with:	
Insulation monitoring device IRDH1065B-424	
U_n DC 0 ... 500 V, U_S DC 88...264 V	B910 680 61
Under / Overvoltage relays SUA1000Z-220V	
U_n DC 220 V	B932 170
Ripple detector **RUG1002Z-24**	
U_n DC 24-220 V, U_S DC 77-286V	B980 190
System Monitoring Unit RGG804	
U_n DC 235 V, U_S DC 235 V	B980 045 018
with:	
Insulation monitoring device IRDH1065B-424	
U_n DC 0 ... 500 V, U_S DC 88 ... 264 V	B910 680 61
Under / Overvoltage relays SUA1000Z-235V	
U_n UC 235 V	B932 607
Ripple detector **RUG1002Z-24**	
U_n DC 24-220 V, U_S DC 77 ... 286 V	B980 190
System Monitoring Unit RGG804	
U_n DC 60 V, U_S DC 60 V	B980 045 014
with:	
Insulation monitoring device IRDH1065B-429	
U_n DC 0 ... 500 V, U_S DC 36-72 V	B910 680 89
Under / Overvoltage relays SUA1000Z-60V	
U_n DC 110 V	B932 257
Ripple detector **RUG1002Z-21**	
U_n DC 24-220 V, U_S DC 10.2-80 V	B980 159
System Monitoring Unit RGG804	
U_n DC 64,5 V, U_S DC 64,5 V	B980 045 019
with:	
Insulation monitoring device IRDH1065B-429	
U_n DC 0 ... 500 V, U_S DC 36...72 V	B910 680 89
Under / Overvoltage relays SUA1000Z-64,5V	
U_n DC 48 V	B932 264
Ripple detector **RUG1002Z-21**	
U_n DC 24-220 V, U_S 10.2-80 V	B980 159
System Monitoring Unit RGG804	
U_n DC 60 V, U_S AC 115 V	B980 304
with:	
Insulation monitoring device IRDH1065B-413	
U_n DC 0 ... 500 V, U_S AC 115 V	B910 680 56
Under / Overvoltage relays SUA1000Z-60V	
U_n DC 60 V	B932 257
Ripple detector **RUG1002Z-21**	
U_n DC 24-220 V, U_S 10.2-80 V	B980 159

Right to modifications reserved

On the following pages the complete user manual of the Insulation Monitoring Device IRDH1065B-... is enclosed into this document.



Operating manual
A-ISOMETER® IRDH1065B-...

Insulation monitoring device for IT AC systems, IT AC systems with galvanically connected DC circuits and for IT DC systems (isolated power)

Dipl.-Ing. W. Bender GmbH & CoKG
Londorfer Straße 65
D-35305 Grünberg
Phone: (049) 6401 / 807-0
Fax: (049) 6401 / 807 259

Table of contents

Intended use

The intended use of the A-ISOMETER is to monitor the insulation resistance of IT systems. Any other use, or any use beyond the foregoing, is deemed to be improper. The BENDER companies shall not be liable for any loss and damaging arising therefrom.

Correct use also includes

- compliance with all instructions from the operating manual
- and adherence to any inspection intervals.

As a basic principle, our "General conditions of Sale and Delivery" shall apply. These are available to the operator at the latest the time when the contract is concluded.

Warranty and liability

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

- Improper use of the A-ISOMETER.
- Improper assembly/fitting, commissioning, operation and maintenance of the A-ISOMETER.
- Failure to take note of the operating instructions concerning transport, commissioning, operation and maintenance of the A-ISOMETER.
- Unauthorized structural modifications to the A-ISOMETER.
- Failure to take note of the technical data.
- Improperly performed repairs and the use of spare parts or accessories which are not recommended by the manufacturer.
- Cases of disaster brought about by the effect of foreign bodies and force majeure.
- The assembly and installation of non-recommended combinations of devices.

This operating manual, and in particular the safety information, must be noted by all persons who work with the A-ISOMETER. In addition, it is essential to comply with the rules and regulations on accident prevention which are valid for the place of use.

Personnel

Only appropriately qualified personnel may work on this A-ISOMETER. "Qualified" means that such personnel are familiar with the installation, commissioning and operation of the product, and they have undergone training or instruction which is appropriate to the activity. The personnel must have read and understood the safety chapter and the warning information in these operating instructions.

About the operating manual

This operating manual has been compiled with the greatest possible care. Nevertheless, errors and mistakes cannot be entirely ruled out. BENDER companies assume no liability whatsoever for any injury to persons or damage to property which may be sustained as a result of faults or errors in these operating instructions.

Hazards when handling the A-ISOMETER IRDH1065B

The A-ISOMETER IRDH1065B is constructed to state of the art and the recognized safety engineering rules. Nevertheless, when it is being used, hazards may occur to the life and limb of the user or of third parties, or there may be adverse effects on the A-ISOMETER or on other valuable property. The A-ISOMETER must only be used

- for the purpose for which it is intended
- when it is in perfect technical condition as far as safety is concerned

Any faults which may impair safety must be eliminated immediately. Impermissible modifications and the use of spare parts and additional devices which are not sold or recommended by the manufacturer of the devices may cause fire, electric shocks and injuries.

Unauthorized persons must not have access to or contact with the A-ISOMETER.

Warning signs must always be easily legible. Damaged or illegible signs must be replaced immediately.

Inspection, transport and storage

Inspect the dispatch packaging and the equipment packaging for damage, and compare the contents of the package with the delivery documents. In the event of damage during transport, please notify the BENDER company immediately.

The A-ISOMETER must only be stored in rooms where they are protected against dust and moisture, and spraying or dripping water, and where the indicated storage temperatures are maintained.

Important

Please check for correct system and supply voltage !

When insulation and voltage tests are to be carried out, the A-ISOMETER must be isolated from the system for the test period.

In order to check the proper connection of the device, it is recommended to carry out a functional test, before starting the A-ISOMETER.

Please check whether the basic setting of the device complies with the system requirements.

Children or the public must not have access to the A-ISOMETER.

Explanation of symbols and notes

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

This symbol means a possible threat of danger to the life and health of human beings.

Warning

➪ Failure to comply with these warnings means that death, serious physical injury or substantial damage to property may ensue if the relevant precautions are not taken.

This symbol means a possible dangerous situation.

Caution

➪ Failure to comply with these warnings means that slight physical injury or damage to property may ensue if the relevant precautions are not taken.

This symbol gives important information about the correct handling of the A-ISOMETER.

➪ Failure to comply with this information can result in faults on the A-ISOMETER or in its environment.

When you see this symbol, you will find application tips and other particularly useful information.

➪ This information will help you to make optimal use of the A-ISOMETER.

Directions for installation

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

The terminals ⏚ and KE (e14, a14) must be connected by a separate wire to the protective conductor (PE). If the device is connected with the terminals L1 (e2), L2 (e6), L3 (e10) or L/+ (e4), L/- (e8) or a remote coupling device to a system under operation, the connection between the terminals E ⏚ and KE (e14, a14) and the protective conductor (PE) must not be removed or opened.

In order to check the proper connection of the device, it is recommended to carry out a functional test using a genuine earth fault, e.g. via a suitable resistance, before starting the A-ISOMETER.

When insulation or voltage tests are to be carried out, the device must be isolated from the system for the test period.

The device is delivered with the following basic setting:

Alarm 1 / Alarm 2	=	180 kΩ / 40 kΩ (version -4..) 40 kΩ / 10 kΩ (version -3..) 1.8 MΩ / 400 kΩ (version -6..)
Operating principle K1/K2	=	N/O operation (normally open)
System leakage capacitance	=	max. 150 µF (version -4..) max. 500 µF (version -3..) max. 50 µF (version -6..)
Current output	=	0...400 µA

Please check, whether the basic setting of the A-ISOMETER complies with the requirements of the system being monitored.

Insulation faults in DC circuits which are directly connected to the AC system are only monitored when the rectifiers carry a load > 5 ... 10 mA.

The fundamental functions

- for IT AC systems, IT AC systems with galvanically connected rectifiers and IT DC systems (isolated power)
- universal for 3(N)AC, AC systems and DC systems
- extended voltage range via coupling devices
- automatic adaptation to the existing system leakage capacitance
- AMP measuring principle (patent pending).
- adjustable response ranges
- LC display
- RS485 interface
- RS232 interface
- 0 (4) ... 20 mA current output
- connection monitoring
- automatic self-test

Product description

The A-ISOMETER IRDH1065B monitors the insulation resistance of 3(N)AC, AC/DC, and DC systems. The AC system may include extensive DC-supplied loads (e.g. rectifiers, converters, thyristor-controlled DC drives, see 1.3). The devices automatically adjust to the existing system leakage capacitance.

Appropriate coupling devices are available to extend the voltage range.

The A-ISOMETER IRDH1065B is built onto a plug-in p.c.b. in Eurocard format, 100 x 160 mm. The controls and displays are integrated in the frontplate, width 60.96 mm (12 TE). The device can be connected via plug-in connectors according to DIN 41 612, design E 48.

Measuring procedure

A pulsating AC measuring voltage is superimposed on the system (AMP measuring principle*). The measuring pulse consists of positive and negative pulses of the same amplitude. The period depends on the respective leakage capacitances and the insulation resistance of the system to be monitored. An insulation fault between system and earth closes the measuring circuit. An electronc evaluation circuit calculates the insulation resistance which is indicated on a LC display or an external ohmmeter after the response time.

The response time depends on the system leakage capacitance, the insulation resistance, and the system related interference disturbances. System leakage capacitances do not influence the measuring accuracy.

If the reading is below the selected response values ALARM1/ALARM2, the appropriate alarm relays are activated, the alarm LEDs ALARM1/2 illuminate and the measuring value is indicated on the LC display (in the event of DC insulation faults, the faulty supply line is indicated, too). If the terminals X1.c20 and X1.e24 are bridged (external RESET button [N/C contact] or wire jumper), the fault indication will be stored.

By pressing the test button, the function of the A-ISOMETER IRDH1065B can be tested. After pressing the test button (> 2s), the display indicates "SYSTEM TEST". If no fault has been found, the display indicates "TEST OK [↵]", the alarm relays switch and both alarm LEDs illuminate after the expiry of the time delay. If a system fault has been detected during the test, the LC display indicates "ALARM No...". The fault indications can be reset by pushing the SET button.

*) Measuring principle "adaptive measuring pulse", developed by BENDER (patent pending).

Self-test

The A-ISOMETER IRDH1065B automatically carries out a self-test if the insulation resistance exceeds 20 times the maximum response value, resp. every 24 h, provided that the alarm relay has been set to system fault alarm.

Connection monitoring

The connections to the system and earth (PE) are continuously monitored. If the connections are broken or not connected, or high-resistance, the display indicates "ALARM E-KE" or "ALARM L1-L3".

In this case, please check the connecting leads as otherwise the insulation resistance will not be measured correctly.

If the insulation resistance is in the range of 20 times the maximum response value, which may be the case in new or small IT systems, an alarm will be initiated, too. In this case, the connection monitoring can be switched off in the Setup2 menu.

System fault

Warning

If a system fault occurs, the alarm message "ALARM NO." is indicated on the LC display. In this case, switch the supply voltage of the A-ISOMETER off for a short time and then switch it on again.

If the device keeps on indicating the message after the expiry of the response time, it points out a device error (please also refer to Annex "Test sequence and fault description).

Information about the wiring diagram

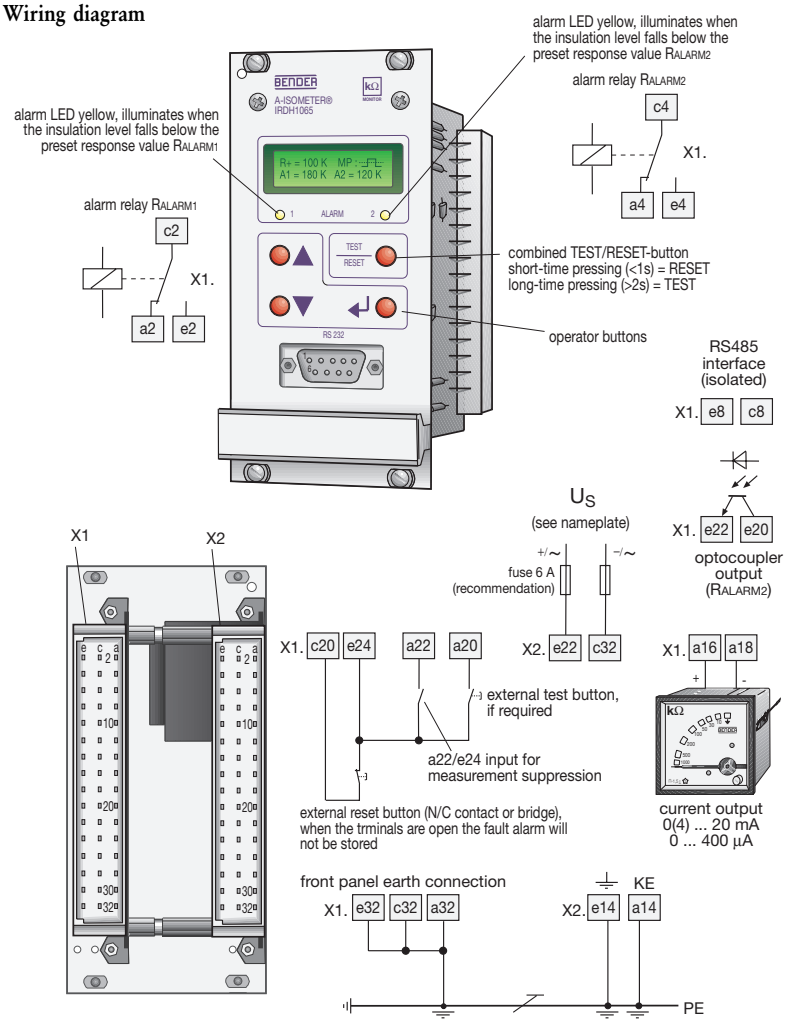
„Optocoupler output“
potential-free, switches with R_{ALARM2}.

„Input for measurement suppression“
The measurement suppression can be activated by closing the contacts X1.a22 and X1.e24. The internal resistance Ri changes to >2 MΩ and no measuring voltage is output. The current measuring value is stored. The LC display indicates “OFFLINE“.

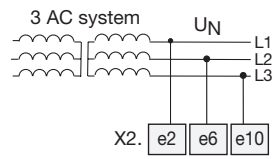
For short-circuit protection, the connection to the supply voltage has to be equipped with a protective device according to IEC 60364-4-473 (a fuse of 6 A is recommended).

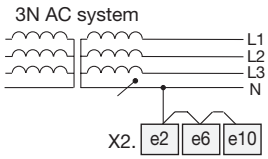
For the measuring connection of the insulation monitoring device to the system, it is not necessary, according to IEC 60364-4-473, to use protective devices as protection against short-circuit provided that the wire or cable is realized in a way which restricts the risk of a short-circuit to a minimum, in this case, a short-circuit proof and earth-fault proof wiring is recommended.

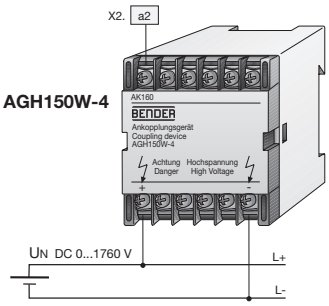
Wiring diagram

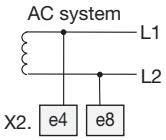


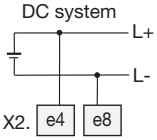
Connection to power supply

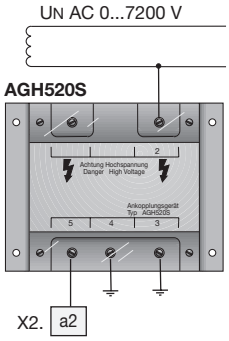


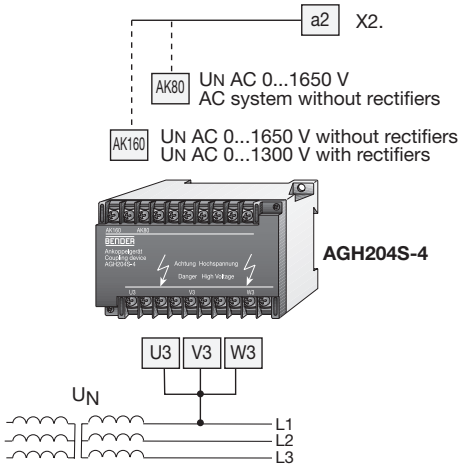












Operation with coupling device AGH204S-4 (only version -4...)
AC system with rectifier

The maximum DC voltage is the voltage which may appear in the AC part of the system to PE, if the IRDH1065B is coupled with AGH204-S-4. This voltage is dependent on the level of the nominal voltage, the type of rectification (6 pulse, 12 pulse), the type of inverter intermediate circuit (current or voltage), and the inverter technology. In the case of inverters with voltage intermediate circuits it usually corresponds to the phase to phase voltage of the AC system multiplied by √2.

In the case of current-controlled intermediate circuits there may be higher DC voltages.

The given voltage values for AC/DC systems take into account values found by previous experience (factor √2 between DC voltage and AC voltage).

The maximum DC voltage in the case of insulation failure in the DC part of the system, e.g. inverter intermediate circuit, is DC 1840 V. From this, the maximum nominal AC voltage is calculated:

Umax = DC 1840 V / √2 = AC 1300 V

Function keys

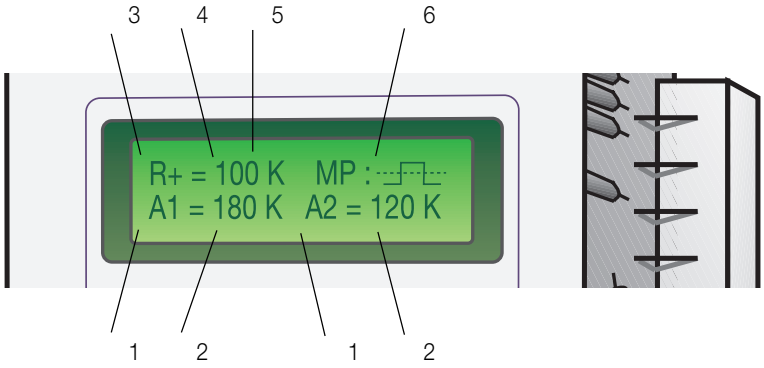
Use the <UP> resp. <DOWN> keys to change the parameter or to select the next setting.

Use the <SET> key to activate the next menu or to save the parameter modification.

Use the <TEST/RESET> key to select the previous menu.

During all setting-up functions, insulation monitoring is interrupted for the setting time.

Operating elements and displays IRDH1065B



1 A1 = Alarm 1, A2 = Alarm 2

2 pre-set response value (kΩ)
„A1/2 = SYST“ system test selected
„A1/2 = UG“ UG measuring principle selected

3 fault location
"R" = AC insulation fault
"R+" = DC insulation fault at L+
"R-" = DC insulation fault at L-
"Rs" = new measuring value is being calculated (measuring cycle active)

4 measuring value

5 unit measuring value (k = kΩ, M = MΩ)

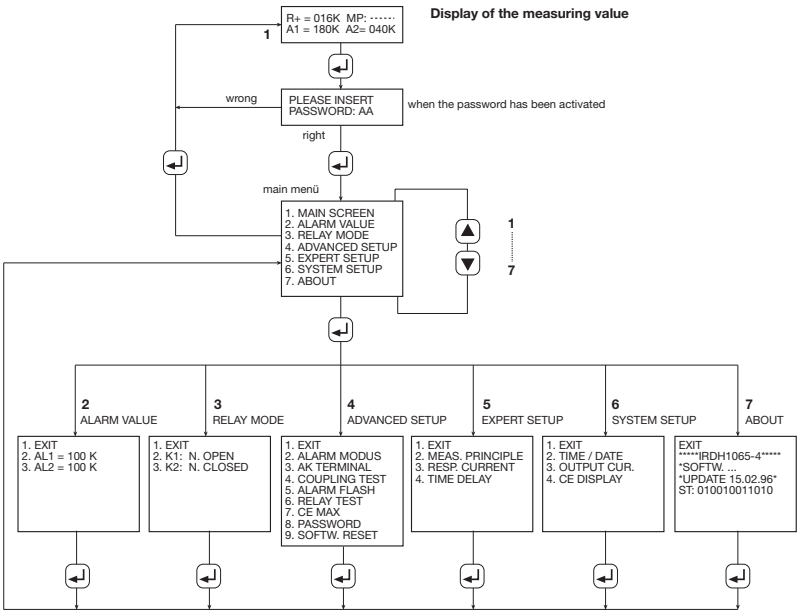
6 display measuring voltage
AMP measuring principle
DC measuring principle
..... UG measuring principle (no measuring voltage)
„OFFLINE“ measurement suppression active

Indication of alarm and measuring values

After commissioning, the actual measuring value and alarm value are displayed.

Press the <SET> key ↵ to branch off into the main menu.

Setting the basic functions in the main menu



Password

The “password“ query cannot be carried out unless the function in the Setup2 menu has been set to “ON“ position. The password consists of two letters (e.g. AB). The flashing letter can be changed using the arrow keys ▲ ▼ . After pressing the enter key ↵, the second letter will flash and can also be changed. The password entry can be quitted by pressing the enter key↵.

If a wrong password is used, the A-ISOMETER returns to the display of the measuring values.

Response values [ALARM VALUE]

Use the arrow keys ▲ ▼ for setting the response values 1 and 2 and the enter key ↵ for saving the response values.

Operating principle of the alarm relays [RELAY MODE]

Use the arrow keys ▲ ▼ to select the operating principle of the alarm relays.

N/O operation „N. OPEN“,
N/C operation „N. CLOSED“.

Branching off into Setup2
(ADVANCED SETUP)

Selec this menu item to branch off into the extended Setup. This menu offers special functions to choose from.

Branching off into Expert Setup [EXPERT SETUP]

Call up this menu for selecting a special measuring principle. Do not carry out any modification without being familiar with the functions of the respective measuring principle.

Branching off into System Setup [SYSTEM SETUP]

Select this menu item to branch off into the System Setup. This menu offers several choices for setting the current output, the capacitance display and the real-time clock .

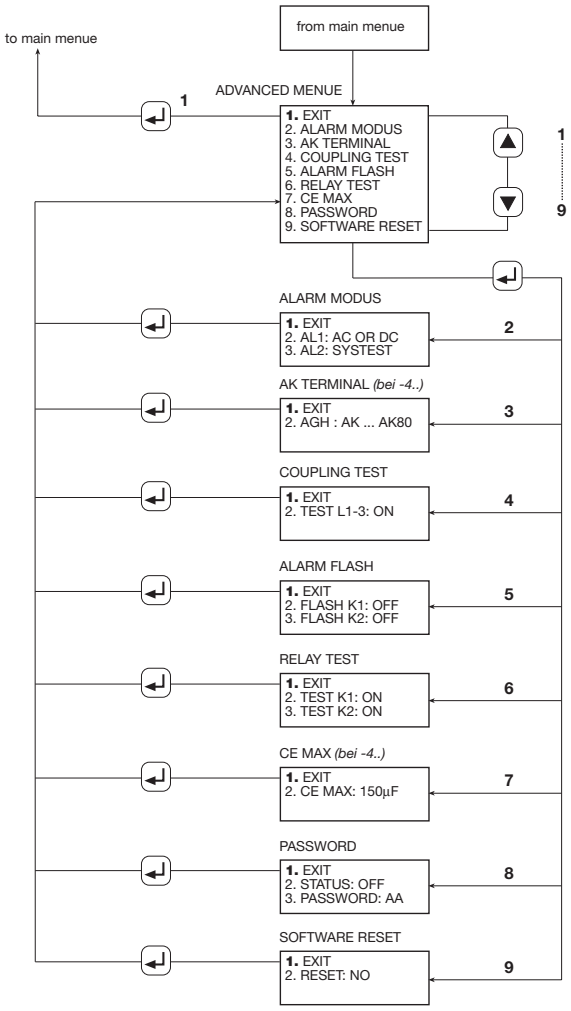
Software information [ABOUT]

Use the arrow keys ▲▼ for detailed information about the software of the A-ISOMETER.

Status display menu [ABOUT]

Figure	Description	Number						
		0	1	2	3	4	5	6
1	RELAY MODE AL1	N/O operation	N/C operation					
2	RELAY MODE AL2	N/O operation	N/C operation					
3	ALARM MODUS AL1		AC or DC	ONLY AC	ONLY DC	ONLY DC+	ONLY DC-	System test
4	ALARM MODUS AL2		AC or DC	ONLY AC	ONLY DC	ONLY DC+	ONLY DC-	System test
5	COUPLING TEST	Off	On					
6	ALARM FLASH K1	Off	On					
7	ALARM FLASH K2	Off	On					
8	RELAY TEST K1	Off	On					
9	RELAY TEST K2	Off	On					
10	CE MAX	150 µF	500 µF	50 µF				
11	MEASURING PRINCIPLE	AMP	AMP/UG	UG/AMP	DC			
12	OUTPUT CURRENT	0...400 µA	0...20 mA	4...20 mA				

Setting of the extended functions [ADVANCED SETUP]



Alarm functions ALARM 1/ 2
[ALARM MODUS]

Use this menu to specify which types of insulation faults are to be signalled.

The following indications are possible:

AC OR DC	=	alarm in the event of AC or DC faults
ONLY AC	=	alarm only in the event of AC or symmetrical DC faults in a de-energized system.
ONLY DC	=	alarm only in the event of single-pole DC fault
ONLY DC+	=	alarm only in the event of single-pole DC faults at L+
ONLY DC-	=	alarm only in the event of single-pole DC faults at L-
SYST	=	alarm only in the event of system faults. The 24 h self-test will be activated.

Certain combinations of the alarm functions cannot be used, since no alarm would be activated. The following combinations are possible:

ALARM 1	ALARM2
AC OR DC	AC OR DC
AC OR DC	ONLY DC
AC OR DC	ONLY AC
AC OR DC	SYST
ONLY AC	AC OR DC
ONLY AC	ONLY DC
ONLY DC	AC OR DC
ONLY DC	ONLY AC
ONLY DC+	ONLY DC- *)
ONLY DC-	ONLY DC+ *)
SYST	AC OR DC

*) This setting may only be carried out in pure IT DC systems !

Setting the coupling devices (AK TERMINAL) (only version -4..)
[AGH: AK ... AK80]

Basic setting, when no coupling device is used (pre-set by factory).
or

When the terminal of IRDH1065B is connected to the terminal AK80 of the AGH204S-4, the operating range of the nominal voltage will be extended to 3AC 0 ... 1650 V. Current converters must not be connected to the system.

[AGH: AK ... AK160]

When the terminal of the IRDH1065B is connected to the terminal AK160 of the AGH204S-4, the operating range of the nominal voltage will be extended to 3AC 0 ... 1300 V. Current converters must not be connected to the system.

or

When the terminal AK of IRDH1065B is connected to the terminal AK160 of the AGH150W-4, the operating range of the nominal voltage will be extended to DC 0 ... 1760 V.

Connection monitoring (COUPLING TEST)

Use this menu to switch the automatic connection monitoring on or off. This connection monitoring should always be in ON position.

Activating the flashing function (ALARM FLASH)

The alarm relays and the associated alarm LEDs can be set to flashing function (pulse frequency 1Hz).

Flash K1OFF = alarm relay Alarm1 not flashing

Flash K1 ON = alarm relay Alarm1 flashing

Flash K2 OFF = alarm relay Alarm2 not flashing

Flash K2 ON = alarm relay Alarm2 flashing

Alarm initiated during functional test (RELAY TEST)

In this menu, the alarm relays can be switched off during functional tests

TEST K1: OFF relay does **not** switch during a functional test

TEST K1: ON relay switches during a functional test

TEST K2: OFF relay does **not** switch during a functional test

TEST K2: ON relay switches during a functional test

Matching to the system leakage capacitance [CE MAX: 150µF]
(only version -4..)

In this menu, the A-ISOMETER can be matched to the relevant system leakage capacitance (max. 500 µF). Please take into consideration that the basic measuring time will be increased to approx. 15 s (see characteristic curves in section 7.1) when the setting CE = 500 µF has been selected.

Activating the password

Use this menu to activate the password query. In this way, the A-ISOMETER can be protected against unauthorized modifications.

STATUS: OFF password **not** activated

STATUS: ON password activated

Entering the password

Use this menu to enter a new password.

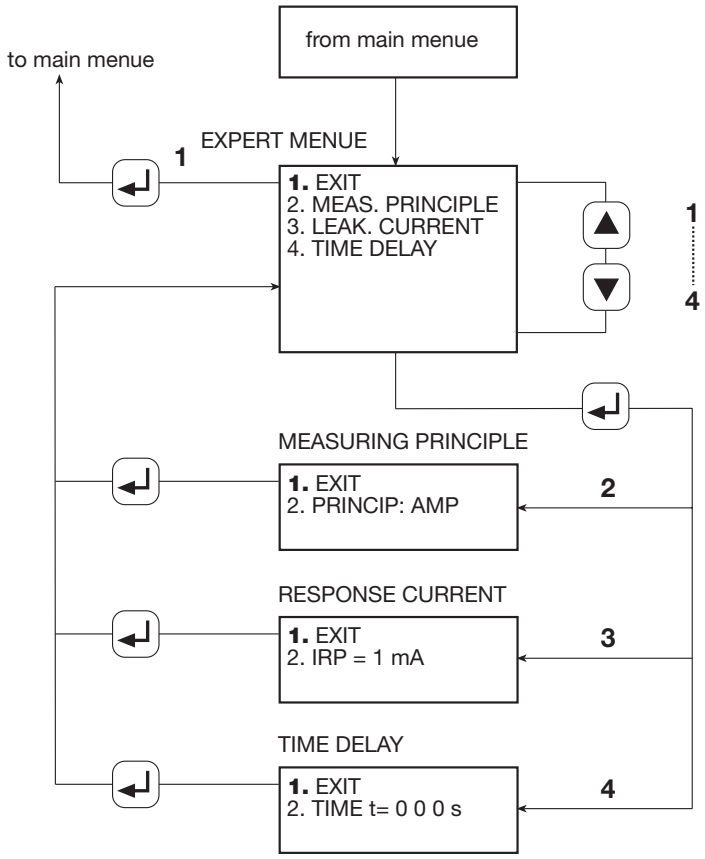
The password consists of two letters (e.g. AB). the flashing letter can be changed with the arrow keys ▲ ▼. After pressing the enter key ↵, the second letter flashes and can be changed, too. The password entry can be quitted by pressing the enter key ↵.

RESET for basic setting (SOFTWARE RESET)

Use this menu to reset to the manufacturer`s basic setting.

Additional device settings (EXPERT SETUP)

In this menu, the measuring principle of the A-ISOMETER can be selected. A modification within this Setup should not be carried out without having thorough knowledge of the functions of the individual measuring principles.



Selecting the measuring principle [MEAS. PRINCIPLE]

AMP measuring principle [PRINCIP: AMP]

The device is pre-set to the AMP measuring principle. The characteristics are explained in the functional description.

DC measuring voltage [PRINCIP: DC]

Instead of a measuring pulse, a DC voltage (27 V) is superimposed on the system. This measuring principle applies to pure AC systems only, since DC insulation faults are indicated with increased response sensitivity respectively are not monitored correctly.

UG/AMP measuring principle [PRINCIP: UG/AMP] (only version -3, -4)

Passive asymmetry measurement with re-measuring by AMP, applies to DC systems only. The DC current, which is caused by asymmetrical faults at L+ or L-, respectively the shift voltage caused thereby, is measured.

By setting the response value I_{AN}, a DC fast response adapted to the system can be carried out. The alarm is indicated via ALARM2. After a fault indication via ALARM2, the insulation resistance is measured again according to the AMP measuring principle and the value is signalled via ALARM1. In order to detect symmetrical faults too, additionally every hour the insulation resistance is measured according to the AMP measuring principle. If a fault is detected, the AMP measuring principle remains activated.

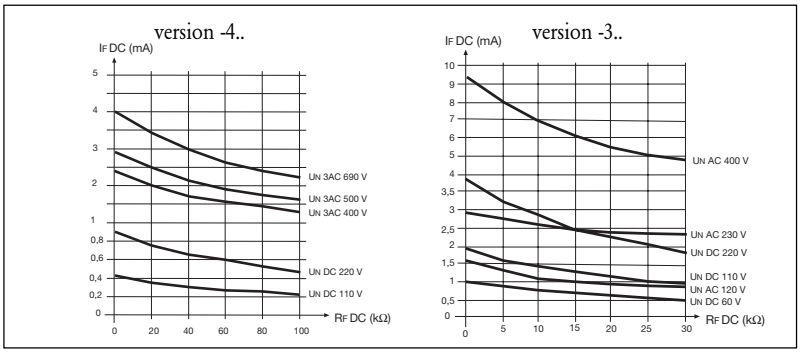
AMP/UG measuring principle [PRINCIP: AMP/UG] (only version -3, -4)

AMP measuring principle with superimposed asymmetry measurement. Fault indications of the AMP measurement are displayed via ALARM2, fault indications of the asymmetry measurement are displayed via ALARM1.

Only with AMP; DC or AMP/UG setting, the device complies with the standards for insulation monitoring devices.

Current level for DC fast response [RESP. CURRENT]

In this menu, the alarm current level for DC fast response can be set. The pre-set value of the current is the DC current I_{FDC}, which in case of single-pole insulation faults flows via the internal resistance of the A-ISOMETER driven by the system voltage. The respective values for the insulation resistance in AC systems in case of insulation faults behind directly connected rectifiers are shown in the diagram below.



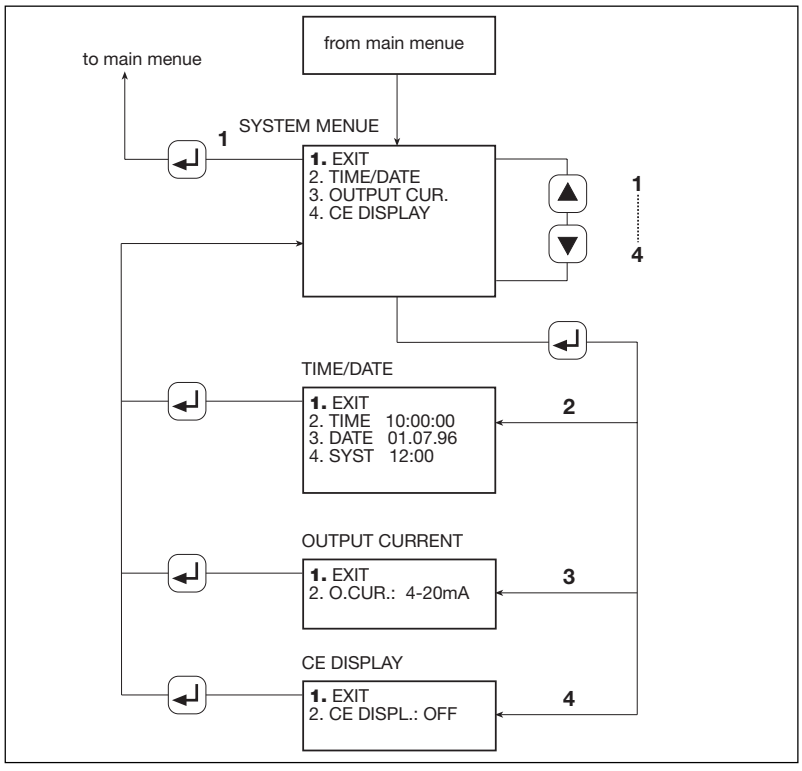
Time delay [TIME-DELAY]

Use this menu to set the time delay for the alarm relays. Precondition for setting a time delay is that the A-ISOMETER is either set to the UG/AMP or to the DC measuring method. The time delay has an effect on the alarm steps according to these measuring methods and adds to the measuring time.

System Setup [SYSTEM SETUP]

Use the System Setup to set

- time and date of the real -time clock
- self-test starting-time
- current output
- capacitance display



Setting the real-time clock [TIME / DATE]

Time [TIME]

Use the format 24:00:00 to set the time. Press the enter key to jump to the respective field "hours" and/or "minutes", use the arrow keys to select the appropriate time. The field "seconds" is automatically set to "00" the fields "hours" or "minutes" are changed.

Date [DATE]

Use the format 01.01.96 (day. month. year) to enter the system date. Press the enter key to go to the respective field and change the date with the arrow keys.

Self-test starting time [SYST]

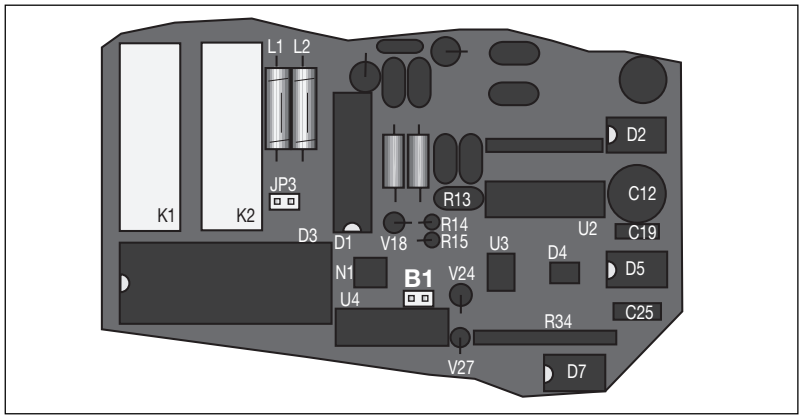
Use the format 24:00 to enter the time of the "SYSTEM TEST". If "system test" has been selected in the menu ALARM MODUS, a system self-test is carried out every day at the pre-selected time.

Setting the current output [OUTPUT CUR.]

Three different output currents can be selected:

Current output 0...400 µA

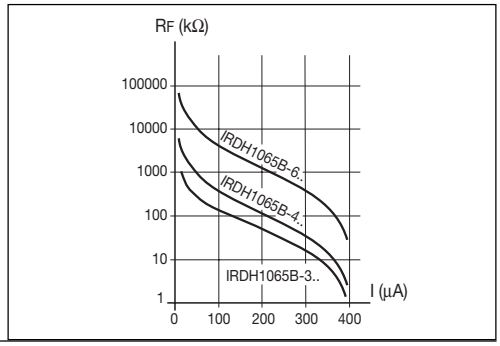
The output is a non linear current of 400 µA. The maximum load is 12.5 kΩ. A short-circuit is equivalent to 400 µA, an insulation fault of 120 kΩ, version -4.., is equivalent to 200 µA (resp. 28 kΩ, version -3..). Jumper B1 must be open.



The formula for the output current is:

$$I = \frac{400\ \mu A \times Ri}{Ri + R_F}$$

R_F = Insulation fault
I = output current
Ri = internal DC resistance



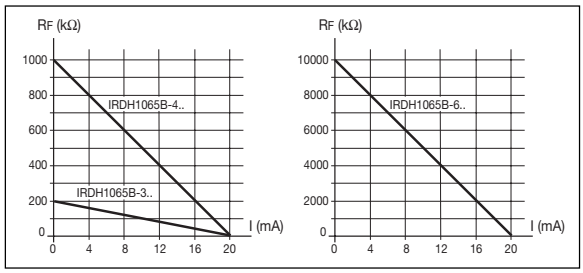
Current output 0...20 mA

The output is a linear current of 20 mA. The maximum load is 400 Ω. A short-circuit to earth is equivalent to 20 mA, an insulation fault of 1 MΩ (version -4..) or 200 kΩ (version -3..) or 10 MΩ (version -6..) is equivalent to 0 mA. Jumper B1 must be closed.
The formula for the output current is:

$I = -0.02\ mA / k\Omega \times R_F + 20\ mA$ (version -4..)
$I = -0.1\ mA / k\Omega \times R_F + 20\ mA$ (version -3..)
$I = 0.002\ mA / k\Omega \times R_F + 20\ mA$ (version -6..)

R_F = insulation fault

I = output current



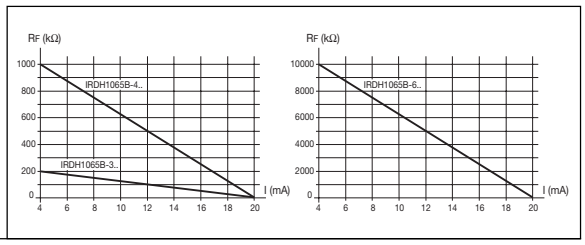
Current output 4...20 mA

The output is a linear current of 20 mA. The maximum load is 400 Ω. A short-circuit is equivalent to 20 mA, an insulation fault of 1 MΩ, version -4.., is equivalent to 4 mA (resp. 200 kΩ, version -3.. resp. 1200 kΩ, version -6..). Jumper B1 must be closed.
The formula for the output current is:

$I = -0.016\ mA / k\Omega \times R_F + 20\ mA$ (version -4..)
$I = -0.08\ mA / k\Omega \times R_F + 20\ mA$ (version -3..)
$I = 0.0016\ mA / k\Omega \times R_F + 20\ mA$

R_F = insulation fault

I = output current



CE DISPLAY

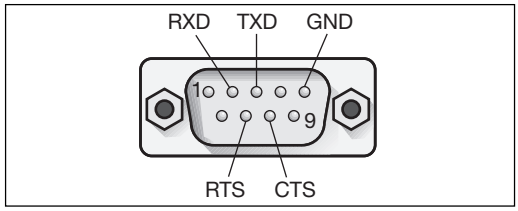
When you select this menu, the calculated leakage capacitance will be indicated on the display.The measuring pulse (measuring frequency) is then indicated by a flashing point.

Measuring range:	1 µF ... 50 µF (version -6..) 10 µF ... 500 µF (version -4..) 50 µF ... 500 µF (version -3..)
Accuracy:	approx. ± 30%
Display:	**"CE>...µF"** when the insulation resistance is <50 kΩ (-3.., -4..), 500 kΩ (-6..) or in the event of low-frequency interferences between system and earth.

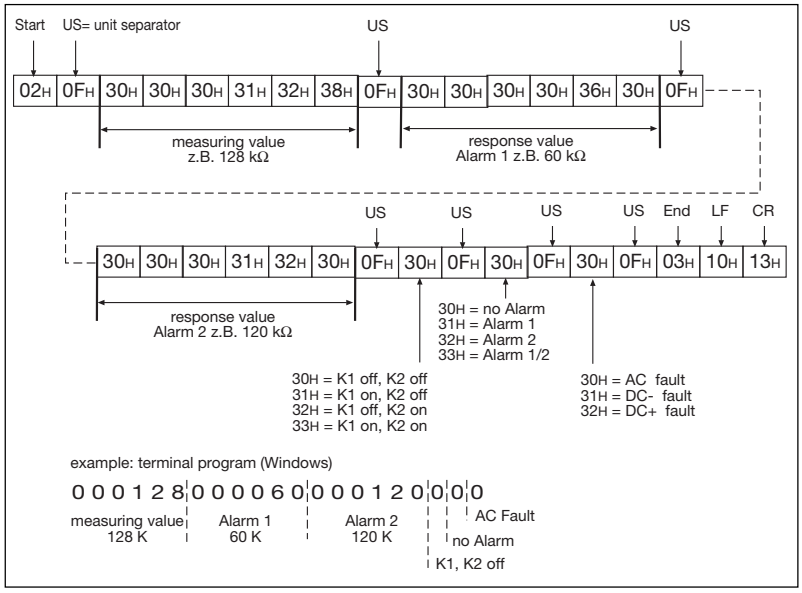
Serial interface

- Serial interface RS485, isolated
  (= EIA RS-485, AC 500 V/1 min)
- Connection RS485 to contact e8 (A) and c8 (B) to X1
- Serial interface RS232, isolated (AC 1 kV/1 min)
- Connection RS232 to 9-pole D-type subminiature connector in the front plate
- Max. cable length RS485 1200m
  for shielded cable RS232 10 m
- Transmission protocol 9600 baud - 1 start bit - 1 stop bit - 8 data bit

RS232 interface with electrical separation



Every 10 seconds the following data block will be transmitted:



The data transmission is carried out continuously and cannot be interrupted or influenced in some other way.

Technical data	Standard -4..	-3..	-6..
Insulation coordination acc. to IEC 60664-1			
Rated insulation voltage	AC 500 V		
Rated impulse withstand voltage/contamination level	4 kV / 3		
Dielectric test acc. to IEC 60255-5	2.5 kV		
System being monitored			
Operating range of the nominal voltage Un 3AC/AC	0...575 V	0...506 V	
Frequency range (for f<50Hz see characteristic curves)	50...400 Hz		
Operating range of the nominal voltage Un DC	0...575 V	0...286 V	
Supply voltage			
Operating range of the supply voltage U_S (see nameplate) (for other voltages refer to ordering details)	AC 50...60 Hz	184...264 V	
Max. power consumption	10 VA		
Response values			
Response values $R_{ALARM1/ALARM2}$ Hysteresis approx. 25%	10 ... 990 kΩ	2 ... 200 kΩ	0.1 ... 9.9 MΩ
Measuring time (C_E=1µF) AMP measuring principle see characteristic curves	8 sec.	8 sec.	30 sec.
Measuring time (C_E=1µF) DC measuring principle	< 2 sec.	< 2 sec.	< 6 sec.
Response value voltage asymmetry principle	0.1 ... 5mA	0.1...10 mA	
Response time voltage asymmetry principle (in case of direct earth fault, 0kΩ, 0...150µF)	<1s		
Time delay, adjustable for voltage asymmetry principle and DC measuring principle	1 ... 10s		
System leakage capacitance	max. 500µF		max. 50 µF
Pre-set by factory	150µF	500 µF	50 µF

	Standard -4..	-3..	-6..
Measuring circuit			
Measuring voltage $U_{M\ (peak\ value)}$	27 V		
Measuring current I_M	max. 225 µA	1 mA	22.5 µA
Internal DC resistance R_i acc. to DIN VDE 0413 T8	120 kΩ	28 kΩ	1200 kΩ
Impedance Z_i, 50 Hz DIN VDE 0413 T8	> 250 kΩ	> 250 kΩ	> 800 kΩ
Outputs			
Measuring instrument SKMP	120 kΩ	28 kΩ	1.2 MΩ
Current output (max. load)	0...400 µA (12.5 kΩ)		
	4...20 mA (400 Ω)		
	4...20 mA (400 Ω)		
Display range	<1 kΩ ... >10 MΩ	<1 ... >500 kΩ	<10kΩ...>100MΩ
Terminal AK for coupling device	yes		
Optocoupler (R_{ALARM2}) floating	DC 27 / 50 mA		
Contact circuits			
Switching components	2 change-over contacts		
Protective separation			
Contact circuits against U_S	230 V		
Contact circuits against U_N	500 V		
U_S against U_N	500 V		
Contact against contact	110 V		
Contact class	IIB acc. to DIN IEC 60255 Teil 0-20		
Rated contact voltage	AC 250 V / DC 300 V		
Admissible number of operations	12000 cycles		
Making capacity	UC 2 A		
Breaking capacity			
AC 230 V, cos phi = 0.4	AC 2 A		
DC 220 V, L/R = 0.04s	DC 0.2 A		
Operating principle	N/O or N/C operation		
Pre-set by factory	N/O operation		

Type tests	
Test of the electromagnetic compatibility (EMC):	
Immunity against electromagnetic interferences EN 50 082-2	
Emissions acc. to EN 50 081:	
Emissions acc. to EN 55 011/CISPR11	class A [2)]
Mechanical test	
Shock resistance acc. to IEC 6068-2-27	15 g / 11 ms
Bumping acc. to IEC 6068-2-29	40 g / 6 ms
Vibration strength acc. to IEC 6068-2-6	10...150 Hz / 0.15 mm - 2 g
Environmental conditions	
Ambient temperature, during operation	-10°C ... +70°C
Storage temperature range	-40°C ... +70°C
Climatic class acc. to IEC 60721	3K5, except condensation and formation of ice
General	
Operation class	continuous operation
Mounting	any position
Connection	screw terminals acc. to DIN 41 612 design E48
Protection class acc. to DIN 40050	
Built-in components	IP 00
Weight approx.	920 g

[2)] **Class A devices** are designed for industrial use. For any other use, it may be necessary to take additional measures for interference suppression.

Standards

The A-ISOMETER has been designed in conformance with the following standards:

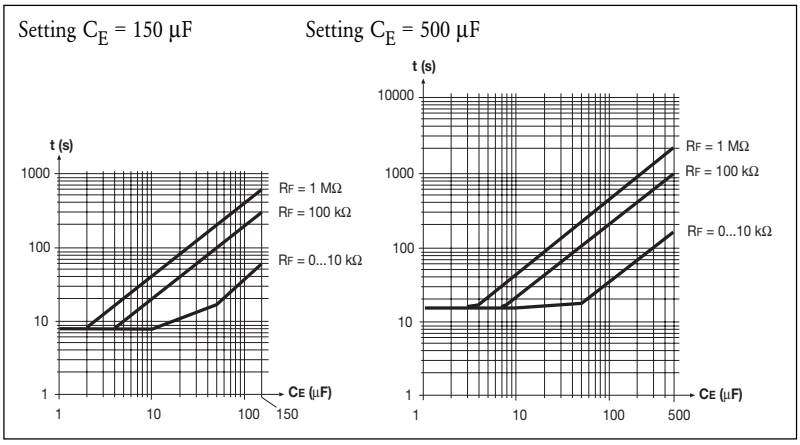
EN61557-8 / IEC 61557-8: 1997
Insulation monitoring Devices for IT systems.

DIN VDE 0413 T.8: 1984-02

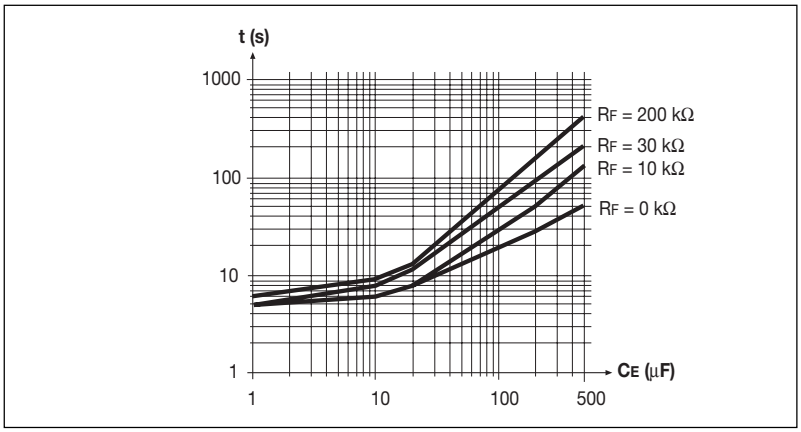
(Isolationsüberwachungsgeräte für Wechselspannungsnetze mit galvanisch verbundenen Gleichstromkreisen und für Gleichspannungsnetze).

DIN VDE 0110 T1: 1989
Isolationskoordination für elektr. Betriebsmittel in Niederspannungsschaltanlagen sowie weitere für die Geräte zutreffende Normen.

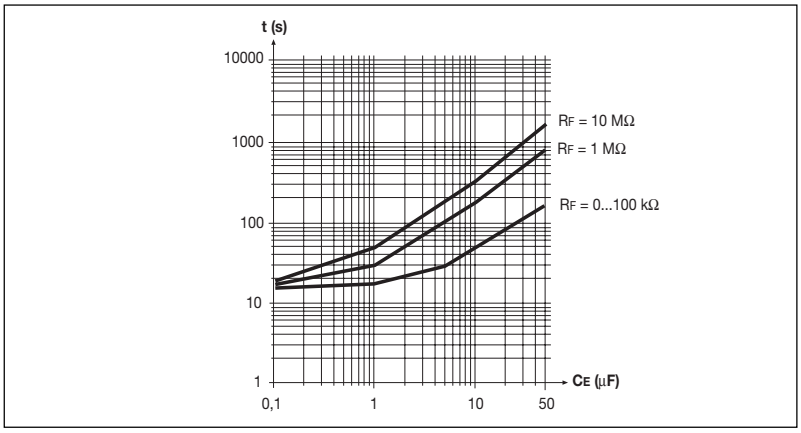
Response time -4..



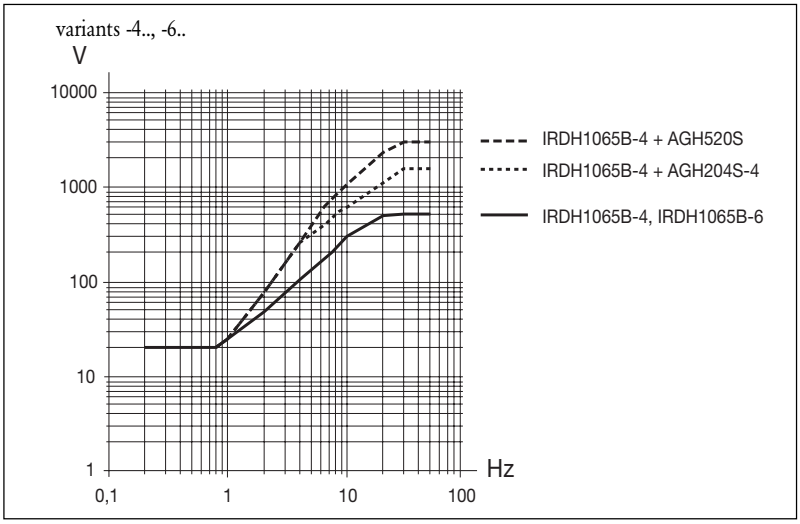
Response time -3..

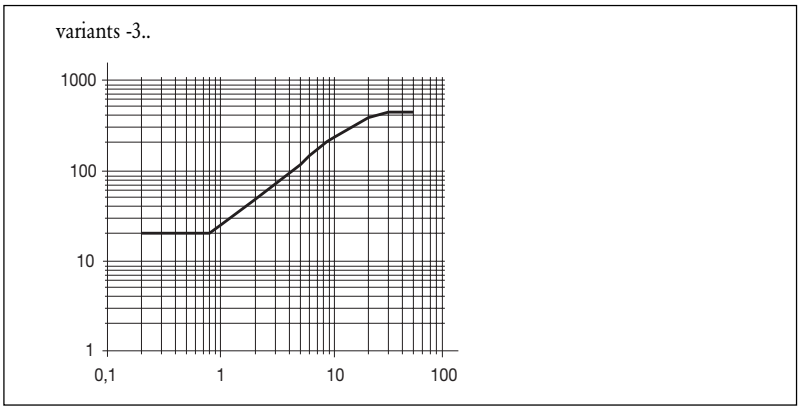


Response time -6..

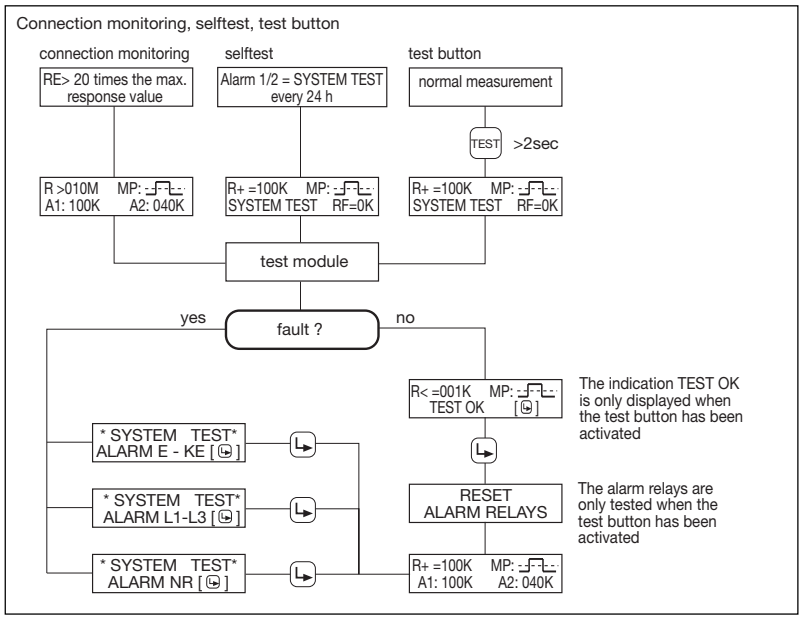


Max. AC voltage between system and PE (earth) in the requency range <50Hz





Test sequence, self-test, test button



ALARM FAULT DESCRIPTION

ALARM E-KE no connection between E-KE (>1 kΩ)

ALARM L1-L3 connection between coupling and earth > 20 times the max. response value and no voltage (only version -3.., -4..) between L1-L3 (<12 V)

ALARM FAULT DESCRIPTION

1 fault in the AMP measuring module
2 fault in the DC measuring module
3 fault in the active rectifier
4 fault in the analog-digital converter
5 fault in real-time clock
6 fault in display
7 fault in parameter data memory

A-ISOMETER®

Type	Supply voltage U_S	Art. No.
IRDH1065B-4	AC 184...264 V	B 9106 8033
IRDH1065B-413	AC 90...132 V	B 9106 8056
IRDH1065B-425	DC 18...36 V	B 9106 8028
IRDH1065B-6	AC 184...264 V	B 9106 8080

Coupling devices for version -4..

Type	Nominal voltage range Un	Art. No.
AGH204S-4	AC 0 ... 1650 V	B 914 013
AGH520S	AC 0 ... 7200 V	B 913 033
AGH150W-4	DC 0 ... 1760 V	B 9801 8006

Measuring instruments for version -4.. (current output 0...400 µA)

Type	Dimensions	Art. No.
7204-1421	72x72 mm	B 986 763
9604-1421	96x96 mm	B 986 764
7204S-1421	72x72 mm	B 986 804
9604S-1421	96x96 mm	B 986 784

Measuring instruments for version -3.. (current output 0...400 µA)

Type	Dimensions	Art. No.
7204-1311	72x72 mm	B 986 755
9604-1311	96x96 mm	B 986 753
7204S-1311	72x72 mm	B 986 705
9604S-1311	96x96 mm	B 986 779

Measuring instruments for version -6.. (current output 0...400 µA)

Type	Dimensions	Art. No.
7204-1621	72x72 mm	B 986 700
9604-1621	96x96 mm	B 986 782
7204S-1621	72x72 mm	B 986 806

The measuring instruments 7204S-... and 9604S-... are shock and vibration resistant.