Operating Manual

A-ISOMETER® IRDH575

Insulation monitoring for ungrounded AC and DC systems
with integrated test generator and controller for
EDS46..., EDS47... and EDS49... systems
Software version: D185 V1.6

BENDER

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BENDER GROUP

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TGH1364en/04.2007

1. How to use this documentation effectively

This operating manual is intended to address qualified experts in electrical engineering!

1.1 Use for the intended purpose

The A-ISOMETER® is exclusively intended for:

- monitoring the insulation resistance of IT (ungrounded) systems and
- localization of insulation faults in combination with insulation fault evaluators EDS4....

Any other use, or any use which goes beyond the foregoing, is deemed to be use other than for the intended purpose.

1.2 Safety information

General safety information

In addition to this operating manual, the documentation includes the supplementary sheet „Important safety instructions for BENDER Products".

Device-specific safety information

Only one insulation monitoring device may be used in each interconnected IT system.
When insulation or voltage test are to be carried out, the device shall be isolated from the system for the test period.

If the terminals L1, L2, L3 of the device are connected to a system under operation, the terminals ⏚ and KE must not be disconnected from the protective conductor (PE).

1.3 Warranty and liability

As a basic principle, the general conditions for the supply of products and services of the electrical and electronics (recommended by ZVEI (German Electrical and Electronic Manufacturers' Association)) shall apply. As the latest, these shall be available to the operator when the contract is concluded.

1.4 Explanations of symbols and warnings

The following symbols are used in BENDER documentation to draw attention to important information and to make it easier to find certain text passages.

The following examples explain the meaning of the symbols:

The "Attention" symbol is used to draw attention to information warning employees of hazardous situations.

Information you should know for correct handling of the product is marked with the "Info" symbol.

2. Function

2.1 General characteristics

- Four-line LC display
- Automatic device self-test
- Memory with real-time clock to store all alarm messages with date and time stamp
- RS485 interface (BMS protocol) for data exchange with other Bender devices (RS485 electrically isolated)
- Remote setting of certain parameters via the Internet (option; FTC470XET additionally required)
- Option "W":
  Improved shock and vibration resistance for use in ships, on rolling stock and in seismic environment.

2.2 Essential functions of the A-ISOMETER®

- A-ISOMETER® for IT AC systems with galvanically connected rectifiers and for IT DC systems **("IT System" is the international IEC term for "Ungrounded System")**
- Automatic adaptation to the existing system leakage capacitances
- *AMP*^{Plus} measuring principle (European Patent: EP 0 654 673 B1)
- Two adjustable response values in the range 1 kΩ ... 10 MΩ (Alarm 1/Alarm 2)
- Connection monitoring
- Internal disconnection of the A-ISOMETER from the IT system to be monitored (using a control signal; terminals F1/F2) , e.g. if several A-ISOMETERs® are interconnected.
- Current output 0(4)...20mA (galvanically separated) in relation to the measured insulation value.

2.3 Essential functions of the Insulation fault location system (EDS)

- Generation of the test current necessary for selective insulation fault location
- Indication of the insulation faults selectively localized by the EDS4... systems
- Parameterization of EDS4... systems
- Test function for EDS4... systems, incl. the connected measuring current transfor.

2.4 Product description

The IRDH575 A-ISOMETER® monitors the insulation resistance of IT systems. It is suitable for universal use in 3(N)AC, AC/DC and DC systems. AC systems may include extensive DC supplied loads, such as converters or thyristor-controlled DC drives. The device automatically adapts itself to the existing system leakage capacitance. (IT system = Ungrounded System) .

The IRDH575 A-ISOMETER® is fitted into an enclosure for panel mounting, 144 x 96 mm (WxH). For protection against dust and moisture, a panel seal (IP42) or a front-face transparent cover (IP65) are available as accessories, see page 88.

The IRDH575 can be used in combination with a control and indicating device, PRC1470 version 2 or higher, for example, on the BMS (BMS = Bender Measuring Device Interface) bus.

2.5 Function

The IRDH575 A-ISOMETER® is connected between the unearthed system and the protective conductor (PE).

The response values and other function parameters are set via the function keys. The parameters are indicated on the LC display and are stored in a non-volatile memory (EEPROM) after the setting is completed.

A microprocessor-controlled pulsating AC measuring voltage is superimposed on the system (***AMP^Plus*** measuring principle*). The measuring cycle consists of positive and negative pulses of the same amplitude. The period depends on the respective system leakage capacitances and the insulation resistance of the system to be monitored. An insulation fault between system and earth closes the measuring circuit. From the measured current value, the microprocessor calculates the insulation resistance which is indicated on the LC display or the external kΩ measuring instrument.

> *When an AC system includes galvanically connected DC circuits, the following shall be considered:*
> *Insulation faults in DC circuits can only be monitored correctly when the rectifiers carry a continuous load of at least 5...10 mA.*

The measuring time is determined by the system leakage capacitances, 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

associated alarm relays respond and the alarm LEDs "ALARM1/2" light up and the measuring value is indicated on the LC display (in the event of DC insulation faults, the faulty supply line is indicated). The fault indication can be stored by bridging the terminals R1/R2 (external RESET button [NC contact]) or by setting the fault memory to "Memory:on" in the "ISO SETUP" menu.

Pressing the external or internal RESET button, resets the fault message, provided that the insulation resistance is at least 25 % above the preset value.

R1/R2 bridged + Memory:on	fault memory activated
R1/R2 bridged + Memory:off	fault memory activated
R1/R2 not connected + Memory:on	fault memory activated
R1/R2 not connected + Memory:off	fault memory deactivated

*) **AMP**^*Plus* measuring principle "adaptive measuring pulse", a measuring principle developed by BENDER.

2.5.1 Current output for external measuring instrument

The current output of IRDH575 provides 0(4)...20 mA. The current output is electrically isolated from the device electronics and the RS485 interface. The ISO SETUP menu, on page 41, allows to switch over between 0...20 mA and 4...20 mA.

2.5.2 Real-time clock

The real-time clock serves as a time base for the historical memory and self test function. At first the correct time and date must be set in the menu "ISO ADVANCED". If time and date are not set, a "C" (clock) is flashing in the standard display. In the event of a supply voltage failure, time and date will be stored for thirty days. If the 24 h self test is activated in the ISO ADVANCED menu, a special time of day can be selected for the execution of the self test in the menu "TEST: 12:00". Then a self test will be started automatically once a day exactly at the preset time. If the 1 h test has been selected, the self test is automatically carried out every full hour.

2.5.3 Insulation fault location

Another function of the IRDH575 is selective insulation fault location. If the value of the insulation resistance falls below the set response values ALARM 1 and ALARM 2, a certain test current is generated by the IRDH575. The maximum value of the test current is determined by the maxPuls parameter, see page 46. In combination with an insulation fault evaluator EDS47...-12 and the associated measuring current transformers connected to it, the insulation fault is selectively detected. The detected insulation fault is signalled to the IRDH575 via the RS485 interface (BMS protocol) and is then indicated by an alarm LED and indicated on the display. In the Master mode (Addr. 1), this alarm message is indicated by the alarm relay K3 as common alarm.

> ⚠ *In sensitive parts of the electrical installation malfunction can occur due to the test current flowing between system and earth. Please note that the value of the test current is compatible with the electrical installation being monitored.*

2.5.4 Interconnected systems

When using A-ISOMETERs® in IT systems care shall be taken that only one active A-ISOMETER® is connected in each interconnected system. If IT systems are interconnected via coupling switches, make sure that ISOMETERs not currently used are disconnected and deactivated via a control system. IT systems coupled via diodes or capacitances may also influence the insulation monitoring process. Hence, also in this case a central control of the different ISOMETERs is required.

2.5.5 Function input F1/F2 for connection or disconnection of IT systems being monitored

The A-ISOMETER® can be disconnected from the IT system and set to STANDBY mode with the function input F1/F2. When the input F1/F2 is bridged, the terminals L1/L2 are isolated from the measuring circuit via internal coupling relays and terminal L3 remains connected to the measuring circuit via a resistor of 10 MΩ. The measuring function is stopped and the message „STANDBY" appears on the display. When using software version 1.4 or higher, the latest measured insulation resistance is blanked and the value > 10 MΩ appears on the display. Furthermore, the alarm relays and alarm LEDs no longer provide alarm messages. Insulation faults already detected will be indicated by all EDS4... devices.

After opening the function input F1/F2, first of all the connection to the IT

system will be restored and a completely new measuring cycle for insulation monitoring will be started. Using this function, selective disconnection of an IRDH575 in interconnected IT systems can be carried out via auxiliary contacts of the respective coupling switch. One coupling switch each in a line-type or ring-type arrangement can deactivate a subsequent IRDH575. This arrangement guarantees that only one A-ISOMETER® is active in each galvanically connected IT system.

Theoretically speaking, in a ring-type arrangement with all coupling switches closed, all A-ISOMETER R s would be deactivated. In order to prevent this, a BMS Master (IRDH575 Adr1) monitors the condition of the function input F1/F2 of all Slave ISOMETER®s. When all Slave ISOMETERs are in the STANDBY mode, the insulation monitoring function of the Master ISOMETER® remains active, that means, the input F1/F2 of the Master is without function in this mode.
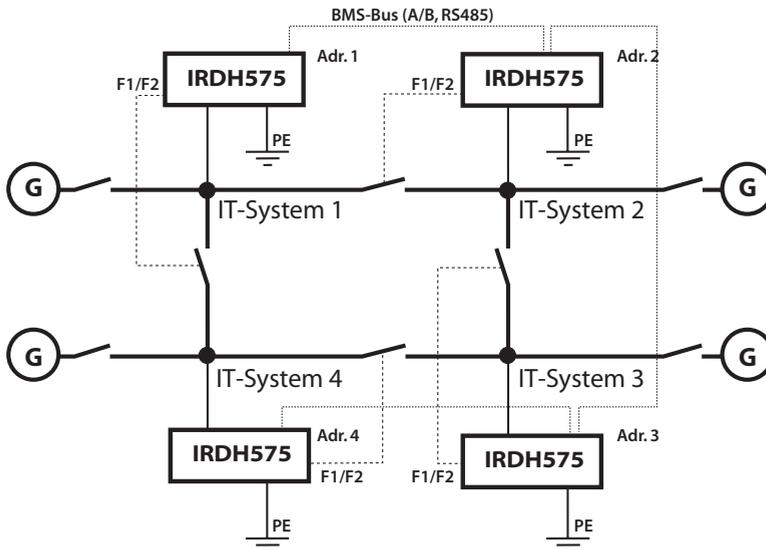
Example:

Let as assume, in the before-mentioned ring-type arrangement, the associated coupling switch of the Slave ISOMETER® 2 were open. The coupling switches of the BMS Master (Addr. 1) and of the Slaves 3 and 4 were closed. In this case the ISOMETER® and EDS functions of the Master and the Slaves 3 and 4 would be deactivated. In spite of changing to the STANDBY mode,

the Master status of the device with address 1 would remain. That means, if a parameterization is necessary, it has to be carried out via the IRDH575 with BMS address 1.

2.5.6 ISOnet function for central control of the insulation monitoring process when several IRDH575 are interconnected in IT systems.

Up to 30 A-ISOMETER® can communicate with each other in an ISOnet network. The ISOnet network can only be activated when a BMS bus is used for interconnection. A typical method with four devices is shown as an example. The ISOnet function of all A-ISOMETER® in the ISOnet network must be activated in the COM SETUP „ISOnet=ON" menu, refer to page 58.

The BMS master (BMS address 1) with activated ISOnet function controls the ISOnet slave devices via the BMS bus. Address 1 must not be assigned to another BMS device on the respective BMS bus.

When the master ISOMETER has finished one measuring cycle, the authorization for insulation monitoring is passed on to the next higher BMS address. This authorization is returned by the slave with the highest BMS address to the BMS master after a cycle has been completed.

During the insulation monitoring process, all other A-ISOMETER®, are in the STANDBY mode. In this way it is prevented that A-ISOMETER®s influence each other in interconnected IT systems.

At $f = 50\,Hz$ and $C_e = 1\,\mu F$, an ISOnet device stays in the measuring mode for 12 s and then changes to the STANDBY mode. The maximum response time of the ISOnet device that made the last measurement, will be extended by the number of devices x 12 s, in our example 48 s.

When an insulation fault is detected by an A-ISOMETER®, the insulation fault location process is started. The device stays in the measuring mode during this time. Only after completion of insulation fault location, the ISOnet device stops the monitoring mode and passes the authorization for insulation monitoring on to the next device.

In the STANDBY mode, the ISOnet device displays the last measured insulation resistance.

Each ISOnet slave checks the network for an ISOnet master. If there is no master available, the display will show the fault message „ISOnet Master?". With the ISOnet function activated, the function input F1/F2 is automatically deactivated.

> *All EDS devices in the IT systems being monitored must be operated with activated fault memory.*

In comparison to a solution with coupling switches and function input F1/F2, the response time will be extended because the measurement is not permanently carried out.
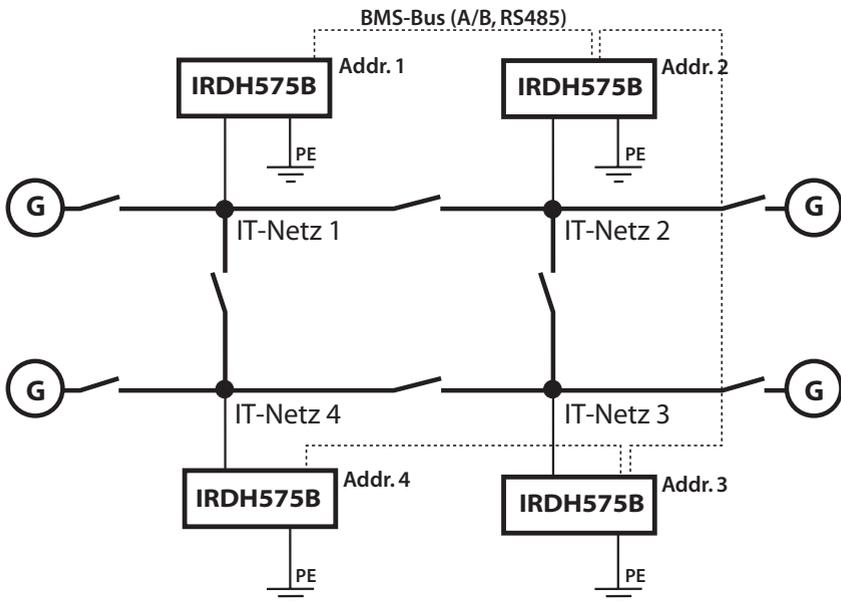
This has the advantage that no auxiliary contacts of a coupling switch are required. Furthermore, this solution is recommended for IT systems coupled via capacitances or diodes.

2.5.7 Self test

In order to guarantee high functional reliability, the A-ISOMETER® provides comprehensive self test functions. After switching the supply voltage on, all internal measuring functions, the components of the process control such as data and parameter memory as well as system and earth connections are checked using the self test functions. The progress of the self test is indicated

on the display by a bar graph. Depending on the system conditions, the duration of the self test is 15... 20 seconds, then the device indicates "Test ok" for approximately 2 seconds. Then the device returns to normal measuring mode and the current measuring value is displayed after the expiry of the reading time.

When a fault is found the message "!Error!" appears on the display, the device fault relay K3 (31-32-34) drops, the device fault LED lights up and the respective error message (see table) is indicated. If such a device fault occurs, a self test will be started every 60 seconds. If no more malfunction is detected, the fault message will automatically be deleted, the device fault LED extinguishes and the device fault relay K3 energizes again.

During operation, the self test function can be started by pressing the TEST button (internal or external) or automatically every hour or every 24 hours by selecting "ISO ADVANCED": Autotest:" in the menu. The alarm relays ALARM 1/2 can only switch after starting the self test function by pressing the TEST button, that means if an automatic self test has been selected, the alarm relays do not switch.

Error message	Meaning	Steps to taken
System connection?	No low-resistance connection of terminals L1, L2, L3 to the system	1. Check the wiring of terminal L1, L2, L3 to the system 2. Press the TEST button 3. Switch the supply voltage on and off 4. Check the fuses
Connection PE?	No low-resistance connection of the terminals ⏚ and KE to earth (PE)	1. Check wiring of terminal ⏚ and KE to earth (PE) 2. Press the TEST button 3. Switch the supply voltage on and off
Device error x	Internal device error	1. Press the TEST button 2. Switch the supply voltage on and off 3. Please contact Bender

If the on/off switching of the supply voltage is not possible for technical reasons, a RESET of the device can be carried out by pressing the "ESC", "RESET" and "MENU" key simultaneously

2.5.8 Relay K3: device fault alarm and EDS common message

Relay K3 is intended to signal device and connection errors of the A-ISOMETER®. In the Master mode with bus address 1, EDS alarm messages can be collectively indicated by the K3 relay as well as system fault messages. Collective indication of the EDS alarms by K3 can be disabled by selecting „K3 Alarm: off" from the "EDS Setup" menu. Refer to page 47.

K3 is permanently set to N/C operation, with the contacts 31-34 normally closed, that means when a fault occurs, the relay deenergizes (K3: 31-32 connected).

Further details are described in "chapter 2.5.7 Self test". Even when a protocol converter of the FTC470... series is installed in a BMS system which is temporarily taking over the Master function is, the function collective EDS message will remain. This function is directly dependent on BMS address 1, the Master status is a secondary factor.

2.5.9 Factory setting

The devices are delivered with the following factory setting:

ISO SETUP:	Alarm 1 / Alarm 2 =	40 kΩ / 10 kΩ
		(response values)
ISO SETUP:	Operating principle K1/K2 =	N/O operation
--------------	K3 =	N/C operation (fixed setting)
ISO SETUP:	Memory =	off
ISO ADVANCED:	System leakage capacitance =	150 μF
EDS SETUP:	EDS =	auto
EDS SETUP:	System =	3 AC
EDS SETUP:	max. pulse =	25 mA (for EDS460/490, EDS470)
COM SETUP:	Bus address =	1 (Master)

Please check if the basic setting of the A-ISOMETER® complies with the requirements of the system to be monitored.

3. Commissioning flow chart

3.1 Commissioning of the A-ISOMETER® function range (1)

```
┌──────────────────────┐         ┌──────────────────────────┐
│   System = IT system? │── no ──▶│   IRDH575 not suitable   │
└──────────────────────┘         └──────────────────────────┘
            │ yes
            ▼
┌──────────────────────┐         ┌──────────────────────────┐
│    Un<AC/DC575V?      │── no ──▶│   use device version B2  │
└──────────────────────┘         └──────────────────────────┘
            │                           │ yes
          yes                           │
```

Deenergize the installation before connecting the device !

```
┌──────────────────────┐         ┌──────────────────────────────┐
│  Device connection   │         │  Optional device connection  │
└──────────────────────┘         └──────────────────────────────┘
            │                                 │
            ▼                                 ▼
┌──────────────────────┐         ┌──────────────────────────────┐
│    E and KE to PE     │         │ External kΩ instrument to M+/M-│
└──────────────────────┘         └──────────────────────────────┘
            │                                 │
            ▼                                 ▼
┌──────────────────────┐         ┌──────────────────────────────┐
│  System to L1/L2/L3  │         │   External TEST button       │
└──────────────────────┘         │   (NO contact) toT1/T2       │
            │                     └──────────────────────────────┘
            ▼                                 │
┌──────────────────────┐         ┌──────────────────────────────┐
│ Supply voltage to A1+/A2 – │   │   External RESET button      │
└──────────────────────┘         │   (NC contact) R1/R2         │
            │                     └──────────────────────────────┘
            │                                 │
            │                     ┌──────────────────────────────┐
            │                     │     Output contacts          │
            │                     │ 11-12-14, 21-22-24, 31-32-34 │
            │                     └──────────────────────────────┘
            ▼
┌──────────────────────┐
│ connect supply voltage │
└──────────────────────┘
            │
            ▼
┌──────────────────────┐
│ connect system voltage │
└──────────────────────┘
            │
            ▼
```

Commissioning of the A-ISOMETER® function range (2)

```
        ┌──────────────────────────────┐
        │ Internal function test is    │
        │ carried out by the IRDH      │
        └──────────────────────────────┘
                       │
        ┌──────────────────────────────┐
        │ Time setting                 │
        └──────────────────────────────┘
                       │
                                          Refer to the chapter
                                          "Operation and Setting"
        ┌──────────────────────┐        ┌──────────────────────────────┐
        │ Shall the basic      │  no    │ Enter the new values in the  │
        │ setting be maintained?│──────▶│ ISO-SETUP menu               │
        └──────────────────────┘        └──────────────────────────────┘
                  │ yes
        ┌──────────────────────┐        ┌──────────────────────────────┐
        │ Are all alarm LEDs   │  no    │ The insulation resistance has│
        │ disabled ?           │──────▶│ fallen below the set level; a│
        └──────────────────────┘        │ new level should be set.     │
                  │ yes                  └──────────────────────────────┘
        ┌──────────────────────────────┐
        │ Function test with a suitable│
        │ resistance between system and│◀──────┐
        │ earth. Resistance value: 50% │       │
        │ of the response value ALARM2 │       │
        └──────────────────────────────┘       │
                  │                             │
        ┌──────────────────────┐  no    ┌──────────────────────┐
        │ Alarm LEDs activated?│──────▶│ Check connections    │
        │ Alarm relays switching?│      └──────────────────────┘
        └──────────────────────┘
                  │ yes
        ┌──────────────────────┐
        │ Remove resistance    │◀──────┐
        └──────────────────────┘       │ no
                  │                     │
        ┌──────────────────────┐       │
        │ Alarm LEDs extinguished?│────┘
        │ Did the alarm relays respond?│
        └──────────────────────┘
                  │
        ┌──────────────────────────────┐
        │ The IRDH575 is correctly     │
        │ connected and functions      │
        │ reliably                     │
        └──────────────────────────────┘
```

3.2 Commissioning of the insulation fault location function (EDS) (1)

Disconnect the electrical installation before connecting the device !

Install the respective devices of
the insulation fault location system
EDS47x and the associated
measuring transformers

BENDER Manuals
TGH1282 and 1243 respectively 1321

Connect the RS485 interface of
the EDS system to the IRDH575

Assign the adress to the
respective RS485 device

Turn the supply voltage on

Turn the system voltage on

An internal self test is running

Which EDS system is connected
to the IRDH575?

EDS473 →

Operation and setting or
TGH1321

Use the EDS-SETUP menu to
set the maximum test current
(max. pulse) to 2.5 mA (1 mA)

EDS470

Use the EDS-SETUP menu to set
the max. test current (max. pulse)
to 25 mA (10 mA), for example

TGH1243

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Commissioning of the insulation fault location function (EDS) (2)

```
┌────────────────────────┐                    ┌────────────────────────┐
│ Shall the basic setting │        no          │ Change the settings in │
│ be maintained?         │ ─────────────────▶ │ the SETUP / ADVANCED   │
└────────────────────────┘                    │ menu                   │
         │ yes                                 └────────────────────────┘
         ▼
┌────────────────────────┐ ◀──────────────────────────────────┐
│ Carry out the test in  │                                     │
│ the EDS-ADVANCED menu  │                                     │
└────────────────────────┘                                     │
         │                                                     │
         ▼                                                     │
┌────────────────────────┐        no          ┌────────────────────────┐
│ Are all bus nodes      │ ─────────────────▶ │ Check the wiring and   │
│ available after the    │                    │ bus nodes (RS485 LED)  │
│ completion of the test?│                    └────────────────────────┘
└────────────────────────┘
         │ yes
         ▼
┌────────────────────────┐        no          ┌────────────────────────┐
│ Do the EDS47x-12       │ ─────────────────▶ │ Check the CT wiring    │
│ recognize all measuring│                    └────────────────────────┘
│ transformers correctly?│
└────────────────────────┘
         │ yes
         ▼
┌────────────────────────┐ ◀──────────────────────────────────┐
│ Function test using a  │         no                          │
│ suitable resistance    │                                     │
│ between system and     │                                     │
│ earth. Resistance      │                                     │
│ value: 50% of the      │                                     │
│ lowest response value  │                                     │
│ downstream a CT.       │                                     │
└────────────────────────┘
         │
         ▼
┌────────────────────────┐
│ Alarm LEDs light up    │
│ Alarm relays switch    │
└────────────────────────┘
         │
         ▼
┌────────────────────────┐        no          ┌────────────────────────┐
│ Does the LED "EDS on"  │ ─────────────────▶ │ Check whether the sub  │
│ light up? Do the RS485 │                    │ menu EDS-auto is       │
│ LEDs light at the bus  │                    │ activated in the       │
│ nodes? Are the CTs     │                    │ EDS-SETUP menu         │
│ being scanned by the   │                    └────────────────────────┘
│ EDS47X-12?             │
└────────────────────────┘
         │ yes
         ▼
┌────────────────────────┐
│ When the faulty        │
│ subcircuit is          │
│ recognized correctly,  │
│ the display indicates: │
│ ADR:xx  k:xx   xxmA    │
└────────────────────────┘
         │ yes
         ▼
┌────────────────────────┐        yes         ┌────────────────────────┐
│ Are there other CTs    │ ─────────────────▶ │ Remove the resistance  │
│ installed that are to  │                    │ and select another     │
│ be checked?            │                    │ location downstream a  │
└────────────────────────┘                    │ measuring transformer  │
         │ no                                  │ where the insulation   │
         ▼                                     │ fault is to be         │
                                               │ simulated.             │
                                               └────────────────────────┘
```

Commissioning of the insulation fault location function (EDS) (3)

```
              ┌──────────────────────────┐
              │   Remove the resistance   │◄──────┐
              └──────────────────────────┘       │ no
                           │                      │
              ┌──────────────────────────┐        │
              │  Alarm LEDs extinguished? │────────┘
              │ Did the alarm relays respond ? │
              └──────────────────────────┘
                           │
              ┌──────────────────────────┐
              │ Delete the alarm messages by │
              │   pressing the RESET button  │
              │  of the EDS4...-12 or selecting │
              │      EDS RESET from the      │
              │     EDS ADVANCED menu        │
              │       of the IRDH575         │
              └──────────────────────────┘
                           │
              ┌──────────────────────────┐
              │ The EDS4...-12 is ready for  │
              │   operation and correctly    │
              │         connected.           │
              └──────────────────────────┘
```

4. Connection

IRDH575 has plug-in terminals.

Connect the terminals A1/+ and A2/- to the supply voltage U_S in accordance with IEC 60364-4-43. The connections to the supply voltage shall be provided with protective devices to afford protection in the event of a short-circuit (a 6 A fuse is recommended).

Devices for protection against short-circuit in conformity with IEC 60364-4-43 for the IT system coupling L1/L2/L3 can be omitted if the wiring is carried out in such a manner as to reduce the risk of a short-circuited to a minimum (a short-circuit-proof and earth-fault-proof wiring is recommended).

Use the accompanying terminal covers for terminal protection

Only one A-ISOMETER® may be connected to an external TEST or RESET button. The TEST and RESET inputs of different insulation monitoring devices must not be connected in parallel for collective testing.

⚠️ *Only one insulation monitoring device may be used in each interconnected IT system.*
When insulation or voltage test are to be carried out, the device shall be isolated from the system for the test period.

IRDH575
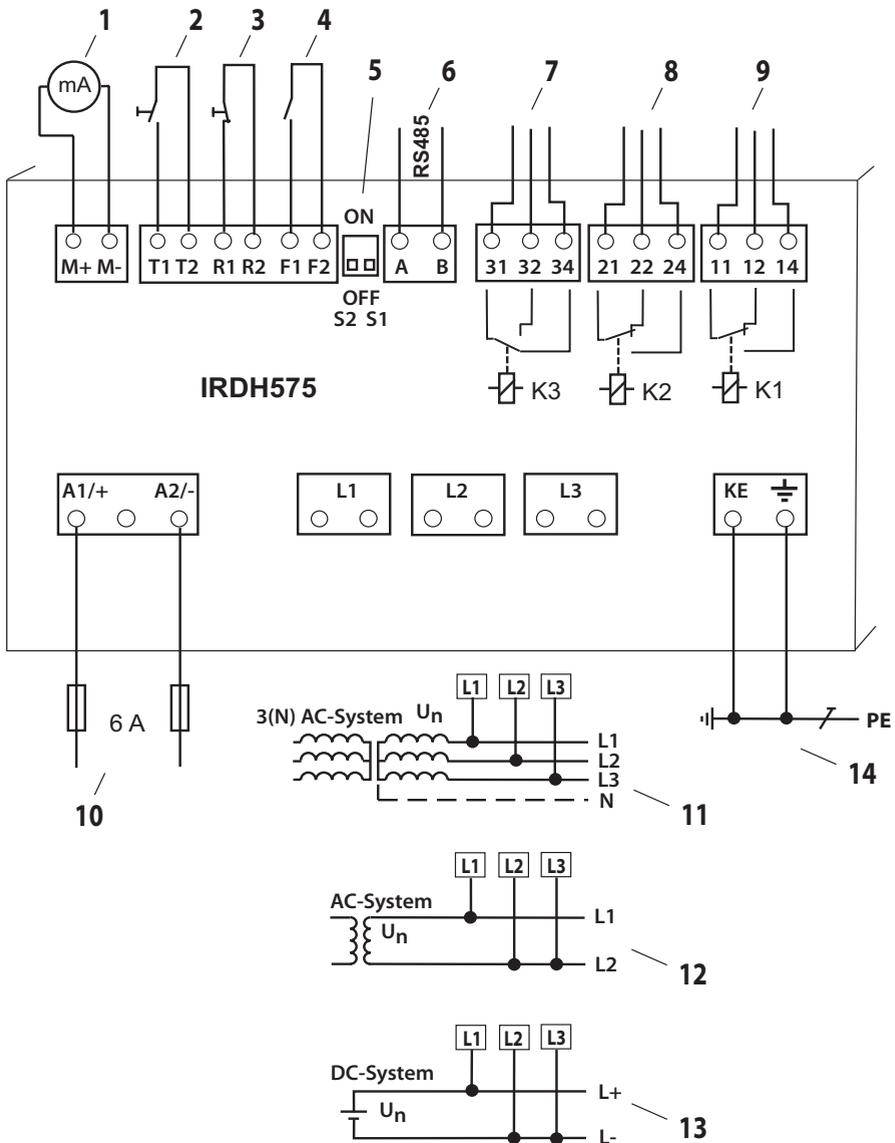
Legend to wiring diagram :

 1 For external indicating instrument:
    current output 0...20 mA oder 4...20 mA

 2 External TEST button (NO contact)

 3 External RESET button (NC contact or wire jumper),
    (with the terminals open and the ISO-SETUP menu set to Memory:off, insulation fault alarms will not be stored).

 4 STANDBY
    When the contact is closed, insulation measurement does not take place; system disconnection

 5 S1 = ON : RS485 interface (A/B) is terminated with 120 Ω resistor
    S2 = unassigned)

 6 Serial interface RS485 (A/B)

 7 System fault relay K3 (device fault and EDS Alarm) (Addr.: 1);
    N/C operation (fixed setting)

 8 Alarm relay K2 (insulation fault 2); changeover contacts provided

 9 Alarm relay K1 (insulation fault 1); changeover contacts provided

10 Supply voltage U_S (see nameplate) via 6 A

11 Connection to the 3 AC system to be monitored:
    connect terminals L1, L2, L3 to conductor L1, L2, L3

12 Connection to the AC system to be monitored:
    terminal L1 to conductor L1and
    terminal L2, L3 to conductor L2

13 Connection to the DC system to be monitored:
    terminal L1 to conductor L+ and
    terminals L2, L3 to conductor L-

14 Separate connection of ⏚ and KE to PE

5. Operation and setting

5.1 Operating features and displays IRDH575

1	INFO button: to query standard information /
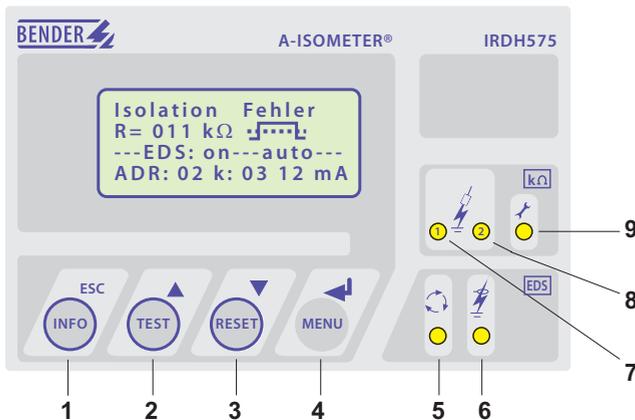
1 INFO button: to query standard information /
   ESC key: back (menu function), confirmation parameter change
2 TEST button: to call up the self test (A-ISOMETER® only) /
   Up key: parameter change, moving up in the menu
3 RESET button: to delete insulation fault alarms (A-ISOMETER® only)
   Down key: parameter change, moving down in the menu
4 MENU button: to activate the menu system/
   ENTER key: confirmation parameter change
5 EDS LED lights: insulation fault location has been started
6 EDS alarm LED lights: insulation fault is detected
7 Alarm LED 1 lights: insulation fault, first warning level reached
8 Alarm LED 2 lights: insulation fault, second warning level reached
9 Device fault LED lights: IRDH575 defective

BENDER

5.1.1 Display in case of active EDS and detected fault

```
    Insulation    Fault  ──── 8
1 ──Rs=011kΩ  ⌐⊓.H      ──── 7
2 ────EDS:on---auto---   ──── 6
    ADR:02 k03 12mA

        3      4       5
```
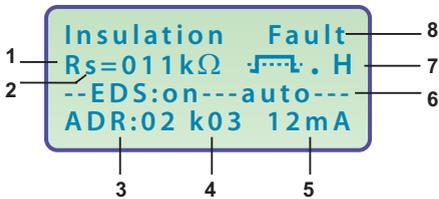
1	Insulation resistance is indicated in kΩ
2	Additional information about the insulation resistance:
	„+": insulation fault at L+
	„–": insulation fault at L−
	„s": new measurement has started
3	Bus address of the active EDS4... (indication in case of fault detection)
4	Channel being monitored by the EDS4... (indication in case of fault detection)
5	Test current in mA or µA (indication in case of fault detection)
	or
	short = measuring input short-circuited
	noCT = no CT connected
6	-on---auto: EDS is in the AUTO mode and just running. Further modes are:
	- on: EDS is activated
	- off: EDS is deactivated
	- pos470 : Addr. and channel of the EDS have to be selected
	(in the Master mode only), EDS47... only
	- 1cycle : after testing all the channels, once the EDS is deactivated
7	⌐⊓ = Polarity of the test current pulse
	. = valid RS485 traffic
	H = a new entry is made in the memory data base
	C = flashing, if the clock has to be set
8	Messages:
	- Insulation fault
	- Connection system?
	- Connection PE?
	- Device error x
	- *****STANDBY*****

5.1.2 Display in the menu mode

```
1. EXIT          ⌂
2. HISTORY INFO
3. ISO SETUP
4. ISO ADVANCED
```

Parameter change is permitted

Parameter change is blocked, enabling by a password

5.1.3 Function keys

Two functions are assigned to each function key. In addition to the basic function marked with a circle, the keys allow navigation within the menu.

ESC / INFO

Pressing the INFO key provides the following information without opening the menu:

- Device name, firmware version
- Response values Alarm1 and Alarm2
- Leakage capacitance C_e (value is indicated only if insulation values are > 20 kΩ)
- EDS Setup (operating mode, type of power supply system, max. test current)
- Setup status (for details refer to the table of status numbers on page 86)
- COM Setup (IRDH575 bus address)

Please have the details above on hand if you have a problem and if you contact Bender for technical questions.

TEST / RESET
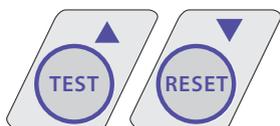
Activating the TEST button starts the self test of the A-ISOMETER®.

Pressing the RESET key resets insulation and fault messages of the A-ISOMETER.This function is only active after activating the fault memory in the ISO-SETUP menu or after bridging R1/R2. Furthermore, the A-ISOMETER® can only be reset when the present insulation value is 25% higher than the preset response value.
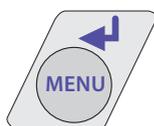
MENU

The menu system is called up by pressing the MENU key.

For controlling the menu system, the Up/Down keys, the ENTER key and the ESC key are used:

Up key:
Moving up in the menu, increasing a parameter

Down key:
Moving down in the menu, decreasing a parameter

ENTER key:
Selecting a menu item or sub menu item, confirming or storing a parameter change and going back to the associated sub menu item or going to the next input area.

ESC key:
to return to the previous menu.
If the menu has not been closed, the device returns to the display mode again after approximately 5 minutes.

For the sake of clarity, the following symbols are used for the functions ENTER, UP/DOWN and ESCAPE in the menu diagrams of this operating manual:

5.2 Menu structure and menu mode

The presentation of the menu structure consists of two parts. One part consists of the menu options 1 to 8, the other one of the menu options 9 to 12. All EDS-related menu options are grouped together and are represented on one display. The EDS Setup menu option is designed for the test current generator parameter setting of the IRDH575 for all insulation evaluators. One exception in the EDS Setup menu is the parameter "Position mode", it is only designated for EDS47... devices.

Switchover to the menu mode
Pressing the MENU key, will change the display from the standard mode to the menu mode. From the main menu you can link to the different sub menus.

Navigation within the menu
Select the desired menu item using the UP/DOWN keys. The selected menu item is indicated by a flashing cursor. Press the ENTER key to open the associated sub menu.
Use the UP/DOWN keys again to select the desired parameters. Move the cursor to the edit field by pressing the ENTER key.
If you have reached the end of the main menu list, it will be indicated by the "Arrow UP" symbol.

Changing the parameters
When password protection is activated, indicated by the symbol "padlock closed" , the first thing to enter is the correct password before the parameters can be changed using the UP/DOWN keys. Entering the correct password once allows all parameters to be changed as long as you do not leave the menu.
Changing the parameter usually has an immediate effect on the measuring and alarm functions. The changed parameter is stored in a volatile memory by pressing the ENTER or ESC key after returning to the sub menu (flashing cursor in column 1). During menu operations, all measuring and alarm functions carry on working as usual in the background.

Changing from the menu mode to the standard mode
Pressing the ESC key allows fast changing from the menu mode to the standard mode. Thus, the menu item "EXIT" need not to be activated. Automatic switchover from the menu mode to the standard mode takes place when no

key is pressed for approximately 5 minutes in a main or sub menu.

5.2.1 Diagram menu structure

```
****IT-SYSTEM****
R >010 MΩ  ⌐····⌐
- EDS: off -- auto --
*****************
```

MENU

1. **EXIT**
2. HISTORY INFO
3. ISO SETUP
4. ISO ADVANCED
5. EDS SETUP
6. EDS 460/490
7. EDS 470
8. COM SETUP
9. PASSWORD
10. LANGUAGE
11. SERVICE

ESC

ESC

Menu item 1 … 7

COM SETUP   PASSWORD   LANGUAGE   SERVICE

```
1. EXIT
2. Password: XXX
3. Status: off
```

```
Insert Service
Password: 000
```

```
1. EXIT
2. Addr: 001
3. ISO Monitor
```

```
1. EXIT
2. Text: Deutsch
```

BENDER

```
****IT-SYSTEM****
R >010 MΩ
- EDS: off -- auto --
*****************
```

→ **MENU**

↵ ESC

```
1.  EXIT
2.  HISTORY INFO
3.  ISO SETUP
4.  ISO ADVANCED
5.  EDS SETUP
6.  EDS 460/490
7.  EDS 470
8.  COM SETUP
9.  PASSWORD
10. LANGUAGE
11. SERVICE
```

↵

ESC

Menu item 8 ...11

HISTORY INFO

```
Nr.: 01    #Nr.: 02
   Power on
12.09.02   09:21
Clear all:  off
```

ISO SETUP

```
1. EXIT
2. Alarm1 040 kΩ
3. Alarm2 010 kΩ
4. K1 : NO
5. K2 : NO
6. Memory: off
7. M+/M-: 0-20 mA
```

ISO ADVANCED

```
1. EXIT
2. AGH : no
3. Ce max: 150 µF
4. Measure: AMP
5. Autotest: 24h
6. Clock:  19:08
7. Date: 01.01.01
8. Test:    12:00
```

EDS SETUP

```
1. EXIT
2. EDS: auto
3. System: 3AC
4. MaxPuls:025mA
```

EDS 460/490

```
1. EXIT
2. General
3. Channel
4. Relay: N.O
5. Test/Reset
```

EDS 470

```
1. EXIT
2. EDS-Monitor
3. EDS Test: off
4. EDS Reset: off
5. Relay: N.O
6. Memory: on
7. CT Setup
8. n-peak: 001
9. K3 Alarm: on
```

5.3 HISTORY INFO menu

99 events with date and time stamp can be stored in the memory database. The database is designed as a ring memory, i.e. the eldest entry is overwritten. Data is written into a non-volatile memory and therefore provides protection against voltage failure.

For each record the display indicates the actual record number, the total number of records, the event message (see table below, right column), the date and time. The first two records have a special meaning:

1. Last power on time.

2. Lowest measured insulation value R_F since memory reset.

Data record	Event	Display indication
1	Supply voltage switched on	Power On
2	Lowest measured insulation value	Rmin
3...99	Response value Alarm 1 triggered	● Alarm1
3...99	Response value Alarm 1 cleared	○ Alarm1
3...99	Response value Alarm 2 triggered	● Alarm2
3...99	Response value Alarm 2 cleared	○ Alarm2
3...99	Error system connection triggered	● System connection?
3...99	Error system connection cleared	○ System connection?
3...99	Error PE connection triggered	● PE connection?
3...99	Error PE connection cleared	○ PE connection?
3...99	Device error triggered	● Device error
3...99	Device error cleared	○ Device error
3...99	System reset (watchdog)	System reset

Before storing the events with the actual date and time stamp, set the real-time clock in the ISO ADVANCED menu (refer page 42).
The following function keys are provided to query data from the "HISTORY INFO" menu: the UP/DOWN keys to change the data record number, the ENTER key to change from the data record number to the menu item "Clear all:on" to delete the memory storage, and the ESC key to leave the menu. A new entry into the memory is signalled with an "H" on the display in the standard mode. The "H" will be deleted as soon as the "HISTORY INFO" menu is called up.

5.3.1 Diagram HISTORY INFO

```
****IT-SYSTEM****
R >010 MΩ  ⌐┈┈┐
- EDS: off -- auto --
******************
```

```
1.  EXIT              ⌂
2.  HISTORY INFO
3.  ISO SETUP
4.  ISO ADVANCED
5.  EDS SETUP
6.  EDS 460/490
7.  EDS 470
8.  COM SETUP
9.  PASSWORD
10. LANGUAGE
11. SERVICE          ↥
```

ESC

```
Nr.: 01   #Nr: 08
  Power   on
01.01.06   16:12
Clear all: off
```

```
Nr.: 02   #Nr: 08
Rmin:      010kΩ
01.01.02   17:26
Clear all: off
```
→ Clear all: **off** → Clear all: **on** →

```
Nr.: 03   #Nr: 08
● Alarm1:    004kΩ
03.01.06   10:33
Clear all: off
```
→ Clear all: **off** → Clear all: **on** →
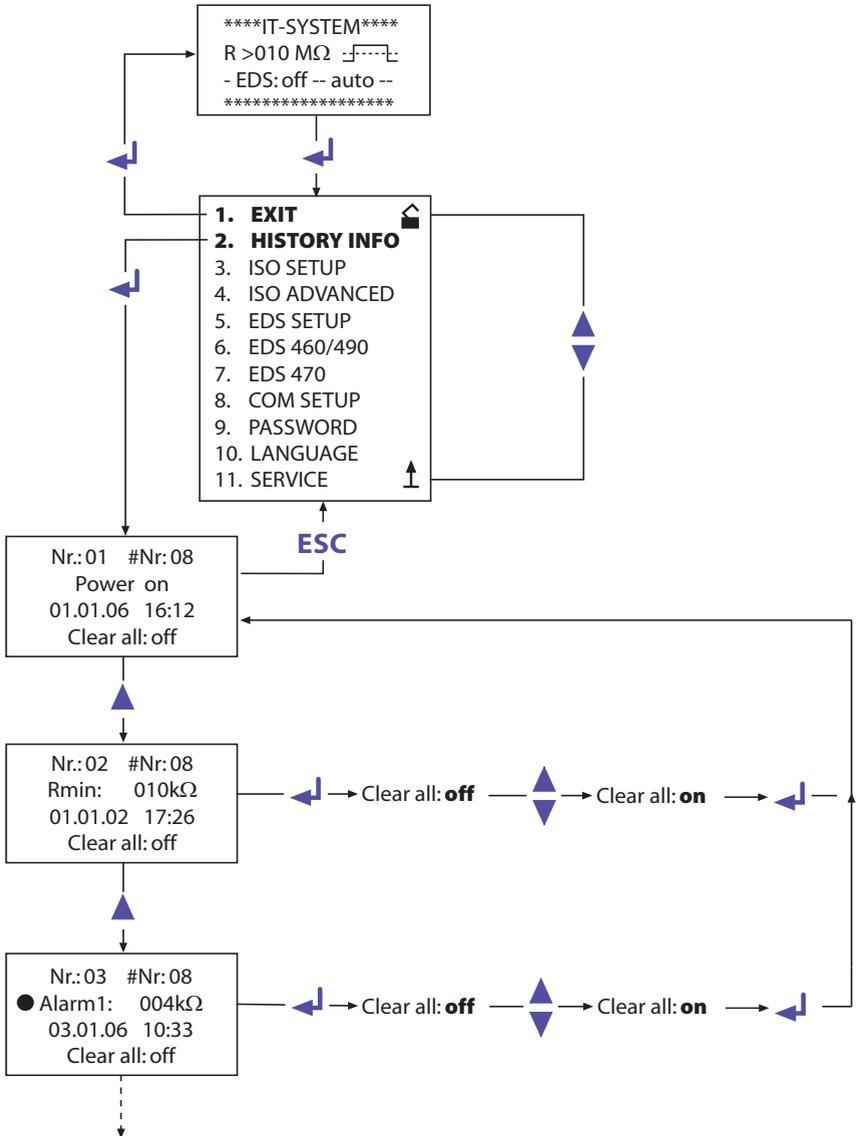
5.4 ISO SETUP menu: Setting of the basic A-ISOMETER® functions

The response values (Alarm 1/2, prewarning and main alarm), the operating principle of the alarm relays K1 and K2 (N.O = N/O operation, N.C = N/C operation), the fault storage behaviour and the selection of the current output between two different ranges are set in this menu.

5.4.1 Response values Alarm 1 and Alarm 2

The response values Alarm 1 and Alarm 2 are selected with the UP/DOWN keys and stored with the ENTER key.

5.4.2 Starting the EDS system via the response values ALARM 1and ALARM 2

The EDS system is started when the value of the insulation resistance falls below the lowest preset response value, i.e. below both alarm values. When setting the A-ISOMETER® response values, make sure that the lower value of them is within a range which the EDS system is able to find. Therefore it is recommended to set the A-ISOMETER® response value according to the response characteristic curves of the EDS system (Refer to page 80).

5.4.3 Operating principle of the alarm relays

K1/K2 are factory set to N.O Test, that means N/O operation. When the supplement "Test" has been selected, the alarm relays switch over during a manual self test.

If, for any reason, the alarm relays may not switch over during a manual self test, the settings N.C or N.O are to be selected.

K1: N.C Test   = N/C operation contacts 11-12-14, with relay test
                 (the alarm relay is energized during normal operation)
K1: N.O Test   = N/O operation contacts 11-12-14, with relay test
                 (the alarm relay is deenergized during normal operation)
K1: N.C   = N/C operation contacts 11-12-14, without relay test
                 (the alarm relay is energized during normal operation)
K1: N.O   = N/O operation contacts 11-12-14, without relay test
                 (the alarm relay is deenergized during normal operation)
K1: Flash   = Flashing function contacts 11-12-14
                 (the alarm relay and the LED flash in the event of an alarm
                 message, approximately 0.5 Hz

Diagram ISO SETUP

```
****IT-SYSTEM****
R >010 MΩ  ⌐----⌐
- EDS: off -- auto --
*****************
```

```
1.  EXIT
2.  HISTORY INFO
3.  ISO SETUP
4.  ISO ADVANCED
5.  EDS SETUP
6.  EDS 460/490
7.  EDS 470
8.  COM SETUP
9.  PASSWORD
10. LANGUAGE
11. SERVICE
```

```
1. Exit
2. AL1:  40 KΩ
3. AL2:  10 KΩ
4. K1   : N.O
5. K2   : N.O
6. Memory: off
7. M+/M-: 0-20 mA
```

Alarm1 : **40** KΩ

001 KΩ
.
.
10 MΩ

Alarm2 : **10** KΩ

K1: **N.O Test**

N.O Test
N.C Test
Flash
N.O
N.C

K2: **N.O Test**

Memory: **off**

Memory: **on**
Memory: **off**

M+/M-: **0-20 mA**

M+/M-: **0-20 mA**
M+/M-: **4-20 mA**
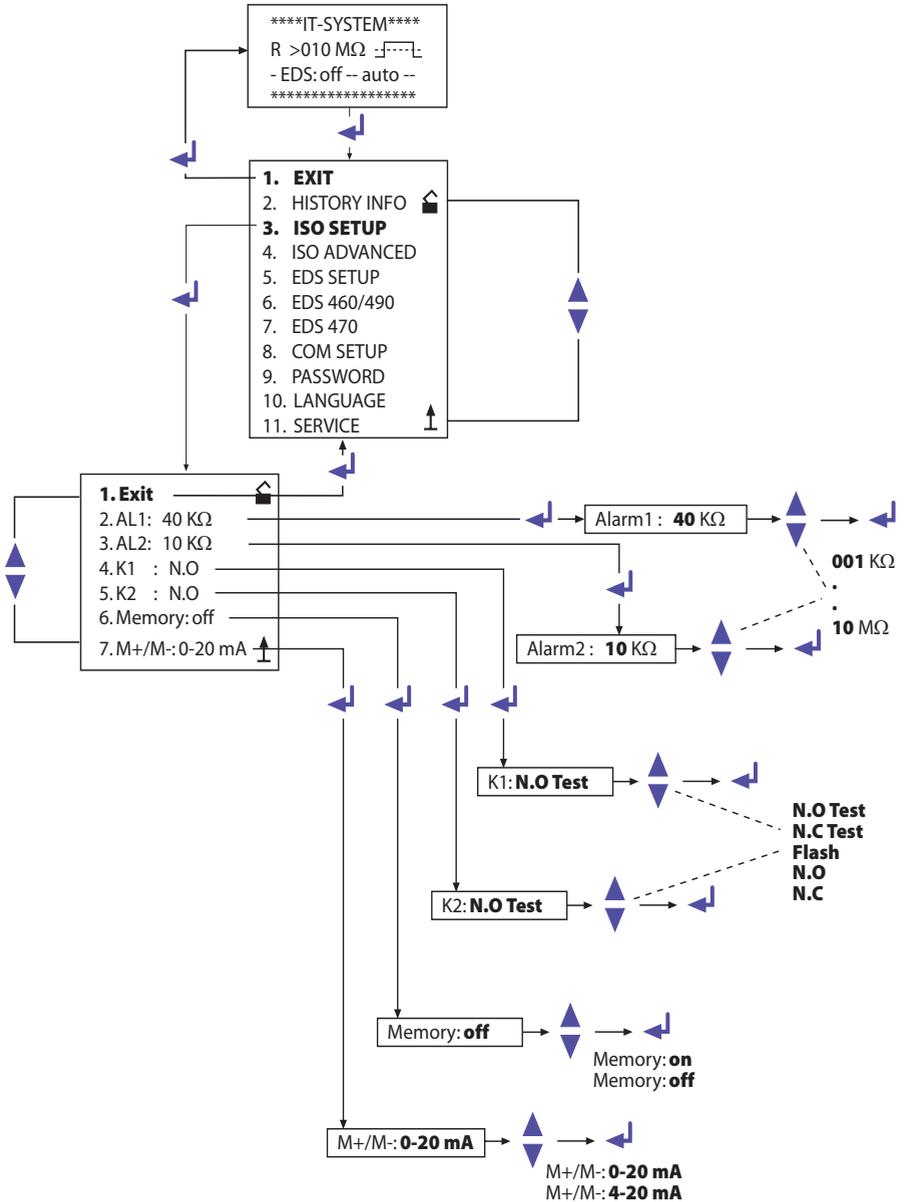
K2: N.C Test = N/C operation contacts 21-22-24, with relay test
                (the alarm relay is energized during normal operation)
K2: N.O Test = N/O operation contacts 21-22-24, with relay test
                (the alarm relay is deenergized during normal operation)
K2 : N.C   = N/C operation contacts 21-22-24, without relay test
                (the alarm relay is energized during normal operation)
K2 : N.O   = N/O operation contacts 21-22-24, without relay test
                (the alarm relay is deenergized during normal operation)
K2 : Flash   = Flashing function contacts 21-22-24
                (the alarm relay and the LED flash in the event of an alarm
                message, approximately 0.5 Hz)

K3 has to be parameterized in the Menu EDS Setup, refer to page 47.

5.4.4 Memory setting (on/off)

Memory: on   = Fault memory is activated
               The device must be reset with the RESET button after
               clearing the fault.
Memory: off = Fault memory deactivated (factory setting)

> *In the ISO SETUP menu the memory behaviour of the IRDH575 can be*
> *set. This setting does not have an effect on the memory behaviour of*
> *the connected EDS devices, these settings must be carried out in the*
> *EDS460/490 and EDS470 menu.*

5.4.5 Current output for external measuring instruments

Factory setting: 0...20 mA

The current output of the IRDH575 can be set to "0...20 mA" oder "4...20 mA" via the menu point "M+/M-:". The maximum load is 500 Ω.

Function 0...20 mA:
R_F = insulation fault, I = current in mA

$$R_F = \frac{20\ \text{mA} \times 120\ \text{k}\Omega}{I} - 120\ \text{k}\Omega$$

Function 4...20 mA:
R_F = insulation fault, I = current in mA

$$R_F = \frac{16\ \text{mA} \times 120\ \text{k}\Omega}{I - 4\ \text{mA}} - 120\ \text{k}\Omega$$

The associated characteristic curves are illustrated on page 76.

5.5 ISO ADVANCED menu: Setting of the extended functions

5.5.1 External coupling device (AGH: no = factory setting)
Coupling devices cannot be connected to the IRDH575.

5.5.2 Selecting the system leakage capacitance range
This menu allows to select the maximum system leakage capacitance $C_e$max. You can select between two different ranges: 150 µF or 500 µF. Adaptation within the selected range is carried out automatically. Please note that the basic measuring time will be increased to approximately 10 seconds when the setting is C_e = 500 µF. Please also consider $C_e$max for the EDS-System, refer to curves at page 81. Factory setting = 150 µF.

5.5.3 Changing the measuring principle from AMP to DC (Measure: AMP)
The DC measuring principle (reduced measuring time) is only suitable for pure AC systems. Factory setting = AMP.

5.5.4 Setting the repetition time for automatic self tests (Autotest: 24h)
The time for the repetition of automatic self tests can either be set to 1 hour or to 24 hours or can be deactivated. Factory setting = 24 h

5.5.5 Setting the real-time clock (Clock)
The setting of the real-time clock is the time base for the memory and for the automatic self test. In case of failure of the supply voltage, the real-time clock keeps running for approximately 30 days. When the device will be switched on after this period, a flashing "C" appears on the display and the clock has to be set again.

5.5.6 Setting the date (Date)
As well as the time, the date is required for the memory, too. In the event of power supply failure, the date function is not influenced for at least 30 days. If the device is switched on again after this period, a new setting of date and time of the real-time clock is required.

5.5.7 Specifying the starting time of the automatic self test (Test)
If the 24h self test is activated in the ISO ADVANCED menu, it is possible to set the time (hour) when the self test is to be carried out by means of the "TEST: 12:00" sub menu. Then the self test is automatically carried out once a day at a given time. If the 1 hour auto test has been selected, the self test will be carried out at every full hour.

BENDER

5.5.8 Diagram ISO ADVANCED

```
****IT-SYSTEM****
R > 010 MΩ
- EDS: off -- auto --
******************
```

1. **EXIT**
2. HISTORY INFO
3. ISO SETUP
4. **ISO ADVANCED**
5. EDS SETUP
6. EDS 460/490
7. EDS 470
8. COM SETUP
9. PASSWORD
10. LANGUAGE
11. SERVICE

1. **Exit**
2. AGH: no
3. Ce max : 150µF
4. Measure: AMP
5. Autotest: 24h
6. Clock: 21:09
7. Date: 01.01.01
8. Test: 12:00

Ce max : **150**µF

Ce max : **150**µF
Ce max : **500**µF

Measure: AMP

DC
AMP

24h
no
01h

Autotest: **24h**

Clock: **21:09**

Date: **01.01.01**

Test: **12:00**

Test: **00:00**
.
.
.
Test: **23:00**

5.6 EDS-SETUP menu: Settings for fault location

This menu allows to carry out the necessary settings for the insulation fault location system (EDS).

5.6.1 EDS auto / on / off / pos / 1cycle

A selection of the start and stop conditions for EDS systems and their meaning are listed below:

- on
  The EDS is running continuously, regardless of the insulation value and the alarm messages from the A-ISOMETER®. This setting is essential, for example, for mobile insulation fault location systems such as EDS3060/3360.

- off
  The EDS system is constantly switched off.

- pos470 (EDS47... only)
  For continuous measurement at a desired address (EDS4...-12) and a certain channel. The selected parameters are kept until a new operating mode is set.
  This function is only possible in the Master mode (bus address 1).
  The following messages are possible in the POSITION mode.
  Note: the messages noCT and short are only generated when the CT monitoring for the respective channel has been switched on (= factory setting, menu CT SETUP):

  - no EDS: no EDS47... of this address available
  - no Alarm: no insulation fault detected
  - ... mA: indication of the fault current in case of an insulation fault
  - >1A/>10 A: AC residual current > 1 A (EDS473) or >10 A (EDS470)
  - peak fault: measurement disturbed
  - short: CT input short-circuited
  - noCT: no CT connected

5.6.2 Diagram EDS-SETUP

```
****IT-SYSTEM****
R > 010 MΩ
- EDS: off -- auto --
*****************
```

```
1.  EXIT
2.  HISTORY INFO
3.  ISO SETUP
4.  ISO ADVANCED
5.  EDS SETUP
6.  EDS 460/490
7.  EDS 470
8.  COM SETUP
9.  PASSWORD
10. LANGUAGE
11. SERVICE
```

```
1. Exit
2. EDS: auto
3. System: 3AC
4. MaxPuls: 025mA
```

```
EDS :  auto

auto
on
off
pos470
1cycle
```

```
System:  3AC

3AC
AC
DC
```

```
MaxPuls: 025mA

1 mA
2,5 mA
10 mA
25 mA
50 mA
```

```
POSITION SETUP
ADR: 002  k: 001
no EDS/ 15mA/
>1A/ >10A
```
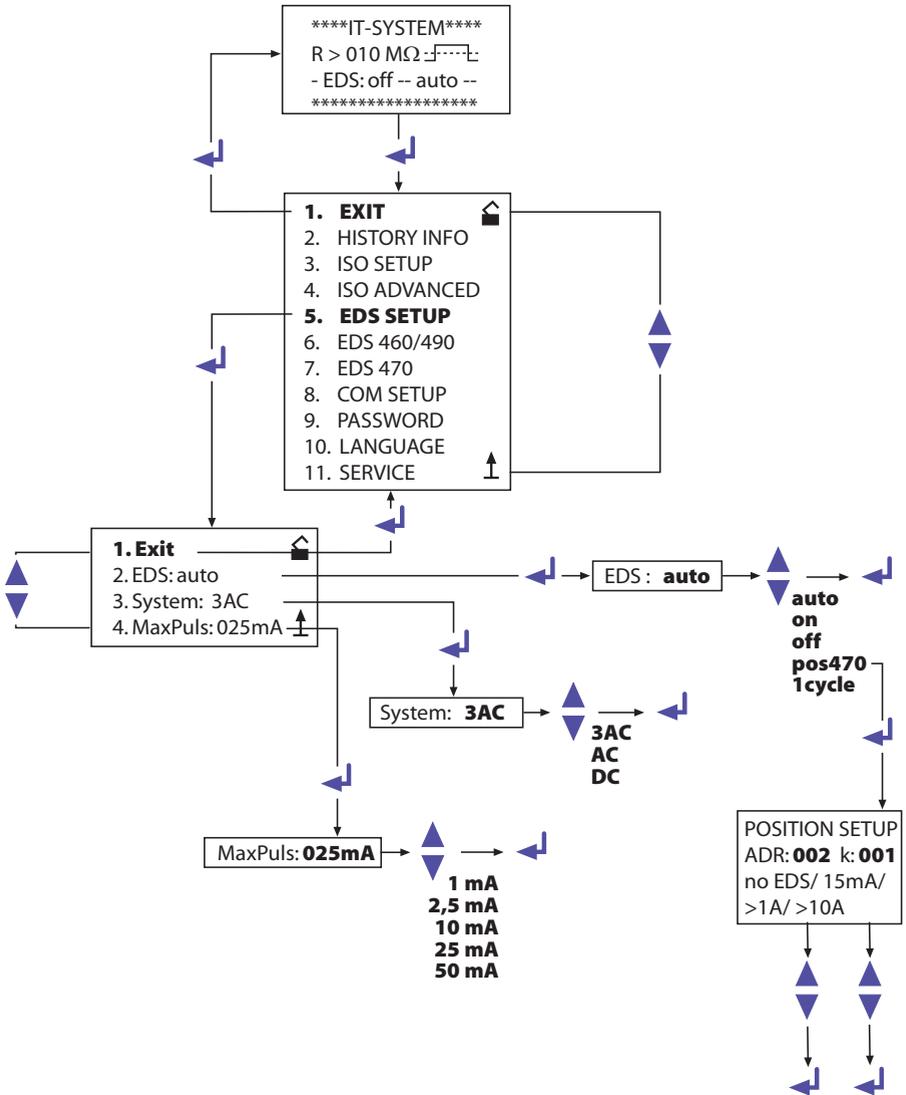
- 1cycle
  EDS47... :
  As soon as the insulation resistance has fallen below the A-ISOMETER® response values ALARM 1 **and** 2, the EDS system is automatically activated. It remains active until every EDS4...-12 has measured all channels once and when the test current during the measurements is above 5 mA (EDS470) or 0.5 mA (EDS473).
  EDS46... / 49... :
  As soon as the insulation resistance has fallen below the A-ISOMETER® response values ALARM 1 **and** 2, the EDS system is automatically activated. It remains active for approximately 5 minutes when the test current during the measurement is above 2 mA (EDS470) or 0.2 mA (EDS473).

- auto
  As soon as the insulation resistance has fallen below the A-ISOMETER® response values ALARM 1 and 2, the EDS system is automatically activated and remains activated as long as the test current is above 5 mA (0.5 mA). The EDS insulation fault location process is cyclically interrupted for approximately 5 minutes (factory setting), i.e. for the time the A-ISOMETER® is carrying out insulation fault measurements.

5.6.3 System DC / 1 AC / 3 AC

The type of the system to be monitored are to be selected from this sub menu:

- DC   = DC system
- 1 AC   = single phase AC system
- 3 AC   = three-phase AC system

Factory setting is 3AC!

5.6.4 maxPuls 1 / 2.5 / 10 / 25 / 50 mA:

This setting determines the maximum test current.

- 1 and 2.5 mA for EDS473 / 461 / 491 systems, preferably 2.5 mA.
  1mA is recommended when sensitive electrical equipment is supplied by the system, such as PLC controllers.

- 10, 25 and 50 mA for EDS470 / 460 / 490 systems, preferably 25 mA.
  10 mA is recommended when sensitive equipment such as control relays is supplied by the system. 50 mA should only be used in case of systems involving a lot of parallel faults (factory setting 25 mA).

The test current of the IRDH575 is factory set to 25 mA.

Please note that the test current is to be set according to the type of supply system.

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. Therefore, the test current setting 1 mA for EDS473 and 10 mA for EDS470 devices is not admissible in AC systems.

A list of possible test current settings for IRDH575 in relation to the type of supply system and insulation fault evaluators is given in the table below:

Type of supply system	EDS460/490 min.	max.	EDS461/491 min.	max.	EDS470 min.	max.	EDS473 min.	max.
DC	10 mA	50 mA	1 mA	2,5 mA	10 mA	25 mA	1 mA	2,5 mA
AC	10 mA*	50 mA	1 mA**	2,5 mA	25 mA	25 mA	2,5 mA	2,5 mA
3AC	10 mA*	50 mA	1 mA**	2,5 mA	25 mA	25 mA	2,5 mA	2,5 mA

* = Set the response value of EDS460/490 to < 5 mA
(TGH1394, Chap. 6.6.3.2)
** = Set the response value of EDS461/491 to < 0.5 mA
(TGH1394, Chap. 6.6.3.2)

5.6.5   K3 alarm: ON
The K3 relay can be used either for one or for two functions. It is always used for signalling IRDH575 device errors.

- K3 alarm: on
  = K3 signals additionally occurring EDS alarms as common alarm.
  Please note that this function is only active in the master mode
  (BMS address 1 = factory setting).

- K3 alarm: off
  = K3 only signals IRDH575 device

Detailed information about the function is given on page 17 and page 15

5.7 EDS460/490 menu

This menu can only be opened in the master mode (bus address 1), all the settings via the BMS bus can only be carried out in the master mode, even when several IRDH575 are interconnected. After starting the menu, the IRDH575 queries the essential parameters of EDS46... / EDS49... and the current parameters appear on the display.

5.7.1 General

The following parameters have an effect on that device the BMS address of which is being displayed. Set the address in order to select the appropriate device.

Memory

Use this menu option to switch the fault memory of the selected EDS46... / EDS49... on or off. Factory setting = off.

Trigger

Use this parameter to specify whether the fault location of EDS46... / EDS49... is to be started by an IRDH575 (Com) or if automatically and continuously all measuring channels are measured in parallel (Auto). Factory setting = Com.

N. freq

Use this menu option to select the nominal frequency of the system to be monitored. You may select 50, 60 or 400 Hz. Factory setting = 50 Hz.

System

Use this menu option to select the type of the distribution system to be monitored. You may select:

- DC   = DC system
- AC   = single-phase AC system
- 3 AC   = three-phase AC system

Factory setting = AC.

5.7.2 Channel

The following parameters have an effect on the device the BMS address and measuring channel of which is being displayed. Set the respective address and channel in order to select the appropriate device.

Diagram EDS460 /490 with General and Channel

5. EDS SETUP
6. EDS 460/490
7. EDS 470
8. COM ETUP

1. Exit
2. General
3. Channel
4. Relay: N/O
5. Test/Reset

see
next
page

ADR: 2...90   Sw:V1.02
1. Exit
2. Memory: off
3. Trigger: Com
4. N.freq.: 50 Hz
5. System: AC

on
off

Memory: **on**

Com
Auto

Trigger: **Auto**

DC
50 Hz
60 Hz
400 Hz

N.freq.:   **60 Hz**

AC
DC
3AC

Systeme: **3AC**

2...
10mA

ResVal: **0005 mA**

ADR: 2...90   CH: 1...12
1. Exit
2. ResVal: 0004 mA
3. CT: W/WR
4. T(on) :00 s
5. T(off) :06 s
6. CTmonitor: on
7. Inverter: off
8. Op. mode: N/O

W/WR
WS
P52
P165
P20
off

CT: **off**

00 s
06 s
12 s
18 s
24 s

T(on) :   **12 s**

T(off) :   **18 s**

on
off

CTmonitor: **off**

on
off

Inverter: **on**

N/C
N/O

Op. mode: **N/C**

ResVal
Use this menu option to set the response values of the EDS device to be parameterized. This applies to:
- EDS460 / EDS490: 2...10 mA in 1 mA steps, factory setting = 5 mA
- EDS461 / EDS491: 200...1000 µA in 1 µA steps, factory setting. = 500 µA

CT: W/WR
Select the measuring current transformer type to be used from the list below:
- W/WR = circular or rectangular measuring current transformer = factory setting
- WS = split-core current transformer
- off = channel switched off

T(on)
Use this menu option to set a response delay of 0...24 s for the selected EDS4... Factory setting = 0 s.

T(off)
Use this menu option to set a delay on release of 0...24 s for the EDS4...; Factory setting = 6 s.

CT monitor
To enable or disable the CT monitoring. That enables the EDS... to check the proper connection of the respective measuring current transformer. After the test, this will be indicated on the display as described in "chapter 5.7.4 EDS Test". Faults are indicated by the "Alarm 1" LED. In position "off", this function is deactivated.
Factory setting = on.

Inverter
Use this menu option to adapt a selected channel of the EDS46... /49... to a circuit comprising a frequency converter; Factory setting. = off.

Op.mode
Use this menu option to determine the operating mode of the 12 channel-related alarm relays of an EDS490 / EDS491; Factory setting = N/O.

5.7.3 Relay
Use this menu to set the parameters for common alarm and system fault alarm at the relays of EDS46... and EDS49. The following parameters have an effect on that device the BMS address and the associated alarm relay of which are being displayed. Set the address and the respective relay /1,2) in

order to select the appropriate device.

Op.mode
Use this menu option to set the operating mode of the common relays for alarm 1 and alarm 2. Factory setting: Relay 1 = N/O, Relay 2 = N/C.

ALARM
Use this menu option to assign an occurring EDS alarm to one or both EDS alarm relays. Factory setting for Relay 1/2 = on.

Dev. Error
Use this menu option to assign an occurring EDS device fault alarm to one or both EDS alarm relays. Factory setting. Relay 1 = off, Relay 2 = on.
In case of fault the following fault messages appear on the display of the IRDH575:
- no CT (measuring current transformer not connected)
- short (measuring current transformer short-circuited)
- AC residual> 1 A (EDS461 /EDS491)
  AC residual> 10 A (EDS460 /EDS490)

5.7.4   EDS Test
After activating this menu option, the IRDH575 checks all BMS bus nodes displaying the following details:
- Device address
- Device type
- Software version
- CT connection
  at EDS47... means:
  - ok   = channel switched on
  - off   = channel switched off
  - noCT = no measuring current transformer connected
  - short = measuring current transformer short-circuited
- Memory behaviour of the EDS47... (Memory on/off)
- Operating principle of the alarm relays of EDS47... (N.O/N.C)

If one of the tested BMS devices does not provide the required properties, no answer is shown in the list of properties.
Factory setting = off.

5.7.5 EDS Reset

Use this menu option to reset stored fault messages of the connected EDS devices. Factory setting = off.

Diagram EDS46... /49... with Relay, EDS-Test and EDS-Reset
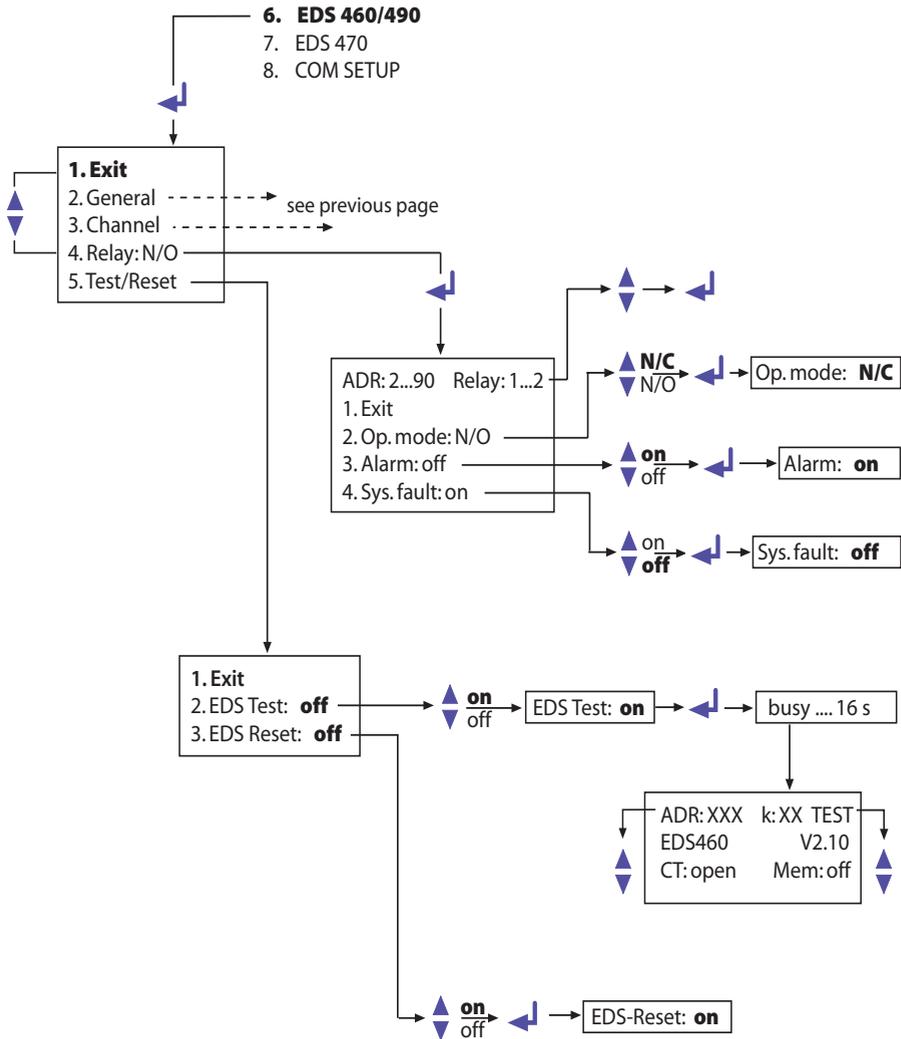
5.8 EDS 470 menu

This menu can only be opened in the Master mode (bus address 1). When several IRDH575 are interconnected via the BMS bus, all these settings can only be carried out with a Master device.

5.8.1 EDS Monitor

- Indication of all detected insulation faults signalled to the IRDH575 via the BMS bus by the connected EDS devices. The second line of the display shows the respective number of an alarm as well as the total number of alarms. The third line shows the address and the channel of the insulation fault evaluator EDS4... as well as the measured test current.

5.8.2 EDS Test

IRDH575 checks all BMS bus nodes and indicates the following details:

- Device address
- Device type
- Software version
- CT connection
  in case of EDS47... means:
    - off = channel switched off
    - noCT = no measuring current transformer connected
    - short = measuring current transformer short-circuited
- Memory behaviour of the EDS47... (Memory on/off)
- Elongation of the measuring time EDS47... (peak 1...255) in case of measurement disturbances
- Operating principle of the alarm relay EDS47... (N.O/N.C)

5.8.3 EDS Reset

This menu point can be used to reset stored fault messages of the connected EDS devices.

5.8.4 Details about the menu points Relay, Memory and n-peak

The parameters indicated on the IRDH575 display do not necessarily correspond to the EDS47... settings. Only when a control command is sent to EDS by pressing Return, the EDS settings of EDS47... correspond to the IRDH575 indication.

5.8.5 Diagram EDS 470

5. EDS SETUP
6. EDS 460/490
7. EDS 470

```
****EDS-Monitor****
Nr.: 01      #Nr.: 02
ADR: 03   k12   20mA
********************
```

Nr: **01**

01...50

---

1. Exit
2. EDS Monitor
3. EDS Test: off
4. EDS Reset: off
5. Relay: N/O
6. Memory: on
7. CT Setup
8. n-peak: 1...255
9. K3 Alarm: on

```
****CT-SETUP****
ADR: 2....90   k: 1....12
Typ: standard/split /off
conn.-CT: on/off
```

K3 Alarm: **on**   **on**
                     off

EDS-Test: **off**

EDS-Test: **on**
on
off

busy .... 16 s

```
ADR: XXX   k: XX  TEST
EDS470-12        V2.10
CT:noCT       Mem: off
peak: 255      Rel: N/O
```

EDS-Reset: **off**   EDS-Reset: **off**
on
off

4. EDS Reset: off
5. Relay: N.O   Relay: **N.O**   Relay: **N.C**
6. Memory: on   N.O
                                       N.C

Memory: **on**   EDS-Reset: **off**
off
on

5.8.6 Relay

Operating principle of the alarm relays of EDS47...:

- N.C = N/C operation
- N.O = N/O operation = factory setting

5.8.7 Memory

- Setting of the memory behaviour of EDS47...
  The factory setting is „on".
  When the memory is in "on" position, the alarms of an EDS47... are maintained until a RESET is carried out via the menu (IRDH575) or the RESET key is pressed on the EDS47....
  When the memory if in "off" position, the alarm stored in the EDS47... will be deleted when the next scanning is carried out, provided that no insulation fault exists and no insulation fault location process is running.

5.8.8 CT Setup:

Setting of the CT type and connection monitoring for EDS47...:

- ADR:
  Setting the BMS address of an EDS47... that is to be configured.
- k:
  Setting the BMS channel that is to be configured.

Note:
When ADR:2-90 and k:1-12 are selected, the same CT type will be set for every channel of every device address.

- Type:
  - standard = measuring current transformers of circular and rectangular type = factory setting
  - split = split-core measuring current transformers
  - off = channel switched off
- conn.-CT
  On or off switching of the CT monitoring
  Factory setting is „on".

The CT connection monitoring of the EDS4...-12 recognizes whether a measuring current transformer is correctly connected. This will be indicated on the display after a test has been carried out as described in "chapter 5.8.2 EDS Test". In "off position" this function is deactivated.

5.8.9 n-peak:

- n-peak: 1-255
  Setting of the maximum automatic elongation of the measuring time of the connected EDS47... if disturbances are likely to occur in the system being monitored. By default, four measurements are carried out per channel before the EDS47... proceeds to the next channel.
  If disturbances occur during the measurement due to system interferences (signalled by the "Fault"-LED at EDS47...), the number of measurements per channel will automatically be increased by the preset number n, that means 4 + n measurements per channel are carried out in this case. The n-times elongation of the measuring time per channel will automatically be stopped, when the fault is eliminated.
  Factory setting is n = 5.

The functions of the EDS470 menu and the position mode in the EDS SETUP menu is not available in the Slave mode!
Both functions are only available in the Master mode (address 1).

5.9   COM SETUP menu: Setting the BMS interface

5.9.1   Bus address (Addr:)

This menu item is used to set the BMS bus address of the IRDH575. Take care that the bus address is not assigned twice.
The device is factory set to address 1 and hence acts as a Master.

> *If several IRDH575 are operated on one BMS bus, the addresses of other A-ISOMETER®s must be assigned one after the other, since only one device may represent the Master.*

5.9.2   ISO Monitor

This function allows to query the current measured value as well as the messages of all bus-capable A-ISOMETER®s existing in the BMS network. After selecting the bus address, the entire information stored by the selected device is indicated on the display

The display indication is structured similar to the standard indication, but instead of the indication of the measuring pulse, the selected bus address is indicated. Without pressing a key, the indication changes to the standard indication of the IRDH575 after about five minutes.
If there is no information available from the selected A-ISOMETER®, the message "!!!!NO DATA!!!!" will be displayed.

Information is being searched:

```
<<BUS SCANNING>>
R=           ADR:02
```

No data found:

```
!!!!NO DATA!!!!
R=           ADR:02
```

Current data address 03:

```
Insulation Fault
R= 010KΩ      ADR:03
```

5.9.3 ISOnet

Use this menu item to activate the ISOnet function of an IRDH575. Refer to page 14 for an ISOnet description.

5.9.4 Diagram COM SETUP

```
                    ┌────────────────────┐
                    │ ****IT-SYSTEM****   │
                    │ R > 010 MΩ ⌐····¬   │
                    │ - EDS: off -- auto -│
                    │ ****************** │
                    └────────────────────┘

                    ┌────────────────────┐
                    │ 1.  EXIT        ⌂   │
                    │ 2.  HISTORY INFO    │
                    │ 3.  ISO SETUP       │
                    │ 4.  ISO ADVANCED    │
                    │ 5.  EDS SETUP       │
                    │ 6.  EDS 460/490     │
                    │ 7.  EDS 470         │
                    │ 8.  COM SETUP       │
                    │ 9.  PASSWORD        │
                    │ 10. LANGUAGE        │
                    │ 11. SERVICE      ↕  │
                    └────────────────────┘

  ┌──────────────────┐                          ┌─────────────┐         ADR: 001
  │ 1. Exit      ⌂   │                          │ Addr: XXX   │            ⋮
  │ 2. Addr:  XXX    │                          └─────────────┘         ADR: 030
  │ 3. ISO Monitor ↕ │
  └──────────────────┘

         ┌────────────────────┐
         │ ****IT-SYSTEM****   │
         │ R >123 kΩ    ADR: 01│
         └────────────────────┘
```
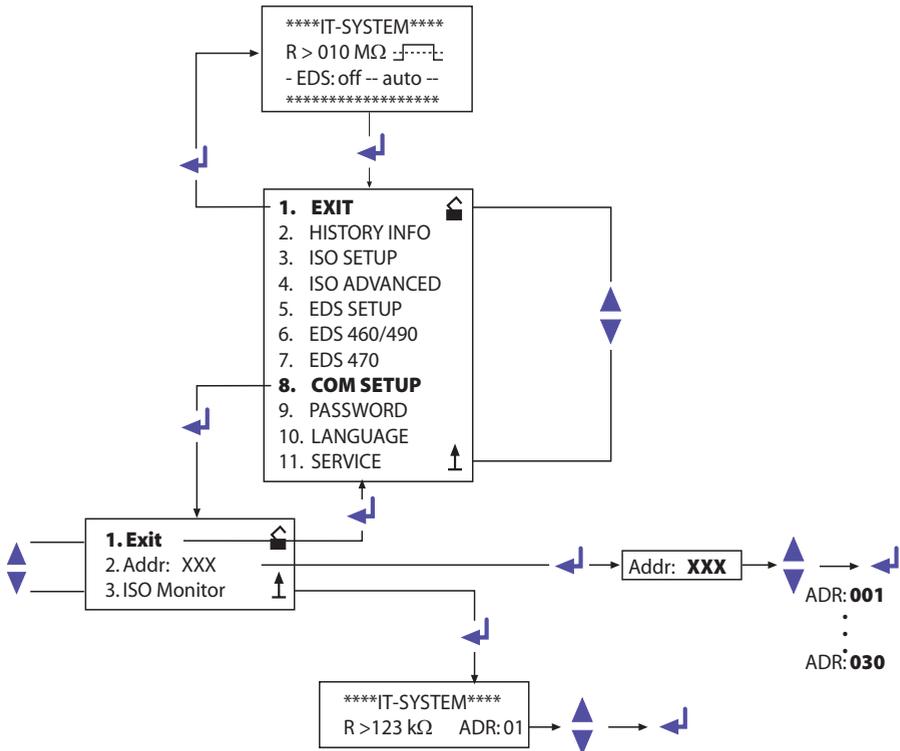
5.10 PASSWORD menu

5.10.1 Activating and setting the password

This menu can be used to activate a "Password" query. This protects the A-ISOMETER® against unauthorized settings and modifications.

The desired password (menu item 2. Password: xxx) can be set with the UP/DOWN keys and confirmed with the ENTER key.
The password can be activated in the menu item "3. Status: on" by clicking the ENTER key. The factory setting is "3. Status: off", that means that the password is deactivated.

5.10.2 Diagram PASSWORT

```
****IT-SYSTEM****
R >010 MΩ  :∫----:∟
- EDS: off -- auto --
******************
```

```
1.  EXIT          ⌂
2.  HISTORY INFO
3.  ISO SETUP
4.  ISO ADVANCED
5.  EDS SETUP
6.  EDS 460/490
7.  EDS 470
8.  COM SETUP
9.  PASSWORD
10. LANGUAGE
11. SERVICE       ↥
```

```
1. Exit           ⌂
2. Password:  XXX
3. Status:    off ↥
```

```
Password:  XXX
```
000
·
·
999

```
Status :  off
```
off
on
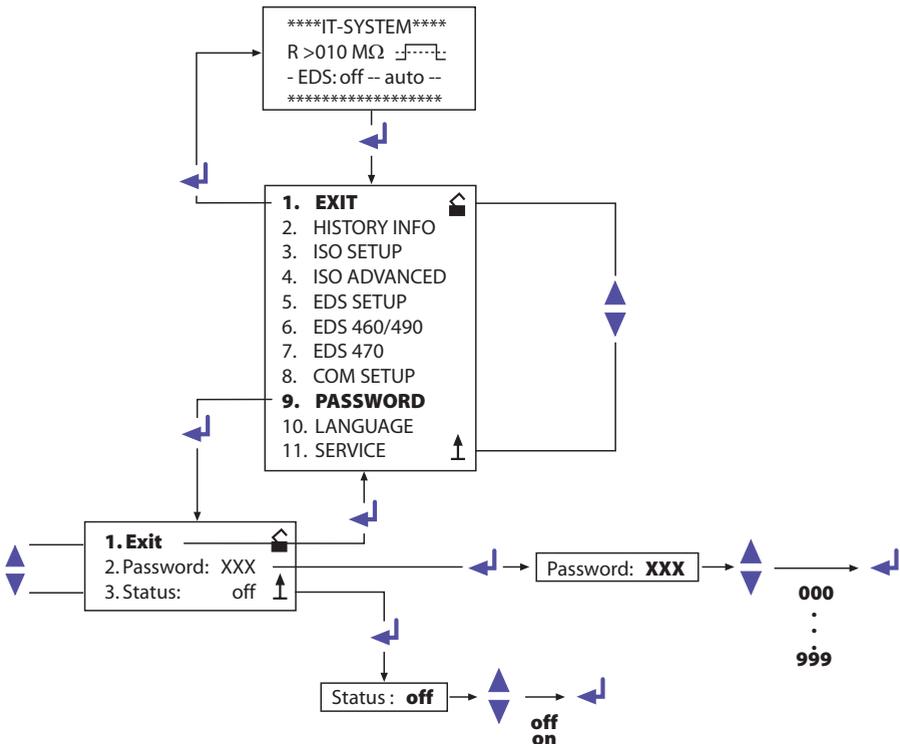
5.11 Menu LANGUAGE

5.11.1 Setting the national language

The menu item "Language" allows fault messages of the A-ISOMETER® to be set to different languages. There is the choice of German and English. The device menu is not influenced by the language selection.

5.11.2 Diagram Language
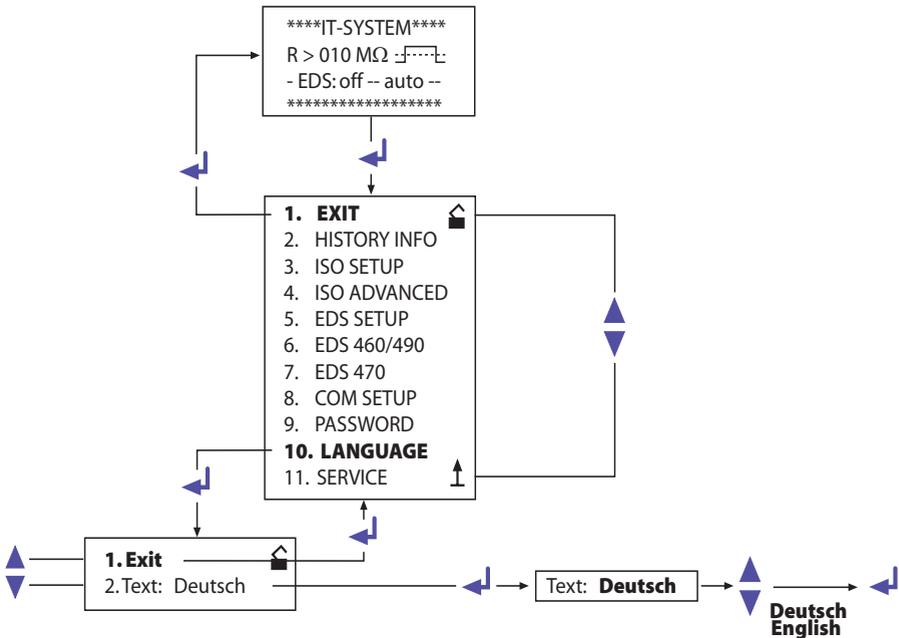
5.12 Menu SERVICE

This menu item is provided for the BENDER service personnel and is protected by a password against erroneous settings. It is intended to provide fast fault clearance by qualified experts in the event of a device error.

5.13 Parameterization via Internet

The parameters of an IRDH575 indicated below can be checked and set from a remote place of use by using a personal computer. In addition, a browser (viewing program for Internet application) and our protocol converter FTC470XET (BMS <==> Ethernet/TCP/IP) are required.

Remote setting is, for example, possible for:

- Response value Alarm 1 (1...10,000 kΩ)
- Response value Alarm 2 (1...10,000 kΩ)
- Operating principle alarm relay K1 (e.g. N/O operation)
- Operating principle alarm relay K2 (e.g. N/O operation)
- Measuring principle (AMP or DC)
- Current output ranges for external measuring instruments (0/4...20 mA)
- Maximum system leakage capacitance (150 µF or 500 µF)
- Time for repetition of the automatic self test (off/ 1 h/ 24 h)
- Starting time of the automatic self test (0.00...23.00 h)
- Language of the alarm messages to be displayed (D, GB)
- Setting the fault memory to ON or OFF
- EDS mode (on, off, auto, 1 cycle), start and stop conditions for the EDS systems
- EDS type of system (DC, AC, 3 AC)
- EDS max. test current (1 / 2,5 / 10 / 25 / 50 mA)
- EDS Position Mode address (BMS address of the EDS47... to be requested)
- EDS Position Mode channel (BMS channel of the EDS47... to be requested)

6. Serial interfaces

6.1 RS485 interface with BMS protocol

The RS485 interface is galvanically isolated from the device electronics and current output serves as a physical transmission medium for the BMS protocol. If several IRDH575 or other bus-capable devices are interconnected in a network via the BMS bus, the BMS bus must be terminated at both ends with a 120 Ω resistor. (Switch S1 = ON).

An RS485 network that is not terminated, is likely to get instable and may result in malfunctions. Only the first and the last device in one line may be terminated. Devices in between must not be terminated with 120 Ω (switch S1 = OFF). Hence, stub feeders in the network must not be terminated. The length of the stub feeders is restricted to 1 meter.
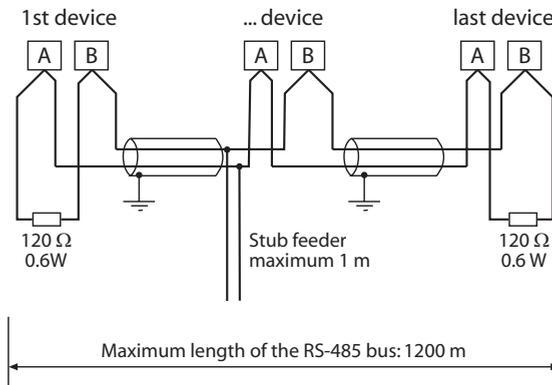
6.2 Topology RS485 network

The optimum topology for the RS485 network is a daisy-chain connection. In this connection, device 1 is connected to device 2, device 2 to device 3, device 3 to device n etc. The RS485 network represents a continuous path without branches.

6.2.1 Correct arrangement

Three examples for correct arrangement:
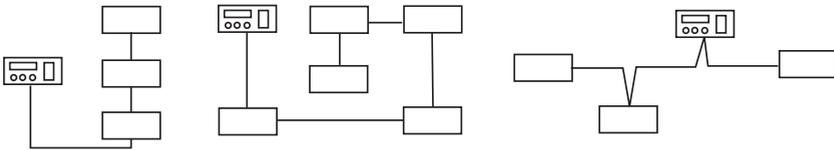
6.2.2 Wrong arrangement

Three examples for wrong arrangement:
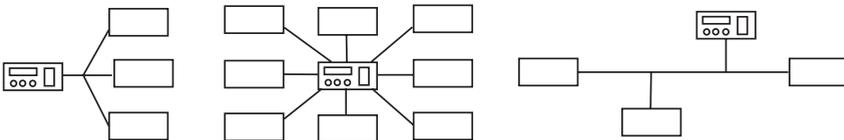
6.2.3 Wiring

A suitable type of cable for the wiring of the RS485 network is:
screened cable, core diameter ≥ 0.6 mm
(e.g. J-Y(ST)Y 2x0.6), screen on one side connected to earth (PE).
Connection to the terminals A and B.
The number of bus nodes is restricted to 32 devices. When more devices are to be connected, Bender recommends to use an RS485 repeater DI1.
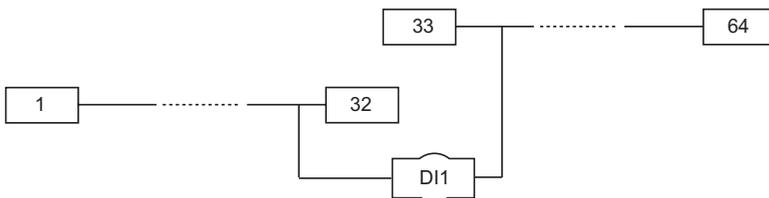
6.3 BMS protocol (BMS)

This protocol is an essential part of the Bender Measuring Device Interface. Data transmission generally makes use of ASCII characters.
Interface data are:

- Baud rate: 9600 baud
- transmission: 1 start bit, 7 data bits, 1 parity bit, 1 stop bit (1, 7, E, 1)
- Parity: even
- Checksum: sum of all transmitted bytes = 0 (without CR and LF)

The BMS bus protocol works according to the MASTER-SLAVE principle. That means that one device represents the MASTER while all other bus nodes are SLAVES. It is important that only one MASTER is present in each network. All bus nodes are identified by a unique address. The MASTER scans all other devices on the bus cyclically, listens to their signals and then carries out specific commands. Bus address 1 must be assigned to the Master, which can be one IRDH575 device.

6.3.1 BMS Master

A Master can query all warning and operating messages from a slave.
If the bus address 1 has been selected for the IRDH575, this device automatically represents the Master, that means that all addresses between 1 and 150 are cyclically scanned via the BMS bus for alarm and operating messages. If the Master receives no answer from five subsequent addresses, the scanning cycle is started again. If the Master recognizes incorrect answers from a slave, the fault message "Fault RS485" is issued by the Master.

```
Fault RS485
Rs=011kΩ  ⊏···⊐.H
--EDS:on---auto---
*******************
```

Faults may be caused when:

- addresses are assigned twice
- a second master exists on the BMS bus
- interference signals occur on the bus lines
- a defective device is connected to the bus
- terminating resistors are not activated

6.3.2 BMS-Slave

In a BMS network for each slave an individual address between 2 and 30 slave has to be selected. **There may be no gaps of more than five subsequent addresses**, so that all slaves can be scanned by the Master. For IRDH575 a BMS address can be selected from the address range 1 ... 30. When assigning the addresses, also other devices such as the EDS4... must be considered.

The correct reception of BMS data is indicated by a flashing point on the display on the right of the measuring pulse indication.

```
Fault RS485
Rs=011kΩ  ⌐┄┐.H
--EDS:on---auto---
```
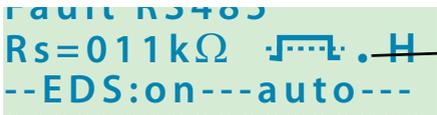
Flashing point:
BMS data received

If no flashing point appears, it may be attributed to the following:

- no Master available in the network
- more than one Master available in the network
- RS485 interface (terminal A/B) not connected or reversed

In the Slave mode, the functions of the EDS470 menu and the position mode in the EDS SETUP menu are not available! Both functions are only available in the Master mode.

6.3.3 BMS operation in the Standby mode

The BMS function of the Master A-ISOMETER® is completely available in the standby mode (Stand-by: F1/F2 bridged).

The function ISO Monitor in the COM menu can be used to request data from other bus nodes, for example:

- actual insulation values of other SLAVE ISOMETERs connected to the BMS bus
- fault messages of all SLAVE devices connected to the BMS bus

The following table gives an overview about essential alarm messages and the assignment of the messages indicated on the display or operator panels, e.g. PRC1470.

Message	Channel	Meaning
Insulation Fault	1	Insulation resistance < setting Alarm 1
Insulation Fault	2	Insulation resistance < setting Alarm 2
Connection system	3	Connection error L1/L2 against system
Connection PE	4	Connection error ⏚ /KE against PE conductor
Device error	5	Internal device error
Standby	6	Isolated from the system to be monitored, no insulation measurement

6.3.4 Combination with EDS46... devices

The following illustration shows an IRDH575 device in combination with EDS46... and the measuring current transformers W ... for insulation fault location.The factory setting of the devices can usually be maintained. If several EDS46... are used, the addresses within the range 2 to 30 in subsequent order must be used. For details about the EDS settings refer to EDS SETUP and EDS460/490 on page 44 respectively page 53.
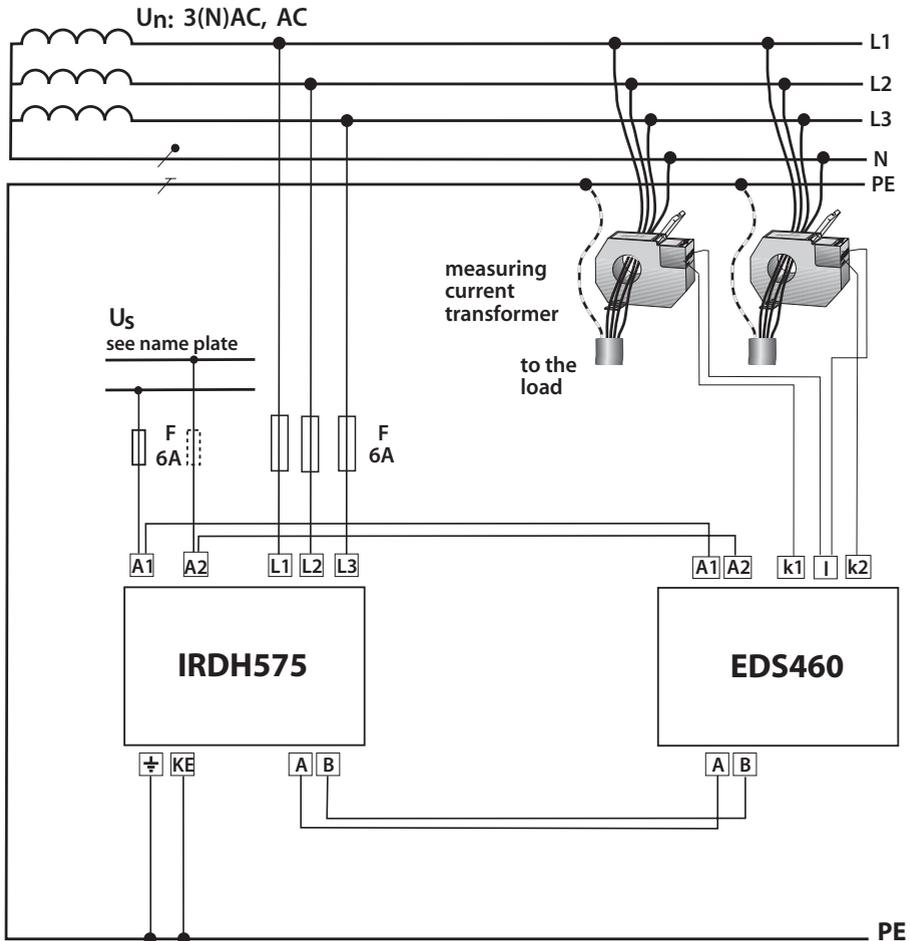
The following operating manuals are available when using the IRDH575 in combination with EDS systems for other applications:

- TGH 1243 for EDS470 application:
  power supply systems, extended systems, systems with frequency converters, response sensitivity of at least 5 mA

- TGH 1321 for EDS473 application:
  control systems, small systems, systems with PLC, response sensitivity at least 0.5 mA

- TGH 1282 about project planning for EDS470 and EDS473 systems

- TGH 1394 for EDS460 /EDS490, Application:
  power supply systems, extended systems, systems with frequency converters, response sensitivity of at least 2 mA
  for EDS461 /EDS491, Application:
  control systems, small systems, systems with PLC, response sensitivity at least 0.2 mA

6.3.5 Commissioning of an RS485 network with BMS protocol

- Connect the terminals A and B of all bus nodes in one line

- Switch the terminating resistors on at the beginning and end of the RS485 network or in case of devices without a terminating switch, at the end of the bus, connect a 120 Ω resistor to the terminals A and B.

- Switch the supply voltage U_S on.

- Determine one IRDH575 as the Master and assign address 1.

- Assign the addresses (2...150) **successively without gaps** to all other IRDH575 devices and other bus nodes (see table below).

- Check whether a flashing point appears on all devices with a display (BMS commands are being received). Other devices use an RS485 LED to signal the bus traffic.

- The sub menu "ISO-Monitor" in the COM SETUP menu allows insulation values of the A-ISOMETERs® to be queried. Before starting the query, the address of the A-ISOMETER® has to be entered.

- In the "EDS Test" menu all preset Slave addresses can be checked

BMS bus address ranges

Addresses*	Device	Meaning
0		There is no device with address 0 ! Information sent to BMS address 0 applies to all devices connected to the BMS bus (broadcast)
1	PRC1470	Control and indicating device
1...30	IRDH275B/ 375B/575	Insulation monitoring device
1...30	FTC470...	Protocol converter
2...30	EDS47...	Insulation fault evaluators (localisation)
31...60	SMO480 EDS4...E2	Signal converter relay Insulation fault evaluator (localisation
1...90	EDS46... / 49...	Insulation fault evaluators (localisation)
61...90	EDS4...E	Insulation fault evaluators (localisation)
111...119	PGH47x	Insulation fault test device
121...150	PGH47xE	Insulation fault test device

When assigning addresses, take care that there are no gaps greater than five in the respective ranges (1...30, 31...60, 61...90, 111...119 and 121...151

7. Technical data IRDH575

7.1 Data in tabular form

The values marked with * are absolute values

Insulation coordination acc. to IEC 60664-1

Rated voltage .... AC 800 V
Rated impulse voltage/pollution degree .... 8 kV / 3

Voltage ranges

IRDH575B**1-4235**:
Nominal voltage range U_n .... AC, 3(N)AC 20...150 V*
Nominal frequency f_n .... 50...460 Hz
Nominal voltage range U_n .... DC 20...150 V*

IRDH575B**1-435**:
Nominal voltage range U_n .... AC, 3(N)AC 20...575 V*
Nominal frequency f_n (for f < 50 Hz see characteristic curve on page 75) .... 50...460 Hz
Nominal voltage range U_n .... DC 20...575 V*

IRDH575B**2-435**:
Nominal voltage range U_n .... AC, 3(N)AC 340...760 V*
Nominal frequency f_n (for f < 50 Hz see characteristic curve on page 75) .... 50...460 Hz
Nominal voltage range U_n .... DC 340...575 V*

IRDH575B**1-435**:
Supply voltage U_s (see name plate) .... 88...264 V*
Frequency range U_s .... 42...460 Hz
Supply voltage U_s (see name plate .... DC 77...286 V*

IRDH575B**1-427**:
Supply voltage U_s (see name plate) .... DC 19,2...72 V*
Power consumption .... ≤ 14 VA

Response values

Response value R_{an1} (Alarm1) .... 1 kΩ...10 MΩ
Response value R_{an2} (Alarm2) .... 1 kΩ...10 MΩ
Absolute error (1 kΩ...10 kΩ) .... +2 kΩ
Relative percentage error (10 kΩ...10 MΩ) .... 0 %...+20 %
Measuring time .... see characteristic curves
Hysteresis (1 kΩ...10 kΩ) .... +2 kΩ
Hysteresis (10 kΩ...10 MΩ) .... 25 %

Measuring circuit for insulation measurement

Measuring voltage U_m .... ≤ 40 V

Measuring voltage U_m (IRDH575B1-4227) .... ≤ 10 V

Measuring current I_m (at $R_F = 0\,\Omega$) .... ≤ 220 µA

Internal DC resistance DC R_i .... ≥ 180 kΩ

Internal impedance Z_i, at 50 Hz .... ≥ 180 kΩ

Permissible extraneous DC voltage U_{fg} (version **B1**) .... $\leq$ DC 810 V

Permissible extraneous DC voltage U_{fg} (version **B2**) .... $\leq$ DC 1060 V

System leakage capacitance C_e .... ≤ 500 µF

Factory setting C_e .... 150 µF

Measuring circuit for insulation fault location (EDS)

Test current I_p DC .... 1/2,5/10/25/50 mA

Test pulse/break .... 2 s / 4 s

Displays

Display, illuminated .... four-line display

Characters (number of characters) .... 4 x 16

Display range, measuring value .... 1 kΩ....10 MΩ

Absolute error (1 kΩ...10 kΩ) .... ± 1 kΩ

Relative percentage error (10 kΩ...10 MΩ) .... $\pm$ 10 %

Inputs / Outputs

Test / Reset button .... internal/external

Current output for measuring instrument SKMP (scale centre point $=$ 120 kΩ):....................................

Current output IRDH575 (max. load) .... 0/4...20 mA ($\leq 500\,\Omega$)

Accuracy current output (1 kΩ...1 MΩ) .... $\pm$ 10 %, $\pm$ 1 kΩ

Serial interface

Interface / protocol .... RS485 / BMS

Cable length .... ≤ 1200 m

Recommended cable (screened, screen on one side connected to PE) .... J-Y(ST)Y 2x0,6

Terminating resistor .... 120 Ω (0,5 W)

Switching elements

Switching components .... 3 changeover contacts: K1 (Alarm 1), K2 (Alarm2),

.... K3 (device fault, additionally selectable EDS Alarm)

Operating principle K1, K2 .... N/O or N/C operation

Factory setting (Alarm1/Alarm2) .... N/O operation

Operating principle K3... N/C operation

Electrical endurance .... 12 000 cycles

Contact class .... IIB (DIN IEC 60255-23)
Rated contact voltage .... AC 250 V / DC 300 V
Making capacity .... AC / DC 5 A
Breaking capacity .... 2 A, AC 230 V, cos phi = 0.4
.... 0.2 A, DC 220 V, L/R = 0.04s
Contact current at DC 24 V .... ≥ 2 mA (50 mW)

General data

EMC immunity .... acc. to EN 61326
EMC emission .... acc. to EN 61326
Shock resistance acc. to IEC 60068-2-27 .... 15 g / 11 ms
Bumping acc. to IEC 60068-2-29 .... 40 g / 6 ms
Vibration resistance acc. to IEC 60068-2-6 (device in operation) .... 1 g / 10...150 Hz
Vibration resistance acc. to IEC 60068-2-6 (during transport) .... 2 g / 10...150 Hz
Ambient temperature, during operation .... -10 ℃...+55 ℃
Storage temperature range .... -40 ℃...+70 ℃
Climatic class according to IEC 60721-3-3 .... 3K5
Operating mode .... continuous operation
Mounting .... as indicated on the display
Connection .... plug-in terminals
Connection, rigid/flexible .... 0.2...4 mm^2 / 0.2...2.5 mm^2
Connection, flexible with connector sleeve, without/with plastic sleeve .... 0.25...2.5 mm^2
Conductor sizes (AWG) .... 24...12
Degree of Protection, internal components (DIN EN 60529) IP30
Degree of Protection, terminals (DIN EN 60529) IP20
Degree of Protection, in case of door mounting (DIN EN 60529) IP40
Degree of Protection, in case of mounting into a door with panel sealing (DIN EN 60529) IP42
Type of enclosure: suitable for panel mounting .... free from halogen
Flammability class UL94 V-0
Software version D185 V1.6
Weight .... ≤ 900 g

Option "W"

Shock resistance acc. to IEC 60068-2-27 (device in operation) .... 30 g / 11 ms
Bumping acc. to IEC 60068-2-29 (transport) .... 40 g / 6 ms
Vibration resistance acc. to IEC 60068-2-6 .... 1.6 mm / 10...25 Hz
.... 4 g / 25...150 Hz
Ambient temperature, during operation .... -25 ℃...+70 ℃
Ambient temperature, during operation .. > 55 ℃ no continuous insulation fault location with 50 mA

Storage temperature range .... -40 ℃...+85 ℃

7.2 Standards, approvals and certifications

The A-ISOMETER® was designed under consideration of the following standards:

- DIN EN 61557-8 (VDE 0413-8):1998-05
- IEC 61557-8:1997-02
- EN 61557-8:1997-03
- IEC 61557-9:1999-09
- EN 61557-9:1999-11
- EN 61326
- DIN EN 60664-1 (VDE 0110-1):2003-11
- DIN EN 60664-3 (VDE 0110-3):2003-09
- ASTM F1669M-96(2002)

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7.3 Characteristic curves

7.3.1 Characteristic curves of the A-ISOMETER®

A-ISOMETER® response times in relation to system leakage capacitances of:

C_e = 1...500 µF
U_n = 20...575 V (Version B1) / 50 Hz
U_n = 340...760 V (Version B2) / 50 Hz
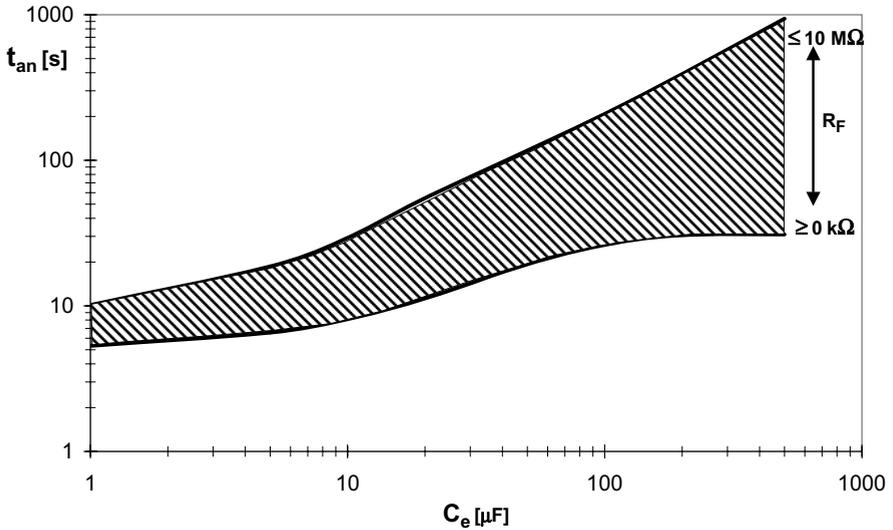
Max. AC voltage between system and earth in the frequency range < 50 Hz
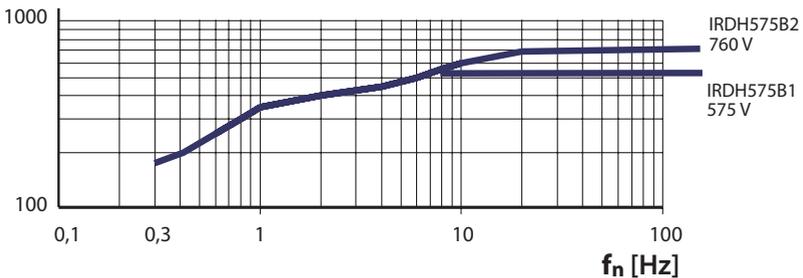
Current output 0…20 mA

R$_F$ [kΩ]
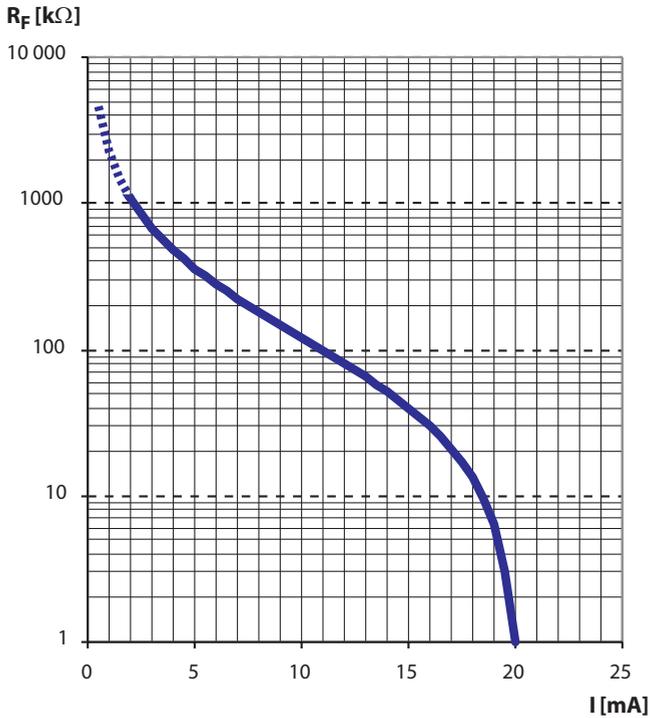
$$R_F = \frac{20\text{ mA} \times 120\text{ k}\Omega}{I} - 120\text{ k}\Omega$$

R$_F$ = Insulation fault in kΩ
I   = Current output in mA

Current output 4...20 mA

R$_F$ [kΩ]
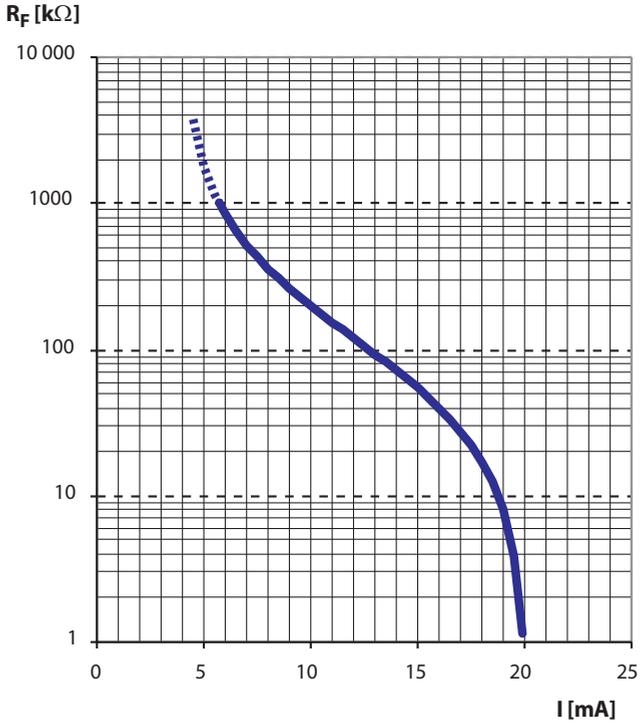
$$R_F = \frac{16\ mA \times 120\ k\Omega}{I - 4\ mA} - 120\ k\Omega$$

R$_F$ = Insulation fault in kΩ
I = Current output in mA

7.3.2 Characteristic curves of the insulation fault evaluators EDS46... /EDS49...

Allowable response values for AC systems

R_F [kΩ]
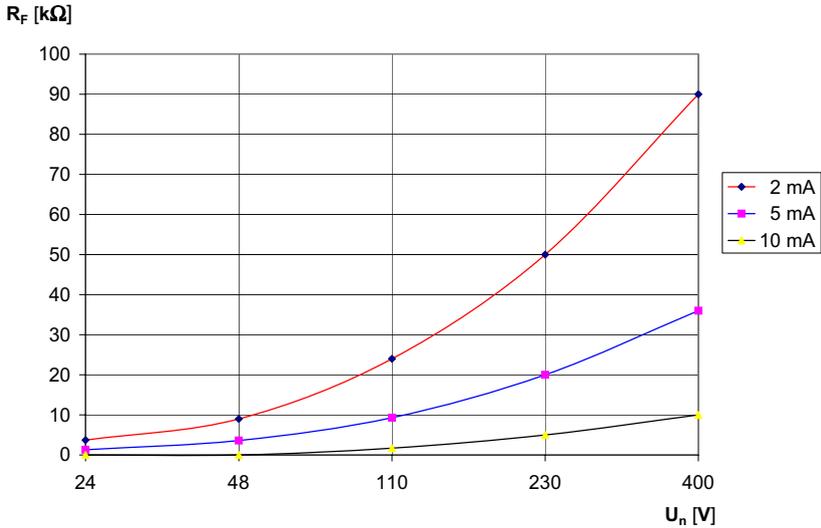
Allowable response values for 3 AC systems

R_F [kΩ]
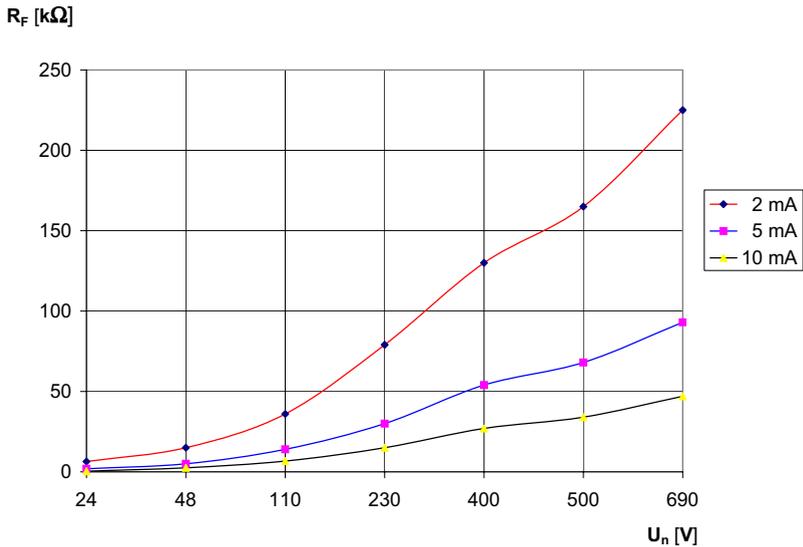
Allowable response values for DC systems
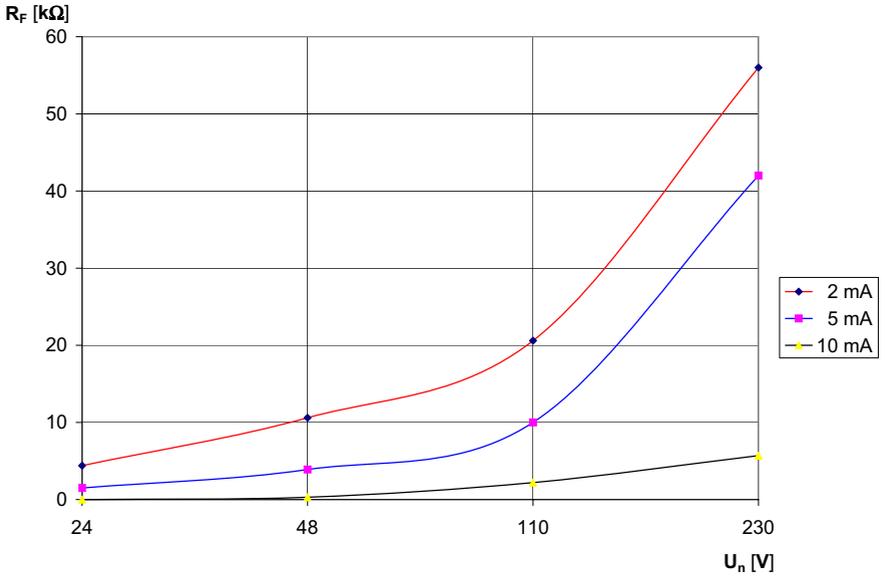
7.3.3 Characteristic curves for the insulation fault location system EDS470

Allowable response values
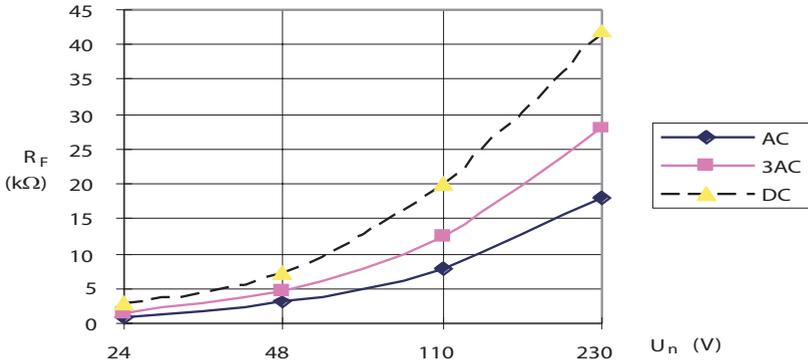
Curve 1a:

Allowable response values in relation to the system voltage to be monitored for a maximum system leakage capacitance C_e as shown by curve 2a
In order to start automatic insulation fault location, the resistance values to be selected for ALARM 1 and ALARM 2 must be sufficiently low at a given nominal voltage. Otherwise, the EDS test current is not sufficient to localise the insulation fault. Determine the suitable values by means of the characteristic curves.
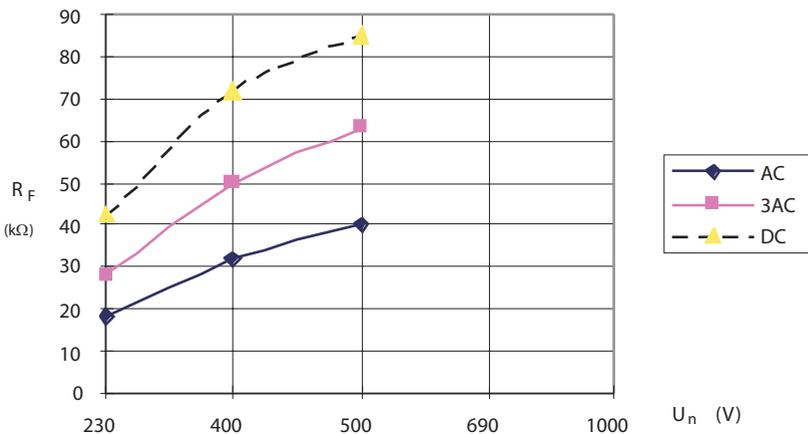
Curve 1b:

Allowable response values in relation to the system voltage to be monitored for a maximum system leakage capacitance C_e as shown in curve 2b.

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Maximum system leakage capacitances for the insulation fault location system EDS470
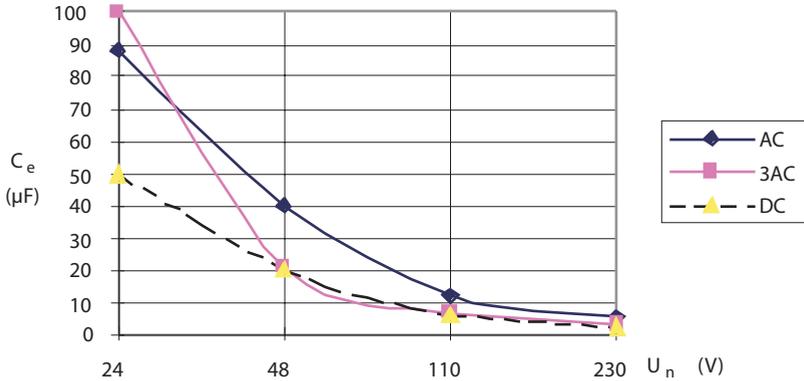
Curve 2a:
Maximum allowable system leakage capacitance in relation to the system voltage to be monitored. Up to this limiting value of the system leakage capacitance, the EDS system has the sensitivity illustrated in curve 1a.
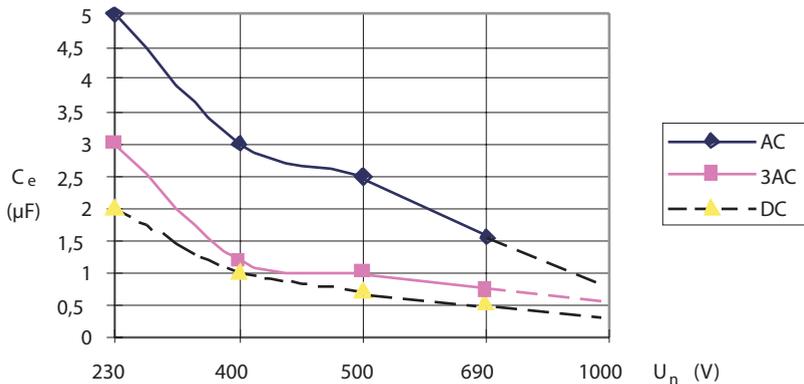
Curve 2b:
Maximum allowable system leakage capacitance in relation to the system voltage to be monitored. Up to this limiting value of the system leakage capacitance, the EDS470 system has the sensitivity shown in curve 1b.
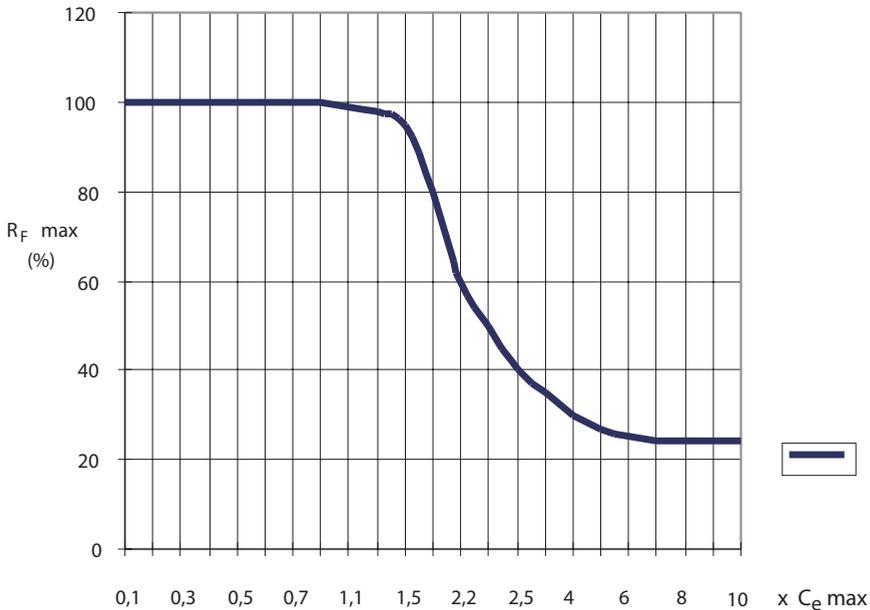
Curve 3:

A reduction of the response sensitivity at system leakage capacitances greater than the maximum permissible value of C_e taken from the curves 2a and 2b. The indication of the test current on the IRDH575 display in case of high system leakage capacitance also changes.

When considering the curves, a point to be taken into account is that the sum of the pre-capacitances upstream the measuring current transformer must amount to at least 50 % of the total capacitance. Otherwise it may result in wrong alarm messages.

A value of 20 000 µFV/400 V = 50 µF is taken for the system leakage capacitance. Exceeding the limiting value may result in false trippings.

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Limiting values for the insulation fault location system EDS473

In order to start automatic insulation fault location, the resistance values set for ALARM 1 and ALARM 2 at a given nominal voltage must not be too high. Otherwise, the EDS test current will not be sufficient for the detection of the insulation fault. Determine the suitable values for your installation by means of the characteristic curves
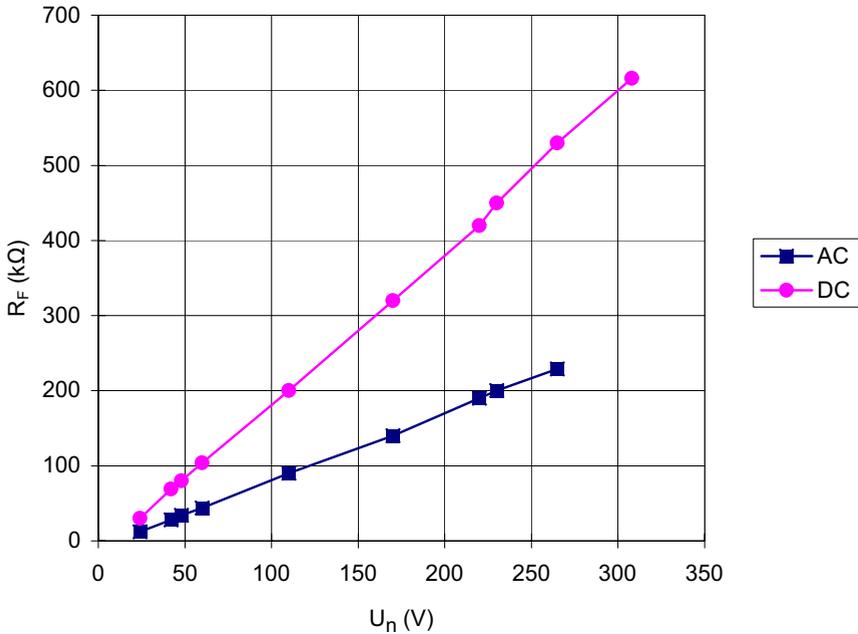
Curve 4:
Allowable response values in relation to the system voltage to be monitored at a maximum system leakage capacitance C_e as shown by curve 5.
DC: set a test current of 1 or 2.5 mA.
AC: set a test current of 2.5 mA.

The EDS473 system is suitable for nominal voltages of AC 265 V and DC 308 V.

Maximum system leakage capacitances for the insulation fault location system EDS473
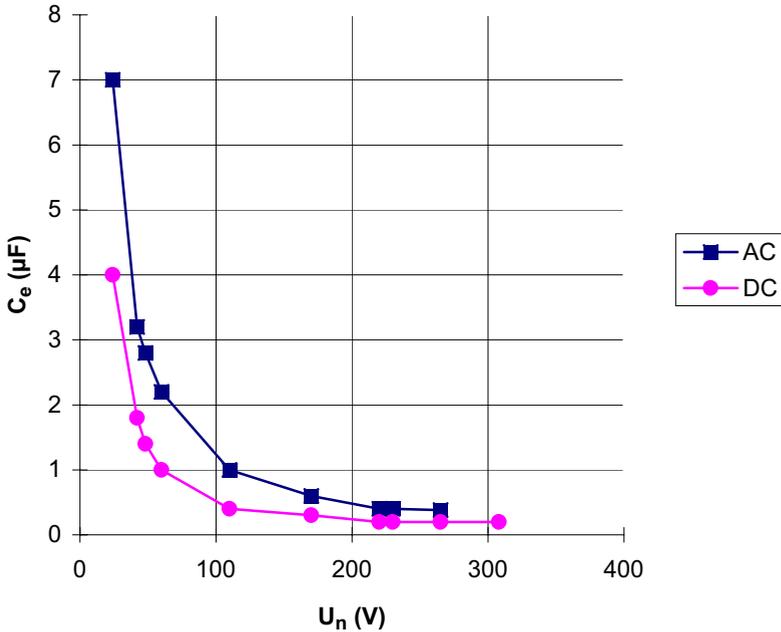
Curve 5:

Maximum allowable system leakage capacitance in relation to the system voltage to be monitored.

DC: the test current is to be set to 1 or 2.5.

AC: the test current is to be set to 2.5 mA.
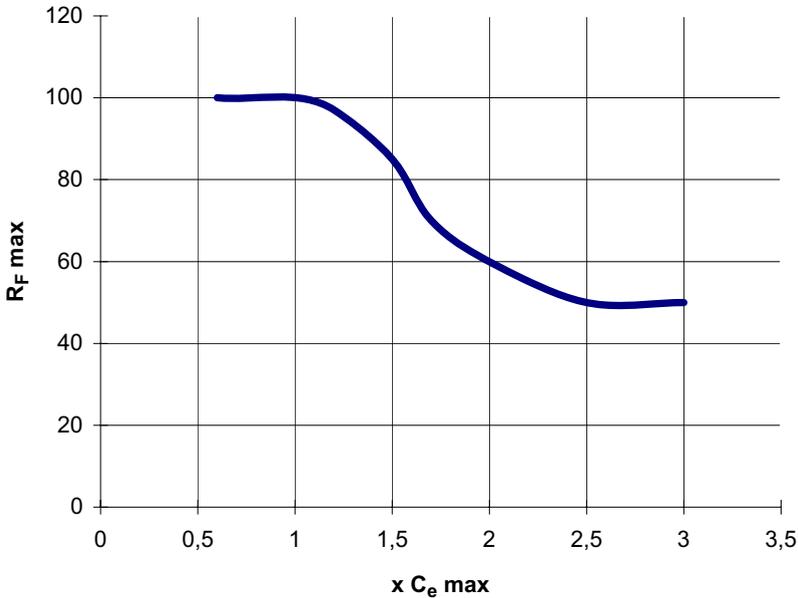
Curve 6:

When the system leakage capacitances are greater than the maximum permissible value for C_e, as shown in curve 5, the response sensitivity decreases. The indication of the test current on the IRDH575 display in case of high system leakage capacitance also changes.

When considering the curves, a point to be taken into account is that the sum of the pre-capacitances upstream of the individual measuring current transformer must amount to at least 50 % of the maximum total capacitance. Otherwise, it may result in wrong alarm messages.

A value of 300µFV/230V = 1.3 µF is taken to be the maximum system leakage capacitance value. When the limiting value is exceeded, false tripping may occur.

Status number

Position of numbers from the left	Value of the respective number				
	0 =	**1 =**	**2 =**	**3 =**	**4 =**
1	K1: N/O operation Test	K1: N/C operation Test	K1: flashing function	K1: N/O operation	K1: N/C operation
2	K2: N/O operation Test	K2: N/C operation Test	K2: flashing function	K2: N/O operation	K2: N/C operation
3	no external coupling				
4	Cemax 1 µF **	Cemax 10 µF **	Cemax 150 µF	Cemax 500 µF	
5					
6	Self test every 24 hours	Self test every hour	no periodic self test		
7	Language German	Language English			
8	Password protection not activated	Password protection activated			
9	AMP measuring principle	DC measuring principle			
10	max. filter frequency 0.1Hz **	max. filter frequency 1Hz **	max. filter frequency 10Hz **	max. filter frequency 50Hz **	
11	min. filter frequency 0,1Hz **	min. filter frequency 1Hz **	min. filter frequency 10Hz **	min. filter frequency 50Hz **	
12	BMS mode **	Isodata **	test data **		
13	Bus address in the tens-place IRDH575				↑ Value: 5 ... 9
14	Bus address in the units-place IRDH575				↑ Value: 5 ... 9
15	Number of pulses 2-9 **				↑ Value: 5 ... 9

** The parameters marked with two asterisks are settable via the Service menu item! A password is required for that purpose !

Dimension diagram enclosure IRDH575
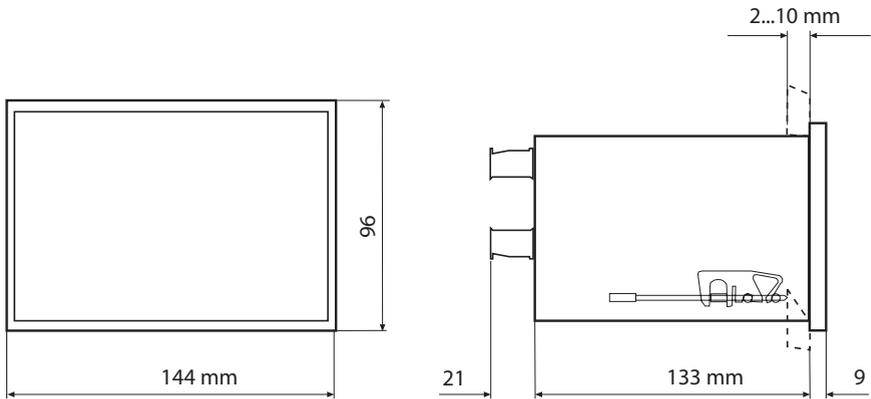
Panel cut out 138 x 90 mm

7.4 Ordering details

7.4.1 Standard version

Type	Nominal volt. U_n	Supply voltage U_s	Art. No.
IRDH575**B1**-427	AC 20...575 V DC 20...575 V	DC 19,2...72 V	B 9106 5502
IRDH575**B1**-435	AC 20...575 V DC 20...575 V	AC 88...264 V DC 77...286 V	B 9106 5500
IRDH575**B1**-4227	AC 20...150 V DC 20...150 V	DC 19,2...72 V	B 9106 5505
IRDH575**B1**-4235	AC 20...150 V DC 20...150 V	AC 88...264 V DC 77...286 V	B 9106 5504
IRDH575**B2**-435	AC 340...760 V DC 340...575 V	AC 88...264 V DC 77...286 V	B 9106 5503

Device with ending "W" provide improved shock and vibration resistance. A special varnish of the electronics provides higher resistance against mechanical stress and moisture. This makes the devices suitable for use in ships, on rolling stock and in seismic environment.

7.4.2 Protection against dust and moisture

Type	Dimensions	Art. No.
Panel sealing, degree of protection IP42	144 x 96 mm	B 9806 0006
Transparent cover, degree of protection IP65	144 x 96 mm	B 9806 0007

7.4.3 Measuring instruments

Type	Measuring range	Dimensions	Art. No.
9620-1421	0...20 mA	96 x 96 mm	B 986 841
9620S-1421	0...20 mA	96 x 96 mm	B 986 842

7.4.4 Label for modified versions

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

INDEX

A

B

C

D

E