BENDER
The Power in Electrical Safety©

# Electrical safety for ships, mobile and fixed offshore platforms

- Insulation monitoring
- Offline monitoring
- Insulation fault detection
- Residual current monitoring

# Electrical safety in maritime applications

Bender provides electrical safety products that contribute to an optimum of high operating safety and reliability in power supplies. The innovative solutions we offer today are based on more than half a century of experience. The products are developed for demanding applications in industries, hospitals, commercial buildings, ships and many other various areas.

A high degree of standardization means cost effective and highly reliable solutions.

- A-ISOMETER® – Insulation monitoring device
- Insulation fault location systems (EDS)
- Systems for the electrical safety of medically used rooms
- Residual current monitors (RCM)
- Control and indication panels
- Communication solutions.

**Unearthed systems become standard**

Electrical systems on ships and offshore platforms should be designed in such a way that:

- Operating safety and reliability of the electrical systems must be guaranteed
- Protection for passengers and personnel in case of insulation faults is secured
- International standards and regulations are complied with.

Therefore, the use of unearthed electrical systems (IT systems) with insulation monitoring is crucial in many maritime applications. For example:

*IEEE – Recommended practice for electrical installations on shipboard*
33.7.6 Electrical installations on tank vessels
Electrical distribution systems of less than 1000 V (line to line) should be unearthed

**Service and support**

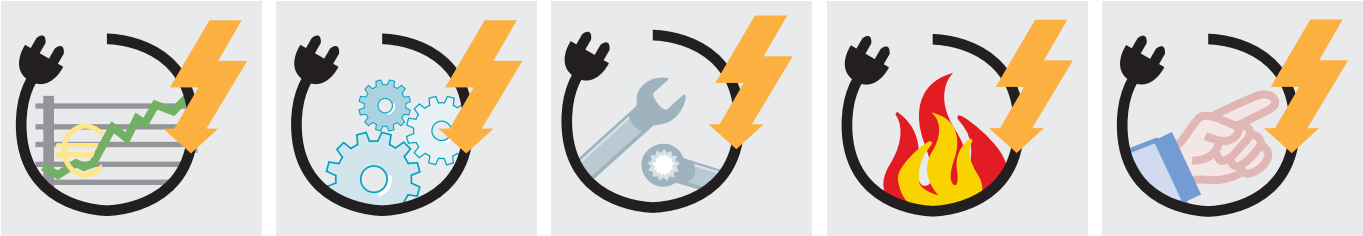
Bender supplies electrical safety products worldwide. We also provide support and service for all Bender supplied systems and plants. Our involvement begins with the concept stage as we work very closely with the ship builder. We continue as an integral member of the team during the construction phase and, thereafter, through the entire operational life of the ship or offshore platform.

Unearthed power supplies (IT systems) monitored by an A-ISOMETER® provide solutions which on one hand offer comprehensive protection of people and equipment and on the other hand meet the ever increasing high requirements for availability and cost reduction. IT systems – in many parts of the world better known as "unearthed systems or floating systems" – are mentioned in all national and international standards. For all IT Systems the standard IEC 60364-4-41 (2001-08): "Protection against electric shock" applies. In addition, the following standards for maritime applications apply:

- IEC 60092-201 (1994-08): Electrical installations in ships – part 201: System design – General
- IEC 60092-502: 1999-02: Electrical installations in ships – part 502: Tankers: Special features
- IEC 60092-504: Electrical installations in ships – part 504: Special features – Control and instrumentation
- IEC 60092-507 (2000-02): Electrical installations in ships – part 507: Pleasure craft
- IEC 61892-1: 2001-02 Mobile and fixed offshore units – Electrical installations – Part 1: General requirements and conditions
- IEC 61892-1:2001-02 Mobile and fixed offshore units – Electrical installations – Part 5: Mobile units
- IEC 61892-5 (2000-08): Mobile and fixed offshore units – Electrical installations – Part 7: Hazardous areas
- Regulations relating to maritime electrical installations: 2001-12, Directorate for fire and electrical safety, Norway and other international standards, like: Solas, IMO, Lloyd's, IEE, NEK etc.

# Why unearthed systems with insulation monitoring?

**Five good reasons for IT systems with insulation monitoring**



**Improved economic efficiency**

- Expensive and unexpected interruptions to operation are avoided
- Time and costs for maintenance are reduced
- Weak points in the installation are recognised
- Investment management is supported

**Increased operating reliability**

- No interruption to operation in the event of phase-to-earth fault
- No control malfunction in the event of insulation faults
- Electrical installations are kept at a high level of availability
- Off-line monitoring

**Optimised maintenance**

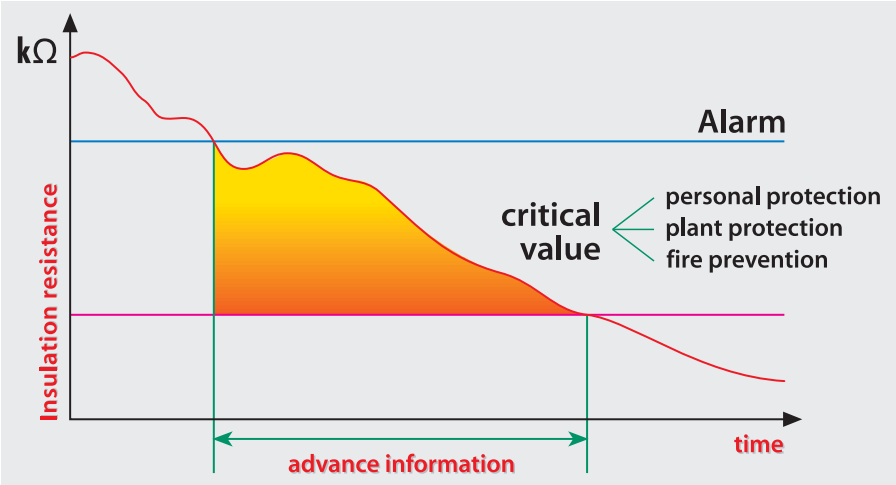
- Insulation deteriorations are early recognised and signalled
- Automatic localisation of sections of the system with insulation faults
- Optimised planning of time and personnel resources
- Central information about the condition of the electrical installation
- Remote diagnosis via Internet/Ethernet

**Increased fire prevention**

- Gradually developing insulation faults are detected at an early stage
- Arcing faults, a frequent cause of fire, do not occur
- Areas subject to explosion and fire hazards can be separated from the rest of the system by means of isolating transformers and can be monitored

**Increased accident prevention**

- Low touch currents in small and medium-sized installations
- No malfunctions in control circuits of equipment and machines




*Time gained thanks to advance information*

# Insulation monitoring – making the right choice

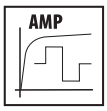
The unearthed electrical system is continuously monitored by an A-ISOMETER®. Connected between the active conductors and earth (ship's hull), it superimposes a measuring voltage on the system. If an insulation fault occurs, the measuring circuit is closed and a small measuring current will flow. This measuring current is proportional to the insulation resistance and it is then evaluated by the device's electronic system. Insulation monitors are an important part of IT systems. Therefore, they are demanded by the regulations, for example:

IEC60092-201: 1994-08 Electrical installations on ships – system design
7.2 Insulated distribution systems
When a distribution system, whether primary or secondary, for power, lighting or heating, with no connection to earth is used, a device capable of continuously monitoring the insulation level to earth and of giving an acoustic and optical indication of low insulation values shall be provided.

Depending on the system to be monitored the following measuring principles are used:

**DC measuring voltage**
One frequently used measuring principle is the superimposition of a DC measuring voltage between the system and the protective conductor. This is the standard measuring principle for pure AC one and three phase unearthed systems.
Today's electrical systems frequently contain alternating current loads which include electrically connected DC components e.g. PC's, solenoid valves, rectifiers etc. DC voltage components, high capacitances, voltage and frequency changes can cause a negative influence on this measurement.

**AMP measuring principle**
The AMP measuring principle (by Bender patent) is based on a specially clocked measuring voltage which is controlled by a micro-controller and adapts itself automatically to the respective system conditions. All devices mentioned in this brochure are operating with this measuring principle and can be used universally in AC, DC and AC/DC IT systems with voltage or frequency variations, high system leakage capacitances and DC components. These devices are able to cope with today's modern distribution systems, which usually contain influencing variables.




**Approvals**

Llyod's Register of Shipping

Underwriters Laboratories Inc.

Germanischer Llyod

| Type |
|---|
| **Fields of application** |
| Insulation monitoring |
| Coupled IT systems |
| IT systems with converter drives |
| Insulation fault location |
| Nominal voltage (insulation monitoring) |
| Frequency range |
| **Response values/contacts** |
| Number of response values |
| Response values |
| Contact main alarm |
| Contact prewarning |
| Contact change over for |
| **Communication** |
| LC display |
| Pre-alarm display |
| RS-485 interface |
| Real time clock |
| **General features** |
| Measuring principle |
| Fault memory |
| Selective fault location L+/L- |
| Connection monitoring |
| Historical memory |
| Isometer disconnection relays |
| **Insulation fault location** |
| Nominal voltage IRDH575B1-… |
| Nominal voltage IRDH575B2-… |
| Frequency range |
| Evaluators |
| Measuring current transformers |
| Approvals |

# No matter what kind of IT system you have, A-ISOMETER® will monitor them all

## Functions and characteristics at a glance

| | IR1575 | IRDH275B – IRDH375B | IRDH575 | IR420-D6 |
|---|---|---|---|---|
| |  |  |  |  |
| | Control and auxiliary circuits | Main circuits | Main circuits<br>Control and auxiliary circuits | Offline-Monitoring<br>TN, TT and IT systems |
| | -- | × | × | -- |
| | -- | × | × | -- |
| | -- | -- | × | -- |
| | 3(N)AC, DC, AC/DC 0 … 480 V | 3(N)AC 0 … 793 V DC 0 … 650 V<br>extentable via coupling unit | see "Insulation fault location" | -- |
| | DC, 30 … 460 Hz | DC, 0.2 … 460 Hz | DC, 42 … 460 Hz | -- |
| | 2 | 2 | 2 | 2 |
| | 2 kΩ … 1 MΩ | 1 kΩ … 10 MΩ | 1 kΩ … 10 MΩ | 100 kΩ…10 MΩ |
| | 1 changeover contact | 1 changeover contact | 1 changeover contact | 1 changeover contact |
| | 1 changeover contact | 1 changeover contact | 1 changeover contact | 1 changeover contact |
| | -- | system fault | system fault/EDS alarm | -- |
| | Two lines | Two lines | Four lines | × |
| | × | × | × | -- |
| | -- | BMS protocol (B version) | BMS protocol | -- |
| | -- | × (B version) | × | -- |
| | AMP | AMPPlus | AMPPlus | DC |
| | × | × | × | measured value memory |
| | × | × | × | × |
| | IT system/PE | IT system/PE | IT system/PE | PE |
| | -- | × (B version) | × | -- |
| | -- | × (B version) | × | -- |
| | -- | -- | AC, 3(N)AC 20 … 575 V DC 20 … 575 V | -- |
| | -- | -- | AC, 3(N)AC 340 … 760 V DC 340 … 575 V | -- |
| | -- | -- | DC, 42 … 460 Hz | -- |
| | -- | -- | EDS460/EDS461 | -- |
| | -- | -- | W, WS, WR series | -- |
| | -- | GL, UL, LR | LR, UL | -- |

# Bender A-ISOMETER® IRDH 275 / 375 / 575 series and IR1575 – the solution for all IT systems in ships and offshore platforms

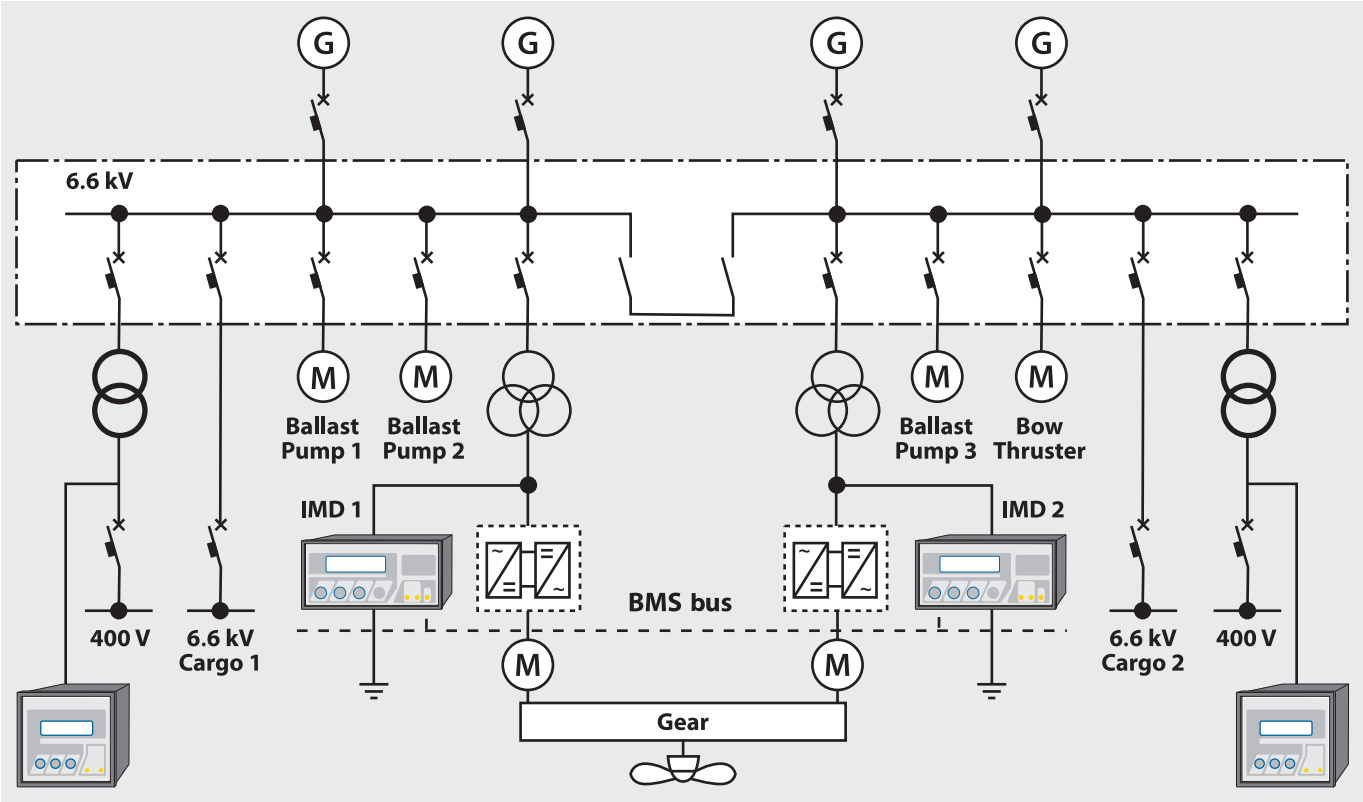
**General features of IRDH275/375/575 and IR1575**

- **AMP measuring principle for precise measurement of the insulation resistance** in all AC, DC or AC/DC IT systems
- **Simple to operate**
  The user-friendly menu structure and large keys make the device simple to operate
- **Clear indication**
  with illuminated text display
- **Increased alarm set points**
  Two programmable alarms provide warnings when the insulation resistance drops below pre-set values (alarm 1 can be used as pre-warning)
- **Easy to install and to connect**
  The panel mounting enclosure is easy to install into the fascia of a switchboard. The entire information is available to the user at a glance. Easy to connect by colour-coded plug-in terminals.

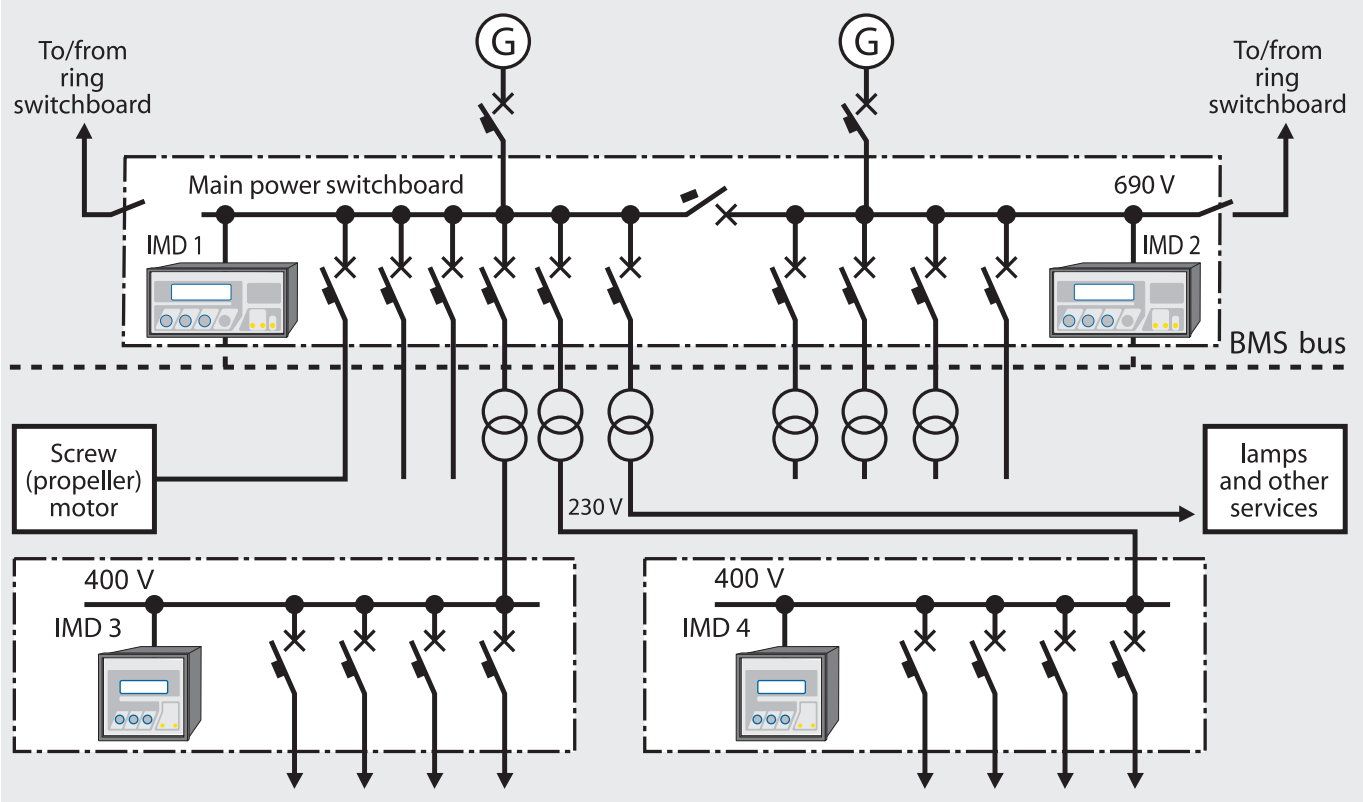
**Special features of IRDH275B/375B/575**

- **Monitoring several interconnected IT systems**
  The IRDH275/375/575 can be configured to operate as an IT system manager to provide the necessary control information exchange between the A-ISOMETER® when several IT systems are interconnected.
- **Informed at the press of a button**
  Additional information such as system leakage capacitance, parameter values etc. are immediately available at the press of the info button
- **Insulation monitoring with automatic fault location system EDS**
  The IRDH575 series can be extended to an automatic insulation fault location system
- **Data history info**
  By pressing the INFO key, additional information and up to 99 alarm messages with time and date stamp immediately available

# Practical examples

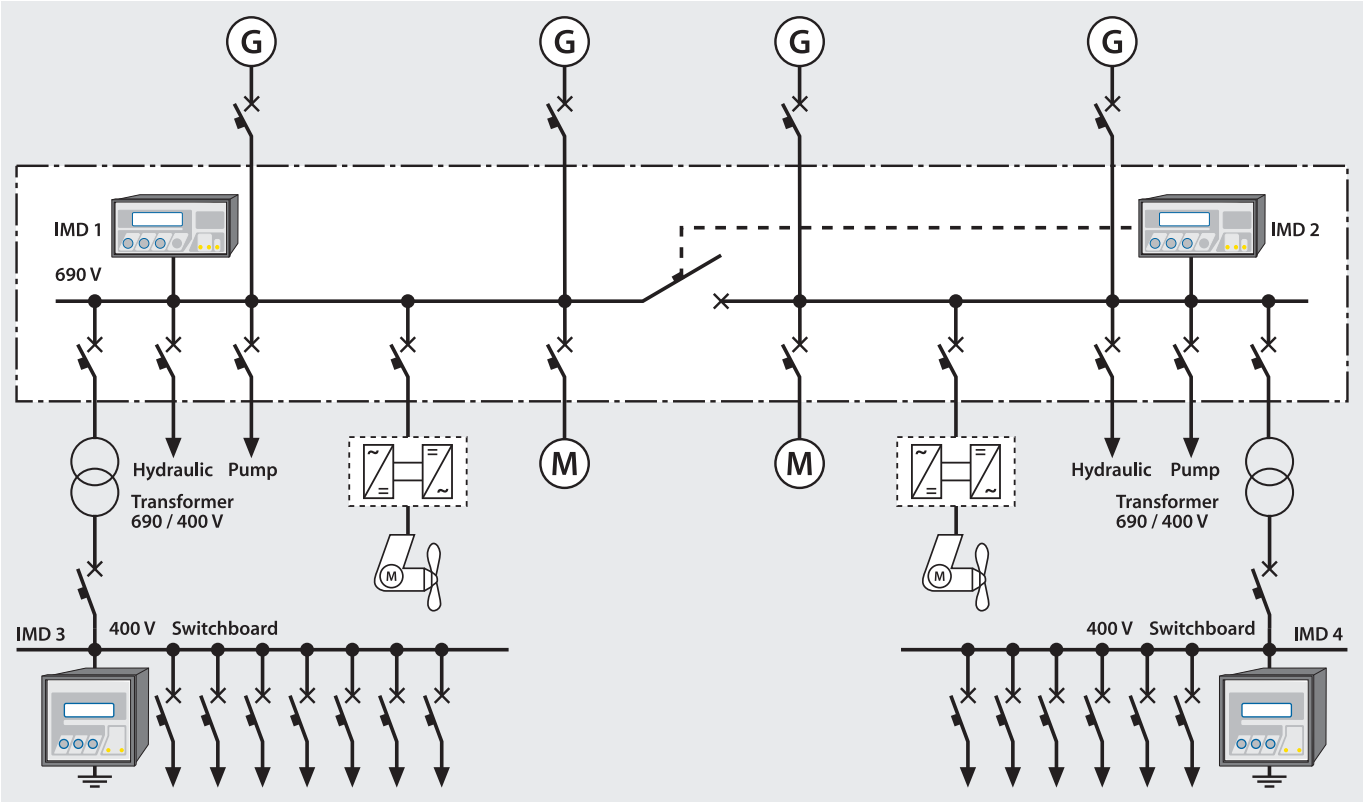



*Insulation monitoring of a electric propulsion system with IRDH375B*



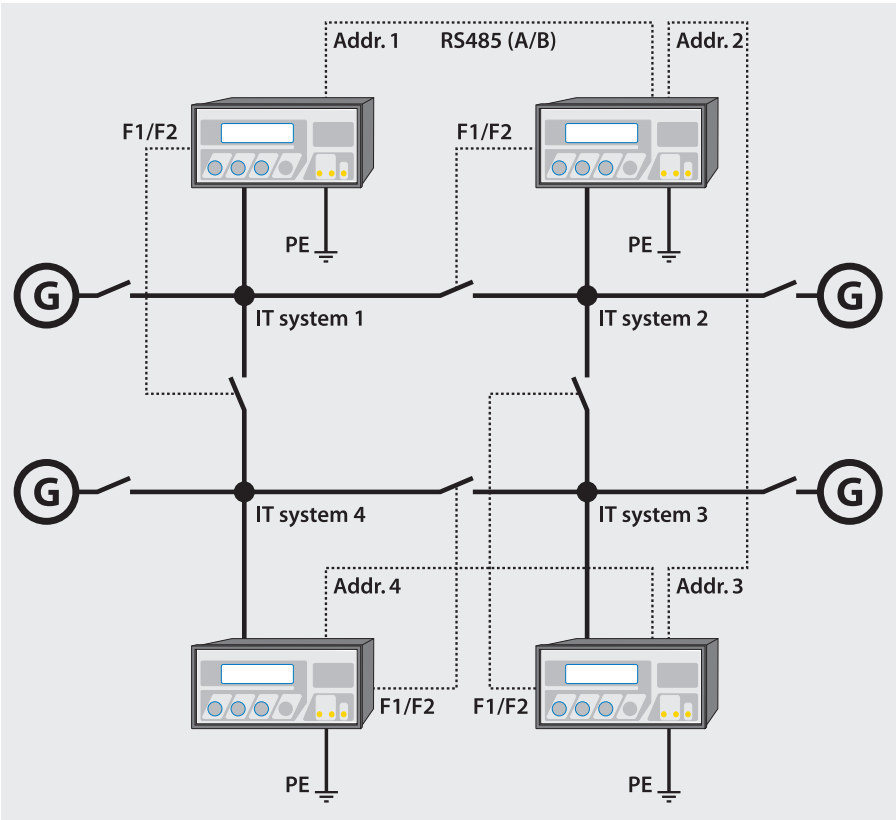

*Insulation monitoring of secondary distribution system with IR1575*

# Practical examples




*Insulation monitoring of primary distribution system with IRDH375 – Insulation monitoring of secondary distribution system with IR1575*

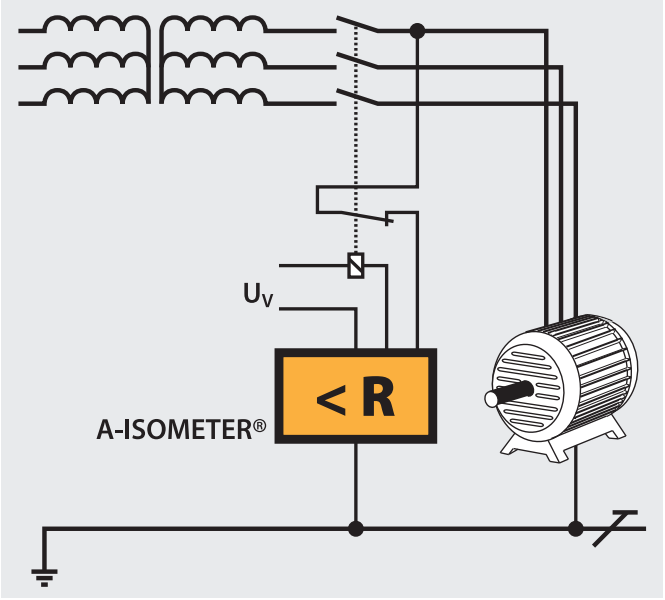
**Coupled IT systems – no problem**
In some maritime applications a lot of IT systems will be sometimes coupled during operation. For a correct measurement of the insulation resistance it is necessary that only one insulation monitor is active. The IRDH375 series will manage this by bus connection and controlling of the switches.




*Insulation monitoring in coupled systems with IRDH375*

# Practical examples


*A-ISOMETER® IR420-D6*



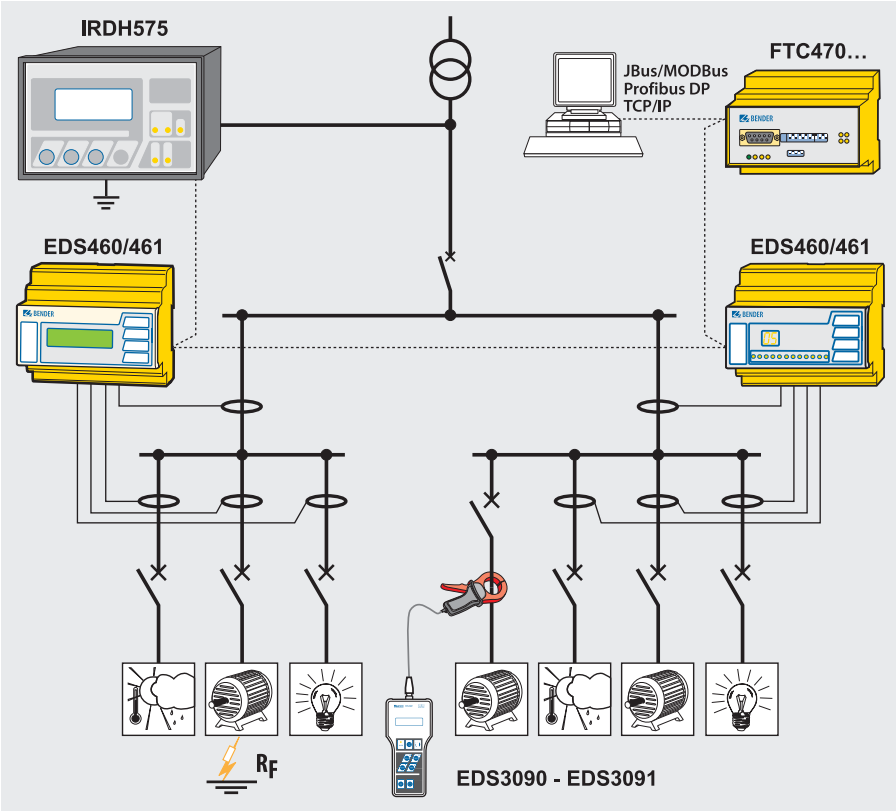

*Offline monitoring with IR420-D6*

**Offline monitoring with IR420-D6**

- Provides safe monitoring of electrical insulation integrity in certain installations
- Monitors the insulation resistance of de-energised TN, TT and IT systems, e. g. fire extinguisher pumps, slide-valve drives, standby generators, deck machinery in offshore platforms and marine environment
- Gives early warning of insulation degradation, before motors (or generators) with deteriorated insulation are in immediate danger of failing on start up
- Early warning for preventive maintenance to be scheduled when convenient
- Eliminates failure and the need for an emergency replacement or rewind
- Two separate response values
  100 kΩ…10 MΩ

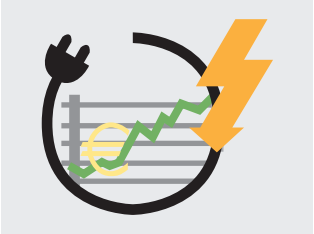
# Insulation fault location system EDS

In order to achieve high availability and to avoid costly shut-down periods of electrical installations, it is necessary to recognise insulation faults at an early stage – before interruption or disconnection of the power supply occurs. Unearthed systems (IT systems) with insulation monitoring are used for this reason to protect these power supplies to essential electrical installations and loads. The A-ISOMETER® provides the necessary advance information. Fast localisation and elimination of insulation faults is required by DIN VDE 0100-410 (VDE 0100 part 410: 1997-01, IEC 60364-4-410: 1997.
The IRDH575 in combination with the EDS system is a modular system ideally suited for this task.




*Insulation fault location with communication via FTC470*

**Advantages of insulation fault location with the EDS system**



**Improved economic efficiency**

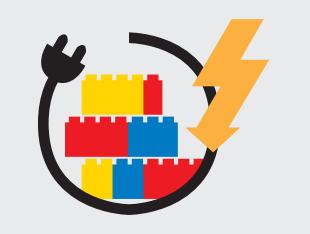
- Time and costs for maintenance are reduced
- Weak points in the installation are recognised

**Optimized maintenance**

- Insulation fault location without disconnecting the electrical installation
- Selective fault location by fast and precise localisation of the faulty sub circuit
- Centralized indication and operation with LC text display
- Reduced maintenance costs

**Increased operating reliability**

- Electrical installations are kept at a high level of availability
- Increased productivity because interruptions to operation are avoided
- More comfort for passengers and crew



**Flexible and configurable solutions**

- Cost-effective construction by modular system components
- Measuring current transformers are available in different sizes and shapes (round, rectangular and split core)

# Components of EDS systems – Functions and characteristics at a glance

| Type of supply system | AC, DC, AC/DC (mixed systems) | | AC, DC, AC/DC (mixed systems) |
|---|---|---|---|
| Applikation | Main circuit | | Control circuit |
| Function | Insulation monitoring device A-ISOMETER® and insulation fault test device | | |
| Type | IRDH575 | IR1575 | IRDH575 |
| |  |  |  |
| Nominal system voltage $U_n$ (B1) | 3AC/AC 20…575 V DC 20…575 V | DC/AC/3 AC 20…480 V | 3AC/AC 20…150 V/DC 20…150 V (Version IRDH575B1-4227, RDH575B1-4235) |
| Nominal system voltage $U_n$ (B2) | 3AC/AC 340…760 V DC 340…575 V | -- | -- |
| Supply voltage | | -- | |
| IRDH575B1-435<br>IRDH575B2-435<br>IRDH575B1-4235<br>IR1575PG1-435 | AC 88…264 V<br>DC 77…286 V | AC 88…264 V<br>DC 77…286 V<br>AC 340…460 V | AC 88…264 V<br>DC 77…286 V |
| IRDH575B1-427<br>IRDH575B1W-4227 | DC 19,2… 72 V | -- | DC 19,2… 72 V |
| IR1575PG1-434 | -- | AC 16…72 V, DC 10,2…84 V | -- |
| Test current | 10/25/50 mA | 10/25 mA | 1/2,5 mA |
| Response values | 1 kΩ …. 10 MΩ | 1 kΩ … 1 MΩ | 1 kΩ …. 10 MΩ |
| LC display | 4 x 20 characters | 2x16 characters | 4 x 20 characters |
| alarm relay | 3 changeover contacts | 2 changeover contacts | 3 changeover contacts |
| Interface/protocol | RS-485 (BMS) | -- | RS-485 (BMS) |
| Address range | 1…30 | -- | 1…30 |

| Insulation fault evaluators | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Type | EDS460-D/DG… | EDS490-D… | EDS460-L… | EDS490-L… | EDS461-D… | EDS491-D… | EDS461-L… | EDS491-L… |
| |  |  |  |  |  |  |  |  |
| Graphic LCD | × | × | -- | -- | × | × | -- | -- |
| 7-segment / LED display | -- | -- | × | × | -- | -- | × | × |
| $U_S$: DC 16…94 V, AC 42…460 Hz 16…72 V | EDS460-D-1, EDS460-DG-* | EDS490-D-1 | EDS460-L-1 | EDS490-L-1 | EDS461-D-1 | EDS491-D-1 | EDS461-L-1 | EDS491-L-1 |
| $U_S$: AC / DC 70…276 V AC 42…460 Hz | EDS460-D/DG-2, EDS460-DG-2* | EDS490-D-2 | EDS460-L-2 | EDS490-L-2 | EDS461-D-2 | EDS491-D-2 | EDS461-L-2 | EDS491-L-2 |
| Scanning time | < 10 s for up to 1080 measuring channels | | | | < 10 s for up to 1080 measuring channels | | | |
| Response value | 2…10 mA | | | | 0,2…1 mA | | | |
| Residual current display | 100 mA...10 A (EDS460DG 20mA-2 A) | | | | 10 mA … 1 A | | | |
| Parameterization function | × | × | -- | -- | × | × | -- | -- |
| Error codes display | × | × | × | × | × | × | × | × |
| Address range | 1…90 | | 1…90 | | 1…90 | | 1…90 | |
| Internal clock (RTC) | × | × | -- | -- | × | × | -- | -- |
| History memory | × | × | -- | -- | × | × | -- | -- |
| Alarm relay "Common alarm" | 2 x 1 changeover contact | | | | 2 x 1 changeover contact | | | |
| Alarm relay per channel | -- | 12 x 1 N/O contact | -- | 12 x 1 N/O contact | -- | 12 x 1 N/O contact | -- | 12 x 1 N/O contact |

* EDS460-DG-…particularly for localising insulation faults in DC IT systems with a number of branch circuits where high system leakage capacitances are involved

| EDS460-D/DG… | EDS490-D… | EDS460-L… | EDS490-L… |
|---|---|---|---|
|  |  |  |  |

# Measuring current transformer for EDS and RCMS systems – Overview

| Type of supply system | AC, DC, AC/DC (mixed systems) | | AC, DC, AC/DC (mixed systems) | |
|---|---|---|---|---|
| Application | Main circuit | | Control circuit | |
| Function | Measuring current transformers | | | |
| | Dimensions | Type | Dimensions | Type |
| W… series |  |  |  |  |
| Circular | ø 10 | W10 | ø 10 | W10-8000 |
| | ø 20 | W20 | ø 20 | W20-8000 |
| | ø 35 | W35 | ø 35 | W35-8000 |
| | ø 60 | W60 | ø 60 | W60-8000 |
| | ø 120 | W120 | | |
| | ø 210 | W210 | | |
| W…-S… series |  |  | | |
| Circular | ø 20 | W0-S20 | | |
| | ø 35 | W1-S35 | ø 35 | W1-S35-8000 |
| | ø 70 | W2-S70 | | |
| | ø 105 | W3-S105 | | |
| | ø 140 | W4-S140 | | |
| | ø 210 | W5-S210 | | |
| WR… series |  | | | |
| Rectangular (H x W) | 70 x 175 | WR70x175 | | |
| | 115 x 305 | WR115x305 | | |
| WR…S series |  | | | |
| Rectangular (H x W) | 70 x 175 | WR70x175S | | |
| | 115 x 305 | WR115x305S | | |
| | 150 x 350 | WR150x350S | | |
| | 200 x 500 | WR200x500S | | |

| | | | | |
|---|---|---|---|---|
| **Type of supply system** | **AC, DC, AC/DC (mixed systems)** | | **AC, DC, AC/DC (mixed systems)** | |
| **Application** | **Main circuit** | | **Control circuit** | |
| **Function** | **Measuring current transformers** | | | |
| | Dimensions | Type | Dimensions | Type |
| WS… series |  | |  | |
| Split-core (W x H) | 20 x 30 | WS20x30 | 20 x 30 | WS20x30-8000 |
| | 50 x 80 | WS50x80 | 50 x 80 | WS50x80-8000 |
| | 80 x 120 | WS80x120 | | |
| WS…S series |  | |  | |
| Split-core (W x H) | -- | -- | 20 x 30 | WS20x30S-8000 |
| | 50 x 80 | WS50x80S | 50 x 80 | WS50x80S-8000 |
| | 80 x 80 | WS80x80S | | |
| | 80 x 120 | WS80x120S | | |
| | 80 x 160 | WS80x160S | | |
| **Alternative accessories for communication** | | | | |
| FTC470… |  | | | |
| For PROFIBUS | FTC470XDP | | | |
| For Internet/Intranet | FTC470XET | | | |
| For Jbus/Modbus | FTC470XMB | | | |
| MK800… |  | | | |
| Flush-mounting | MK800… | | | |
| Surface-mounting | MK800A… | | | |
| Surface-mounting, front door | MK800AF… | | | |
| DI-1 PSM |  | | | |
| | BMS extension: > 32 BMS nodes, > 1200 m cable length | | | |

# Components for portable systems with installed test device (A-ISOMETER® IRDH575/IR1575PG1)

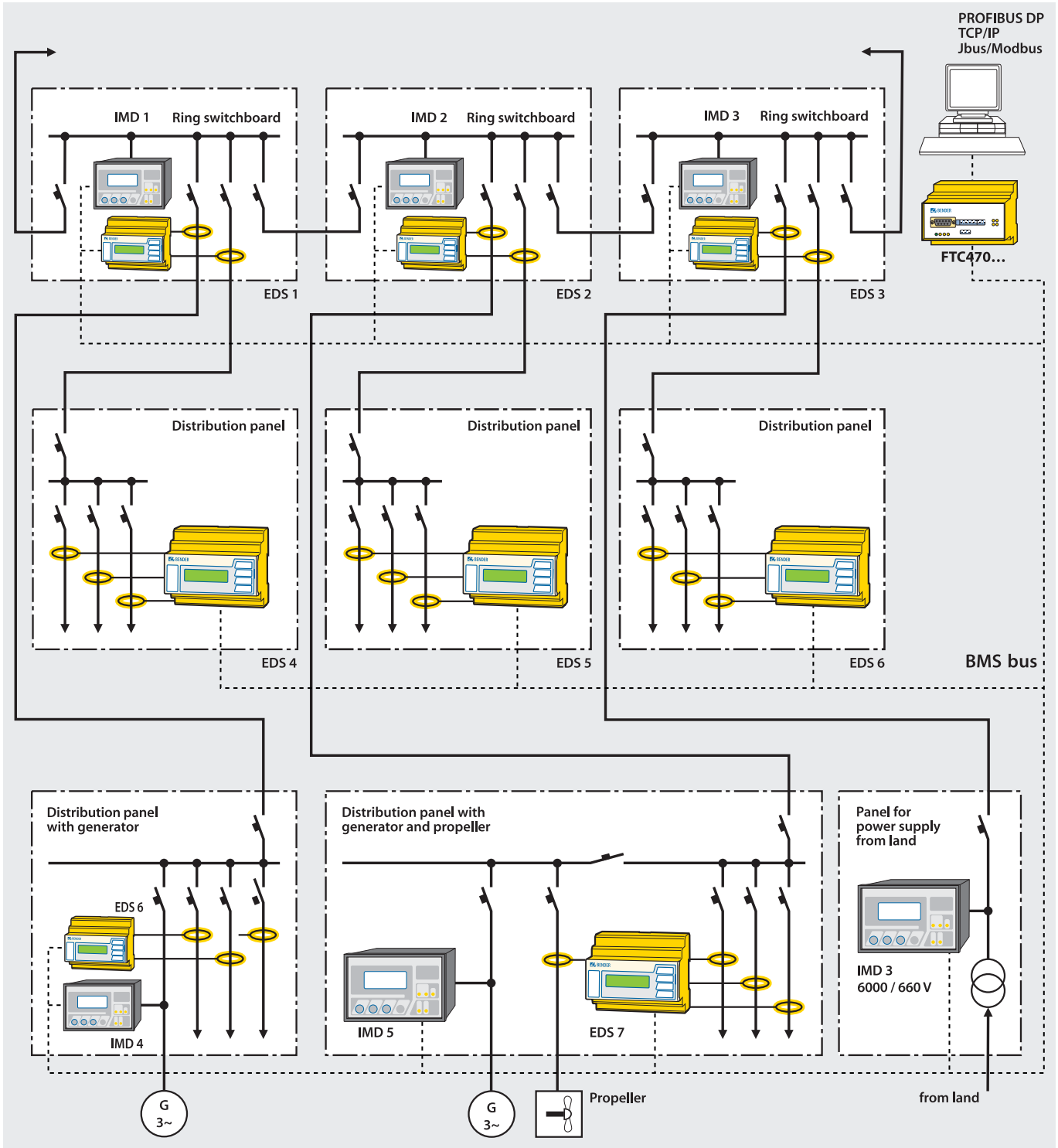
| | | | |
|---|---|---|---|
| **Type of supply system** | **AC, DC, AC/DC (mixed systems)** | | **AC, DC, AC/DC (mixed systems)** |
| **Applikation** | **Main circuit** | | **Control circuit** |
| **Function** | **Insulation monitoring device A-ISOMETER® and insulation fault test device** | | |
| Type | IRDH575 | IR1575 | IRDH575 |
| |  |  |  |
| Nominal system voltage $U_n$ (B1) | 3AC/AC 20…575 V DC 20…575 V | DC/AC/3 AC 20…480 V | 3AC/AC 20…150 V/DC 20…150 V (Version IRDH575B1-4227, RDH575B1-4235) |
| Nominal system voltage $U_n$ (B2) | 3AC/AC 340…760 V DC 340…575 V | -- | -- |
| Supply voltage | | -- | |
| IRDH575B1-435<br>IRDH575B2-435<br>IRDH575B1-4235<br>IR1575PG1-435 | AC 88…264 V<br>DC 77…286 V | AC 88…264 V<br>DC 77…286 V<br>AC 340…460 V | AC 88…264 V<br>DC 77…286 V |
| IRDH575B1-427<br>IRDH575B1W-4227 | DC 19,2… 72 V | -- | DC 19,2… 72 V |
| IR1575PG1-434 | -- | AC 16…72 V, DC 10,2…84 V | -- |
| Test current | 10/25/50 mA | 10/25 mA | 1/2,5 mA |
| Response values | 1 kΩ …. 10 MΩ | 1 kΩ … 1 MΩ | 1 kΩ …. 10 MΩ |
| LC display | 4 x 20 characters | 2x16 characters | 4 x 20 characters |
| alarm relay | 3 changeover contacts | 2 changeover contacts | 3 changeover contacts |
| Interface/protocol | RS-485 (BMS) | -- | RS-485 (BMS) |
| Address range | 1…30 | -- | 1…30 |

| | | |
|---|---|---|
| **Insulation fault evaluators** | | |
| Type | EDS190P | |
| |  | |
| LCdisplay | × | |
| Test current max. | 1/2,5/10/25/50 mA | |
| Response value | 0,2…1/2…10 mA | |
| Supply voltage | DC 6 V +/- 10%, external battery charger | |
| Measuring clamps | | |
| 20 mm | PSA3020 | PSA3320 |
| 52 mm | PSA3052 | PSA3352 |
| 115 mm | PSA3165 | -- |
| **Complete system** | **EDS3090** | **EDS3091** |
| Comprising | Aluminium case, EDS190P, PSA3020, PSA3052, battery charger | Aluminium case, EDS190P, PSA3020, PSA3052, battery charger |
| |  | |

# Components for portable systems without installed test device

| Application | Main circuit | | Control circuit |
|---|---|---|---|
| | in operation | offline | |
| **Function** | **Insulation fault test device PGH** | | |
| Type | PGH185, PGH186 | | PGH185 |
| |  | |  |
| Nominal system voltage $U_n$ | 3AC/AC 20…575 V DC 20…504 V | offline | 3AC/AC 20…150 V DC 20…150 V |
| $U_S$ AC 230 V | PGH185 | PGH186 | PGH183 |
| $U_S$ AC 90…132 V | PGH185-13 | -- | PGH183-13 |
| Test current | 10/25 mA | 10/25 mA | 1/2,5 mA |
| **Insulation fault evaluators** | | | |
| Type | EDS190P | | |
| |  | | |
| LC display | × | | |
| Test current max. | 1/2,5/10/25/50 mA | | |
| Response value | 0,2…1/2…10 mA | | |
| Supply voltage | DC 6 V +/- 10%, external battery charger | | |
| Measuring clamps | | | |
| 20 mm | PSA3020 | | PSA3320 |
| 52 mm | PSA3052 | | PSA3352 |
| 115 mm | PSA3165 | | -- |
| **Complete system** | **EDS3090** | | **EDS3091** |
| Type | EDS3090PG, EDS3096PG for $U_S$ = AC 50…60 Hz 230 V<br>EDS3090PG-13, EDS3096PG-13 for $U_S$ = AC 50…60 Hz 90…132 V | | EDS3091PGH for $U_S$ = AC 50…60 Hz 230 V<br>EDS3091-13 for $U_S$ = AC 50…60 Hz 90…132 V |
| Comprising | Aluminium case, PGH185, EDS190P, PSA3020, PSA3052, battery charger | Aluminium case, PGH186, EDS190P, PSA3020, PSA3052, battery charger | Aluminium case, PGH185-3, EDS190P, PSA3020, PSA3052, battery charger |
| |  | | |
| Accessory | Coupling device AGE185 for 500-790 V/DC400-960 V | | |
| |  | | |

# Practical example




*Insulation monitoring and earth fault location in a distribution system*

- Insulation monitoring of different IT systems with A-ISOMETER® IRDH575
- Evaluators for earth fault location EDS460
- Measuring current transformers in different sizes and shapes (round, rectangular and split core)
- Communication via FTC470… to other bus systems

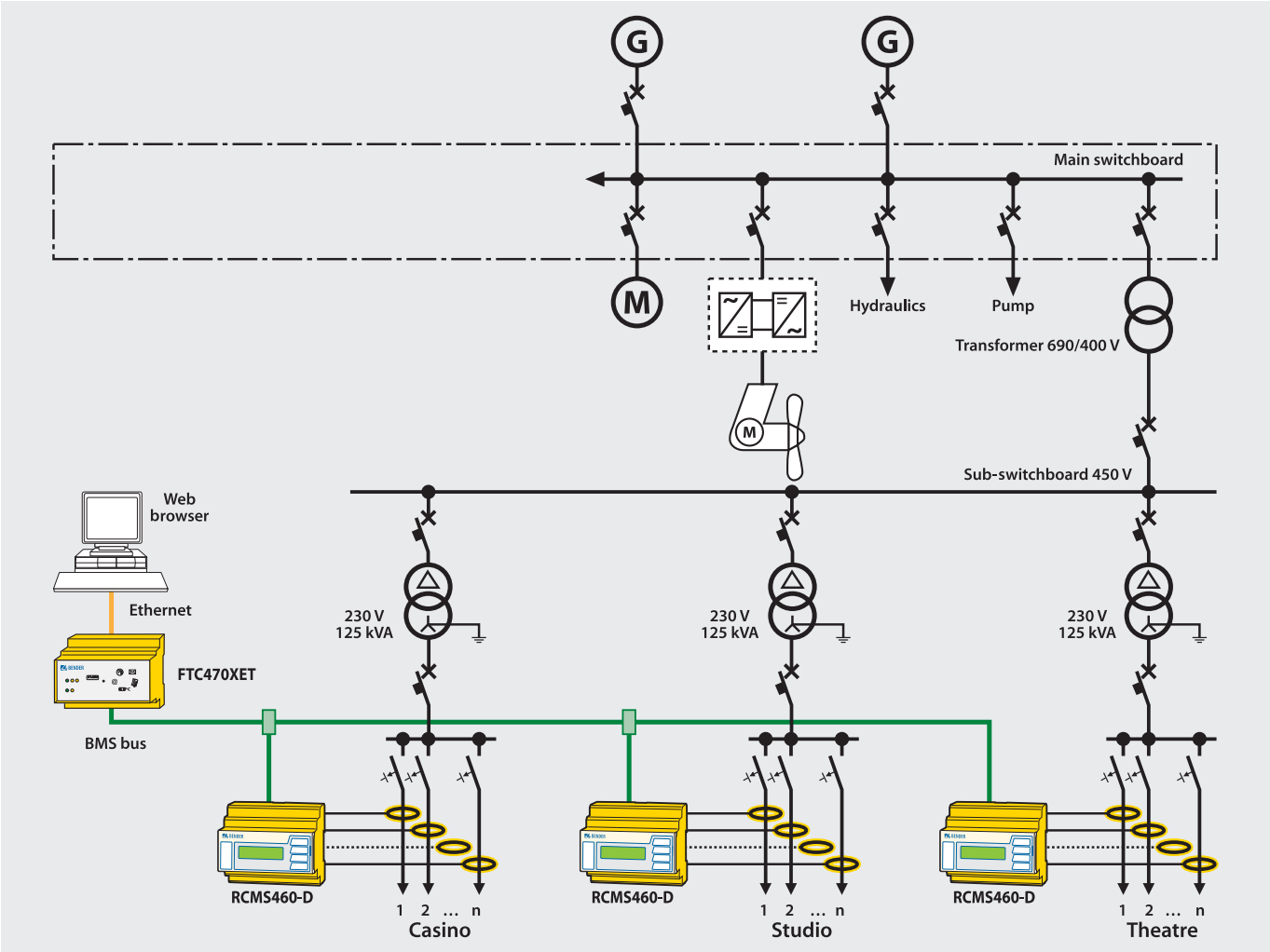
# Higher electrical safety for earthed sub-circuits for entertaiment areas, cabins, elevators and other applications

An RCMS system is a multi-channel residual current location system which can monitor up to 12 circuit branches per device and up to 1080 measuring points in a network divided over 58 12-channel devices. RCMS is suitable for d.c., alternating and pulsating residual currents. RCMS system gives an alarm before other protective measures are interrupting the power supply. Typical applications in ships and offshore units are earthed sub-circuits for the power supply of entertainment areas, cabins, elevators and other applications.

### Features of RCMS System

- Unexpected interruptions to operations are avoided
- Installation reliability and operational reliability are increased considerably
- Fire risk is reduced
- Maintenance costs are reduced
- Approvals: UL, LR


*RCMS460-D-2*




*Residual current monitoring with communication via FTC470*

# Communication solutions

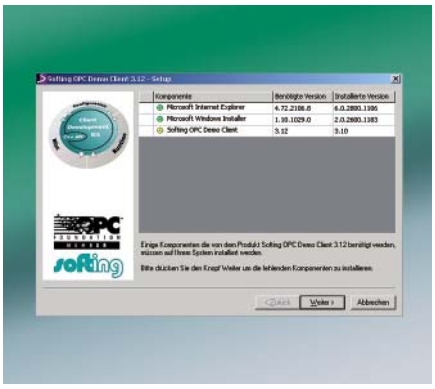
In the field of automation of electrical installations, the use of modern fieldbus technologies and the use of Ethernet technology has become a must. We offer various communications solutions to enable the integration of Bender systems in these areas.

Approvals: LR

**FTC470XDP**
**FTC470XMB**
Protocol converter for the connection of Bender monitoring systems to fieldbus PROFIBUS DP or Modbus RTU

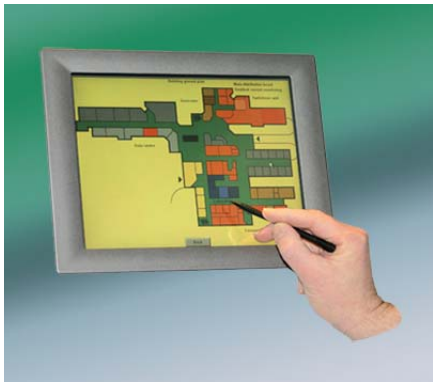

**FTC470XET**

Protocol converter/web server for the connection of Bender monitoring systems to Ethernet (TCP/IP) networks and visualization software (OPC)



**BMS-OPC server**

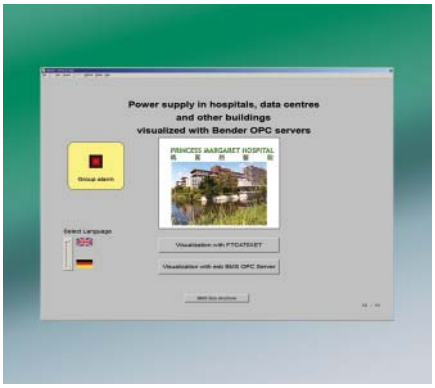
Software for the connection of Bender monitoring systems to Building Control and Central Building Process Control Systems and visualization software via OPC



**Touch Panel TPC**

For the visualization of Bender monitoring systems via OPC respectively Modbus RTU

**MK2430**
**TM panels**
Indicator and operator units for indication, operation and parameter setting of Bender monitoring systems via BMS bus




**SCADA software**

SCADA software and AxedaWizcon for the visualization of data from Bender monitoring systems

**Communication possibilities with Bender systems and devices**

1 - Bender systems or devices with BMS bus, e.g. RCMS, EDS, MEDICS® systems, A-ISOMETER®s IRDH275, 375, 575

2 - Bender BMS bus (internal)

3 - Alarm indicator and test combination MK2430

4 - Alarm indicator and test combination MK800

5 - TM alarm indicator and operator panels

6 - Protocol converter FTC470XDP
Conversion BMS bus/PROFIBUS DP

7 - Protocol converter FTC470XMB
Conversion BMS bus/Modbus RTU

8 - Bender BMS bus (external)

9 - Protocol converter FTC470XET
Conversion BMS bus/Ethernet (TCP/IP), web server, OPC interface

10 - PC with standard browser (Internet Explorer, Firefox, Opera, .etc.)

11 - OPC server in FTC470XET

12 - OPC client: Axeda Wizcon visualisation software

13 - OPC client: Touch Panel TPC

14 - OPC client: Scada software

15 - FTC470XET functionality: E-mail notification via Internet

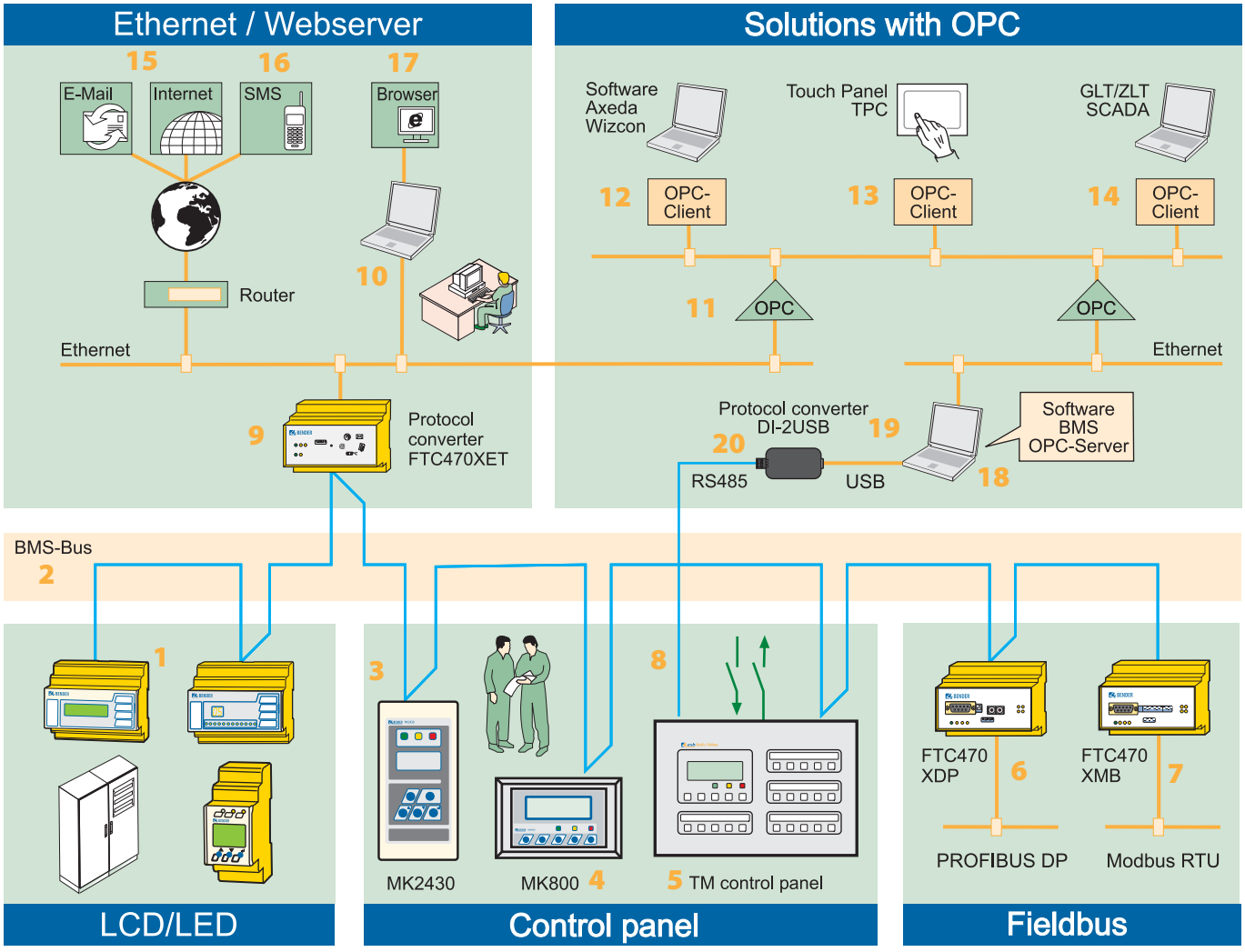
16 - FTC470XET functionality:
Operation of Bender systems via web browser

17 - FTC470XET functionality:
Short message service to mobile phones

18 - BMS OPC server

19 - PC with software BMS OPC server

20 - Protocol converter DI-2USB BMS bus (RS-485)/USB



# The individual programme that meets your expectations:

## Designed for electrical safety – to meet every requirement – for every application

**For more than 60 years Bender innovative measuring and monitoring systems are monitoring power supplies and provide early warning of critical operating conditions in many sectors**

- Power supply in industrial, residential and functional buildings
- Machines and systems in production processes
- Power generation and distribution systems
- Information and communication technology systems

### Electrical safety for unearthed power supplies

- Insulation monitoring devices A-ISOMETER®
- Insulation fault location systems EDS
- Earth fault relays

### Electrical safety for earthed power supplies

- Residual current monitors RCM, RCMA
- Residual current monitoring systems RCMS
- For AC, pulsed DC and smooth DC currents (AC / DC sensitive)

### Power supply for medically used rooms

- MEDICS®-Changeover and monitoring modules for medical locations in accordance with DIN VDE 0100-710: 2002-11 and IEC 60364-7-710: 2002-11
- Remote alarm indicator and operator panels
- Complete distribution systems
- IT system transformers

### Measuring and monitoring relays

- For electrical quantities: current, voltage, phase sequence, frequency, etc.
- For special applications such as mining, mobile generators, welding robots, solar photovoltaic systems and many more

### Communication solutions

- Protocol converter for standard bus systems (PROFIBUS, Modbus), Protocol converter for Ethernet /TCP / IP
- Visualisation of data via Axeda Wizcon and Active X
- Communication via OPC

### Testing systems

- For electrical safety of medical electrical equipment and general electrical equipment
- Function testers for medical electrical equipment
- Equipment management software

### Service

- Function check, EMC check, system quality check
- Electro thermography, commissioning, periodic testing
- Technical approvals of electrical installations by recognised experts, inventory taking / maintenance of installations
- Modernisation, central building control systems / visualisation, on-site training courses
- Fault elimination, insulation fault location

BENDER
The Power in Electrical Safety©

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