Your Advantages
- Quick correction of insulation faults in complex power networks
- Universal auxiliary voltage range

Features
- Insulation troubleshooting in AC, DC and AC/DC networks (IT systems) in connection with the insulation fault locator RR 5887 according to DIN EN 61557-9 (VDE 0413-9):2009 and DIN EN 61557-1 (VDE 0413-1)
- Insulation coordination according to IEC 60664-1
- External control via insulation monitor possible
- Positive and negative test current to monitor DC networks and networks with simultaneous alternating current and direct current portions present
- RS-485 bus connection to synchronise the test current analysis and optionally for the connection to the Modbus RTU field bus
- Modbus RTU interface for controlling the insulation fault location and readout of insulation fault currents
- Pushbutton for manual test current output
- Terminal connection for automatic test current output
- Status output of insulation fault detection via external switching output
- Width: 105 mm

Approval and Markings

Application
- Insulation fault detection in complex AC/DC networks
- Industry, shipbuilding, plant engineering, PV systems
- Quick fault correction of insulation faults in medical facilities

Indication
Green LED "ON": On, when supply connected
Yellow LED „BUS“: Indicates RS-485 bus activity
Yellow LED „ „: Indicates the output of the positive test current pulse
Yellow LED „ „: Indicates the output of the negative test current pulse

Connection Terminals

<table>
<thead>
<tr>
<th>Terminal designation</th>
<th>Signal description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1(+), A2</td>
<td>Auxiliary voltage AC or DC</td>
</tr>
<tr>
<td>L1(+), L2(-), L3, PE</td>
<td>IT network voltage connections AC / DC / 3AC</td>
</tr>
<tr>
<td>SH, GND, Rb, B, A, Ra</td>
<td>RS-485 Bus (galvanic separation)</td>
</tr>
<tr>
<td>Y1, Y2</td>
<td>Switching input Test current output to control</td>
</tr>
<tr>
<td>G, H</td>
<td>Status switching output Test current output</td>
</tr>
</tbody>
</table>

All technical data in this list relate to the state at the moment of edition. We reserve the right for technical improvements and changes at any time.
Switching input
The test current release can be externally controlled via the switching input (terminals Y1, Y2). Bridging the terminals Y1-Y2 overrules the start-stop button and hence deactivates it. If the terminal connection is left open, the test current release can be controlled manually via the start/stop button. The test current release is activated and deactivated in alternating fashion with each push of the button.

While the terminals Y1-Y2 and the start-stop button, respectively, allow the release of the test current, the point of time when it is actually output is determined by the bus mode (s. below RS-485 bus connection).

Attention:
A started current output cycle (12 seconds) will last to the end and cannot be interrupted.

If the test current output is controlled via the terminals Y1,Y2, a complete test cycle is performed after the release has been cancelled in order to enable the insulation fault locators to confirm a fixed insulation fault.

The switching input can also be selected directly via an external device, e.g. insulation monitoring device. The switching input is supplied as well via the electrically separated supply voltage. The switching input can therefore be switched via a transistor or a relay output.

Configuration options for the test current release:
Y1 Automatic test current release
Y2 Release of the test current output through Y2 higher level control or external switch
Y1 Test current release controlled manually
Y2 via device pushbutton

Switching output
The device is equipped with a transistor switching output (terminals G, H), which is protected by a series-connected PTC (RN = 220 Ω). In the idle state (no test current output), the output is high-resistance. During test current output, the output is low-resistance (RN) and delivers a low-level in conjunction with a series resistor and an external voltage source.

RS-485 bus connection
Depending on the application the RS-485 bus mode is either master mode or slave mode. This is set on a 10 step rotary switch. If the insulation fault location system is part of a Modbus RTU field bus system, the pulse generator works as a bus slave. With the rotary switch a free channel in the range of 101 to 109 has to be selected. If the insulation fault locating system is working independently, the test current generator works in master mode and the channel selector has to set to the relevant position.

The rotary switches for baudrate selection of all RR 5886 and RR 5887 devices have to be identical independent of the bus operation mode. The preferred baudrate is 9600 Baud (rotary switch position 4).

The RS-485 telegrams the locating current injector sends to synchronise the insulation fault measurement are identical in both bus modes.

Attention:
While in the master mode the output of the telegrams occurs automatically every 12 seconds, in slave mode it occurs as response to a modbus master request. A pending test current output is announced here in the user data range of the response telegram.

The insulation fault locators RR 5887, generally working in slave mode, synchronise themselves by monitoring the RS-485 telegram network with manual test current output.

Modbus RTU
For communication between motor controller and a supervising control the Modbus RTU protocol according to Specification V 1.1b3 is used.

Adress- / Baud rate setting

<table>
<thead>
<tr>
<th>Pos. Potentiom.</th>
<th>Master 1 2 3 4 5 6 7 8 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adress Modbus RTU</td>
<td>--- 101 102 103 104 105 106 107 108 109</td>
</tr>
<tr>
<td>Pos. Potentiom.</td>
<td>BAUD 1 2 3 4 5 6 7 8</td>
</tr>
<tr>
<td>Baud rate</td>
<td>1200 2400 4800 9600 19200 38400 57600 115200</td>
</tr>
</tbody>
</table>

Device address and baudrate are only read once after application of the auxiliary voltage.

Bus Interface
Protocol Modbus Serial RTU
Adress 101 bis 109
Baud rate 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud
Data bit 8
Stop bit 2
Parity None

More information about the interface, wiring rules, device identification and communication monitoring can be found in the Modbus user manual.

Function-Codes
At RR 5886 the following function codes are implemented:

<table>
<thead>
<tr>
<th>Function-Code</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x02</td>
<td>Read Discrete Inputs</td>
<td>Device state read / Start test current output</td>
</tr>
<tr>
<td>0x04</td>
<td>Read Input Register</td>
<td>Device state / Device ID data read</td>
</tr>
</tbody>
</table>


### Technical Data

#### Auxiliary voltage

- **Measured nominal voltage** $U_{M}$: AC/DC 24 ... 80 V; AC/DC 85 ... 230 V
- **Operating voltage** $U_{o}$: AC/DC 21 ... 88 V; AC 77 ... 265 V, DC 77 ... 290 V
- **Frequency range**: DC or AC 45 ... 400 Hz
- **Nominal consumption**: DC max. 3 W; AC max. 3.5 VA

#### Monitored network

- **Operating voltage** $U_{M}$: DC / AC / 3AC 21 ... 500 V
- **Measured nominal voltage** $U_{o}$: DC / AC / 3AC 24 ... 455 V
- **Frequency range**: AC / 3AC 40 ... 60 Hz

#### Rated current range for insulation test currents

- 1 ... 5 mA
- 0.3 ... 1.0 mA

#### Response sensitivity

- 0.4 mA
- 0.3 mA

#### Maximum test current output

- 6.5 mA
- 1.0 mA

#### Width: 105 mm

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### Technical Data

#### Degree of protection

- **Housing**: IP 40
- **Terminals**: IP 20
- **Wire connection**: DIN 46228-1/-2/-3/-4

#### Vibration resistance

- Amplitude 0.35 mm

#### Climate resistance

- 20 / 060 / 04

#### Terminal designation

- EN 50005

#### Fixed screw terminals

- Cross section: 0.2 ... 1.5 mm² (AWG 24 - 16) solid or 0.2 ... 1.5 mm² (AWG 24 - 16) stranded wire with ferrules
- Stripping length: 7 mm
- Fixing torque: 0.4 Nm
- Mounting: DIN-rail

#### Weight

- Approx. 200 g

#### Dimensions

- Width x height x depth: 105 x 90 x 71 mm

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### Technical Data

#### Standard Type

**RR 5886**

- **Article number**: 0067693
- **Auxiliary voltage**: AC/DC 85 ... 230 V
- **Rated current range for insulation test currents**: 0.3 ... 1.0 mA
- **Response sensitivity**: 0.3 mA
- **Maximum test current output**: 1.0 mA
- **Width**: 105 mm

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### Technical Data

#### Variant

**RR 5886/010**

- **Article number**: 0068220
- **Auxiliary voltage**: AC/DC 85 ... 230 V
- **Rated current range for insulation test currents**: 1 ... 5 mA
- **Response sensitivity**: 0.4 mA
- **Maximum test current output**: 6.5 mA
- **Width**: 105 mm

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### Ordering Example for Variants

**RR 5886 / 0 _ 0 AC/DC 85 ... 230 V**

- **Auxiliary voltage**: AC/DC 85 ... 230 V
- **Rated current range for insulation test currents**: 0.3 ... 1.0 mA
- **Response sensitivity**: 0.3 mA
- **Maximum test current output**: 1.0 mA
- **Width**: 105 mm

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### General Data

#### Nominal operating mode

- Continuous operation

#### Temperature range

- Operation: - 20 ... + 60 °C
- Storage: - 25 ... + 60 °C
- Relative air humidity: 93% at 40 °C
- Altitude: ≤ 2000 m

#### Clearance and creepage distance

- Rated impulse voltage/ pollution degree: 6 kV / 2
- EMC: IEC 60664-1

#### Electro static discharge (ESD): 8 kV (air) IEC/EN 61000-4-2

#### HF irradiation

- 80 MHz ... 2.7 GHz: 10 V / m IEC/EN 61000-4-3

#### Fast transients: 2 kV IEC/EN 61000-4-4

#### Surge voltage

- Between wires for power supply: 2 kV IEC/EN 61000-4-5
- Between wire and ground: 4 kV IEC/EN 61000-4-5
- HF-guided: 10 V IEC/EN 61000-4-6

#### Interference suppression

- Limit value class B EN 55011
Parameter table

Every slave owns an output configuration- and actual value table. In these tables it is defined under which address the parameters can be found.

### Discrete Inputs:

<table>
<thead>
<tr>
<th>Register-Adress</th>
<th>Protocol-Adresse</th>
<th>Name</th>
<th>Value range</th>
<th>Description</th>
<th>Data type</th>
<th>Access rights</th>
</tr>
</thead>
<tbody>
<tr>
<td>10001</td>
<td>0</td>
<td>New test cycle started</td>
<td>0 ... 1</td>
<td>0: No test current release or ongoing test cycle</td>
<td>BIT</td>
<td>read</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Test current output</td>
<td></td>
<td>1: New test cycle started</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0x0000: No test current output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0x0001: Test current output active</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Input Register (Device state and measuring values):

<table>
<thead>
<tr>
<th>Register-Adress</th>
<th>Protocol-Adresse</th>
<th>Name</th>
<th>Value range</th>
<th>Description</th>
<th>Data type</th>
<th>Access rights</th>
</tr>
</thead>
<tbody>
<tr>
<td>30001</td>
<td>0</td>
<td>State</td>
<td>0 ... 1</td>
<td>0x0000: No test current output</td>
<td>UINT16</td>
<td>read</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Test current output</td>
<td></td>
<td>0x0001: Test current output active</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Sequence Diagram Modbus Control Insulation Fault Location

![Sequence Diagram Modbus Control Insulation Fault Location]

### Modbus Control Insulation Fault Detection Telegram Examples

**Request test current output:**

6Xh, 02h, 00h, 00h, 01h, XXh, XXh

**Read insulation fault currents (4-channel):**

6Xh, 04h, 00h, 04h, 00h, 04h, XXh, XXh

**Read insulation fault currents (8-channel):**

6Xh, 04h, 00h, 04h, 00h, 08h, XXh, XXh
**System overview**

**Insulation fault without external Modbus-Master (stand-alone system)**

- Insulation fault detection in AC / DC / 3AC IT networks in connection with the insulation fault locator RR 5887
- External selection via an insulation monitoring device possible

**Example for Modbus setting:**

<table>
<thead>
<tr>
<th>Device</th>
<th>Address-Potentiometer</th>
<th>Potentiometer position</th>
<th>Modbus Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR 5886</td>
<td>ADR 101 – 109</td>
<td>Master</td>
<td>-</td>
</tr>
<tr>
<td>RR 5887/1</td>
<td>ADR 100 – 109</td>
<td>0 (optional)</td>
<td>-</td>
</tr>
<tr>
<td>RR 5887/2</td>
<td>ADR 100 – 109</td>
<td>0 (optional)</td>
<td>-</td>
</tr>
<tr>
<td>…</td>
<td>ADR 100 – 109</td>
<td>0 (optional)</td>
<td>-</td>
</tr>
</tbody>
</table>

**Insulation fault with external Modbus-Master**

**Example for Modbus setting:**

<table>
<thead>
<tr>
<th>Device</th>
<th>Address-Potentiometer</th>
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<th>Modbus Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR 5886</td>
<td>ADR 101 – 109</td>
<td>1</td>
<td>101</td>
</tr>
<tr>
<td>RR 5887/1</td>
<td>ADR 100 – 109</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>RR 5887/2</td>
<td>ADR 100 – 109</td>
<td>2</td>
<td>102</td>
</tr>
<tr>
<td>…</td>
<td>ADR 100 – 109</td>
<td>…</td>
<td>…</td>
</tr>
</tbody>
</table>
Connection Examples

3AC network with manual test current output;
EDS measuring bus connection without bus termination

AC (DC) network with automatic test current output;
RR 5886 is bus master; bus termination on the device
Insulation monitoring and insulation fault detection with 4 connected current transformers in an AC (DC) network with subdistribution - insulation fault detection can be controlled by the insulation monitor (LK 5895); bus termination of the first and last device on the RS-485 bus.
Insulation monitoring and insulation fault detection with 4 connected current transformers in an AC (DC)-network with subdistribution - insulation fault detection can be controlled by the insulation monitor /LK 5896); bus termination of the first and last device on the RS-485 bus.
Insulation monitoring and insulation fault detection with 4 connected current transformers in a AC (DC)- network with subdistribution - insulation fault detection can be controlled by the insulation monitor (RN 5897/010); bus termination of the first and last device on the RS-485 bus.
Insulation fault location via Modbus control with external master.