

Your Advantages

- Suitable for DC charging stations for electric vehicles acc. to IEC/EN 61851-23:2014/AC:2016-06
- Insulation monitoring according to IEC/EN 61557-8
- Universal application in non-earthed AC-, DC-, AC/DC networks up to AC max. 250 V resp. DC max. 300 V
- Connection of an external coupling device RP 5898 for voltages up to AC 690 V / DC 1000 V possible
- Extended operating temperature range of - 40 ... + 70 °C
- Very fast reaction time ≤ 1 s
- Optimised insulation resistance monitoring also during mains voltage variation
- Preventive fire and system protection
- Detection of symmetric and asymmetric insulation faults
- Easy adjustment of response values and setting parameter via Modbus
- Suitable for leakage capacitances up to 5 μ F
- Monitoring also with voltage-free mains
- Measuring circuit L(+)/L(-) with broken wire detection (can be switched off)
- Protective conductor PE1/PE2 with broken wire detection (can't be switched off)
- With galvanic separated Modbus RTU interface

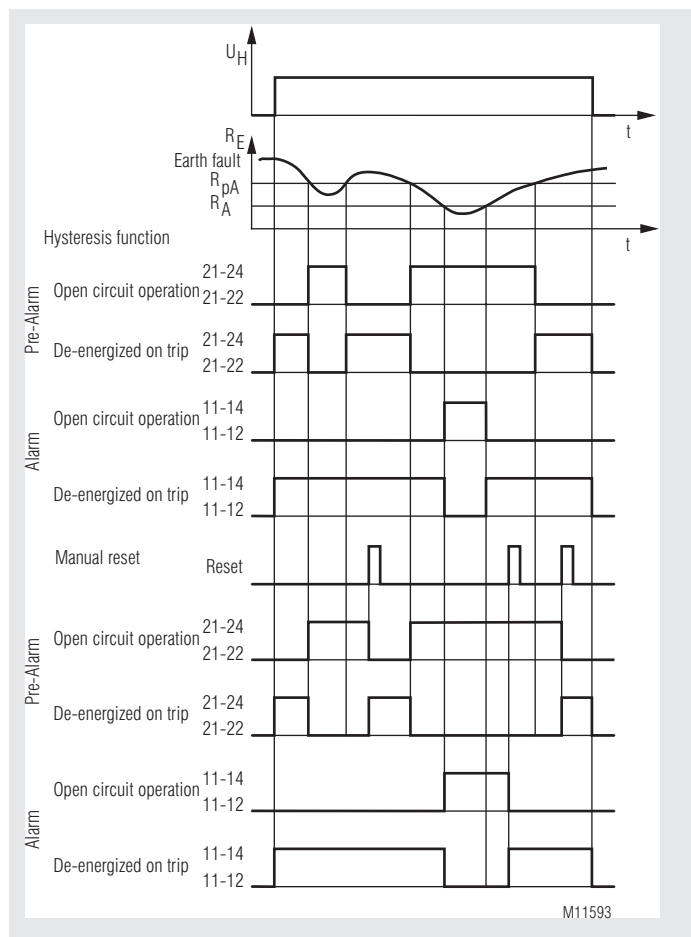
Product Description

The insulation monitor RN 5897/100 of the VARIMETER IMD family is a solution for optimal insulation monitoring of modern IT systems. The device can be used in the most flexible way for AC, DC and AC/DC systems. Mains areas of applications are non-earthed DC charging stations for electric vehicles with mains voltages up to DC 1000 V, that need an extended temperature range. The setting of the parameters and the switching values is done via Modbus. All measured values, device statuses and parameters can also be read out via Modbus. All functions of the device can also be operated via Modbus. The operating status is indicated user friendly via a multicolour LED. With a sealable transparent cover the device is protectet against manipulation.

Function Diagram

By default:

Indicator rel. K1 (11, 12, 14) = Insulation fault-alarm + device fault and
Indicator rel. K2 (21, 22, 24) = Insulation fault-pre-alarm + device fault:



Features

- 2 separate adjustable response thresholds (using e.g. for pre-alarm and Alarm)
- Setting range pre-alarm: 1 k Ω ... 500 k Ω
- Setting range alarm: 1 k Ω ... 500 k Ω
- 2 parameterizable changeover contacts (for insulation fault pre-alarm, insulation fault-alarm, insulation fault-alarm on DC+/DC- or device fault) each galvanic separated
- Energized or de-energized on trip can be selected for indicator relay
- With multicolour status LED to indicate the state of operation.
- Manual device self-test (automatic device self-test can be activated)
- Alarm storage selectable
- Protection against manipulation by sealable transparent cover
- External control input for combined test- / reset-button with additional Stop of the measuring function
- 2 wide voltage input for auxiliary voltage
- Width 52.5 mm

Approvals and Markings



Applications

- Insulation monitoring of:
- Non-earthed AC, DC, AC/DC networks
 - DC charging stations for electric vehicles
 - UPS systems
 - Networks with frequency inverters
 - Battery networks
 - Networks with direct current drives
 - Hybrid and battery-powered vehicles
 - Mobile generator sets

Function

The device is supplied with DC auxiliary voltage via terminals A1(+) / A2. Switching on the auxiliary voltage (Power-On) is followed by an internal self-test for 12 s (see „Device test functions“). The test process is visible with the status LED. After this, measurement of the insulation resistance in the measuring circuits begins and the status LED changes into green.

Measuring circuit

(Insulation measurement between terminals L(+)/L(-) and PE1/PE2)

The insulation monitor RN 5893/100 can only be used with a coupling device. Max. mains voltage and connection diagrams have to be observed! To connect the insulation Monitor RN 5893/100 to a coupling device the terminals with identical designations are connected (VSG1/L(+) and VSG2, L(-)). The voltage system to be monitored is connected to L(+) and L(-) of the coupling device.

The type of the voltage system or the connection method (AC, DC, 3NAC) has to be correctly adjusted via Modbus.

Also the terminals PE1 and PE2 have to be connected with 2 separate wires to the protective earth. An interruption of a wire also causes a fault signal (see section "Behavior on faulty connection"). The monitoring of the PE connection cannot be de-activated.

To measure the insulation resistance an active measuring voltage with changing polarity is connected between L(+)/L(-) and PE1/PE2.

At the end of a measuring cycle the actual insulation resistance is produced and indicated. If the indicator relays K1 and K2 are set to alarm and/or pre-alarm, they switch accordingly when the set response values are not achieved. If the values fall below the response values, the status LED lights up orange for pre-Alarm e.g. red for alarm.

The actual current measured value is output via Modbus. An asymmetric insulation resistance against „+“ or „-“ is also output via Modbus (only with DC networks resp. insulation faults on the DC side).

Manual reset of fault message

The manual reset of insulation fault messages can be set via Modbus (alarm memory). If the manual reset is activated, the insulation fault signals of the measuring circuit remain saved when the adjusted response value is not reached, even if the insulation resistance later goes back to healthy state again. The minimum value of the insulation resistance is stored and can be read out via Modbus. Pressing the „Reset“ button on the front side for 2 s, the alarm signal and the stored minimum value are reset if the actual insulation resistance is in healthy state. The device can also be reset with a Modbus command.

Indicator relay K1 and K2

For the indicator relays K1 (contacts 11-12-14) and K2 (contacts 21-22-24) the function can be set via Modbus to energized on trip or de-energized on trip. With energized on trip, the relays respond in the alarm state with de-energized on trip, they drop out in the alarm state. The status of the indicator relays is also shown via Modbus.

Insulation fault alarm, insulation fault pre-alarm, device fault, insulation fault on DC+/DC- or various collective faults can be flexibly assigned as tripping to the indicator relays K1 and K2 via the Modbus (see "Programming/setting of parameters/set-up of the insulation monitor").

If the insulation fault is set to DC+ or DC-, the respective alarm relay reacts when the value falls below the alarm response value and the insulation fault is on the DC+ DC- line.

In the event of a symmetrical fault or undefinable fault location, the indicator relays also respond (e.g. with setting K1 = insulation fault on DC+ and K2 = insulation fault on DC-, both indicator relays respond in the event of a symmetrical fault or undefinable fault location).

Function

Disable the measuring function

Using the external control input X1/X2 or via Modbus command the measuring function of the RN 5893/100 can be disabled. This could be used when several isolated voltage systems with individual insulation monitors need to be coupled.

The measuring voltage is set to -90V (negative measuring phase) and the evaluation of the measurement is stopped. The indicator relays maintain the current switching state. If the measurement is disabled the status LED flashes continuously orange. Please be aware, only the evaluation of the measurement is stopped and the measuring pulse is interrupted! A high resistive disconnection to PE does not take place (see internal resistance).

Broken wire detection

As described in section "Measuring circuit", the measuring circuits L(+)/L(-) and the protective conductors PE1/PE2 are constantly monitored for wire breaks – not only at Power-On or a manual or occasional automatic test. The response time of PE1/PE2 monitoring is only a few seconds. The response time of monitoring of L(+)/L(-) can be up to approx. 2 min. Broken wire detection between L(+)/L(-) is performed via coupled alternating voltage. This alternating voltage is short-circuited if the terminals are connected to the connected mains at low-resistance. The device detects that the mains to be monitored is properly connected. Since this broken wire detection is carried out with alternating voltage, large capacitances should be avoided between L(+)/L(-), since the capacitive reactance of these capacitances also short-circuits this alternating voltage. The device would no longer detect a connection fault on L(+)/L(-).

Especially parallel lines should be prevented over larger distances.

If larger capacitances between L(+)/L(-) cannot be avoided or if the coupled alternating voltage interferes with the system, the broken wire detection can be de-activated via Modbus. Monitoring deactivated, monitoring only during device test or continuous monitoring (every 2 minutes for 10 s) are the possible options. If the broken wire detection on L(+)/L(-) is de-activated no AC voltage is injected. The broken wire detection on PE1/PE2 cannot be de-activated.

Function

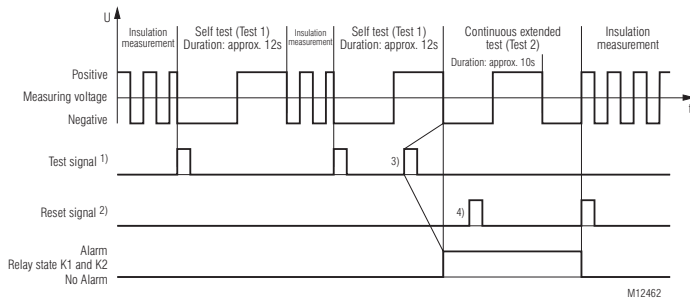
Device test functions

Principally, 2 different test functions are implemented: The "self-test" and the "expanded test":

The device self-tests automatically after power-on. If the automatic self-test is activated via the Modbus, a self-test is carried out after every full hour of operation. The self-test can also be triggered manually at any time by pressing the "Test" button on the front of the device for 2 seconds or via a Modbus command. For applications in accordance with UL 2231, the "automatic self-test" parameter must be deactivated ("oFF").

With the self-test, contrary to the expanded test, the status of the Indicator relays is not affected; the sequence is as follows:

The self test is indicated by the status LED with flash code 1 in orange colour. Additionally, it is output via Modbus that the device is in test mode. First the negative measuring pulses is activated for about 5 s and the internal measuring circuit is checked on failures. Then the positive measuring pulse is activated for about 5 s and more internal tests are performed. If no failures are detected, the normal measurement continuous. The extended test is started, when during or at the end of above procedure (12 s) the button "Test" is pressed again for 2 s or triggered via a Modbus command. The procedure is the same as above (2 measuring phases with 5 sec each) but in addition the output relays K1 and K2 go into alarm state. The Status LED shows flash code 2 in orange colour and via Modbus it is signalled that the device is in extended test mode. The test phases will be continuously repeated. The extended test can be finished after the first complete sequence (approx. 10 sec) by pressing the "reset" button for 2 seconds. The device starts the insulation monitoring again. The extended test can also be ended via a Modbus command.



- 1) Test signal: Button Test > 2 s or X1/X2 > 1.5 s and < 10 s or via Modbus command
- 2) Reset signal: Button Reset > 2 s or X1/X2 < 1.5 s or via Modbus command
- 3) To initiate the extended test (Test 2) the test signal must be operated within the self test (Test 1) again.
- 4) The reset signal has here no function, as the first complete sequence of extended test (Test 2) is not finished.

Function

Behaviour with internal device faults

If internal device faults were detected during the test function, the status LED flashes with flash code 3. If device faults or a collective fault containing device faults have been assigned to the indicator relays K1 or K2, the respective relay goes into the alarm state. The device faults are also indicated via Modbus.

Behavior on faulty connection

When detecting broken wire on terminals L(+)/L(-), the measurement is disabled. The reaction time could be up to 2 min. If device faults or a collective fault containing device faults have been assigned to the indicator relays K1 or K2, the respective relay goes into the alarm state and the status LED indicate the red flashing code 1. After removing the interruption the fault is automatically reset (max. reaction time up to 2 min) and the measurement of the insulation resistance is continued. Stored alarm values remain stored. An interruption of the protective earth connections PE1/PE2 causes the same reaction as interrupting the measuring circuit, only the status LED shows flash code 2 in red colour. Broken wire detection on terminals L(+)/L(-) and PE1/PE2 are also indicated via Modbus.

External control input

To terminals X1/X2 an external combined Test/Reset button can be connected. If the terminals X1/X2 are bridged for approx. > 1.5 s and < 10 s the test mode is started. This has the same function as pressing the internal test button. When bridging X1/X2 for < 1.5 s, a stored alarm will be reset. This has the same function as pressing the internal reset button. If X1/X2 is activated for > 10 s, the measuring function is stopped. The measuring function remains suspended for the duration of the control of X1/X2. The measuring function can also be stopped via Modbus command.

Connection of an external coupling device

An external coupling device (VSG) RP 5898 can be connected to extend the input voltage range of the monitored voltage system on RN 5893/100. The terminals with the same legend of the insulation monitor and the coupling device RP 5898 (VSG1, VSG2, L(+), L(-)) are connected together. The network to be monitored is connected to terminals L1(+) und L2(-) on the coupling device. Via Modbus the connection of the coupling device has to be selected and activated. The broken wire detection is active on the terminals L1(+)/L2(-) on the coupling device. A broken wire between coupling device and insulation monitor cannot be detected immediately but the measured values on interruption of 1 or 2 wires between coupling device and insulation monitor are much lower as the real values, which will cause an early response of the device.

Programming/setting of parameters/set-up of the insulation monitor

All settings are made via the Modbus. The response value for alarm and pre-alarm, the relay principle, the automatic self-test, the alarm storage, the connection monitoring, the mains connection type and the activation/deactivation of the ballast, as well as the signalling relays K1 and K2 can be set.

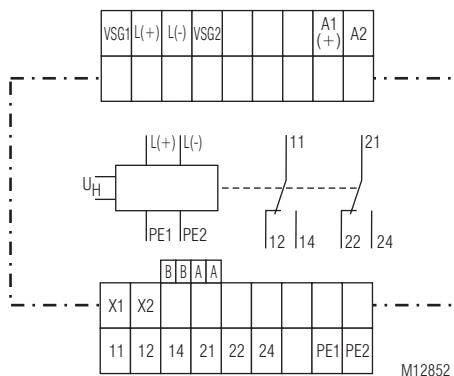
The setting of the Modbus address and baud rate is done via the three rotary switches on the front of the device. The first two rotary switches ("Adr10" and "Adr1") set the Modbus address between 1 and 99 in steps of 10 and 1, the third rotary switch ("Baud") sets the baud rate.

Possible setting values are:

Position potentiometer	1	2	3	4	5	6	7	8
Baud rate kBaud	1.2	2.4	4.8	9.6	19.2	38.4	57.6	115.2

To avoid unauthorized manipulation, all three rotary switches are located behind a sealable transparent cover.

Circuit Diagram



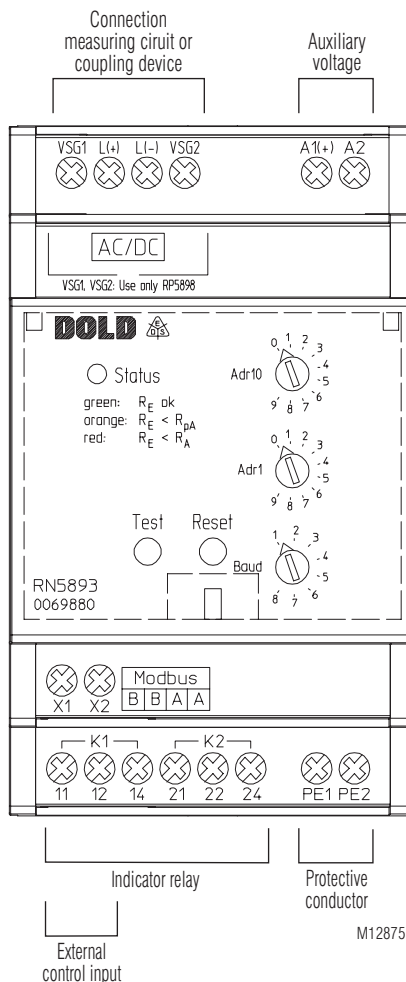
Connection Terminals

Terminal designation	Signal description
A1(+), A2	Auxiliary voltage AC or DC
L(+), L(-), VSG1, VSG2	Connection for measuring circuit or Connection for coupling device
PE1, PE2	Connection for protective conductor
X1, X2	Control input (combined external Test- and Reset-input with additional Stop of the measuring function)
11, 12, 14	Indicator relay K1(1 changeover contact)
21, 22, 24	Indicator relay K2 (1 changeover contact)
A	Modbus signal A
B	Modbus signal B

Modbus RTU

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

Indicators



Indicators

The operational status of the device is indicated on a 3-colour LED:

- Off:** No auxiliary voltage connected
- Green:** Normal operation (Insulation resistance in healthy state)
- Red:** Alarm (measured value below alarm response value)
- Orange:** Warning (measured value below pre-alarm response value)
- Orange flashing:** Test mode / Measurement stopped procedure (see table flashing code)
- Red flashing:** Failure code (see table flashing code)

Flash code orange Status-LED	Description
1	Selftest (measuring circuit, measuring voltage, internal tests)
2	Advanced Test (additional control of indicator relays)
continuously flashing	Measuring function stopped

Error Indication

Flash code red Status-LED	Failure cause	Failure recovery
1	Broken wire detection on L(+)/L(-)	Check measuring circuit L(+) and L (-)
2	Broken wire detection on PE1/PE2	Check protective earth connections PE1 and PE2
3	Internal failure detected in test mode	Press test button again or restart the unit by interrupting the auxiliary supply temporarily. If the fault remains permanent, send device back to manufacturer for examination.
9	Modbus timeout detected	Lock Modbus timeout, extend timeout time, or adjust communication with the master.
10	Faulty calibration values detected in device memory.	Send device back to manufacturer for recalibration and examination.
11	Internal communication error occurred	Restart the unit by interrupting the auxiliary supply temporarily. If the fault remains permanent, send device back to manufacturer for examination.
12	Internal software error occurred	Restart the unit by interrupting the auxiliary supply temporarily. If the fault remains permanent, send device back to manufacturer for examination.

Notes



Risk of electrocution! Danger to life or risk of serious injuries.

- Disconnect the system and device from the power supply and ensure they remain disconnected during electrical installation.
- The display of the voltage is not in real time. The Value on the display is updated at the end of a measuring cycle. The absence of voltage of the system and the device have to be checked with suitable measuring devices!
- The terminals of the control input X1-X2 have no galvanic separation to the measuring circuit L(+) / L(-) and are electrically connected together, therefore they have to be controlled by volt free contacts or bridge. These contacts ore bridges must provide a sufficient separation depending on the mains voltage on L(+)/L(-).
- Please do not connect external voltage to terminals X1/X2. The control must only be made by bridging X1 and X2.
- The coupling unit RP 5898 must only be used in conjunction with the RN 5893/100 on a voltage system and not just by itself.



Attention!

- Before checking insulation and voltage, disconnect the monitoring device RN 5893/100 from the power source!
- In one voltage system only one insulation monitor can be used. This has to be observed when interconnecting two separate systems..
- Device terminals PE1 and PE2 must always be connected via separate lines to different terminal points of the protective-conductor system.
- The device must not be operated without PE1/PE2 connection!
- If telegrams fail in the bus communication due to EMC interference, grounding the bus cable screening on both sides could be a remedy. With this earthing, attention must be paid to possibly occurring equalizing currents, which could occur with larger potential differences between the bus participants.
- To ensure correct measurement of the insulation resistance, there must be a low-impedance connection ($\leq 10 \text{ k}\Omega$) or a low-impedance internal mains resistance across the source or across the load between the measuring circuit connections L(+) and L(-) (or L1(+) and L2(-) when using the ballast unit).



Attention!

- The main measuring circuit can be connected with its terminals L(+) and L(-) both to the DC and also AC side of a mixed network; it is done most practically where the primary incoming power supply takes place e.g. with battery networks with connected inverters on the DC side, with Generators/Transformers with connected Rectifiers or inverters on the AC-side. To monitor a 3NAC system the device can be connected single pole, (L(+)) and L(-) are bridged, to the neutral of the 3p4w system. The 3 phases have a low- Ω_{ic} (approx. 3 – 5 Ω) connection via the transformer windings so also insulation failures of the not directly connected phases are detected. Via Modbus the correct type of network must be selected (see „Connection Examples“).
- If a monitored AC system includes galvanically connected DC circuits (e.g. via a rectifier), an insulation failure on the DC side can only be detected correctly, when a current of min 10 mA can flow via the semiconductor connections.
- If a monitored DC system includes galvanically connected AC circuits (e.g. via an inverter), an insulation failure on the AC side can only be detected correctly, when a current of min 10 mA can flow via the semiconductor connections.
- For the register of the Insulating resistance the value 65535 (0xFFFF) is transmitted via Modbus if $R_E > 2 \text{ M}\Omega$. If no valid mains voltage value was measured or the mains voltage is $< 5 \text{ V}$, the value 0 is transmitted for the register of the measured mains voltage via Modbus. For mains voltages outside the max. measuring range, the value 65535 (0xFFFF) is transferred for the register of the measured voltage (see parameter tables).

Technical Data

Measuring circuit L(+)/L(-) to PE1/PE2 (with coupling device)

Nominal voltage U_N:	AC / DC 0 ... 230 V
Max. max. voltage range U_N:	AC 0 ... 250 V DC 0 ... 300 V
Frequency range:	DC or 40 ... 1000 Hz
Max. line capacitance:	5 μ F
Internal resistance (AC / DC):	> 90 k Ω
Measuring voltage:	Approx. \pm 90 V
Max. measured current ($R_E = 0$):	< 1.10 mA
Response inaccuracy:	\pm 15 % \pm 1.5 k Ω IEC 61557-8
Response value hysteresis:	Approx. + 25 %; min. + 1 k Ω
On delay	
at $C_E = 1 \mu$ F,	
response value \leq 100 k Ω ,	
R_E of ∞ to 0.5 * response value:	\leq 1 s
At $C_E = 1 \mu$ F,	
response value > 100 k Ω ,	
R_E of ∞ to 0.5 * response value:	< 2 s
Measuring time	
at $C_E = 1 \dots 5 \mu$ F	< 5 s
Min. operate time:	> 0.2 s
Response value adjustable via Modbus	
Pre-warning "R _{PA} ":	In the range of 1 ... 500 k Ω in 1 k Ω steps
Alarm "R _A ":	In the range of 1 ... 500 k Ω in 1 k Ω steps
Response value broken wire detection L(+)/L(-):	> Approx. 90 k Ω
Response value broken wire detection PE1/PE2:	> Approx. 0.5 k Ω

Meas. circuit L1(+)/L2(-) to PE1/PE2 (with coupling device RP 5898)

Nominal voltage U_N:	AC 0 ... 690 V DC 0 ... 1000 V
Max. max. voltage range U_N:	AC 0 ... 760 V DC 0 ... 1100 V
Frequency range:	DC or 40 ... 1000 Hz
Max. line capacitance:	5 μ F
Internal resistance (AC / DC):	> 240 k Ω
Measuring voltage:	Approx. \pm 90 V
Max. measured current ($R_E = 0$):	< 0.40 mA
Response inaccuracy:	\pm 15 % \pm 1.5 k Ω IEC 61557-8
Response value hysteresis:	Approx. + 25 %; min. + 1 k Ω
On delay	
at $C_E = 1 \mu$ F,	
response value \leq 100 k Ω ,	
R_E of ∞ to 0.5 * response value:	\leq 1 s
At $C_E = 1 \mu$ F,	
response value > 100 k Ω ,	
R_E of ∞ to 0.5 * response value:	< 2 s
Measuring time	
at $C_E = 1 \dots 5 \mu$ F	< 5 s
Min. operate time:	> 0.2 s
Response value adjustable via Modbus	
Pre-warning "R _{PA} ":	In the range of 1 ... 500 k Ω in 1 k Ω steps
Alarm "R _A ":	In the range of 1 ... 500 k Ω in 1 k Ω steps
Response value broken wire detection L(+)/L(-):	> Approx. 500 k Ω
Response value broken wire detection PE1/PE2:	> Approx. 0.5 k Ω
Max. wire length between insulation monitor and coupling device:	< 0.5 m

Auxiliary voltage input A1(+)/A2

Nom. Voltage	Voltage range	Frequency range
AC/DC 24 ... 60 V	AC 19 ... 68 V	45 ... 400 Hz; DC 48 % W [*])
	DC 19 ... 96 V	W [*]) \leq 5 %
AC/DC 100 ... 240 V	AC 70 ... 276 V	45 ... 400 Hz; DC 48 % W [*])
	DC 80 ... 300 V	W [*]) \leq 5 %

^{*}) W = Permitted residual ripple of auxiliary supply

Nominal consumption:

DC 12 V, 24 V, 48 V:	Max. 3 W
AC 230 V:	Max. 3.5 VA

Technical Data

Control input X1/X2 for external combined Test-/Reset-Taste

Current flow:	Approx. 3 mA
No-load operation voltage	
X1 to X2:	Approx. 12 V
Permissible wire length:	< 50 m
Activat. time t for test signal:	1.5 s < t < 10 s
Activat. time t for reset signal:	t < 1.5 s
Activation time t for stop of the measuring function:	t > 10 s
Outputs	
Indicator contact:	2 x 1 changeover contact indicator relay K1 and K2 (programmable) energized or de-energized on trip (programmable)
Thermal current I_{th}:	Max. 4 A (see also temperature range operation)
Switching capacity	
to AC 15:	
NO contact:	5 A / AC 230 V IEC/EN 60947-5-1
NC contact:	2 A / AC 230 V IEC/EN 60947-5-1
To DC 13:	2 A / DC 24 V IEC/EN 60947-5-1
Electrical life	
at 5 A, AC 230 V:	1 x 10 ⁵ switching cycles
Short circuit strength	
max. fuse rating:	4 A gG / gL IEC/EN 60947-5-1
Mechanical life:	50 x 10 ⁶ switching cycles

General Data

Operating mode:	Continuous operation
Temperature range	
Auxiliary voltage	
AC/DC 24 ... 60 V:	- 40 ... + 60 °C - 40 ... + 70 °C (Device mounted with min. 1 cm distance to adjacent devices or device with max. 2 x 0.5 A contact current)
Auxiliary voltage	
AC/DC 100 ... 240 V:	- 40 ... + 60 °C - 40 ... + 70 °C (Device mounted with min. 1 cm distance to adjacent devices and device with max. 2 x 0.5 A contact current)
Storage:	- 40 ... + 70 °C
Altitude:	\leq 2000 m IEC 60664-1
Clearance and creepage distances	
Rated insulation voltage:	300 V
Overvoltage category:	III
Rated impuls voltage / pollution degree:	IEC 60664-1
Measuring circuit L(+)/L(-) to auxiliary voltage A1(+)/A2 and indicator relay contacts K1, K2:	6 kV / 2
Auxiliary voltage A1(+)/A2 to indicator relay contacts K1, K2:	6 kV / 2
Indicator relay contact K1 to indicator relay contacts K2:	4 kV / 2
Bus A, B to measuring circuit L(+)/L(-) and auxiliary voltage A1(+)/A2 and indicator relay contacts K1, K2:	6 kV / 2
Insulation test voltage	
Routine test:	AC 2,5 kV; 1 s AC 4 kV; 1 s
EMC	
Electrostatic discharge (ESD):	6 kV (contact) 8 kV (air) IEC/EN 61326-2-4 IEC/EN 61000-4-2 IEC/EN 61000-4-2
HF irradiation	
80 MHz ... 6 GHz:	20 V / m IEC/EN 61000-4-3
Fast transients:	2 kV IEC/EN 61000-4-4
Surge voltage between wires for power supply:	1 kV IEC/EN 61000-4-5
Between wire and ground:	2 kV IEC/EN 61000-4-5
HF-wire guided:	20 V IEC/EN 61000-4-6
Interference suppression:	Limit value classe B EN 55011

Technical Data

Degree of protection

Housing: IP 30 IEC/EN 60529

Terminals: IP 20 IEC/EN 60529

Housing: Thermoplastic with V0 behaviour according to UL subject 94

Vibration resistance: Amplitude 0.35 mm, Frequency 10 ... 55 Hz, IEC/EN 60068-2-6 frequency 2 ... 13.2 Hz, 13.2 ... 100 Hz, acceleration ± 0.7 gn IEC/EN 60068-2-6

10 gn / 11 ms, 3 pulses IEC/EN 60068-2-27

40 / 070 / 04 IEC/EN 60068-1

Terminal designation: EN 50005

Wire connection DIN 46228-1/-2/-3/-4

Cross section: 0.5 ... 4 mm² (AWG 20 - 10) solid or

0.5 ... 4 mm² (AWG 20 - 10)

stranded wire without ferrules

0.5 ... 2.5 mm² (AWG 20 - 10)

stranded wire with ferrules

6.5 mm

Stripping length:

Wire fixing: Cross-head screw / M3 box terminals

Wire connection Bus

pluggable cage-clamp terminal: 0.14 ... 0.5 mm² solid or

0.14 ... 0.25 mm² stranded ferruled

Insulation of wires or

sleeve length: 7 mm

Fixing torque: 0.5 Nm

Mounting: DIN rail IEC/EN 60715

Mounting position: Vertical

(air flow trough ventilation slots must be ensured)

Weight: Approx. 205 g

Dimensions

Width x height x depth: 52.2 x 90 x 71 mm

UL-Data

Meas. circuit L1(+)/L2(-) to PE1/PE2 (with coupling device RP 5898)

Nominal voltage U_N : DC 0 ... 1000 V

Max. voltage range U_N : DC 0 ... 1100 V

Output voltage at L(+)/L(-), VSG1/VSG2: Max. DC 230 V

Temperature range:

Operation: - 30 ... + 60 °C

Switching capacity:

Pilot duty C300, R300

5A 250Vac

2A 30Vdc

Wire connection:

60 °C / 75 °C copper conductors only
Torque 0.5 Nm

Test specification:

UL 2231-1, 2nd Edition
UL 2231-2, 2nd Edition
CAN/CSA-C22.2 No. 281.1-12, 1st Edition
CAN/CSA-C22.2 No. 281.2-12, 1st Edition

- For applications in accordance with UL 2231, the "automatic self-test" parameter must be deactivated ("oFF").
- For applications in accordance with UL 2231, a seal must be attached to the transparent cover to prevent unauthorised tampering with the setting parameters.
- For DC chargers with a voltage of 500 V, an alarm value setting of at least 50 k Ω is recommended; for DC chargers with a voltage of 1000 V, an alarm value setting of at least 100 k Ω is recommended.



Technical data that is not stated in the UL-Data, can be found in the technical data section.

Standard Types

RN 5893.12/100/61 AC/DC 24 ... 60 V

Article number: 0069880

• Auxiliary voltage: AC/DC 24 ... 60 V

RN 5893.12/100/61 AC/DC 100 ... 240 V

Article number: 0069881

• Auxiliary voltage: AC/DC 100 ... 240 V

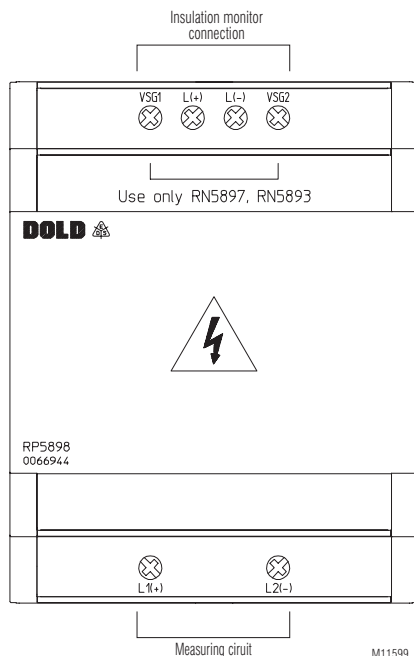
- Outputs: 2 Changeover contacts (programmable)
- Setting range pre-warning: 1 k Ω ... 500 k Ω
- Setting range alarm: 1 k Ω ... 500 k Ω
- With Modbus RTU interface
- With connection facility of a coupling device RP 5898
- Max. line capacitance: 5 μ F
- Energized or de-energized on trip
- Selection of type of network
- Width: 52.5 mm

Accessories

RP 5898/61

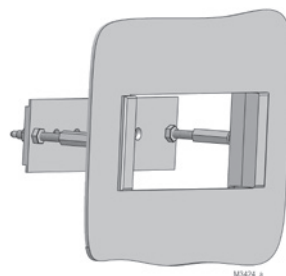
Article number: 0066944

- Coupling device for RN 5893.12/100
- Extension of nominal voltage range U_N to DC 1000 V, AC 690 V
- Weight: Approx. 110 g
- Dimensions
 - Width x height x depth: 70 x 90 x 71 mm



Flush mounting kit

Order reference: KU 4087-150/0056598



For universal use with:

- R-series devices of 17.5 to 105 mm width
- Easy mounting

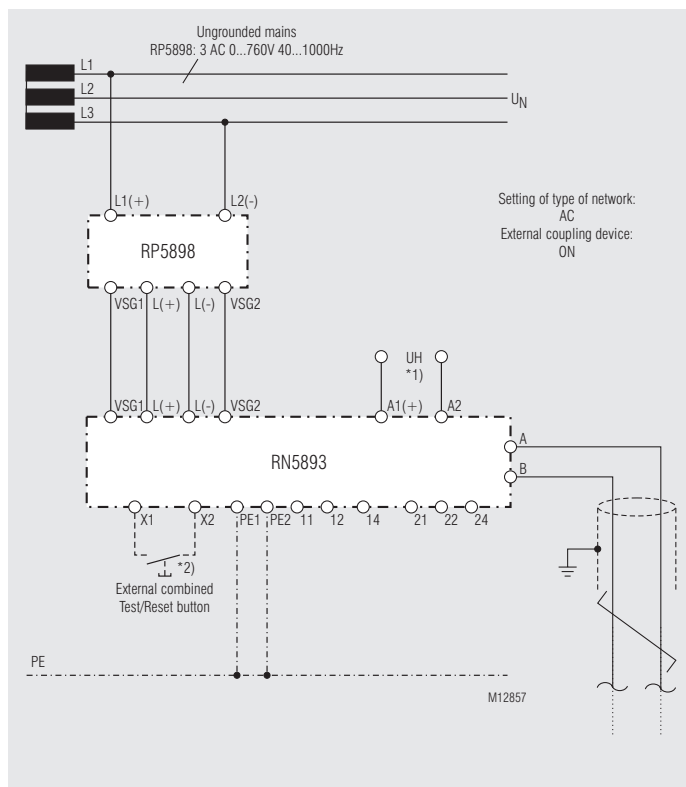
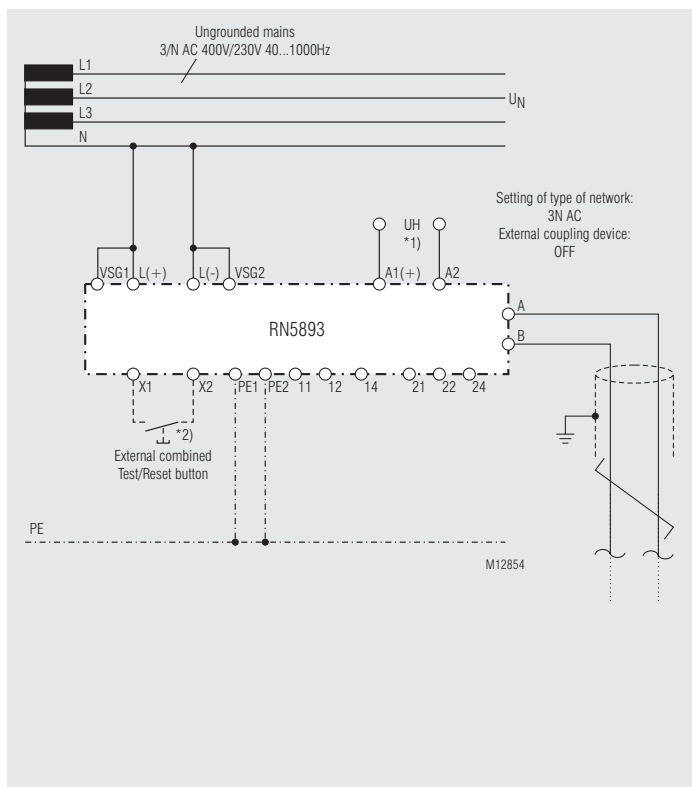
IK 3050.11 AC/DC 24 V:

Coupling relay with gold contacts and 6 kV isolation between contacts and relay coil. Suitable for potential-free control of the control input. Article number: 0067057

RK 8832 AC/DC 24 V:

Alarm transmitter
Acoustic alarm transmitter for signalling an insulation fault. Article number: 0059905

Connection Examples

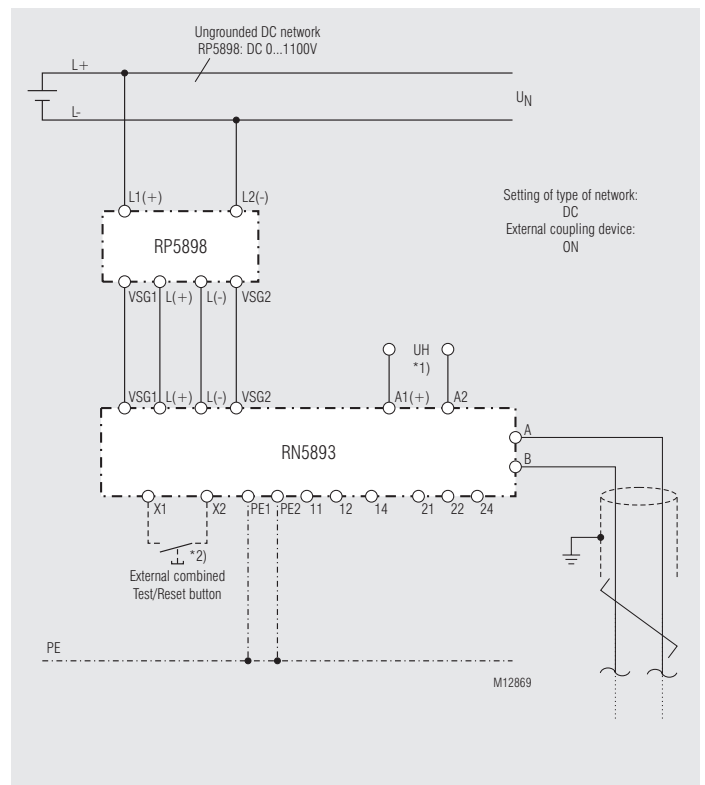
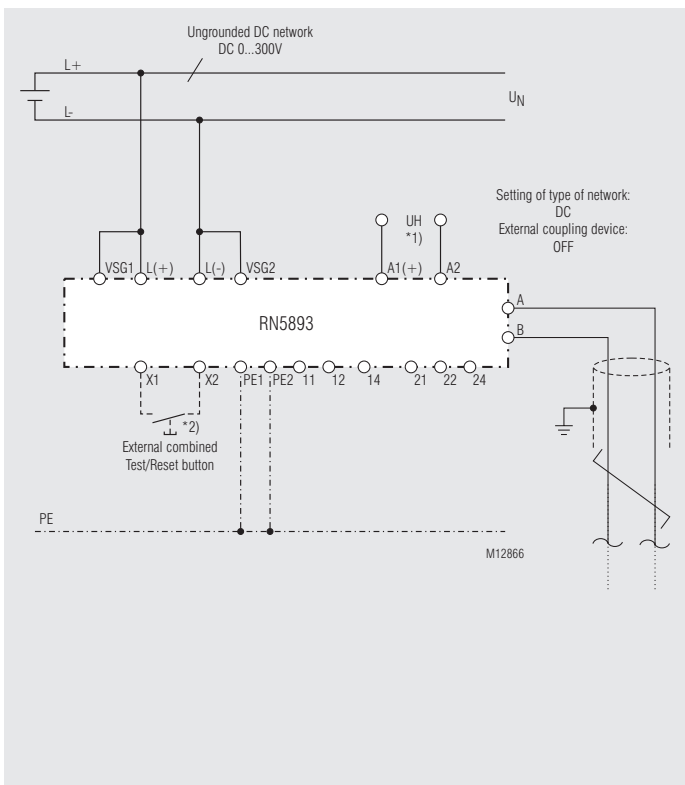
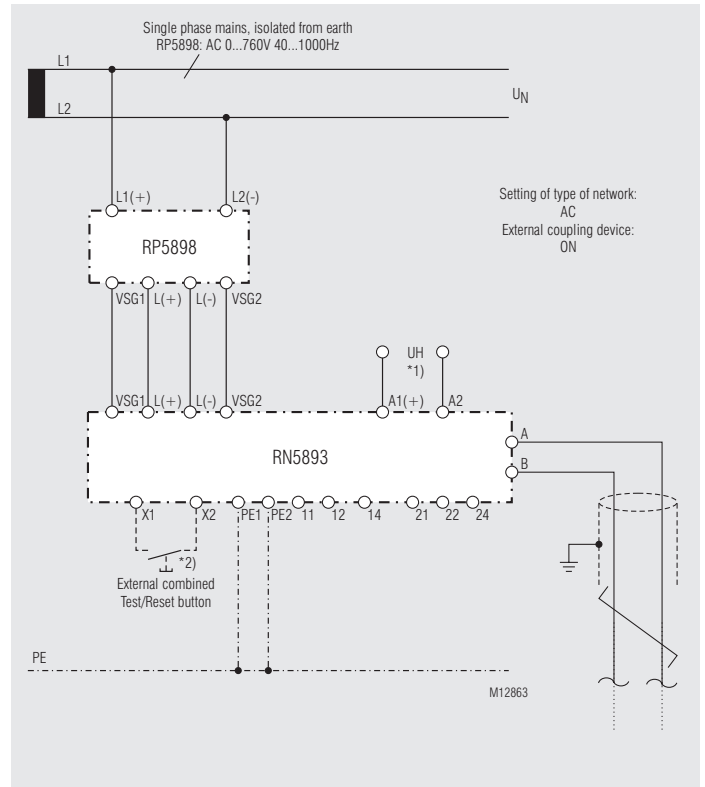
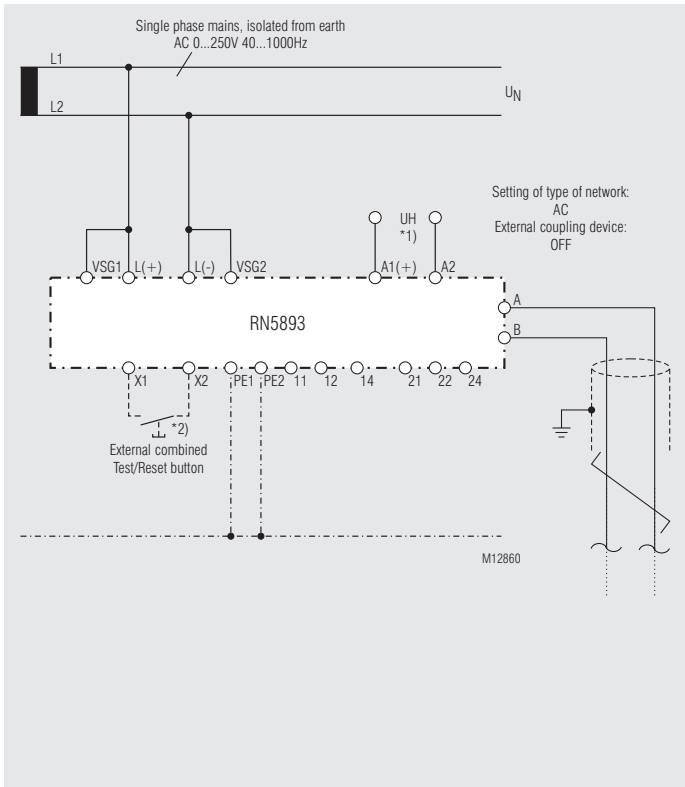


*1) Auxiliary voltage U_H (A1(+)/A2) can also be sourced from the monitored voltage system.
The voltage range of the auxiliary supply has to be taken into account.

*2) Control input X1/X2 for external combined Test-/Reset-button with Stop of the measuring function:

- Control 1.5 s < t < 10 s: Test function
- Control < 1.5 s: Reset function
- Control > 10 s: Stop of measuring function

Connection Examples



*1) Auxiliary voltage U_H (A1(+)/A2) can also be sourced from the monitored voltage system.
The voltage range of the auxiliary supply has to be taken into account.

*2) Control input X1/X2 for external combined Test-/Reset-button with Stop of the measuring function:

- Control $1.5\text{ s} < t < 10\text{ s}$: Test function
- Control $< 1.5\text{ s}$: Reset function
- Control $> 10\text{ s}$: Stop of measuring function

Bus Interface

Protocol Modbus Seriell RTU
Address 1 to 99
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 RN 5893/100 the following function codes are implemented:

Function-Code	Name
0x01	Read Coils
0x03	Read Holding Register
0x04	Read Input Register
0x05	Write Single Coil
0x06	Write Single Register
0x10	Write Multiple Register

Device configuration

Device configuration data (parameters and setting values from register 42001, as well as the "factory setting" command) are directly stored in the EEPROM in non-volatile memory when writing via Modbus. As the write cycles of an EEPROM are limited, the write operation with these registers or this command must not be cyclic.

Parameter Table

Coils

Register-Address	Protocol-Address	Name	Value range	Initial value	Description	Data type	Access rights
1	0	Reset	0x0000 0xFF00	0x0000	No Function Error acknowledgem. device error (relay 2)	BIT	Write / read
2	1	Device reset	0x0000 0xFF00	0x0000	No Function Device restart	BIT	Write / read
3	2	Reserved	0x0000 0xFF00	0x0000	-	BIT	Write / read
4	3	Factory setting	0x0000 0xFF00	0x0000	No Function Factory setting of the parameters	BIT	Write / read
5	4	Device selftesting	0x0000 0xFF00	0x0000	No Function Selftesting	BIT	Write / read
6	5	Fault memory	0x0000 0xFF00	0x0000	No Function Fault memory acknowledgement isolation error	BIT	Write / read
7	6	Reserved	0x0000 0xFF00	0x0000	-	BIT	Write / read
8	7	Advanced Test	0x0000 0xFF00	0x0000	No Function Advanced Test	BIT	Write / read
9	8	Measuring function stopped	0x0000 0xFF00	0x0000	Continue measuring function Interrupt measuring function	BIT	Write / read

Parameter Table

Input Registers

Register-Address	Protocol-Address	Name	Value range	Description	Data type	Access rights
30001	0	Device failure	0 ... 12	0: No failure 1: Broken wire detection L(+)/L(-) 2: Broken wire detection PE1/PE2 3: Internal failure detected in test mode 4: Reserved 9: Communication fault Modbus 10: Checksum failure EEPROM 11: Internal communication fault 12: Internal error 4	UINT16	Read
30002	1	State of device	0 ... 7	0: Device initialize 1: Device is ready and in measuring mode, no response value is exceeded 2: Device in error mode 3: Device in selftesting 4: Device in advanced test 5: Measuring function stopped 6: Device in measuring mode, response value alarm is exceeded 7: Device in measuring mode, response value pre-alarm is exceeded	UINT16	Read
30003	2	Device flags	0 ... 3	Bit 0: Indicator relay K1 energized Bit 1: Indicator relay K2 energized	UINT16	Read

Register-Address	Protocol-Address	Name	Value range	Description	Data type	Access rights
32001	2000	Insulating resistance	0 ... 20000, 65535	In 1/10 kΩ Stored minimum insulating resistance > 2 MΩ	UINT16	Read
32002	2001	Asymmetrical insulating resistance	1,2,4	Bit 0: Resistance is symmetrical Bit 1: Asymmetrical against L+ Bit 2: Asymmetrical against L-	UINT16	Read
32003	2002	Measured mains voltage	5 ... 250 5 ... 300 0 65535 5 ... 760 5 ... 1100 0 65535	Without VSG In V (at AC) In V (at DC) No valid supply voltage detected or < 5 V Supply voltage outside the max. measuring range With VSG In V (at AC) In V (at DC) No valid supply voltage detected or < 5 V Supply voltage outside the max. measuring range	UINT16	Read
32004	2003	Stored min. insulating resistance	0 ... 20000, 65535	In 1/10 kΩ Stored minimum insulating resistance > 2 MΩ	UINT16	Read

Parameter Table

Holding Registers

Register-Address	Protocol-Address	Name	Value range	Initial value	Description	Data type	Access rights
40001	0	Control word 1	0 ... 511	0	Bit 0 = Reset Bit 1 = Device reset Bit 2 = Reserved Bit 3 = Factory settings Bit 4 = Device selftesting Bit 5 = Fault memory acknowledgement isolation error Bit 6 = Reserved Bit 7 = Advanced test Bit 8 = Measuring function stopped	UINT16	Write / read
40002	1	Timeout release	0 ... 1	0	Bit 0 = Enable	UINT16	Write / read
40003	2	Timeout	100 ... 10000 0 ... 10000	1000	Timeout Wert in ms (schreiben) Timeout Wert in ms (lesen)	UINT16	Write / read

Register-Address	Protocol-Address	Name	Value range	Initial value	Description	Data type	Access rights
42001	2000	Broken wire detect in measuring circuit	1,2,4	1	Bit 0 = On Bit 1 = Off Bit 2 = Only during the device selftesting	UINT16	Write / read
42002	2001	Storing insulation fault message	0 ... 1	0	0 = Off 1 = On	UINT16	Write / read
42003	2002	Switching mode of output relays indicator relay K1+ K2	0 ... 1	0	0 = De-energized on trip 1 = Energized on trip	UINT16	Write / read
42004	2003	Power supply type	1,2,4	2	Bit 0 = AC mains Bit 1 = DC mains Bit 2 = 3N AC mains	UINT16	Write / read
42005	2004	Reserved	1	1	-	UINT16	Write / read
42006	2005	Response value Alarm	1 ... 500	500	Response value Insulation fault alarm in kΩ	UINT16	Write / read
42007	2006	Response value Pre-Alarm	1 ... 500	500	Resp. value Insulation fault pre-alarm in kΩ	UINT16	Write / read
42008	2007	Coupling device	1,2	2	Bit 0 = Off Bit 1 = RP 5898	UINT16	Write / read
42009	2008	Indicator relay K1	1,2,4,8,16,32	8	Bit 0 = Insulation fault alarm Bit 1 = Insulation fault pre-alarm Bit 2 = Device fault Bit 3 = Collective fault (Insulation fault alarm and device fault) Bit 4 = Insulation fault on DC+ Bit 5 = Collective fault (Insulation fault on DC+ and device fault)	UINT16	Write / read
42010	2009	Indicator relay K2	1,2,4,8,16,32	8	Bit 0 = Insulation fault alarm Bit 1 = Insulation fault pre-alarm Bit 2 = Device fault Bit 3 = Collective fault (Insulation fault pre-alarm and device fault) Bit 4 = Insulation fault on DC- Bit 5 = Collective fault (Insulation fault on DC- and device fault)	UINT16	Write / read
42011	2010	Automatic self-test	0 ... 1	0	0 = Off 1 = On	UINT16	Write / read