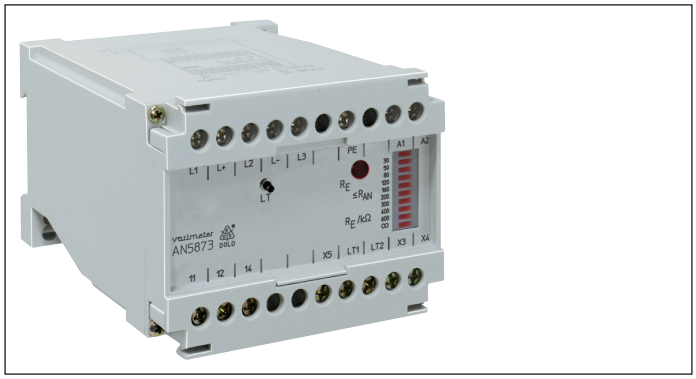
VARIMETER IMD
Insulation Monitor
AN 5873

0225267

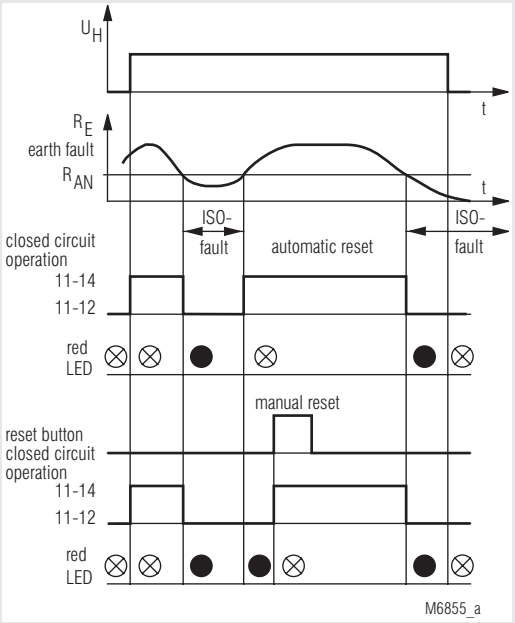


Product Description

The insulation monitor AN 5873 of the series VARIMETER IMD monitors the ground resistance of ungrounded DC and 3-phase AC voltage systems (IT-systems) with nominal voltage up to DC 0 ... 1000 V and 3 AC 24 ... 690 V.

The unit detects symmetrical as well as unsymmetrical faults. The separate auxiliary supply allows also monitoring when the system is without voltage. To indicate the actual ground resistance value the unit has an LED chain and an analogue output. When a fault is detected the relay switches and the red LED lights up.

Function Diagram



Your Adventages
- Preventive fire and system protection
- Insulation monitoring of DC- and 3 AC-systems up to 1000 V and 3 AC 690 V nominal voltage
- No additional coupling device required
- Monitoring also with voltage-free mains

Features
- Insulation monitoring according to IEC/EN 61 557-8
- Fixed response value R_{AN}
- Internal reset button
- External reset and test button can be connected
- LED indicator
- 1 changeover contact
- Programmable for manual reset or hysteresis function
- Analogue output for insulating value
- External connection of indicating instrument possible
- as option de-energized on trip or energized on trip
- Width 100 mm

Approvals and Markings

CE | AC/DC

Applications

Monitoring of the ground resistance of isolated 3-phase and DC-current systems.

Functions

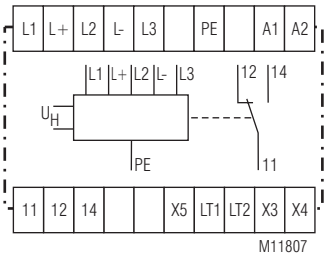
The device is supplied with auxiliary voltage via terminals A1/A2. After connecting the auxiliary supply a 10 s start up delay is active allowing the measuring circuit to start. After this, measurement of the insulation resistance in the measuring circuits begins.

Measuring circuit
(Insulation measurement between terminals L1/L2/L3 and PE resp. L+/L- and PE). The connection to a 3-phase AC voltage system is done on terminals L1, L2, L3, to a DC voltage system on terminals L+ and L-. The terminal PE is connected to protective earth.
An active measuring voltage with alternating polarity is applied between L1/L2/L3 and PE resp. L+/L- and PE to measure the insulation resistance. The length of the positive and negative measuring phases has a fixed factory setting of 2 s (max. leakage capacitance of 1 µF).
The LED-chain and the analogue output show the actual determined insulating resistance, and the output relays witch according to the respective response values set. If the response thresholds has been undercut the red LED "$R_E < R_{AN}$" lights up.

Indicators

LED chain:	shows actual resistance to ground
red LED:	on, when ground fault

Circuit Diagram



Connection Terminals

Terminal designation	Signal description
A1, A2	AC-auxiliay voltage U_H
L1, L2, L3	Connection for measuring circuit (3-phase systems)
L+, L-	Connection for measuring circuit (DC systems)
PE	Connection for protective conductor
X5 (/LT1)	Control input (manual / auto reset) X5/LT1 bridged: manual reset X5/LT1 not bridged: auto reset
LT1, LT2	Connection option for external reset-button
X3, X4	Analogue output
11, 12, 14	Alarm signal relay (1 changeover contact)

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 terminals of the control input X5, LT1 and LT2 have no galvanic separation to the measuring circuit L1 - L2 - L3 resp. L(+) and 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 L1 - L2 - L3 resp. L(+) and L(-).
- No external potentials may be connected to control terminals X5, LT1 and LT2.
- The terminals of the control input X3 and X4 have no galvanic separation to the measuring circuit L1 - L2 - L3 resp. L(+) and L(-) and are electrically connected together, therefore they have to be controlled by volt free contacts or bridge. Connected devices/indicators must have an appropriate separation depending on the level of the mains voltage at L1 - L2 - L3 resp. L(+) and L(-).

Attention!

- Before checking insulation and voltage, disconnect the insulation monitor AN 5873 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.
- The device must not be operated without PE connection!
- The AN 5873 connects an alternating measuring voltage to the monitored voltage system. This voltage has a low frequency with a time periode of 2 ... 16 sec. so that a fast changing mains voltage could lead to a fault. When the mains is back to normal this fault is reset.

Attention!

- The device can be connected on the AC or on DC side of a mixed voltage system and monitors the ground fault on the AC and also on the DC side with the same response sensitivity. When connected on the AC side, the unit requires 3-phase connection.
- 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.
- The response value R_{AN} is fixed. An external indicator instrument can be connected.
- The unit works de-energized on trip, that means, the output relay relase in position of rest at a insulation failures $R_E < R_{AN}$).
- A bridge between X5 and LT1 allows to select auto or manual reset. The AN 5873 has a built in reset button on the front and allows connection of an external button at terminals LT1 and LT2 also.
- A PT test button can be connected via an external test resistor for functional testing of the device.
- The analogue output (terminals X3 and X4) provides a voltage signal proportional to the actual insulation resistance of the mains. The following formula describes the input to output ratio:

  (0V at R_E = 0 and 13.0 .... 13.5 V at $R_E = \infty$)

$$U_A = \frac{U_{max}}{\frac{180\ k\Omega}{R_E} + 1} \quad ; \quad U_{max} = 13.25\ V \pm 0.25\ V$$

These values for U_A are valid for C_E=0 (see characteristic). In practice it makes no sense to monitor values above 11 ... 12 V as the tolerances increase, especially with mains capacity.

Technical Data

Auxiliary circuit

Auxiliary voltage U_H:	AC 230, others on request
Voltage range:	0.8 ... 1.2 U_N
Frequency range:	40 ... 400 Hz
Nominal consumption:	approx. 4 VA

Measuring Circuit

Nominal voltage U_N:	3 AC 24 ... 690 V / ≤ DC 1 000 V	
Voltage range:	0.8 ... 1.15 U_N / 0 ... 1.15 U_N	
Frequency range:	40 ... 60 Hz	
Response value R_{AN}:	50 kΩ, 10 ... 440 kΩ on request	
Setting R_{AN}:	fixed	
Internal AC resistance:	> 120 kΩ	
Internal DC resistance:	> 150 kΩ	
Measuring voltage:	approx. +/- 13 V	
Max. measuring current (RE = 0):	< 0.3 mA	
Max. permissible noise DC voltage:	DC 1000 V	
Measuring cycle internally adjustable:	2 ... 16 s	
Line capacitance CE to ground:	1 ... 20 µF	
factory setting:	2 s (for CE = 1 µF)	
Operate delay		
at R_{AN} = 50 kΩ, CE = 1 µF		
R_E from ∞ to 0.9 R_{AN}:	< 15 s	
R_E from ∞ to 0 kΩ:	< 10 s	
Hysteresis		
at R_{AN} = 50 kΩ:	approx. 5 %	
Nominal consumption:	approx. 4 VA	
Response inaccuracy:	± 15% ± 1.5 kΩ	IEC/EN 61 557-8
Phase failure bridging:	> 40 ms	

Output

Contacts		
AN 5873.11:	1 changeover contact	
Max. switching voltage:	AC 250 V	
Thermal current I_{th}:	8 A	
Switching capacity		
to AC 15		
NO contact:	3 A / AC 230 V	IEC/EN 60 947-5-1
NC contact:	1 A / AC 230 V	IEC/EN 60 947-5-1
Electrical life		
at 8 A, AC 250 V:	2 x 10^5 switching cycles	
Short circuit strength		
max. fuse rating:	6 A gG / gL	IEC/EN 60 947-5-1
Mechanical life:	30 x 10^6 switching cycles	

Analogue output

for actual insulating value, no galvanic separation to measuring circuit terminals X3-X4:	typ. 0 ... 13.25 V / R_i approx. 50 Ω (0 V at R_E = 0 and 13.0 ... 13.5 V at R_E = ∞) X4 is internal connected with PE

Technical Data

General Data

Operating mode:	Continuous operation	
Temperature range		
Operation:	- 20 ... + 60 °C	
Storage:	- 25 ... + 70 °C	
Altitude:	< 2,000 m	
Clearance and creepage distances		
overvoltage category / pollution degree:		
Meas. circuit to auxiliary voltage and relay contact:	6 kV / 2	IEC 60 664-1
Auxiliary voltage to relay contact:	6 kV / 2	IEC 60 664-1
Insulation test voltage		
Routine test:	AC 4 kV; 1 s	
EMC		
Electrostatic discharge:	6 kV (contact)	IEC/EN 61 000-4-2
	8 kV (air)	IEC/EN 61 000-4-2
HF irradiation		
80 MHz ... 1 Ghz:	20 V / m	IEC/EN 61 000-4-3
1 GHz ... 2.7 GHz:	10 V / m	IEC/EN 61 000-4-3
Fast transients:	2 kV	IEC/EN 61 000-4-4
Surge voltages		
between A1 - A2 and L+, L-:	2 kV	IEC/EN 61 000-4-5
between A1, A2 - PE:	4 kV	IEC/EN 61 000-4-5
between control lines:	1 kV	IEC/EN 61 000-4-5
between control lines and ground:	1 kV	IEC/EN 61 000-4-5
HF-wire guided:	10 V	IEC/EN 61 000-4-6
Interference suppression:	Limit value class B	EN 55 011
Degree of protection		
Housing:	IP 40	IEC/EN 60 529
Terminals:	IP 20	IEC/EN 60 529
Housing:	Thermoplastic with V0 behaviour according to UL subject 94	
Vibration resistance:	Amplitude 0.35 mm frequency 10 ... 55 Hz	IEC/EN 60 068-2-6
Climate resistance:	20 / 060 / 04	IEC/EN 60 068-1
Terminal designation:	EN 50 005	
Wire connection		
Cross section:	2 x 2,5 mm² solid or 2 x 1,5 mm² stranded wire with sleeve DIN 46 228-1/-2/-3/-4	
Stripping length:	10 mm	
Wire fixing:	Flat terminals with self-lifting clamping piece	IEC/EN 60 999-1
Fixing torque:	0.8 Nm	
Mounting:	DIN rail	IEC/EN 60 715
Weight:	500 g	

Dimensions

Width x height x depth:	100 x 78 x 115 mm

Standard Type

AN 5873.11/102 AC230 V 50 kΩ

Article number:	0032573
• Output:	1 changeover contact
• Auxiliary voltage U_H:	AC 230 V
• Response value R_{AN}:	50 kΩ
• Closed circuit operation	
• Width:	100 mm

Variants

AN 5873.11/101: open circuit operation
AN 5873.11/102: closed circuit operation

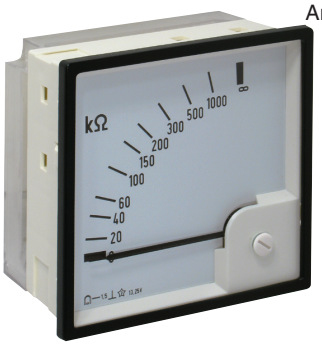
Ordering example for variants

AN 5873 .11 /_ _ _ AC 230 V 50 kΩ

- 50 kΩ — Response value
- AC 230 V — Auxiliary voltage
- /_ _ _ — Variant, if required
- .11 — Contacts
- AN 5873 — Type

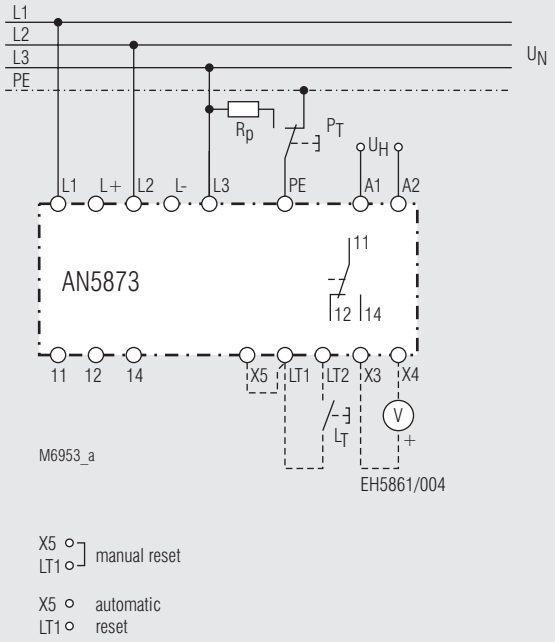
Accessories

AG 5876.11/031: pre-warning device
EH 5861/004: indicating instrument,
degree of protection: IP 52
Article number: 0030618



The indicating device EH 5861 is externally connected to the insulation monitor and shows the actual insulation resistance of the voltage system to ground.
Dimensions:
Width x height x depth
96 x 96 x 52 mm

Connection Examples



L1/L2/L3 or L+/L-: U_N
A1/A2: U_H

Analogue Output Voltage U_A (Terminals X3-X4)

against Insulation Resistance R_E with C_E = 0

Parameter: Max. Analogue Output Voltage **Umax** (at R_E = infinite)