RCMB131-02

AC/DC sensitive residual current monitoring module

for measuring AC and DC currents up to ±100 mA

RCMB131-02_D00354_01_XXEN / 05.2024

BENDER

Intended use

The AC/DC sensitive residual current monitoring module monitors electrically earthed power supplies up to 300 V and connected loads up to nominal currents of 32 A for leakage and fault currents. The module is intended for installation in distribution equipment such as PDUs (Power Distribution Units), outlet boxes or multiple socket-outlets and is supplied with DC 12…24 V.

Any other use than that described in this manual is regarded as improper.

General safety instructions

Part of the device documentation in addition to this manual is the enclosed "Important safety instructions for Bender products".

Installation, connection and commissioning are to be carried out by electrically skilled persons only! It is essential to follow the existing safety instructions.

DANGER! Risk … . This signal word indicates that there is a high risk of danger that will result in death or serious injury if not avoided.

This symbol denotes information intended to assist the user in making optimum use of the product.

Device features

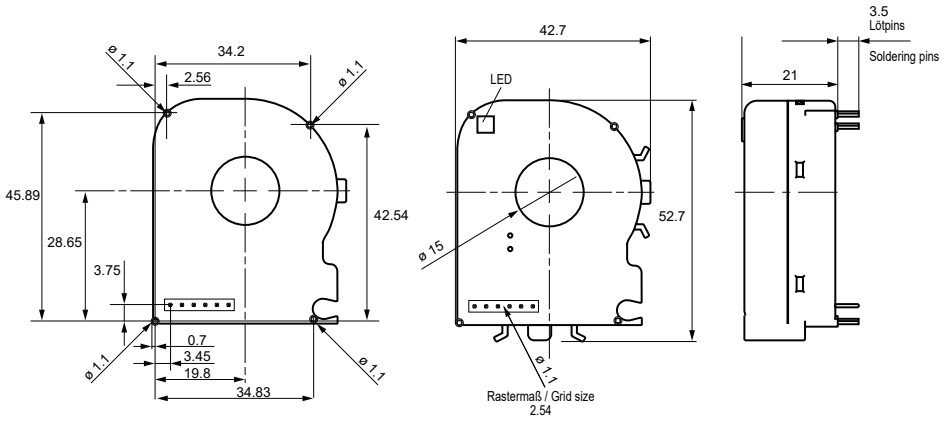
- AC/DC sensitive leakage and fault current monitoring for preventive maintenance
- Suitable for PCB mounting
- High resolution for implementing equipment leakage current monitoring
- Measurement signal output via PWM output
- Frequency range DC…2 kHz
- Compact design for monitoring nominal loads up to I_n = 32 A
- Low load current sensitivity due to fully shielded measuring current transformer
- Continuous monitoring of the connection to the measuring current transformer
- Integrated test function
- Supply voltage DC 12…24 V

Functional description

The RCMB131-02 is used to measure residual currents and output the values via the PWM output. The residual current monitoring module measures both AC and DC currents. The RMS value is calculated from the DC component included in the residual current and the AC component below 2000 Hz. The module outputs the determined RMS value of the residual current at the PWM output. The RCMB131-02 continuously checks the supply voltage and the connection of the internal measuring current transformer. The existing switching output S1 switches to alarm state when the set response value is exceeded or a malfunction occurs. ERR switches in case of an internal error.

When ERR switches, S1 (DC) is also switched simultaneously.

Dimension diagram



All dimensions in mm

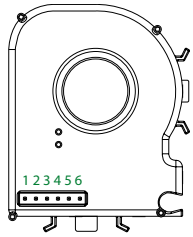
Installation and connection

Risk of an electric shock!

Existing protective conductors and low-resistance conductor loops must not be routed through the measuring current transformer! Otherwise, high currents could be induced into the conductor loop due to the AC/DC sensitive measuring technology used.

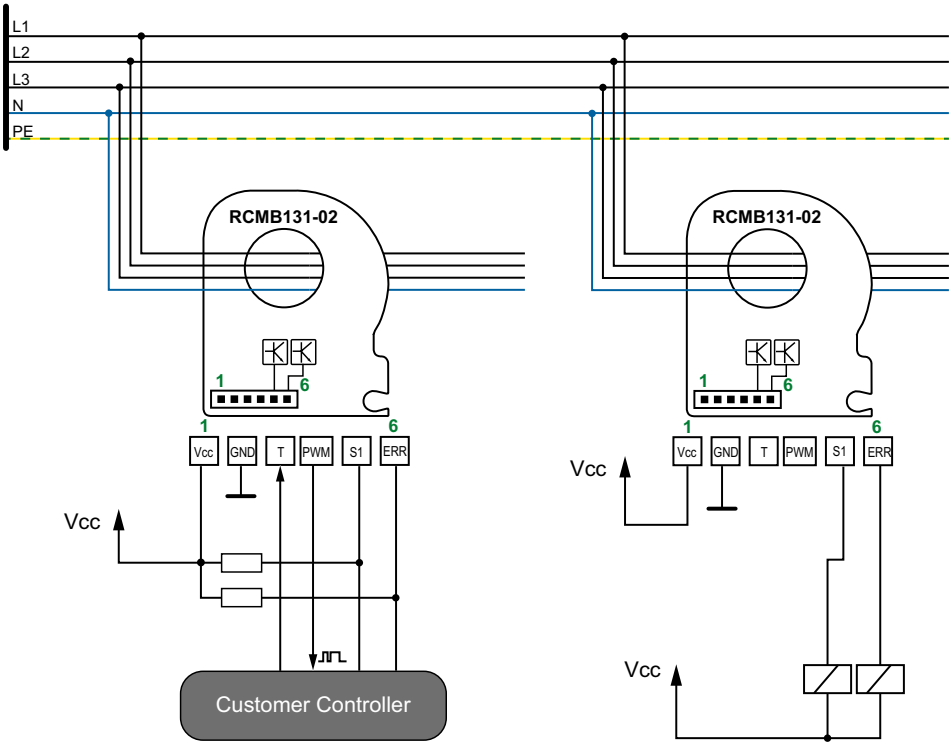
Primary conductors must be insulated in such a way that they fulfil the function of basic insulation for the rated voltage.

Pin assignment



Pin	Name	Description
1	Vcc	Supply voltage (DC 12…24 V)
2	GND	Ground
3	T	Test
4	PWM	Measured value output (RMS 100 mA = 100 %)
5	S1	Switching output 1 (DC 6 mA, Open Collector)
6	ERR	Switching output Error (Open Collector)

Wiring diagram (example)

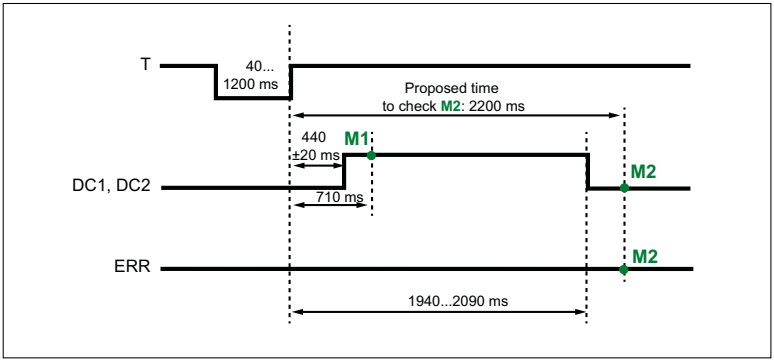


The maximum cable length must be limited to ≤ 10 m.

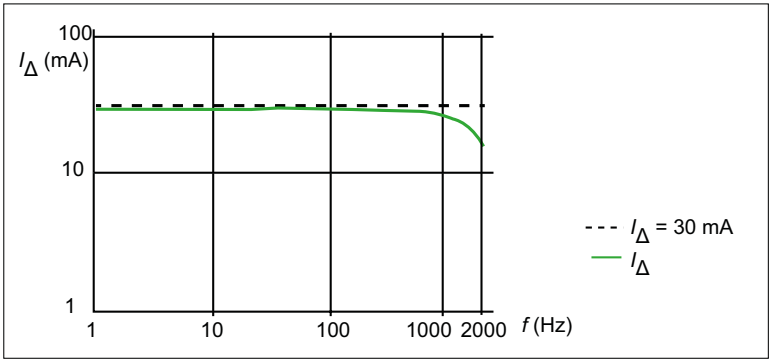
Timing diagram "Functional test"

M1…2 in the timing diagram are the points in time at which a higher-level control can and should check during the functional test that the switching output S1…actually switches. Possible causes for a failed functional test:

- S1 is permanently connected to GND
- S1 is permanently connected to Vcc
- Short circuit between S1 and ERR



Frequency response at response value I_Δ = 30 mA



Dashed line: I_Δ (response value)
Green: I_Δ (measured value)

Technical data

Insulation coordination according to IEC 60664-1

Primary circuit ..... monitored primary conductors
Secondary circuit ..... Connections Vcc, GND, T, PWM, S1, ERR
All following specifications apply to the insulation between the primary and secondary circuit
- Rated voltage ..... 300 V
- Overvoltage category III
- Rated impulse voltage ..... 4 kV

Operating altitude ..... up to 3000 m AMSL
Rated insulation voltage ..... 320 V
Pollution degree 2
Safe separation (reinforced insulation) ..... between primary and secondary circuit
Voltage test acc. to IEC 61010-1 ..... AC 2.2 kV

Voltage supply

Supply voltage U_s ..... DC 12…24 V
Operating range of the supply voltage ..... ±20 %
Ripple ..... 100 mV
Power consumption ..... < 0.75 W

Measuring circuit

Internal diameter primary conductor opening ..... 15 mm
Measured value evaluation ..... DC, RMS
Characteristics according to IEC 60755 ..... AC/DC sensitive, type B
Response value $I_{\Delta n1}$ ..... DC 6 mA
Response tolerance $I_{\Delta n1}$ ..... 0.7…1.0 x $I_{\Delta n1}$
Measuring range ..... AC/DC ±300 mA
Resolution ..... < 0.2 mA
Frequency range ..... DC…2 kHz
Measuring time ..... 180 ms

Operating uncertainty

DC…500 Hz ..... ±(5 % + 0.5 mA)
501…1000 Hz ..... ±(15 % + 0.5 mA)
1001…2000 Hz ..... ±(50 % + 0.5 mA)

Time response

Response time t_{ae} (relay switching time of 10 ms considered)
- for 1 x $I_{\Delta n}$ ..... ≤ 290 ms
- for 2 x $I_{\Delta n}$ ..... ≤ 140 ms
- for 5 x $I_{\Delta n}$ ..... ≤ 30 ms

Recovery time t_b ..... ≤ 2s

Disturbances

Load current I_n ..... 32 A

Connection

Max. Cable length ..... ≤ 10 m

Outputs

Switching outputs S1, ERR Open Collector, not short-circuit-proof
Switching capacity ..... 40 V / 50 mA
Hysteresis ..... ≤ 30 %
PWM ..... PWM signal, push pull
- Internal resistance PWM signal ..... 4.7 kΩ
- Voltage HIGH level ..... 3.1…3.6 V
- Voltage LOW level ..... 0…0.6 V
- Frequency PWM signal ..... 8 kHz
- Specification of the PWM signal ..... (0…100) % = (0…100) mA
- Output resistance ..... not short-circuit-proof

Response value assignment

$I_{\Delta n1}$ (DC) S1
Internal error ..... ERR

Environment/EMC

EMC ..... DIN EN IEC 62020-1:2021-10 ..... (IEC 62020-1:2020-04 Ed. 1.0), where applicable
Ambient temperature (incl. primary conductors routed through module) ..... -25…+70 °C

Classification of climatic conditions acc. to IEC 60721

(related to temperature and relative humidity):
Stationary use (IEC 60721-3-3) 3K22
Transport (IEC 60721-3-2) 2K11
Long-term storage (IEC 60271-3-1) 1K22

Classification of mechanical conditions acc. to IEC 60271

Stationary use (IEC 60721-3-3) 3M11
Transport (IEC 60721-3-2) 2M4
Long-term storage (IEC 60271-3-1) 1M12

Other

Operating mode ..... continuous operation
Mounting ..... any position
Protection class ..... IP 30
Flammability rating UL94 V-0
Service life at 40 °C ..... 10 years
Software D0604

* = factory settings

Standards, approvals, certifications

The specified standards take into account the edition valid until 05.2024 unless otherwise indicated.

EU Declaration of Conformity

The EU Declaration of Conformity is available at the following Internet address:
https://www.bender.de/fileadmin/content/Products/CE/CEKO_RCMB13x.pdf

Ordering details

Type	Measuring range	U_S	Art. No.
RCMB131-02	AC/DC ±100 mA	DC 12…24 V	B94042132

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