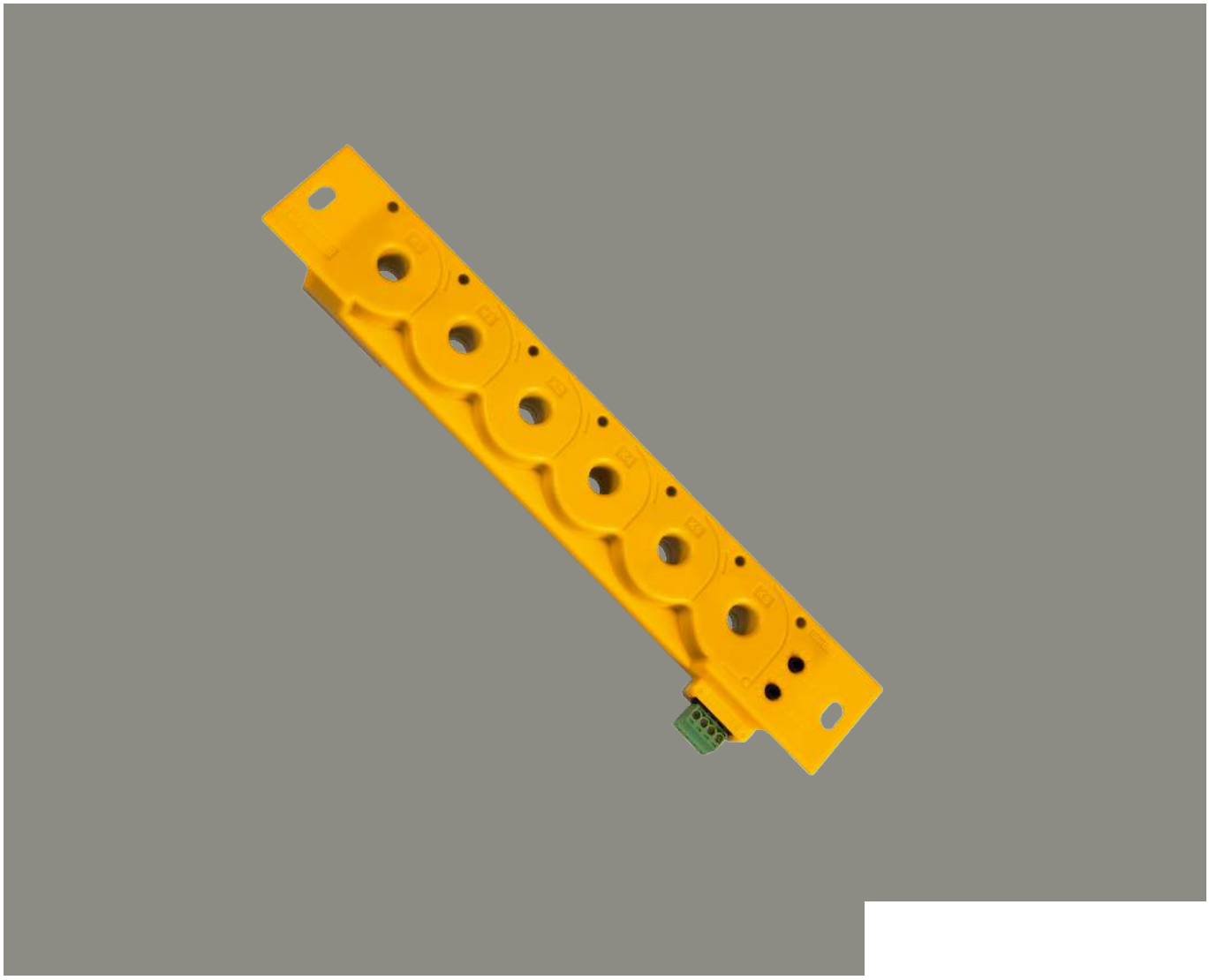
# LINETRAXX® RCMS150 series

Residual current monitor type B
with integrated measuring current transformers
for earthed AC/DC systems (TN and TT systems)



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BENDER

# LINETRAXX® RCMS150 series

**Residual current monitor type B with integrated measuring current transformers for earthed AC/DC systems (TN and TT systems)**



## Device features

- Continuous residual current monitoring by means of periodic verification
- AC/DC sensitive residual current monitoring system type B with 6 channels K1…6
  (each channel features 2 measuring channels: 1 x RMS, 1 x DC)
- Ideal for applications with space limitations
- Easy DIN rail or screw mounting to standard distribution panels
- 2 separately adjustable response values (DC or RMS) per channel
- Continuous self monitoring
- Fully shielded measuring current transformers to avoid external influences due to magnetic fields that may cause disturbances
- Compatible with Bender gateways of type COM465IP or CP9…

**RCMS150** (RS-485 interface with BMS protocol)

- Compatible with RCMS460/490 in a system setup
- Address range 2…90, can be adjusted directly on the device
- Up to 89 RCMS150 can be used on the bus

**RCMS150-01** (RS-485 interface with Modbus RTU protocol)

- Compatible with other Modbus RTU-capable device series from Bender, such as the RCMB300 series and RCMB13…-01 in a system setup
- Address range 1…99, can be adjusted directly on the device via detent potentiometers
- Address range 1…247, can be adjusted via the bus
- Up to 247 RCMS150-01 can be used on the bus

## Intended use

The RCMS150 devices are suitable for measuring residual currents up to $I_{\Delta}$ = 500 mA in a frequency range of DC…2 kHz. The monitored circuit is rated for a voltage of 300 V and a load current of 32 A. If cables with double or reinforced insulation are routed through the measuring current transformers, higher voltages may occur. The device can be operated at an altitude of up to 2000 m above mean sea level.

In order to meet the requirements of applicable standards, customised parameter settings must be made on the equipment in order to adapt it to local equipment and operating conditions. Please heed the limits of the range of application indicated in the technical data.

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

## Functional description

The residual currents are recorded and evaluated as RMS values in the frequency range DC…2 kHz. The response values can be set via the interface. The user can set four response values per channel K1…6:

$I_{\Delta n1\ RMS}$ , $I_{\Delta n2\ RMS}$ , $I_{\Delta n1\ DC}$ , $I_{\Delta n2\ DC}$

*The response values $I_{\Delta n1...}$ apply to the **prewarnings**, the response valuese $I_{\Delta n2...}$ apply to the **main alarms**.*

If one of the four set response values $I_{\Delta n...}$ is exceeded, the assigned response delay $t_{on...}$ starts. If the response value continues to be exceeded, the corresponding alarm message (prewarning or main alarm) is indicated on the gateway after the response delay $t_{on...}$ has elapsed. In the event of a main alarm, the alarm LED of the respective channel K1…6 lights up yellow.

A pending alarm message is emitted via the BMS or Modbus interface with address and measuring channel indication and can be evaluated by means of a gateway.

If the recorded residual current falls below the release value (response value minus hysteresis) the delay on release $t_{off}$ begins. If the value remains below the release value after $t_{off}$ has elapsed, the LED of the respective channel goes out. The alarm message is reset on the interface. If the fault memory is enabled (only applicable to RCMS150-01), the alarm message remains on the bus despite the LED going out.

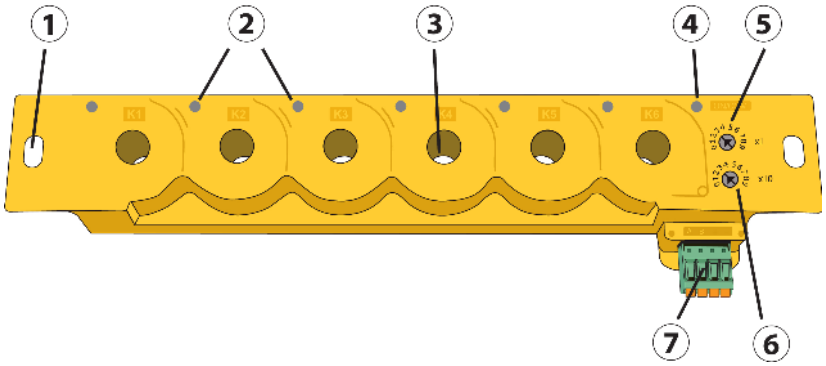
All devices can be accessed via the network from any PC using a standard web browser. Like this, all relevant measurement data of the monitored system are available. All device-related parameters of the RCMS150… can be set via the gateway technology.

To ensure the device function, a continuous automatic self test is run, which monitors the function of all measuring current transformers. In the event of a device error, the alarm LED of the respective channel flashes and an error message is output via the interface.

During the manual self test, a residual current is induced in the respective current transformer at each individual channel K1…6 one after the other via test windings and it is checked whether the corresponding main alarm is triggered. The duration of the test depends on the response delays of the main alarms.

## Device overview, operating and display elements

### Device overview




| | |
|---|---|
| 1 | Slot for screw mounting |
| 2 | Alarm LEDs for channels K1…6 (yellow) |
| 3 | Line feed-through of the measuring current transformers for the channels K1…6 |
| 4 | ON LED: Power on LED (green) |
| 5 | Detent potentiometer: Setting the **unit place** of the bus address (BMS bus or Modbus RTU) |
| 6 | Detent potentiometer: Setting the **tens place** of the bus address (BMS bus or Modbus RTU) |
| 7 | Plug: Connection to the supply voltage Connection RS-485 (BMS bus or Modbus RTU) |

### Operating elements

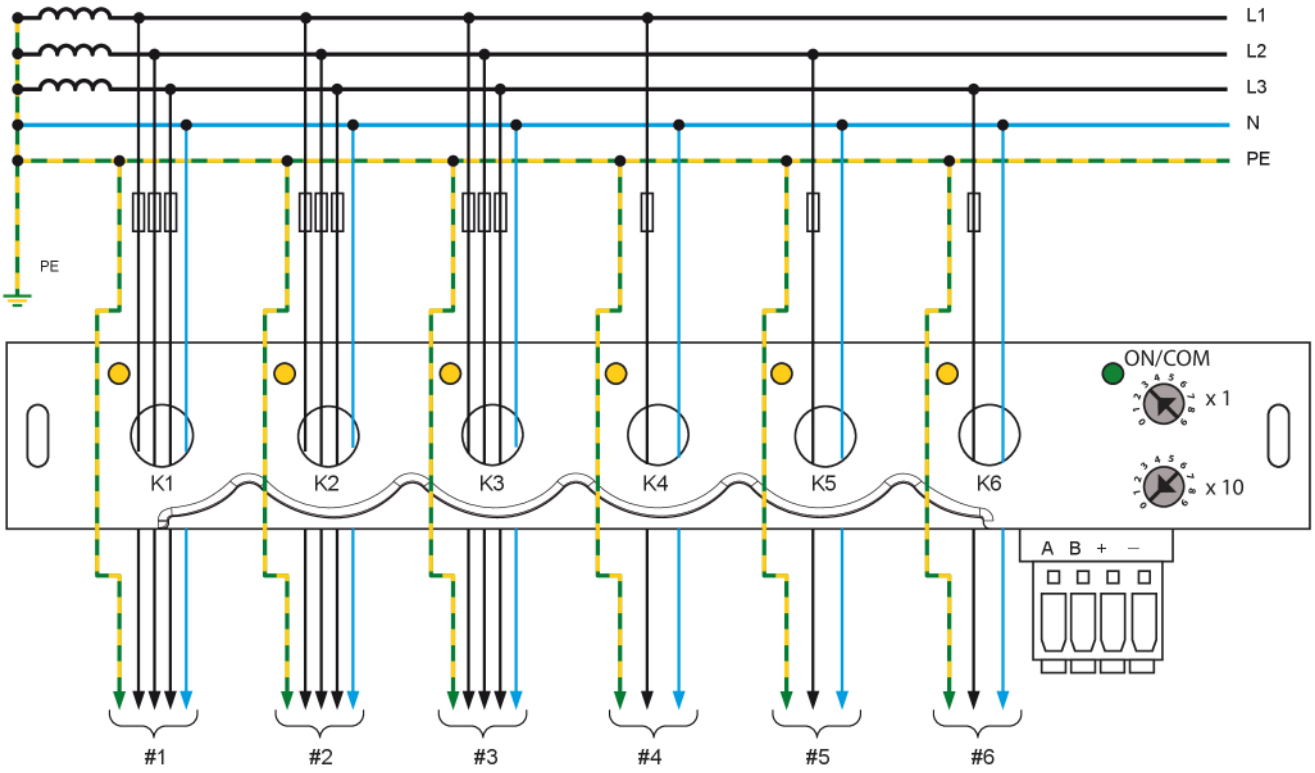
*RCMS150-01*
*If both detent potentiometers are set to 0, the device uses the address parameterised via Modbus (1…247).*

### Display elements (LEDs)

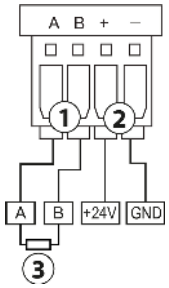
Meaning of the LEDs

| LED | | Meaning |
|---|---|---|
| ON (green) | lights | Normal operation indicator |
| | flashes quickly | RCMS150: Device error or BMS bus address set incorrectly |
| | flashes slowly | RCMS150-01: Device error |
| | flashes very quickly | RCMS150-01: Identify device (via Modbus RTU) |
| | Flash code | Interface address output |
| ALARM K1…K6 (yellow) | lights | Main alarm (response value $I_{\Delta n}$ exceeded) |
| | flashes | Device error channel |

## Wiring diagram




## Terminal

| Detail: Terminal | | |
|---|---|---|
| **1** | RS-485 interface<br>(BMS-Bus or Modbus RTU) |  |
| **2** | Supply voltage $U_S$<br>DC 24 V | |
| **3** | Terminating resistor 120 Ω<br>(required for both the first and the last bus device) | |

## Technical data

### Insulation coordination according to IEC 60664-1

| | |
|---|---|
| Output circuit | (+, –, A, B) |
| Primary circuit | Primary conductors routed through the current transformer |
| Rated insulation voltage | 300 V |
| Overvoltage category | III |
| Rated impulse withstand voltage monitored circuit/output circuit | 4 kV |
| Range of use | ≤ 2000 m above sea level |
| Rated insulation voltage | 250 V |
| Pollution degree | 3 |
| Insulation | |
| To achieve double insulation (DI) for overvoltage category III, insulated primary conductors with sufficient rated voltage must be used on the application side. | |
| Basic insulation (BI) | Overvoltage category III |
| Double insulation (DI) | Overvoltage category II |
| Voltage test acc. to IEC 61010-1 | AC 2.2 kV |

### Power supply

| | |
|---|---|
| Nominal supply voltage $U_S$ | DC 24 V |
| Operating range $U_S$ | ±20 % |
| Power consumption | < 4 W |

### Residual current measuring range

| | |
|---|---|
| Frequency range | 0…2000 Hz |
| Measuring range | ±500 mA |
| Resolution measured value | 1 % of the set response value |

### Response values

| | |
|---|---|
| Residual current $I_{\Delta n2}$ RMS | RMS 3…300 mA (30 mA)* |
| For LR applications | RMS 10…300 mA (30 mA)* |
| Residual current $I_{\Delta n2}$ DC | DC 3…300 mA (6 mA)* |
| For LR applications[1)] | DC 10…300 mA (6 mA)* |
| Ratio $I_{\Delta n2}$ RMS / $I_{\Delta n2}$ DC | 0.2…5 |
| Prewarning $I_{\Delta n1}$ RMS/DC | 50…100 % of $I_{\Delta n2}$ (50 %)* |
| Response tolerance | |
| DC, 10…500 Hz | -20…0 % |
| 500 Hz…2 kHz | -20…+100 |
| Hysteresis | 10…25 % (15 %)* |

1) For LR applications, $I_{\Delta n2}$ DC must be changed to a value ≥ 10 mA.

### Time response

| | |
|---|---|
| Start-up delay $t_{Start-up}$ | 0.5…600 s (0.5 s)* |
| Response delay | |
| $t_{on1}$ RMS/DC | 0…600 s (1 s)* |
| $t_{on2}$ RMS/DC | 0…600 s (0 s)* |
| Delay on release | |
| $t_{off}$ | 0…600 s (1 s)* |

### Indication (LEDs)

| | |
|---|---|
| For a description of the LEDs, refer to page 3 | |
| ON | Green |
| ALARM K1…K6 | Yellow |

### Interface

| | |
|---|---|
| Interface | RS-485 |
| Connection | Terminals A/B |
| Cable | Shielded, shield on one side to PE |
| Recommended | CAT6/CAT7 min. AWG23 |
| Alternative | J-Y(St)Y min. 2 x 0.8 |
| Bus terminating resistor external | (2 x) 120 Ω (0.25 W) |
| Protocol | BMS |
| Cable length | ≤ 1200 m |
| Device address | 2…90 (2)* |
| Protocol | Modbus RTU |
| Cable length | ≤ 1200 m |
| Device address | 1…247 (last 2 digits of the serial number + 100)* |

### Environment/EMC

| | |
|---|---|
| EMC | |
| Immunity | IEC 62020-1 |
| Emission | IEC 62020-1 |
| Operating temperature | -25…+70 °C |
| for UL applications | -25…+65 °C |

#### Classification of climatic conditions acc. to IEC 60721

| | |
|---|---|
| Stationary use (IEC 60721-3-3) | 3K23 |
| Transport (IEC 60721-3-2) | 2K11 |
| Long-term storage (IEC 60721-3-1) | 1K22 |

#### Classification of mechanical conditions acc. to IEC 60721

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

### Connection

| | |
|---|---|
| Connection type | Dual plug-in push-wire terminal |
| Connection properties | |
| Rigid/flexible / conductor sizes | 0.2…1.5 mm² / AWG 24…16 |
| Multi-conductor connection (2 conductors with the same cross section) | |
| Rigid | 0.2…1.5 mm² |
| Flexible | 0.2…1.5 mm² |
| Flexible with ferrule without plastic sleeve | 0.25…1.5 mm² |
| Flexible with ferrule with plastic sleeve | 0.25…0.75 mm² |
| Stripping length | 10 mm |

### Other

| | |
|---|---|
| Operating mode | Continuous operation |
| Position of normal use | Any |
| Enclosure material | Polycarbonate |
| Flammability class | UL94 V-0 |
| Screw mounting to standard distribution panels with 12 DU | 2 x M6 |
| DIN rail mounting | Mounting clip (accessories) |
| Tightening torque | 1.5 Nm |
| Weight | 170 g |

### Measuring current transformer

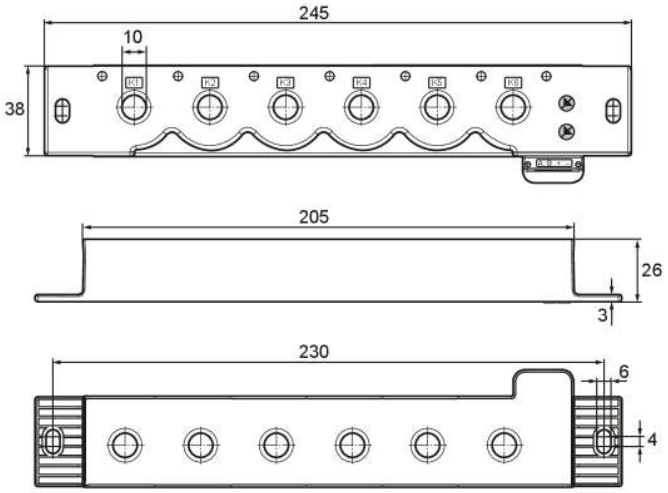
| | |
|---|---|
| Diameter cable gland | 10 mm |
| Load current | 32 A |

### Bus parameters

| | |
|---|---|
| Alarm | Threshold value exceeded, system fault |
| Measured value | Measured value, DC component, r.m.s. (resolution 0.1 mA) |
| Times | Response delay, delay on release, start-up delay |

( )* = Factory settings

### Dimension diagram




Dimensions in mm

### Standards, approvals, certifications

B94053026W only

### Approvals

- UL508
- CSA
- LR (B94053026W only)

### Conformity

#### EU Declaration of Conformity

The EU Declaration of Conformity is available at the following Internet address:

EU declaration of conformity RCMS150

#### UKCA Declaration of Conformity

The UKCA Declaration of Conformity is available at the following Internet address:

UKCA declaration of conformity RCMS150

### Example of a system design



## Ordering information

| Type | Supply voltage $U_S$ | Protocol | Art. No. |
|---|---|---|---|
| RCMS150 | DC 24 V | BMS | B94053025 |
| RCMS150-01 | | Modbus RTU | B94053026 |
| RCMS150-W-01 | | | B94053026W |
| Mounting clip for DIN rail mounting | | | B91080110 |

### Suitable system components

The use of the listed power supply units is recommended. The use of a surge protection device is mandatory for these power supply units.

| Description | Type | Art. No. |
|---|---|---|
| Power supply | STEP-PS/1 AC/24 DC/0.5 | B94053110 |
| | STEP-PS/1 AC/24 DC/1.75 | B94053111 |
| | STEP-PS/1 AC/24 DC/4.2 | B94053112 |

### Accessories

| Description | RCMS 150 | RCMS 150-01 | Type | Art. No. |
|---|---|---|---|---|
| Condition monitor with integrated gateway | X | X | COM465IP | B95061065 |
| | X | X | CP907-I (flush-mounted enclosure) | B95061031 |
| | X | X | CP907-I (control cabinet door mounting) | B95061032 |
| RS-485 repeater | X | X | DI-1DL | B95012047 |
| Residual current monitoring system (In this case, no condition monitor/gateway is necessary)* | X | — | RCMS460-D-1 | B94053001 |
| | X | — | RCMS460-D-2 | B94053002 |
| | X | — | RCMS490-D-1 | B94053005 |
| | X | — | RCMS490-D-2 | B94053006 |

* Suitable for measured value and alarm indication only, not suitable for parameter setting.

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Subject to change!
The specified standards take into account the edition valid until 07.2025 unless otherwise indicated.