Residual current monitor RCM420

Residual current monitor for TN and TT systems (AC and pulsed DC currents)

RCM420

Device features

- AC and pulsed DC sensitive residual current monitor Type A according to IEC 62020
- r.m.s. value measurement (AC)
- Two separately adjustable response values
- Frequency range 42…2000 Hz
- Start-up delay, response delay and delay on release
- Restart function
- Digital measured value display via LC display
- Measured value memory for operating value
- CT connection monitoring LED
- Power On LED, LEDs: Alarm 1 / 2
- Internal/external test/reset button
- Two separate alarm relays (one changeover contact each)
- N / O or N / C operation and fault memory behaviour selectable
- Password protection for device setting
- Device self monitoring
- Sealable transparent cover
- Two-module enclosure (36 mm)
- RoHS compliant
- Push-wire terminal (two terminals per connection)

Approvals and certifications

c UL us LISTED · PCT AE25 · Lloyd's Register TYPE APPROVED

Product description

The AC and pulsed DC sensitive residual current monitor RCMA420-D (Type A) from Bender is designed for fault and residual current monitoring in earthed power supply systems (TN and TT systems) where an alarm is to be activated in the event of a fault, but disconnection must be prevented. In addition, the device can be used to monitor single conductors, such as PE conductors, N-PE connections and PE-PAS connections.

The prewarning stage (50…100 % of the set response value $I_{\Delta n2}$) allow to distinguish between prewarning and alarm. Since the values are measured with measuring current transformers, the device is nearly independent of the load current and the nominal voltage of the system.

Applications

- Residual current monitoring in earthed two, three or four conductor systems
- Current monitoring of single conductors de-energised under normal conditions
- Socket-outlet circuits for devices which are operated unattended for a long time and which may not fail
- Alarm systems, safety devices
- Air conditioning systems, EDP systems
- Cooling equipment with valuable frozen goods
- Canteen kitchens
- Monitoring of earthed power supplies for stray currents
- Impact on N conductors
- Trace heating systems

Function

Once the supply voltage U_S has been applied, the start-up delay "t" starts. Measured values exceeded during this time do not influence the switching state of the alarm relays.

Residual current monitoring takes place via an external measuring current transformer. The actual measured value is indicated on the LCD. In this way any changes, for example when circuits are connected to the system, can be recognised easily.

If the measured value exceeds one or both response values, the response delays $t_{on1\,/\,2}$ begin. Once "$t_{on1\,/\,2}$" have elapsed, the selected alarm relays switch). If the release value is not reached before the response delay "t_{on}" has elapsed, the alarm LEDs "AL1 / AL2" do not light up and the alarm relays do not switch. The set release time "t_{off}" begins when the measured value again falls below the release value (response value minus hysteresis) after the switching of the alarm relays. When "t_{off}" has elapsed, the alarm relays switch back to their initial position. If the fault memory is enabled, the alarm relays remain in the alarm state until the reset button is pressed or until the supply voltage is interrupted. The device function can be tested using the test button. Parameters are assigned to the device via the LCD and the control buttons on the front panel; this function can be password-protected.

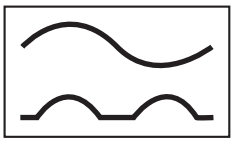
Connection monitoring

The CT connections are continuously monitored. In the event of a fault, the alarm relays K1 / K2 switch without delay, the alarm LEDs AL1 / AL2 / ON flash. After eliminating the fault, the alarm relays return to their initial position either automatically or by pressing the reset button (fault memory behaviour).

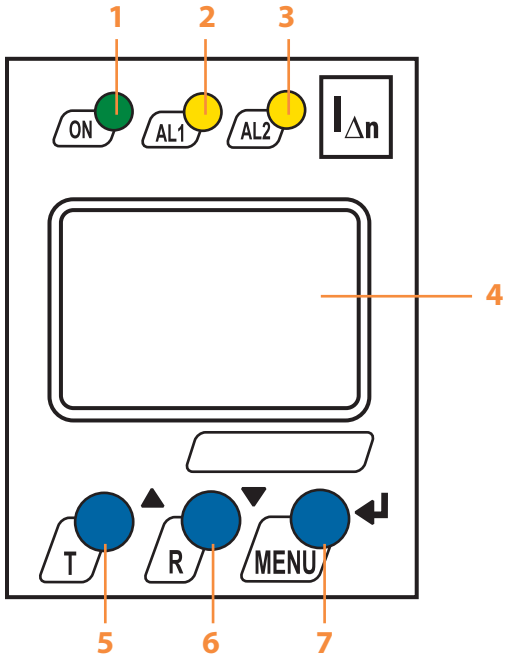
Restart function

If an alarm is pending after resetting the alarm relay and restarting the system being monitored, this reset process is repeated until the preset number of restart cycles is completed.

As soon as the preset number of restart cycles is completed, the fault memory is set to ON.



Operating and display elements



1 - Power On LED "ON" (green); lights when supply voltage is applied and flashes in the event of system fault alarm respectively in the event of CT malfunction.

2 - Alarm LED "AL1" (yellow), prewarning, lights when the set response value $I_{\Delta n1}$ has been exceeded or flashes in the event of system fault alarm respectively in the event of CT malfunction.

3 - Alarm LED "AL2" (yellow), alarm, lights when the set response value $I_{\Delta n2}$ has been exceeded and flashes in the event of system fault alarm and in the event of CT malfunction.

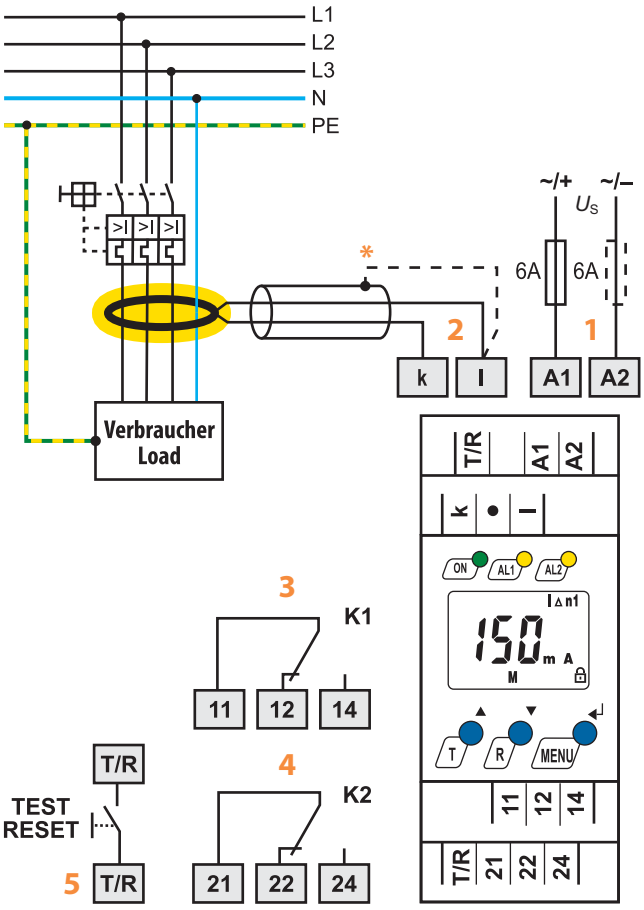
4 - Multi functional LC display

5 - Test button "T": to call up the self test.
Arrow up button: parameter change, to move up in the menu

6 - Reset button "R": to delete saved alarms.
Down button: parameter change, to move down in the menu

7 - "MENU" button: to call up the menu system.
Enter button: confirm parameter change.
Press ESC: press the button > 1.5 seconds.

Wiring diagram



1 - Supply voltage U_S see ordering information, (6 A fuse recommended)

2 - Connection of the external measuring current transformer

3 - Alarm relay K1:
Programmable for alarm $I_{\Delta n1}$ / $I_{\Delta n2}$ / TEST / ERROR

4 - Alarm relay K2:
Programmable for alarm $I_{\Delta n1}$ / $I_{\Delta n2}$ / TEST / ERROR

5 - Combined test and reset button "T/R"
short-time pressing (< 1.5 s) = RESET
long-time pressing (> 1.5 s) = TEST

* when a shielded cable is used.

Do not route the PE conductor through the measuring current transformer!

Technical data

Insulation coordination acc. to IEC 60664-1/IEC 60664-3

Rated insulation voltage	250 V
Rated impulse voltage/pollution degree	4 kV / III
Protective separation (reinforced insulation) between	(A1, A2) - (k, l, T/R) - (11, 12, 14) - (21, 22, 24)
Voltage tests according to IEC 61010-1	2.21 kV

Supply voltage

RCM420-D-1:

Supply voltage U_S	AC 16…72 V / DC 9.6…94 V
Frequency range U_S	42…460 Hz

RCM420-D-2:

Supply voltage U_S	AC/DC 70…300 V
Frequency range U_S	42…460 Hz
Power consumption	≤ 3 VA

Measuring circuit

Measuring current transformers, external type	W…, WR…, WS…
Load	68 Ω
Rated insulation voltage (measuring current transformer)	800 V
Operating characteristic acc. to IEC 62020 and IEC/TR 60755	Type A
Rated frequency	42…2000 Hz
Measuring range	3 mA…16 A
Relative uncertainty	0…-20%
Relative uncertainty	0…30%

Response values

Rated residual operating current $I_{\Delta n1}$ (prewarning, AL1)	50…100 % x $I_{\Delta n2}$, (50 %)*
Rated residual operating current $I_{\Delta n2}$ (alarm, AL2)	10 mA…10 A (30 mA)*
Hysteresis	10…25 % (15%)*

Specified time

Start-up delay t	0…10 s (0.5 s)*
Response delay t_{on2} (alarm)	0…10 s (0 s)*
Response delay t_{on1} (prewarning)	0…10 s (1 s)*
Delay on release t_{off}	0…99 s (1 s)*
Operating time t_{ae} at $I_{\Delta n} = 1$ x $I_{\Delta n1/2}$	≤ 180 ms
Operating time t_{ae} at $I_{\Delta n} = 5$ x $I_{\Delta n1/2}$	≤ 30 ms
Response time t_{an}	$t_{an} = t_{ae} + t_{on1/2}$
Recovery time t_b	≤ 300 ms
Number of restart cycles	0…100 (0)*

Cable lengths for measuring current transformers

Single wire ≥ 0.75 mm²	0…1 m
Single wire, twisted ≥ 0.75 mm²	0…10 m
Shielded cable ≥ 0.75 mm²	0…40 m
Recommended cable (shielded, shield on one side connected to terminal l of the RCM420, not connected to earth)	J-Y(St)Y min. 2x0.8
Connection	screw-type terminals

Displays, memory

Display range, measuring value	3 mA…16 A
Error of indication	±15 % / ± 2 digit
Measured-value memory for alarm value	data record measured values
Password	off / 0…999 (off)*
Fault memory alarm relay	on / off (on)*

Inputs/outputs

Cable length for external test/reset button	0…10 m

Switching elements

Number of switching elements	2 x 1 changeover contact
Operating principle	N/C operation / N/O operation (N/C operation)*
Electrical endurance, number of cycles	10000

Contact data acc. to IEC 60947-5-1:

Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A

Minimum contact rating	1 mA at AC/DC ≥ 10 V

Environment/EMC

EMC	IEC 62020: 2005-11
Operating temperature	-25 °C…+55 °C
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions IEC 60721	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-time storage (IEC 60721-3-1)	1M3

Connection

Connection type	push-wire terminals
Connection properties	
rigid	0.2…2.5 mm² / AWG 24-12
flexible without ferrule	0.2…2.5 mm² / AWG 24-12
flexible with ferrule	0.2…1.5 mm² / AWG 24-16
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

Other

Operating mode	continuous operation
Position of normal use	any
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP20
Enclosure material	polycarbonate
Flammability class	UL94V-0
DIN rail mounting acc. to	IEC 60715
Screw fixing	2 x M4 with mounting clip
Operating manual	TGH1410
Weight	≤ 150 g

( )* = factory setting

Ordering information

Type	Response range $I_{\Delta n}$	Frequency range	Measuring current transformers	Supply voltage U_S*	Art. No.
RCM420-D-1	10 mA…10 A	42…2000 Hz	W…, WR…, WS…	DC 9.6…94 V / AC 42…460 Hz 16…72 V	B 7401 4001
RCM420-D-2	10 mA…10 A	42…2000 Hz	W…, WR…, WS…	DC 70…300 V / AC 42…460 Hz 70…300 V	B 7401 4002

Device version with screw terminals on request.

* Absolute values

External measuring current transformers		
Type	**Inside diameter (mm)**	**Art. No.**
W20	ø 20	B 9808 0003
W35	ø 35	B 9808 0010
W60	ø 60	B 9808 0018
W120	ø 120	B 9808 0028
W210	ø 210	B 9808 0034
WR70x175	70 x 175	B 9808 0609
WR115x305	115 x 305	B 9808 0610
WS20x30	20 x 30	B 9808 0601
WS50x80	50 x 80	B 9808 0603
WS80x120	80 x 120	B 9808 0606

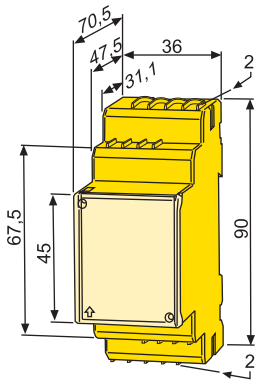
Other measuring current transformer types on request

Accessories	
Type	**Art. No.**
Mounting clip for enclosure XM420 B (1 piece per device)	B 9806 0008
Snap-on mounting for W20…, W35…	B 9808 0501
Snap-on mounting for W60…	B 9808 0502

Dimension diagram XM420

Dimensions in mm

Open the front plate cover in direction of arrow!



Screw mounting

Note: The upper mounting clip must be ordered separately (see ordering information).