Residual current evaluators RCMS460-D / -L – RCMS490-D / -L

Multi-channel AC, pulsed DC and AC / DC sensitive residual current evaluators for earthed AC, DC and AC / DC systems (TN and TT systems)

RCMS460-D / -L and RCMS460-D / -L

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Device features

- Optional AC, pulsed DC or AC / DC sensitive measurement by selecting the respective measuring current transformer for each channel
- True r.m.s. value measurement
- 12 measuring channels per single device for residual current or digital input selectable
- Up to 90 evaluators RCMS… in the system (1080 measuring channels)
- Fast parallel scanning for all channels
- Response ranges
  10 mA…10 A (DC…2000 Hz)
  6 mA…20 A (42…2000 Hz)
- Preset function
- Adjustable time delays
- Adjustable frequency behaviour for protection of persons, fire protection and plant protection
- History memory with date and time stamp for 300 data records
- Data logger for 300 data records / channel
- Analysis of the harmonics, DC, THD
- Two alarm relays with one changeover contact each
- Device version RCMS490 with one alarm contact per channel
- N / O or N / C operation and fault memory behaviour selectable
- Connection external TEST and RESET button
- Backlit graphical display (7-segment display) and alarm LEDs
- Data exchange via BMS bus
- Password protection for device setting
- Continuous CT connection monitoring
- RoHS conform

Approvals

c UL us LISTED

AE25

Product description RCMS460-D / -L and RCMS490-D / -L

The RCMS system consists of one or several RCMS460-D / -L or RCMS490-D / -L residual current evaluators, which are able to detect and evaluate fault, residual and operating currents in earthed power supplies via the associated measuring current transformers. The maximum voltage of the system to be monitored depends on the nominal insulation voltage of the measuring current transformers used in case of busbar systems, or on the cables or conductors that are routed through.

Closed W…AB series measuring current transformers are required to measure AC / DC sensitive residual currents (0…2000 Hz). Six W…AB series measuring current transformers require one AN420 power supply unit. W… (closed), WR… (rectangular) and WS… (split-core) series measuring current transformers are used for alternating and pulsating currents (42…2000 Hz). The measuring current transformer series can be used in any combination with the measuring channels of the evaluators. Each RCMS460-D / -L and RCMS490-D / -L utilizes 12 measuring channels. Up to 90 RCMS evaluators can be connected via a BMS bus (RS-485 interface with BMS protocol), thereby up to 1080 measuring channels (sub-circuits) can be monitored.

If this product is to be used for personnel, fire or plant protection, the frequency response can be set accordingly. The measured currents can be analyzed for harmonics.

Applications

- Monitoring residual, fault and load currents in the frequency range 0…2000 Hz (W…AB measuring current transformers), 42…2000 Hz (W…, WR…, WS… measuring current transformers).
- Monitoring of currents regarded as fire hazards in flammable atmospheres.
- Monitoring of TN-S systems for stray currents and additional N-PE connections
- Monitoring of N conductors for overload caused by harmonics.
- Monitoring of PE conductors to ensure they are free of current.
- Monitoring of stationary electrical systems and equipment for residual currents
- Personnel and fire protection due to rapid disconnection.

Function

The currents are detected and evaluated as true r.m.s. values in the frequency range of 0 (42)…2000 Hz. All channels are scanned simultaneously so that the maximum scanning time for all channels is 180 ms if 1 x the response value is exceeded and 30 ms if 5 x the response value is exceeded. The current values of all channels are shown on the LC display in bar graph format. If one of the two response values is exceeded, the response delay begins. Once the response delay has elapsed, the common alarm relays “K1 / K2” switch and the alarm LEDs 1 / 2 light up. Two response values / common alarm relays, which can be set separately, allow a distinction to be made between “prewarning” and “alarm”. The faulty channel(s) and the measured value in question are shown on the LCD. If the current falls below the release value (response value plus hysteresis), the release delay begins. When the delay time has elapsed, the alarm relays switch back to their initial position. With the fault memory activated, the alarm relays remain in alarm state until the reset button is pressed or until a reset command is sent via the BMS bus. The device function can be tested using the TEST button. Device parameter setting can be carried out via the LCD and the control keys on the front of one of the connected -D devices or via connected panels and gateways (e.g. FTC470XET). The preset function can be used to adjust all channels to the device-specific residual current plus a selectable factor.

Digital input

For each channel it is selectable to monitor the residual current with a measuring current transformer or a digital input (with a potential free contact I / O).

History memory in RCMS460-D, RCMS490-D

The residual current evaluator utilizes a history memory for failsafe storing of up to 300 data records (date, time, channel, event code, measured value), so that all data about an outgoing circuit or an area can be traced back at any time (what happened when).

Analysis of harmonics

The analysis of the harmonics of the measured currents can be selected via a menu item in RCMS460-D, RCMS490-D. There, the DC component, the THD factor and the current value of the harmonics (1…40 at 50 / 60 Hz, 1…5 at 400 Hz) is displayed numerically and graphically.

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Device variants

RCMS460-D

Device version RCMS460-D utilizes a backlit graphical display where information can be displayed in different ways. This version is applied when detailed information about all devices in the switchboard cabinet, connected to the bus, are to be displayed locally. This device is capable of assigning parameters to all RCMS devices connected to the BMS bus and displaying all measurement details. Several RCMS…-D devices can be used in one system.

RCMS460-L

Device version RCMS460-L utilizes a two-digit 7-segment display where the address of this device is displayed within the BMS bus. The alarm LEDs indicate the measuring where the response value has been exceeded. Parameter assignment can be carried out via an RCMS…D or the protocol converter FTC470XET.

RCMS490-D / RCMS490-L

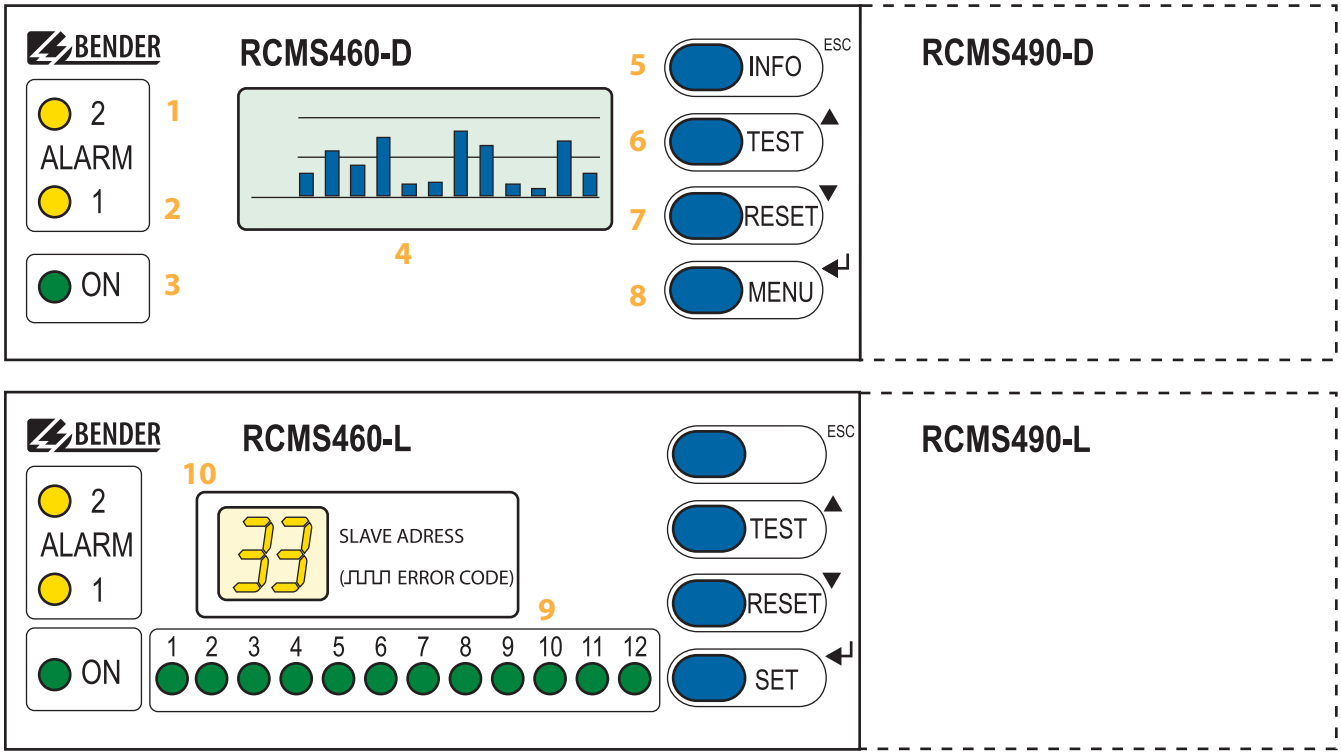
The function of the device versions RCMS490-D / RCMS490-L corresponds to the function described above. In addition, a galvanically isolated alarm contact (N / O contact) is provided, for example, to trigger a circuit breaker in this sub-circuit when a response value has been exceeded.

Overview of device types

Distinctive device features	RCMS460-D	RCMS460-L	RCMS490-D	RCMS490-L
Rated residual operating current AC / DC sensitive Type B pulsed DC sensitive Type A	 10 mA…10 A 6 mA…20 A	 10 mA…10 A 6 mA…20 A	 10 mA…10 A 6 mA…20 A	 10 mA…10 A 6 mA…20 A
Digital input selectable	×	×	×	×
Backlit graphics LC display	×	--	×	--
7-segment display and LED line	--	×	--	×
Parameter setting function	×	--	×	--
Password	×	--	×	--
Display error code	×	×	×	×
Address range	1…90	1…90	1…90	1…90
Master / slave	×	×	×	×
Internal clock	×	--	×	--
Common alarm relay for all channels	2 x 1 changeover contact	2 x 1 changeover contact	2 x 1 changeover contact	2 x 1 changeover contact
Alarm relay per channel	--	--	12 x 1 N / O contact	12 x 1 N / O contact
Analysis of the harmonics $I_{\Delta n}$, DC, THD	×	--*	×	--*
History memory 300 data records	×	--	×	--
Data logger for 300 data records / channel	×	--	×	--
PRESET	×	--*	×	--*
Number of measuring channels	12	12	12	12
Enclosure	XM460	XM460	XM490	XM490

* only in combination with RCMS4…-D

Operating and display elements RCMS460-D / -L and RCMS490-D / -L



1 - LED “ALARM 2” lights when the measured value exceeds or falls below the response value „Alarm“ in a channel.

2 - LED “ALARM 1” lights when the measured value exceeds or falls below the response value „Prewarning“ in a channel or in the event of device error.

3 - The “ON” LED lights up when the device is switched on or lights for the time until the device is ready for operation during switching on.

4 - Backlit graphics LC display

5 - INFO key: to query standard information (does not apply to RCMS4…-L)

ESC key: Exits the menu function without changing parameters.

6 - TEST button: to call up the self test.

Arrow up key: Parameter change, scroll.

7 - RESET button: to delete alarm and fault messages

Down key: Parameter change, scroll.

8 - MENU key: RCMS460-D / 490-D: Toggles between the standard display, MENU and alarm display.

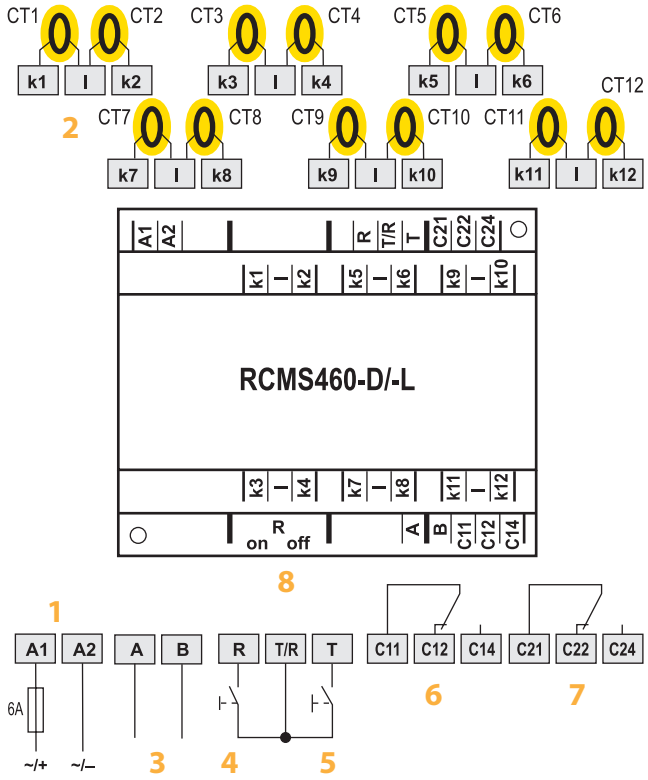
SET key: RCMS460-L / 490-L: BMS address setting

Enter key: to confirm parameter change

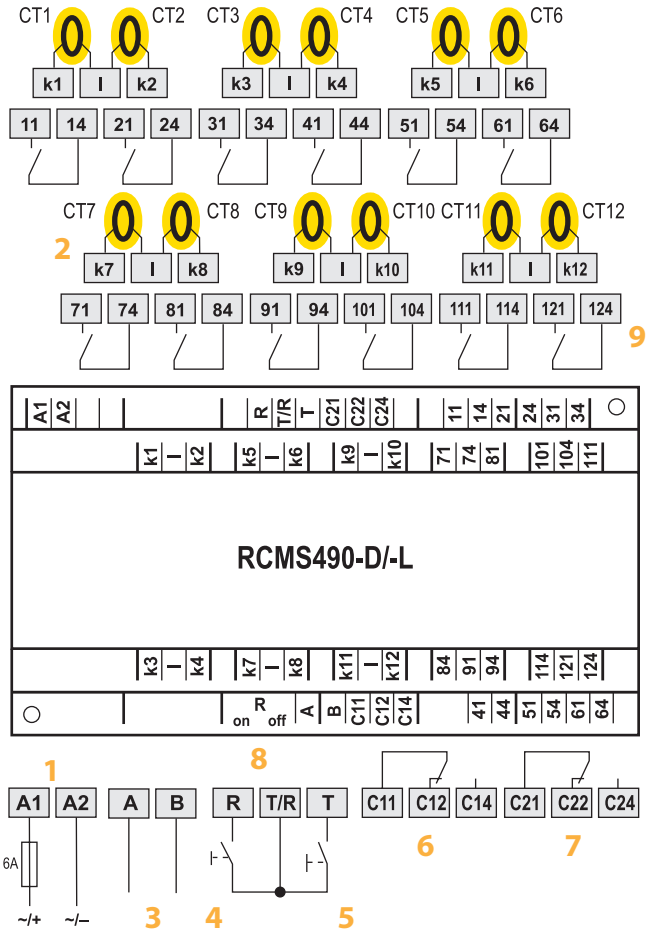
9 - Alarm LEDs “1…12” light up if a fault has been detected in the relevant measuring channel or flash if there is a fault with the measuring current transformer.

10 - Digital display for device address and error codes.

Wiring diagram RCMS460-D / -L



Wiring diagram RCMS490-D / -L



1 - Connection of supply voltage U_S (see ordering information), recommended fuse: 6 A

2 - Connection measuring current transformers CT1…CT12. Either Type A or Type B measuring current transformers can be selected for each measuring channel. Six W…AB series measuring current transformers require one AN420-2 power supply unit.

3 - RS-485 interface (with BMS protocol)

4 - External reset button (N / O contact)

5 - External test button (N / O contact); the external T / R buttons of several devices must not be connected to one another.

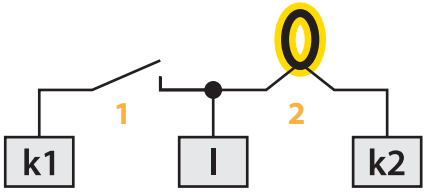
6 - Alarm relay K1: ALARM 1, common alarm for prewarning, alarm device error, selectable

7 - Alarm relay K2: ALARM 2, common alarm for prewarning, alarm device error, selectable

8 - $R_{on / off}$: Activate or deactivate the BMS bus terminating resistor (120 Ω)

9 - Alarm relay: N / O contact per channel

Wiring diagram – Digital input



1 - Potential free contact
0 ≙ > 250 Ω
I ≙ < 100 Ω

2 - Measuring current transformer

RCMS460-D / -L
RCMS490-D / -L

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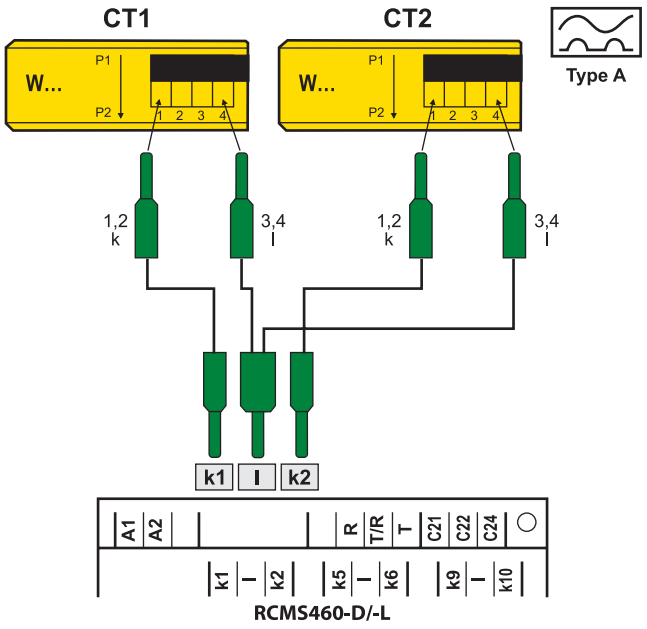
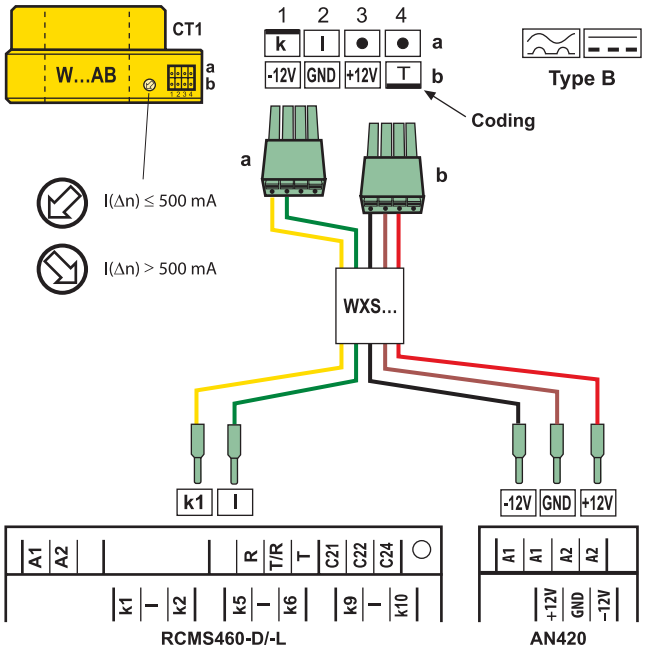
Connection measuring current transformers of the W..., WR..., WS... series (pulsed DC sensitive)

Example: W...



Connection measuring current transformers of the W...AB series (AC / DC sensitive)

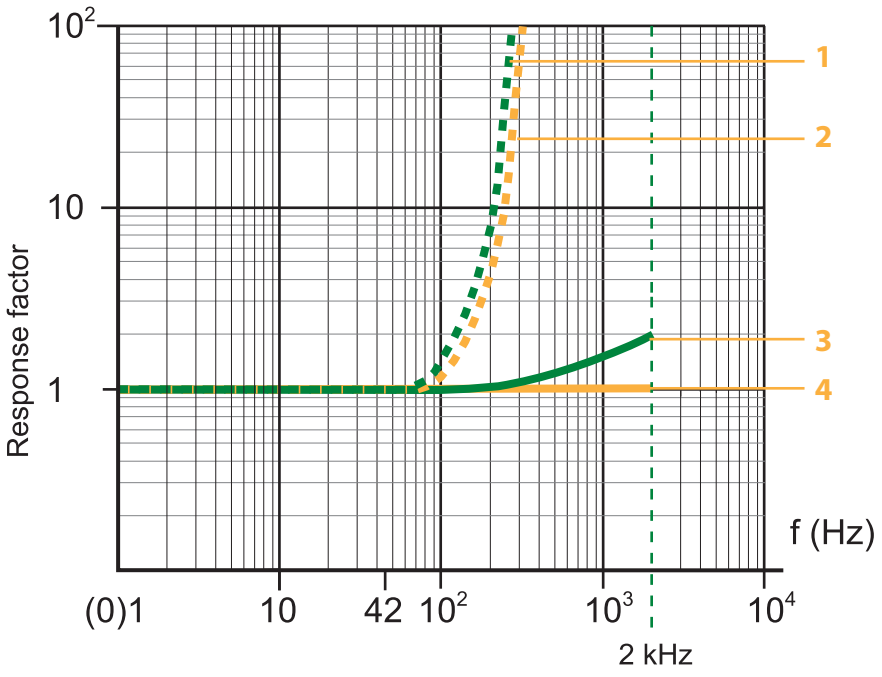


The connections k and l at the residual current evaluator must not be interchanged.

Frequency settings

The frequency response of the equipment can be set to a linear frequency response (up to the maximum frequency of 2000 Hz) if used for fire protection or to a frequency response in accordance with IEC 60990 for personnel protection. For plant protection, the residual current is measured up to the rated system frequency. The figure below shows the corresponding frequency response.

Frequency curves



Response factor = $I_\Delta / I_{\Delta n}$

(I_Δ) Residual operating current: Measured value at which the RCMS responds.

($I_{\Delta n}$) Rated residual operating current: Set response value

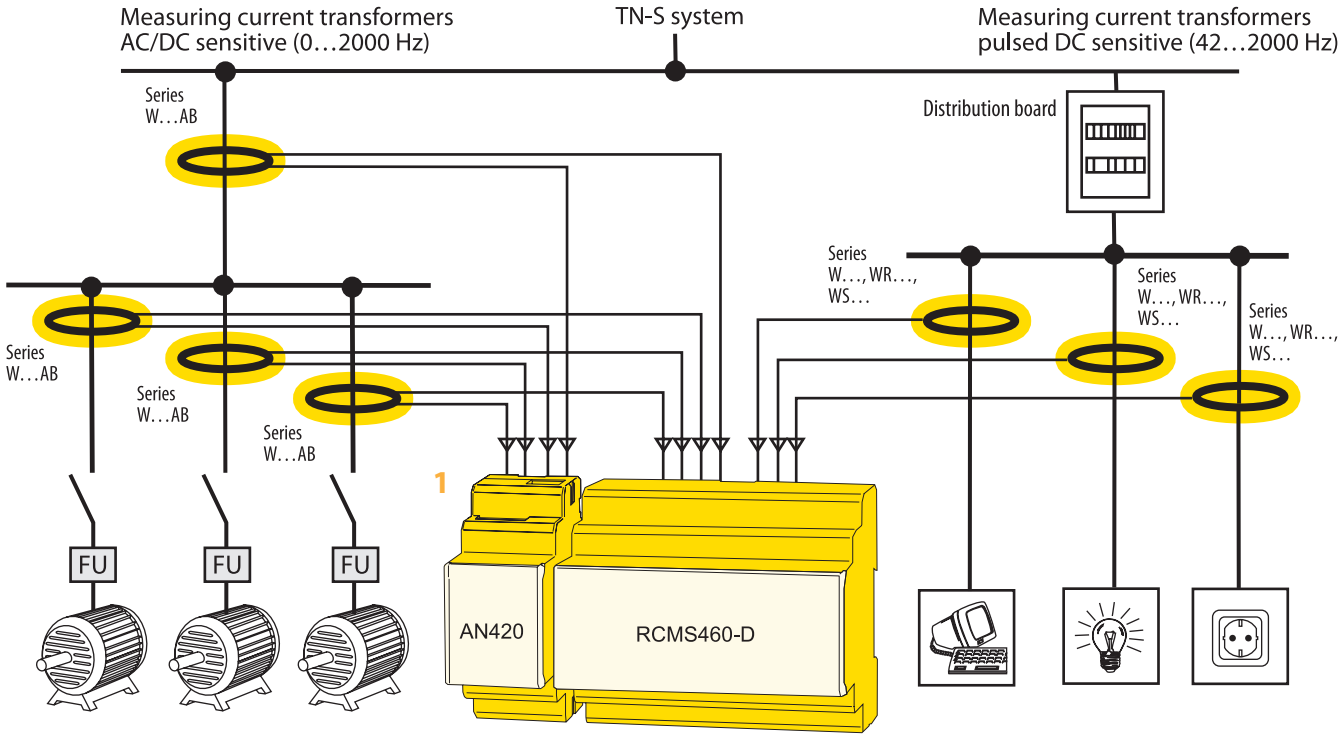
1 - Menu selection “50 Hz” – Plant protection: Only evaluates the fundamental component of the residual current.

2 - Menu selection “60 Hz” – Plant protection: Only evaluates the fundamental component of the residual current.

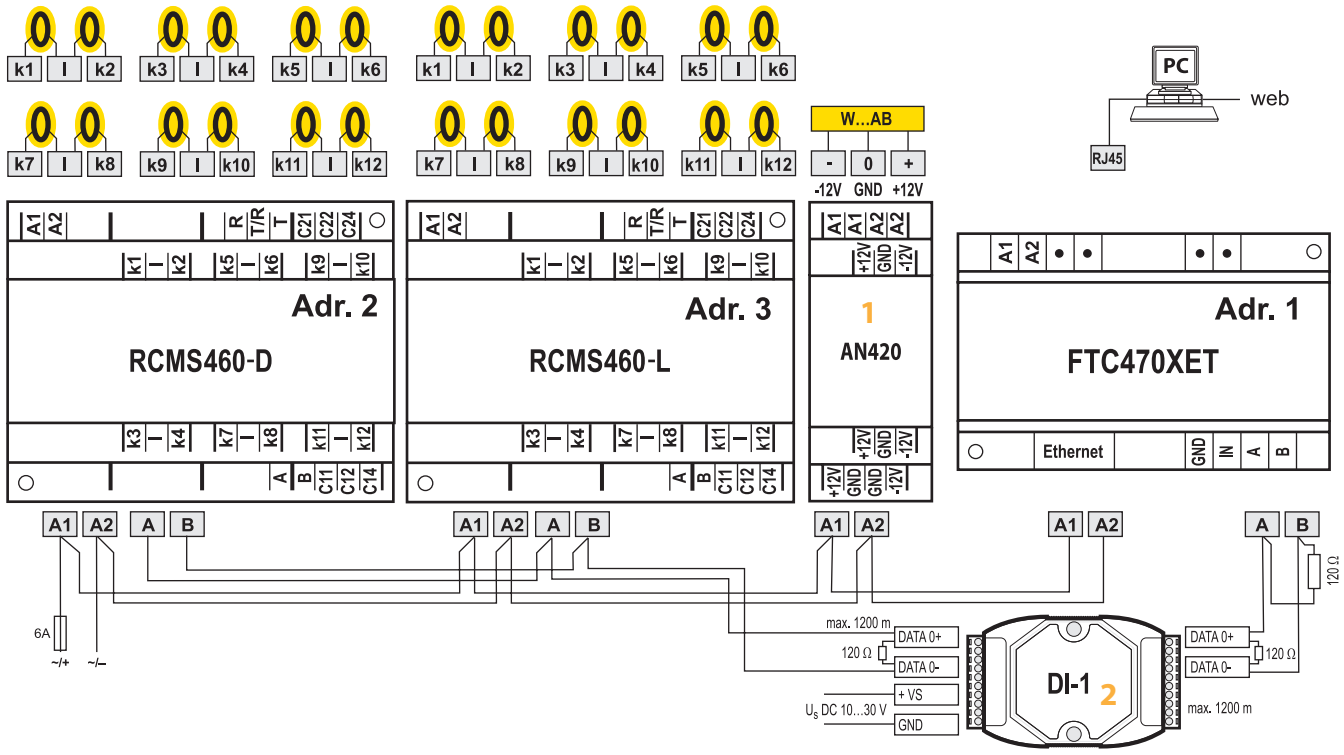
3 - Menu selection “IEC” – Touch current for let go (protection of persons) in accordance with IEC 60990

4 - Menu selection “None” – Fire protection: Response factor remains the same over the entire frequency range.

Example for a design of a minimum system consisting of an RCMS460-D and 12 measuring points



Example for the design of a standard system consisting of an RCMS460-D and RCMS460-L and a protocol converter FTC470XET



Note:

1 - When AC / DC sensitive measuring current transformers of the W…AB series are used, an AN420 is required that supplies up to six measuring current transformers of this type.

2 - The DI-1 repeater only is required when the length of the cable exceeds 1200 m or when more than 32 devices are connected to the bus.

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) – (k1 / I…k12 / R / RT / T, AB) – (11, 12, 14) – (21, 22, 24)
Voltage test according to IEC 61010-1	2.21 kV

Supply voltage

Supply voltage U_S	see ordering information
Frequency range U_S	see ordering information
Power consumption	≤ 5 VA (RCMS460) / ≤ 8 VA (RCMS490)

Measuring circuit

External measuring current transformer	W…, WR…, WS… series (Type A) W…AB series (Type B)
CT monitoring	on / off (on)*
Load	68 Ω
Rated insulation voltage (measuring current transformer)	800 V
Operating characteristic acc. to IEC 60755	Type A and Type B depending on the CT type (Type A)*
Rated frequency	0…2000 Hz (Type B) / 42…2000 Hz (Type A)
Cut-off frequency	none, IEC, 50 Hz, 60 Hz (none)*
Measuring range	0…30 A (CT Type A) – 0…20 A (CT Type B) crest factor up to 10 A = 4, up to 20 A = 2
Rated residual operating current $I_{\Delta n2}$ (Alarm)	10 mA…10 A (Type B) 6 mA…20 A (Type A) (100 mA overcurrent)*
Rated residual operating current $I_{\Delta n1}$ (prewarning)	10…100 % x $I_{\Delta n2}$ min 5 mA (50 %)*
Digital input	1 ≙ < 100 Ω – 0 ≙ > 250 Ω
Preset for alarm	Offset: 0…20 A (30 mA)* and I_Δ x factor 1…99 (3)*
Preset for digital input	0 / I (I)*
Relative percentage error	0…- 20 %
Hysteresis	2…40 % (20 %)*
Factor for additional CT	1…10; x 1…250 (x 1)*
Number of measuring channels (per device / system)	12 / 1080

Specified time

Starting delay t (startup) per device	0…99 s (0 ms)*
Response delay t_{on} per channel	0…999 s (200 ms)*
Release delay t_{off} per channel	0…999 s (200 ms)*
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} ($I_{\Delta n}$)	$t_{an} = t_{ae} + t_{on1\,/\,2}$
Operating time I / 0 inputs	< 3,5 s
Scanning time for all channels ($I_{\Delta n}$)	≤ 180 ms
Recovery time t_b	500…600 ms

Displays, memory

Display range measured value	0…30 A (CT Type A) – 0…20 A (CT Type B)
Display accuracy	± 10 %
LEDs	ON / ALARM (RCMS4…-D) ON / ALARM / channel 1…12 (RCMS4…-L)
LC display	backlit graphical display (RCMS4…-D)
7-segment display	2 x 7.62 mm (RCMS4…-L)
History memory	300 data records (RCMS4…-D)
Data logger	300 data records per channel (RCMS4…-D)
Password	off / 0…999 (off)*
Language	D, GB, F (GB)*
Fault memory alarm relay	on / off (off)*

Inputs / outputs

TEST / RESET button	internal / external
Cable length for external TEST / RESET button	0…10 m

Interface

Interface / protocol	RS-485 / BMS
Baud rate	9.6 kbit / s
Cable length	0…1200 m
Recommended cable (shielded, shield on one side connected to PE)	J-Y(ST)Y min. 2 x 0.8
Terminating resistor	120 Ω (0.25 W) can be connected via DIP switch
Device address, BMS bus (RCMS…-D / -L)	1…90 (2)*

Cable lengths for measuring current transformers W…, WR…, WS…

Single wire ≥ 0.75 mm²	0…1 m
Single wire, twisted ≥ 0.75 mm²	0…10 m
Shielded cable ≥ 0.5 mm²	0…40 m
Recommended cable (shielded, shield on one side to terminal I, not connected to earth)	J-Y(ST)Y min. 2 x 0.8

Cable lengths for measuring current transformers W…AB

Single wire ≥ 0.75 mm²	0…10 m
Connection	plug-in connector, recommended WXS…

Switching elements

Number of changeover contacts	2 x 1 changeover contact (RCMS460) 2 x 1 changeover contact, 12 x 1 N / O contact (RCMS490)				
Operating principle	ON / OFF / N / C operation / N / O operation (N / O operation)*				
Electrical service life under rated operating conditions	10.000 switching operations				
Contact data acc. to IEC 60947-5-1					
Utilization 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 load	1 mA at AC / DC ≥ 10 V				

Environment / EMC

EMC	IEC 62020: 2003-11
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	screw terminals
rigid / flexible / conductor sizes	0.2…4 / 0.2…2.5 mm² / 24…12 AWG
Multi-conductor connection (two conductors of the same cross section)	
rigid / flexible	0.2…1.5 mm² / 0.2…1.5 mm²
Stripping length	8…9 mm
Tightening torque	0.5…0.6 Nm

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
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Standards	IEC 62020
Technical manual	TGH 1393
Weight	≤ 360 g (RCMS460) ≤ 510 g (RCMS490)

( )* Factory setting

Ordering information

Type	Supply voltage U_S*			Art. No.
RCMS460-D-1	DC 16…94 V	AC 42…460 Hz	16…72 V	B 9405 3001
RCMS460-D-2	DC 70…276 V	AC 42…460 Hz	70…276 V	B 9405 3002
RCMS460-L-1	DC 16…94 V	AC 42…460 Hz	16…72 V	B 9405 3003
RCMS460-L-2	DC 70…276 V	AC 42…460 Hz	70…276 V	B 9405 3004
RCMS490-D-1	DC 16…94 V	AC 42…460 Hz	16…72 V	B 9405 3005
RCMS490-D-2	DC 70…276 V	AC 42…460 Hz	70…276 V	B 9405 3006
RCMS490-L-1	DC 16…94 V	AC 42…460 Hz	16…72 V	B 9405 3007
RCMS490-L-2	DC 70…276 V	AC 42…460 Hz	70…276 V	B 9405 3008

Type	Supply voltage U_S*	Art. No.
AN420-2 (power supply unit for six W…AB)	DC 70…276 V / AC 42…460 Hz 70…276 V	B 9405 3100
DI-1 (RS-485 repeater)	DC 10…30 V	B 9501 2015

Type	Supply voltage U_S*	Art. No.
FTC470XET (protocol converter)	DC 85…276 V / AC 50…400 Hz 85…276 V	B 9506 1001

* Absolute values

RCMS46… Connecting cable for W…AB measuring current transformers – RCMS and AN420

Type	Length / m	Art. No.
WXS-100	1	B 9808 0506
WXS-250	2.5	B 9808 0507
WXS-500	5	B 9808 0508
WXS-1000	10	B 9808 0509

Measuring current transformers AC / DC sensitive (Type B)

Type	Inside diameter	Art. No.
W20AB	ø 20 mm	B 9808 0008
W35AB	ø 35 mm	B 9808 0016
W60AB	ø 60 mm	B 9808 0026
W120AB	ø 120 mm	B 9808 0041
W210AB	ø 210 mm	B 9808 0040

Measuring current transformers pulsed DC sensitive (Type A)

Type	Inside diameter	Art. No.
W20	ø 20 mm	B 9808 0003
W35	ø 35 mm	B 9808 0010
W60	ø 60 mm	B 9808 0018
W120	ø 120 mm	B 9808 0028
W210	ø 210 mm	B 9808 0034
WR70x175	70 x 175 mm	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.

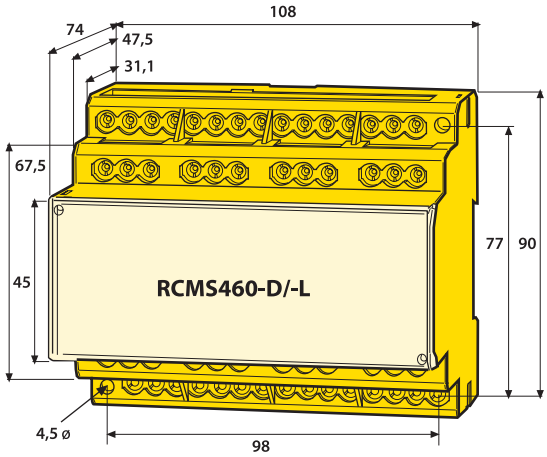
Accessories

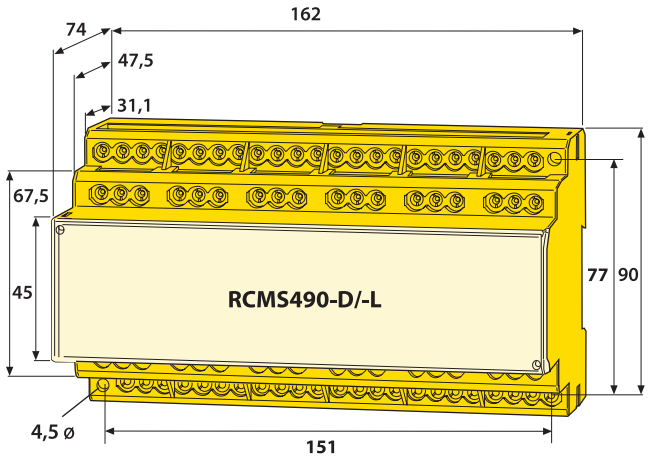
Type	Art. No.
Mounting clip for enclosure XM420 (1 piece per device)	B 9806 0008
Snap-on mounting for W20… / W35…	B 9808 0501
Snap-on mounting for W60…	B 9808 0502

For further information about measuring current transformers, please refer to the respective data sheets.

Dimension diagrams

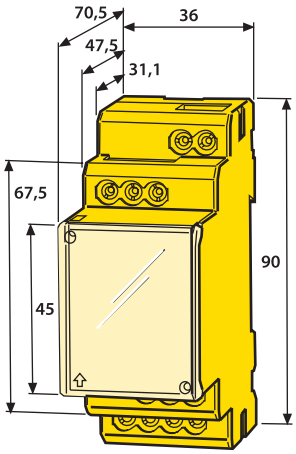
Dimensions in mm





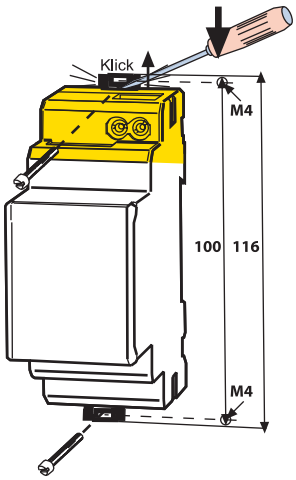
AN420

Open the front plate cover in direction of arrow!



Screw mounting

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



4.3