



RCMB300 series

AC/DC sensitive residual current monitoring module



i Part of the device documentation in addition to this quick-start guide is the enclosed "Safety instructions for Bender products" and the operating manual. This quick-start guide applies to the following devices:

Type	Supply voltage	Response value/variant	Order number
RCMB301	DC 24 V (19.2...28.8 V)	30 mA...3 A/Modbus RTU	B74043100

Intended use

The residual current monitoring modules of the RCMB300 series are intended for measuring AC and DC fault currents in earthed systems (TN and TT systems). The modules are able to measure residual currents up to $I_{\Delta} = 20$ A in a frequency range of DC...100 kHz.

Any other use than that described in this document is regarded as improper. This quick-start guide does not replace the operating manual of the device. Download: www.bender.de/manuals

Safety instruction



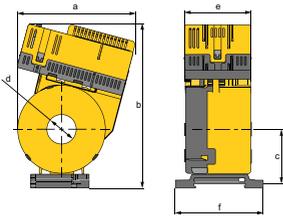
DANGER of electrocution due to electric shock!

Touching live parts of the system carries the risk of:

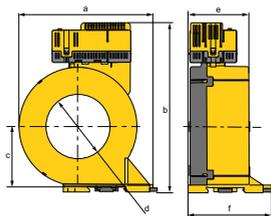
- An electric shock
- Damage to the electrical installation
- Destruction of the device

Before installing and connecting the device, make sure that the installation has been de-energised. Observe the rules for working on electrical installations.

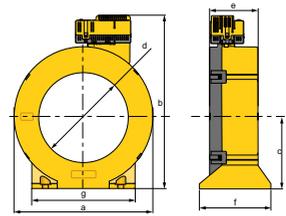
Dimension diagrams RCMB30... + CTBC... (all dimensions in mm, tolerance ± 0.5 mm)



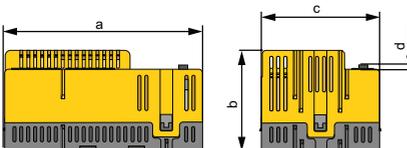
RCMB30... + CTBC20(P)/CTBC35(P)



RCMB30... + CTBC60(P)



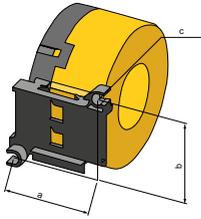
RCMB30... + CTBC120(P)/CTBC210(P)



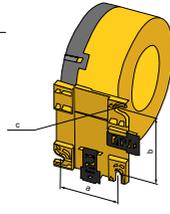
RCMB30...

Type	a	b	c	d	e	f	g
RCMB30...-CTBC20(P)	81	112	37	$\varnothing 20$	46	60	
RCMB30...-CTBC35(P)	97	130	47	$\varnothing 35$	46	61	
RCMB30...-CTBC60(P)	126	158	57	$\varnothing 60$	56	78	
RCMB30...-CTBC120(P)	188	232	96	$\varnothing 120$	65	96	139
RCMB30...-CTBC210(P)	302	346	153	$\varnothing 210$	67	113	277
RCMB30...	74	37	44	2	4.6		

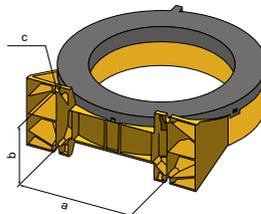
Dimensions of mountings



CTBC20(P)/CTBC35(P)



CTBC60(P)



CTBC120(P)/CTBC210(P)

Type	a	b	c
CTBC20(P)	31.4	49	2 x \varnothing 5.5
CTBC35(P)	49.8	49	2 x \varnothing 5.5
CTBC60(P)	56	66	2 x \varnothing 6.5
CTBC120(P)	103	81	4 x \varnothing 6.5
CTBC210(P)	180	98	4 x \varnothing 5.5

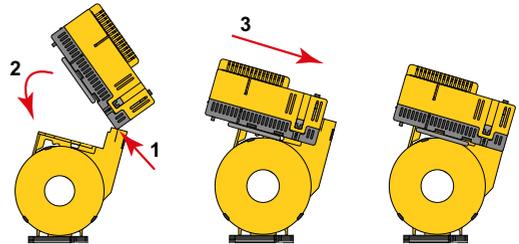
Assembly

A complete residual current monitoring module consists of the RCMB30... evaluation electronics and a CTBC20(P)...210(P) series measuring current transformer core. If ordered separately, these two components must be plugged together and calibrated during commissioning.

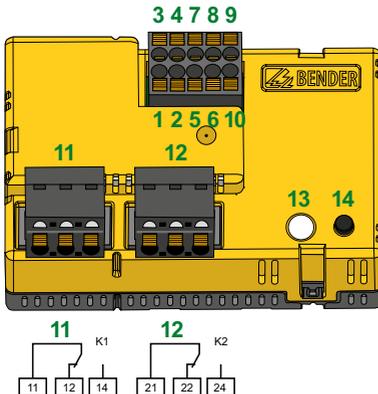
Step 1: Place the electronic module on the mark on the measuring current transformer.

Step 2: Fold the electronic module down onto the measuring current transformer.

Step 3: Slide the electronic module onto the plug contacts of the measuring current transformer.

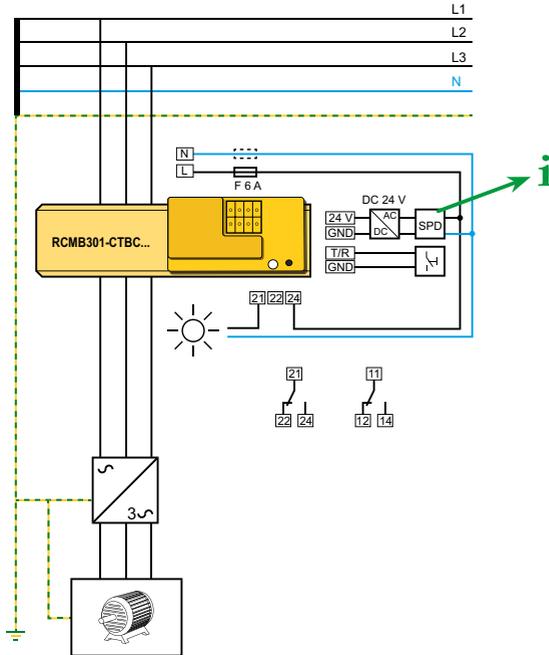


Device view RCMB30...



No.	Terminal	Meaning
1	24 V	Supply voltage U_s
2	GND	
3	D1	Contact feedback
4	DG	
5	T/R	Connection external test/reset
6	GND	
7	A	RS-485 interface
8	B	
9	X1	Terminals for cable bridge for connection of the integrated terminating resistor of the RS-485 interface
10	X2	
11	11, 12, 14	Relay K1 (prewarning)
12	21, 22, 24	Relay K2 (alarm)
13	–	LED: operation "ON" and "Alarm"
14	–	Test and reset button "T"

Connection



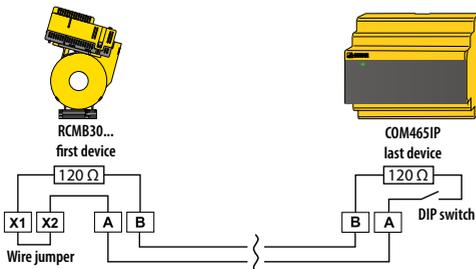
i The use of a type 2 surge protection device (SPD) is mandatory due to possible impulse voltages and in order to comply with normative requirements. The surge protection device must be connected upstream of the power supply unit on the supply side.

Features of the surge protection device:

- Nominal discharge current I_n (8/20 μ s): 20 kA
- Response time: 25 ns
- Two-stage: 1 varistor + 1 spark gap
- Alternatively, the power supply unit must be connected to a CAT II supply without a surge protection device.

Refer to the manual for further connection options.

Commissioning - Modbus RTU



i Within an interconnection of devices via the RS-485 interface, the first and the last device must each be provided with a terminating resistor.

This device-internal resistor can be connected by means of a wire jumper or a DIP switch.

Address setting

i Every RCMB3... has a factory-set Modbus address. The address is 1XX, where XX = the last two digits of the serial number. Example: Serial number = 12345678 -> Modbus address = 178

The preset address can be changed via a COMTRAXX gateway, via Modbus or directly on the device.

The address can be changed on the device before installation and offset calibration. The electronic module must not be connected to the measuring current transformer during address setting. Each address in the bus system may only be assigned once.

LED flashing modes

A		slowly	error
B		medium	mode change
C		quickly	ready for address modification
D		very quickly	address setting mode
E		once	confirmation

Address modification procedure

Phase	Action		LED
1	Supply the electronic module with power		Flashes red briefly (A, error: no measuring current transformer)
2	Press and hold "T" until the LED flashes red very quickly; release afterwards		Flashes red briefly (A, error)
			Flashes red at medium speed (B, mode change)
2			Flashes red quickly (C, ready for address setting mode)
3	Set address (address setting range: 1...247)		Flashes red quickly (D, address setting mode)
3a	Units place	Press "T" repeatedly until reaching the desired digit of the units place	Each keystroke is confirmed with green (E)
		Acknowledge the entry: Press and hold "T" until the LED flashes red; release afterwards	Lights green shortly (E) LED flashes red briefly (C)
3b	Tens place	Press "T" repeatedly until reaching the desired digit of the tens place	Each keystroke is confirmed with green (E)
		Acknowledge the entry: Press and hold "T" until the LED flashes red; release afterwards	Lights green shortly (E) LED flashes red briefly (C)
3c	Hundreds place	Press "T" repeatedly until reaching the desired digit of the hundreds place	Each keystroke is confirmed with green (E)
		Acknowledge the entry: Press and hold "T" until the LED flashes red; release afterwards	Lights green shortly (E) LED flashes red briefly (C)
4	Check address setting: LED indicates the address by flashing ¹⁾		
		Digit units place	Flashes green for each number (E)
		Pause	off
		Digit tens place	Flashes green for each number (E)
		Pause	off
		Digit hundreds place	Flashes green for each number (E)
	Pause	off	
5	Address set		Flashes red briefly (A, error: no measuring current transformer)

¹⁾Example for "Check address setting": flashing pattern after successful setting of address "124":



System state LED and output relays

The LED indicates the system state by means of colours and lighting/flashing. The changeover contacts of the relay outputs K1 and K2 have defined switching positions for each system state.

System state	GREEN LED ON	RED LED Alarm	Notes	Relay K1	Relay K2
Device switched off	off	off	Device is de-energised, no monitoring, no monitoring function	de-energised	de-energised
Normal operating state	lights	off	The device is supplied with the specified voltage and monitors the primary circuit. No residual current flows which would lead to tripping.	energised	energised
Prewarning	lights	flashes briefly	The device is supplied with the specified voltage and monitors the primary circuit. A fault current flows which exceeds the set limit of the prewarning.	de-energised	energised
Alarm state	off	lights	The device is supplied with the specified voltage and monitors the primary circuit. A fault current flows which exceeds the set limit of the alarm.	de-energised	de-energised
Device error	off	flashes slowly	The device is supplied with the specified voltage and monitors the primary circuit. An error is detected by the periodic self tests.	de-energised	de-energised
Device in calibration mode	see manual for DC calibration procedure			de-energised	de-energised
Device in address mode	see manual for procedure				
Device signalling	Flash quickly in alternation		Modbus register 20006 = 2 Use to detect the device in its environment faster. Is automatically deactivated after one minute.		

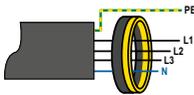
Installation instructions measuring current transformer

i Do not route any shielded cables through the measuring current transformer.

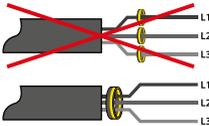
! **CAUTION! Device damage due to high induction currents!** High currents can be induced into the conductor loop due to the AC/DC sensitive measuring technology used. Do not route protective conductors and low-resistance conductor loops through the measuring current transformer!

! **CAUTION! Device damage due to interference pulses!** The connecting cable (supply, analogue interface ...) must not be routed directly past the current transformer core.

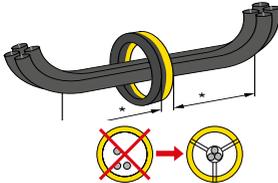
! **CAUTION! Risk of injury due to accessible live conductors!** The measuring current transformer must be connected to the corresponding evaluator before the first use and before commissioning of the monitored system.



Never route an existing protective conductor through the measuring current trans-



All current-carrying cables must be routed together through the measuring current transformer.



The primary conductors may only be bent from the specified minimum distance. The minimum bending radius specified by the manufacturers must be observed. Distance to 90° angle = 2 * external diameter

The cables must be centred in the measuring current transformer.

Offset calibration and completion of the installation

Before commissioning the system, it is recommended that an offset calibration be carried out on the RCMB module at the installation site. Note that during the offset calibration the system is switched off and no current flows through the measuring current transformer. For the CTBC120 and CTBC210 measuring current transformer cores, an offset calibration is mandatory. The offset calibration procedure is described in the manual.

The installation should be completed with a functional test: Press the "T" button for 1.5...5 s.

Technical data

Rated voltage 800 V
 Overvoltage category III
 Nominal supply voltage U_s DC 24 V
 Operating range U_s $\pm 20\%$
 Power consumption ≤ 2.5 W

Measuring circuit

Characteristics according to IEC 62020 and IEC/TR 60755
 AC/DC sensitive, type B
 Measuring range 5 mA ... 20 A
 Response value $I_{\Delta n}$ 30 mA ... 3 A
 Prewarning 50 % ... 100 % $I_{\Delta n}$
 Rated current I_n

CTBC20 when $I_{\Delta n} = 30$ mA 40 A
 CTBC20 when $I_{\Delta n} = 300$ mA 63 A
 CTBC20P 80 A
 CTBC35 when $I_{\Delta n} = 30$ mA 80 A
 CTBC35 when $I_{\Delta n} = 300$ mA 125 A
 CTBC35P 160 A
 CTBC60 when $I_{\Delta n} = 30$ mA 160 A
 CTBC60 when $I_{\Delta n} = 300$ mA 250 A
 CTBC60P 320 A
 CTBC120 when $I_{\Delta n} = 100$ mA 330 A
 CTBC120P when $I_{\Delta n} = 100$ mA 630 A
 CTBC210 when $I_{\Delta n} = 300$ mA 630 A
 CTBC210P when $I_{\Delta n} = 100$ mA 630 A
 CTBC210P when $I_{\Delta n} = 300$ mA 1000 A
 Operating uncertainty $\pm 17.5\%$
 Relative uncertainty 0 ... -35%

Outputs

Outputs 2 changeover contacts
 Operating principle N/C operation or N/O operation
 Switching outputs (K1, K2) 250 V, 5 A
 Switching capacity 1500 VA/144 W

Contact data acc. to IEC 60947-5-1

Rated operational voltage AC 250 V/250 V
 Utilisation category AC-13/AC-14
 Rated operational current AC 5 A/3 A
 Rated operational voltage DC 220/110/24 V
 Utilisation category DC12
 Rated operational current DC 0.1/0.2/1 A
 Minimum current 10 mA at DC 5 V

Ordering details

Suitable measuring current transformer cores

\emptyset current transformers	Type	Art. No.
20 mm	CTBC20	B98120001
	CTBC20P	B98120002
35 mm	CTBC35	B98120003
	CTBC35P	B98120004
60 mm	CTBC60	B98120005
	CTBC60P	B98120006
120 mm	CTBC120	B98120007
	CTBC120P	B98120020
210 mm	CTBC210	B98120008
	CTBC210P	B98120021

System components

max. connected current transformers	Type	Art. No.
4	STEP-PS/1 AC/24 DC/0.5	B94053110
14	STEP-PS/1 AC/24 DC/1.75	B94053111
34	STEP-PS/1 AC/24 DC/4.2	B94053112

Accessories

Type	Art. No.
USB to RS-485 interface converter	B95012045
Terminal set for RCMB module (spare part)	B74043124



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