



RCMA420-DM



Residual current monitor

for monitoring AC, DC and pulsed currents
in TN and TT systems with an analogue interface
Software version: D242 V1.2x



Bender GmbH & Co. KG

P.O. Box 1161 • 35301 Gruenberg • Germany
Londorfer Strasse 65 • 35305 Gruenberg • Germany
Tel.: +49 6401 807-0 • Fax: +49 6401 807-259
E-Mail: info@bender.de • www.bender.de

© Bender GmbH & Co. KG

All rights reserved.
Reprinting only with permission of the publisher.
Subject to change!

Photos: Bender archives

Table of Contents

1. Important information	7
1.1 How to use this manual	7
1.2 Technical support: service and support	8
1.2.1 First level support	8
1.2.2 Repair service	8
1.2.3 Field service	9
1.3 Training courses	10
1.4 Delivery conditions	10
1.5 Inspection, transport and storage	10
1.6 Warranty and liability	11
1.7 Disposal	12
2. Safety instructions	13
2.1 General safety instructions	13
2.2 Work activities on electrical installations	13
2.3 Intended use	14
3. Function	15
3.1 Device features	15
3.2 Function	15
3.2.1 Connection monitoring	16
3.2.2 Fast response value query	16
3.2.3 Automatic self test	16
3.2.4 Manual self test	16
3.2.5 Functional faults	16
3.2.6 Start-up delay t	17
3.2.7 Residual current monitoring in window discriminator mode	17
3.2.8 Password protection (on, OFF)	17
3.2.9 Factory setting FAC	17

3.2.10 Erasable history memory	18
3.2.11 External, combined test/reset button T/R	18
3.2.12 Fault memory	18
3.2.13 Interface option	18
4. Installation and connection	19
5. Operation and setting	21
5.1 Display elements in use	21
5.2 Function of the operating elements	22
5.3 Menu structure	23
5.4 Display in standard mode	24
5.5 Display in menu mode	24
5.5.1 Parameter query and setting: overview	24
5.5.2 Changeover from overcurrent to undercurrent mode or to window mode	26
5.5.3 Response value setting for overcurrent:	27
5.5.4 Setting the fault memory to con mode	28
5.5.5 Selecting the output current range of the analogue interface ...	28
5.5.6 Select output voltage range of the analogue interface	28
5.5.7 Setting the 100% reference related to the analogue interface. ...	29
5.5.8 Setting the time delays	30
5.5.9 Changing from overcurrent operation to window operation	30
5.5.10 Factory setting and password protection	31
5.5.11 Restoring factory settings	32
5.5.12 Device information query (Example)	32
5.5.13 History memory query	33

5.6	Commissioning	33
5.7	Factory setting	33
5.8	Error codes	34
6.	Technical data	35
6.1	Data in tabular form	35
6.2	Standards, approvals and certifications	38
6.3	Ordering information	39
6.4	Current and voltage curves of the analogue interface	40
INDEX	41

1. Important information

1.1 How to use this manual



*This manual is intended for **qualified personnel** working in electrical engineering and electronics!*

Always keep this manual within easy reach for future reference.

To make it easier for you to understand and revisit certain sections in this manual, we have used symbols to identify important instructions and information. The meaning of these symbols is explained below:



*This signal word indicates that there is a **high risk of danger** that will result in **electrocution** or **serious injury** if not avoided.*



*This signal word indicates a **medium risk of danger** that can lead to **death** or **serious injury** if not avoided.*



*This signal word indicates a **low level risk** that can result in **minor** or **moderate injury or damage to property** if not avoided.*



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

This manual has been compiled with great care. It might nevertheless contain errors and mistakes. Bender cannot accept any liability for injury to persons or damage to property resulting from errors or mistakes in this manual.

1.2 Technical support: service and support

For commissioning and troubleshooting Bender offers you:

1.2.1 First level support

Technical support by phone or e-mail for all Bender products

- Questions concerning specific customer applications
- Commissioning
- Troubleshooting

Telephone: +49 6401 807-760*
Fax: +49 6401 807-259
In Germany only: 0700BenderHelp (Tel. and Fax)
E-mail: support@bender-service.de

1.2.2 Repair service

Repair, calibration, update and replacement service for Bender products

- Repairing, calibrating, testing and analysing Bender products
- Hardware and software update for Bender devices
- Delivery of replacement devices in the event of faulty or incorrectly delivered Bender devices
- Extended guarantee for Bender devices, which includes an in-house repair service or replacement devices at no extra cost

Telephone: +49 6401 807-780** (technical issues)
+49 6401 807-784**, -785** (sales)
Fax: +49 6401 807-789
E-mail: repair@bender-service.de

Please send the devices for **repair** to the following address:

Bender GmbH, Repair-Service,
Londorfer Str. 65,
35305 Gruenberg

1.2.3 Field service

On-site service for all Bender products

- Commissioning, configuring, maintenance, troubleshooting of Bender products
- Analysis of the electrical installation in the building (power quality test, EMC test, thermography)
- Training courses for customers

Telephone: +49 6401 807-752**, -762 **(technical issues)
+49 6401 807-753** (sales)
Fax: +49 6401 807-759
E-mail: fieldservice@bender-service.de
Internet: www.bender-de.com

*Available from 7.00 a.m. to 8.00 p.m. 365 days a year (CET/UTC+1)

**Mo-Thu 7.00 a.m. - 8.00 p.m., Fr 7.00 a.m. - 13.00 p.m

1.3 Training courses

Bender is happy to provide training regarding the use of test equipment. The dates of training courses and workshops can be found on the Internet at www.bender-de.com -> Know-how -> Seminars.

1.4 Delivery conditions

Bender sale and delivery conditions apply.

For software products the "Softwareklausel zur Überlassung von Standard-Software als Teil von Lieferungen, Ergänzung und Änderung der Allgemeinen Lieferbedingungen für Erzeugnisse und Leistungen der Elektroindustrie" (software clause in respect of the licensing of standard software as part of deliveries, modifications and changes to general delivery conditions for products and services in the electrical industry) set out by the ZVEI (Zentralverband Elektrotechnik- und Elektronikindustrie e. V.) (German Electrical and Electronic Manufacturer's Association) also applies.

Sale and delivery conditions can be obtained from Bender in printed or electronic format.

1.5 Inspection, transport and storage

Inspect the dispatch and equipment packaging for damage, and compare the contents of the package with the delivery documents. In the event of damage in transit, please contact Bender immediately.

The devices must only be stored in areas where they are protected from dust, damp, and spray and dripping water, and in which the specified storage temperatures can be ensured.

1.6 Warranty and liability

Warranty and liability claims in the event of injury to persons or damage to property are excluded if they can be attributed to one or more of the following causes:

- Improper use of the device.
- Incorrect mounting, commissioning, operation and maintenance of the device.
- Failure to observe the instructions in this operating manual regarding transport, commissioning, operation and maintenance of the device.
- Unauthorised changes to the device made by parties other than the manufacturer.
- Non-observance of technical data.
- Repairs carried out incorrectly and the use of replacement parts or accessories not approved by the manufacturer.
- Catastrophes caused by external influences and force majeure.
- Mounting and installation with device combinations not recommended by the manufacturer.

This operating manual, especially the safety instructions, must be observed by all personnel working on the device. Furthermore, the rules and regulations that apply for accident prevention at the place of use must be observed.

1.7 Disposal

Abide by the national regulations and laws governing the disposal of this device. Ask your supplier if you are not sure how to dispose of the old equipment.

The directive on waste electrical and electronic equipment (WEEE directive) and the directive on the restriction of certain hazardous substances in electrical and electronic equipment (RoHS directive) apply in the European Community. In Germany, these policies are implemented through the "Electrical and Electronic Equipment Act" (ElektroG). According to this, the following applies:

- Electrical and electronic equipment are not part of household waste.
- Batteries and accumulators are not part of household waste and must be disposed of in accordance with the regulations.
- Old electrical and electronic equipment from users other than private households which was introduced to the market after 13 August 2005 must be taken back by the manufacturer and disposed of properly.

For more information on the disposal of Bender devices, refer to our homepage at www.bender-de.com -> Service & support.

2. Safety instructions

2.1 General safety instructions

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

2.2 Work activities on electrical installations



Only **qualified personnel** are permitted to carry out the work necessary to install, commission and run a device or system.



DANGER

Risk 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.

If the device is used outside the Federal Republic of Germany, the applicable local standards and regulations must be complied with. The European standard EN 50110 can be used as a guide.

2.3 Intended use

The AC/DC sensitive residual current monitor RCMA420-DM is designed for use in earthed systems (TN and TT systems) where DC and AC fault currents may occur. These are in particular loads containing six-pulse rectifiers or one way rectifiers with smoothing, such as converters, battery chargers, construction site equipment with frequency-controlled drives.

Two separately adjustable response ranges allow to distinguish between prewarning ($I_{\Delta n1} = 50 \dots 100$ % of the set response value $I_{\Delta n2}$) and alarm ($I_{\Delta n2}$). Since the values are measured with measuring current transformers, the RCMA is nearly independent of the nominal voltage and the load current of the system being monitored.

In order to meet the requirements of the 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 use other than that described in this manual is regarded as improper.

3. Function

3.1 Device features

- AC/DC sensitive residual current monitor Type B according to IEC 62020 and IEC 60755
- Two separately adjustable response ranges (prewarning, alarm)
- Adjustable switching hysteresis
- R.m.s. value measurement
- Start-up delay
- Measured value display via multi-functional LC display
- Alarm indication via LEDs (AL1, AL2) and analogue interface
- Password protection against unauthorized parameter changing
- Fault memory function can be switched off
- CT connection monitoring
- Manual device and CT self test using true test current

3.2 Function

Once the supply voltage U_s is applied, the start-up delay is activated. Residual current measurement takes place via an external measuring current transformer of the W20AB...W60AB(P) series. The currently measured value is shown on the LC display. In this way any changes, for example when circuits are connected to the system, can be recognized easily.

If the measured value exceeds one or both response values, the alarm LEDs AL1 / AL2 light up. If the residual current falls below the release value (response value minus hysteresis), the alarm LEDs AL1/AL2 go out. If the fault memory is activated, the LEDs light until the **reset button R** is pressed or until the supply voltage is interrupted.

The device function can be tested using the **test button T**.

The **parameterization** of the device can be carried out via the LC display and the function keys integrated in the front plate and can be password-protected.

3.2.1 Connection monitoring

The CT connections are continuously monitored. In the event of a fault, the alarm LEDs AL1 / AL2 / ON flash (Error Code E.01).

3.2.2 Fast response value query

With the display in standard mode, the currently measured response values $I_{\Delta n1}$ and $I_{\Delta n2}$ can be queried pressing the Up and Down keys (< 1.5 s). Switchover to the Menu mode is not required. If you want to exit the fast response value query, press the enter key.

3.2.3 Automatic self test

The device automatically carries out a self test after connecting to the system to be monitored and later every 24 hours. During the self test internal functional faults will be detected and appear in form of an error code on the display.

3.2.4 Manual self test

While the test button T is pressed and held down, all device-related display elements appear on the display.

After pressing the test button for > 1.5 s, the device carries out a self test. During this test, internal functional faults are detected and will be displayed in form of an error code.

In addition, a test current is supplied via the CT connection T which exceeds the response value set at the RCMA. When the self test runs correctly, all of the three LEDs light continuously. After successful testing, the yellow LEDs go out. If the test current does not exceed the set response values, the yellow LEDs flash and the fault message E.02 appears on the display.

3.2.5 Functional faults

If an internal functional fault occurs, all of the three LEDs flash. An error code will appear on the display (E01...E32). In such a case please contact the Bender Service.

3.2.6 Start-up delay t

After connection to the supply voltage U_S , the alarm indication is delayed by the preset time t (0...10 s).

3.2.7 Residual current monitoring in window discriminator mode

Change the measuring principle by selecting the window mode (SEt / In). In the window discriminator mode, the threshold values I1 and I2 represent the upper and the lower value. If the measured value is not within this area, an alarm is initiated by the device. See page 30.

3.2.8 Password protection (on, OFF)

When the password protection is activated (on), settings are only possible after entering the correct password (0...999).

3.2.9 Factory setting FAC

After activating the factory setting, all settings previously changed are reset to delivery status.

3.2.10 Erasable history memory

The first alarm value that occurs will be saved in this memory. The memory can be cleared via the menu HiS.

3.2.11 External, combined test/reset button T/R

Reset = Pressing the external button < 1.5 s

Test = Pressing the external button > 1.5 s

3.2.12 Fault memory

The fault memory can be activated, deactivated or set to continuous mode (con). If the fault memory is set to "con" mode, the alarm parameters remain stored even on failure of the supply voltage. Stored alarms can be reset by means of the reset button R.

3.2.13 Interface option

The device provides an analogue interface with galvanic isolation. One of three output signals can be selected from the associated menu. To receive no error (full scale of the connected measuring device), only use the output you have selected via the software:

- DC 0...400 μ A
Current output for Bender measuring instruments of the 96.. series.
- DC 0...20 mA / DC 4...20 mA
Standardized current output with selectable current ranges.
- DC 0...10 V
Standardized voltage signal.

4. Installation and connection



Only **qualified personnel** are permitted to carry out the work necessary to install, commission and run a device or system.



DANGER

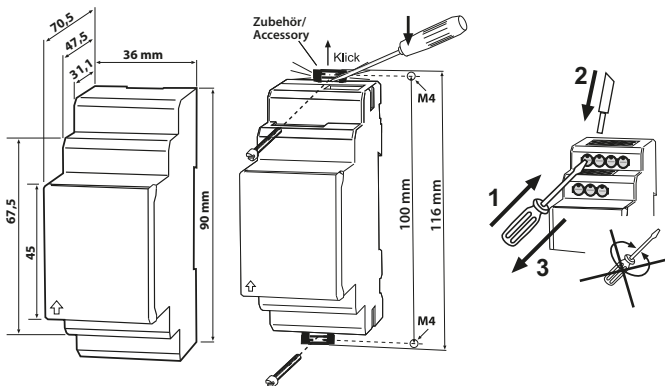
Risk of electrocution due to electric shock!

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 diagram, drawing for screw mounting, push-wire terminal connection



The front plate cover is easy to open at the lower part marked by an arrow.

1. DIN rail mounting:

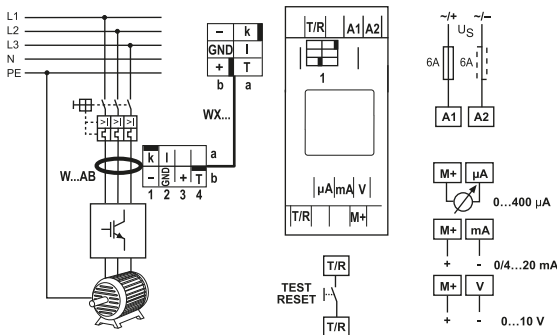
Snap the rear mounting clip of the device into place in such a way that a safe and tight fit is ensured.

Screw fixing:

Use a tool to move the rear mounting clips (a second mounting clip required, see ordering information) to a position that it projects beyond the enclosure. Then fix the device using two M4 screws.

2. Wiring

Connect the device according the wiring diagram.



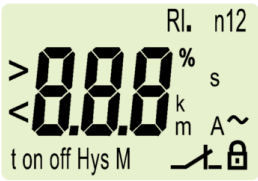

Key to wiring diagram

Terminal	Connections
A1, A2	Connection to supply voltage U_s
k, l	Connection of measuring current transformers
T/R	Connection to the combined test/reset button
M+	(common) positive pole of the analogue interface
μA	Current output 0...400 μA
mA	Current output 0/4...20 mA
V	Voltage output 0...10 V

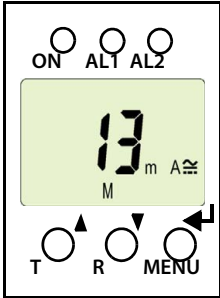
5. Operation and setting

5.1 Display elements in use

A detailed description of the meaning of the display elements is given in the table below.


Display elements in use	Element	Function
	I2	Response value $I_{\Delta n2}$ as mA (Alarm 2)
	I1	Response value $I_{\Delta n1}$ as % of $I_{\Delta n2}$ (Alarm 1, prewarning)
	I Hys, %	Response value hysteresis as %.
	t	start-up delay t
	M	Fault memory active
		Password protection enabled

5.2 Function of the operating elements

Device front	Element	Function
	ON, green	lights continuously: Power On LED, flashes: System fault or connection monitoring fault
	AL1, AL2	LED Alarm 1 lights (yellow): Response value 1 reached ($I_{\Delta n1}$) LED Alarm 2 lights (yellow): Response value 2 reached ($I_{\Delta n2}$)
	13 mA M	13 mA flow through the measuring current transformer, fault memory active
	T, ▲	Test button (> 1.5 s): To indicate the available display elements, to start a self test; Up key (< 1.5 s): Menu items/values
	R, ▼	Reset button (> 1.5 s): Deleting the fault memory; Down key (< 1.5 s): Menu items/values
	MENU, ↩	MENU key (> 1.5 s): Starting the menu mode; Enter key (< 1.5 s): Confirm menu item, submenu item and value. Enter key (> 1.5 s): Back to the next higher menu level.

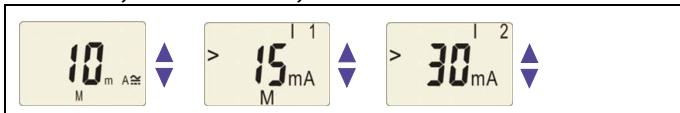
5.3 Menu structure

All adjustable parameters are listed in the columns "menu item" and "adjustable parameters". A display-like representation is used to illustrate the parameters in the column menu item.

Menu	Submenu	Menu item	Activation	Adjustable parameter
AL (response - values)	→	> I2	-(Hi)	$I_{\Delta n2}$ (Alarm 2)
		> I1	-(Hi)	$I_{\Delta n1}$ as % of $I_{\Delta n2}$ (Alarm 1, prewarning)
		Hys	-	Hysteresis $I_{\Delta n1} / I_{\Delta n2}$
out (output control)	→	M	-	Fault memory
		I, U	-	Selection current / voltage 0...400 μ A / 0...20 mA/ 4...20 mA / 0...10 V
	AnA Analogue outp.: 100% reference	I2 AL	-	100% reference related to response value I2 (Alarm 2)
		I	-	100% reference related to the user-defined current value I
t (timing check)	→	t	-	Start-up delay
Set (device control)	→	I 12	HI	Selectable parameters: High, window function, low
			off	Parameter setting via password
		FAC	-	Restore factory settings
		SYS	-	Function blocked
InF	→		-	Display hard / software version
HiS	→	Clr	-	History memory for the first alarm value, erasable

5.4 Display in standard mode

By default, the currently measured residual current is displayed. The current response values I1 (prewarning) and I2 (alarm) can be displayed using the Up and Down key. Press the Enter key to return to the measured value.



In the standard mode, the currently set response values I1 and I2 can be displayed using the Up and Down keys.

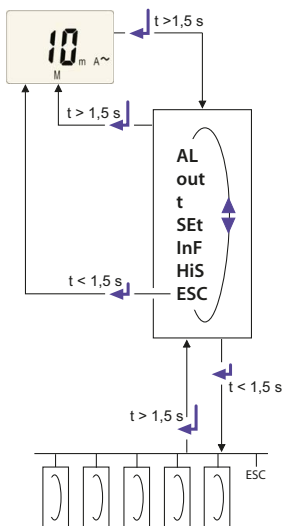
5.5 Display in menu mode

5.5.1 Parameter query and setting: overview

Menu item	Adjustable parameter
AL	Response values query and setting: <ul style="list-style-type: none"> – Residual current $I_{\Delta n2}$ (AL2) – Residual current $I_{\Delta n1}$ (AL1) – Hysteresis of the response values: % Hys
out	Configuration of the fault memory: <ul style="list-style-type: none"> – Activate/deactivate the fault memory or assign continuous mode (on/off/con) – Select output signal – Select 100% reference related to the output signal (AnA)
t	Set start-up delay t

Set	Device control parameter setting: <ul style="list-style-type: none"> - Select the appropriate parameter for response values: overcurrent mode (HI), undercurrent mode (Lo) or window mode (In). - Enable or disable password protection, change password - Re-establish factory settings. - Service menu SyS blocked
InF	Query hard and software version
HiS	Query the first stored alarm value.
ESC	Move to the next higher menu level (back)

Menu structure



Parameter settings

An example is given here on how to change the alarm response value I1 ($I_{\Delta n1}$). It is presumed that the option overcurrent (HI) has been selected in the SEt/I 12 menu (factory setting). Proceed as follows:

1. Press the MENU/Enter key for more than 1.5 seconds. The flashing short symbol AL appears on the display.
2. Confirm with Enter. The parameter response value > I2 flashes, in addition the associated overcurrent value > 30 mA appears.
3. Use the Down key to select the parameter response value I1. The parameter I1 flashes, in addition the associated percentage value for prewarning 50 % of I2 appears.
4. Confirm with Enter. The current value for prewarning appears on the flashing display.
5. Use the Up or Down key to set the appropriate prewarning value. Confirm with Enter. I1 flashes.
6. You can exit the menu by:
 - pressing the Enter key for more than 1.5 seconds to reach the next higher level or
 - selecting the menu item ESC and confirming with Enter to reach the next higher level.



The currently active segments are flashing! In the figures below, the segments where device settings can be carried out are highlighted by an oval. The menu mode can be reached by pressing the MENU key for more than 1.5 seconds.

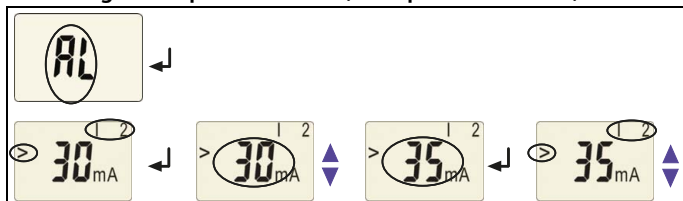
5.5.2 Changeover from overcurrent to undercurrent mode or to window mode

The operating mode can be changed in the SEt/I 12 menu using the parameters HI, Lo and In. By default, overcurrent operation (HI) is set. Refer to page 30 for a detailed description on how to change over to the window mode.

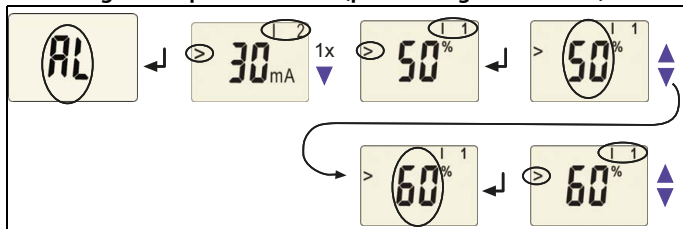
5.5.3 Response value setting for overcurrent:

- Response value I2 (overcurrent)
- Response value I1 (overcurrent)
- Hysteresis (Hys) of the response values I1, I2

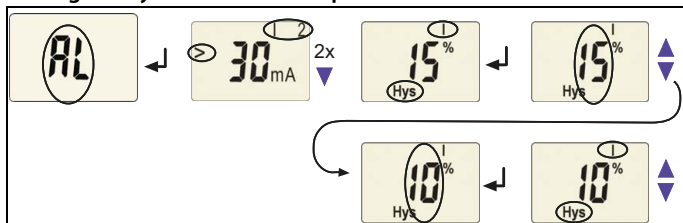
Increasing the response value I2 (Example: overcurrent)



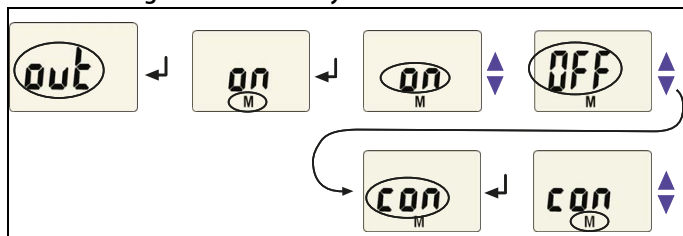
Increasing the response value I1 (prewarning overcurrent)



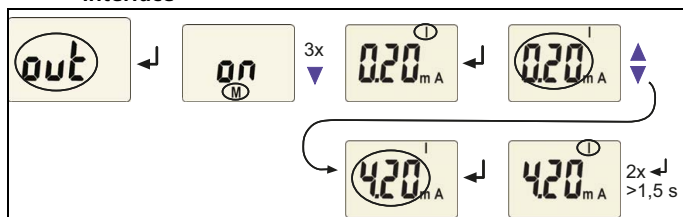
Setting the hysteresis of the response value



5.5.4 Setting the fault memory to con mode



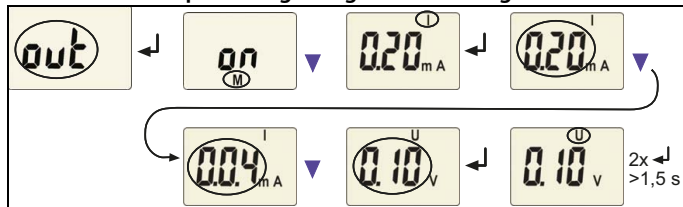
5.5.5 Selecting the output current range of the analogue interface



0.04 mA means 0...400 μ A;

0.20 mA means 0...20 mA; 4.20 mA means 4...20 mA

5.5.6 Select output voltage range of the analogue interface



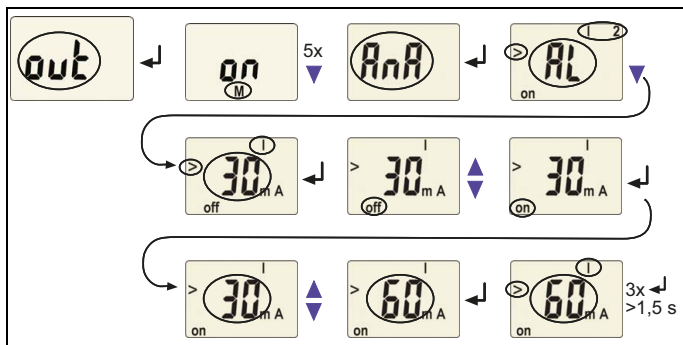
0.10 V means 0...10 V

5.5.7 Setting the 100% reference related to the analogue interface.

Set here whether the 100% value of the output signal is to be referred to response value I2 ($I_{\Delta n2}$) (AL) or to a freely configurable value. Select the appropriate value from the range 10 mA...500 mA.

Factory setting = related to the response value I2 ($I_{\Delta n2}$) (AL).

The example below shows how to change the 100% reference of AL = related to the response value to a 100% value of 60 mA.

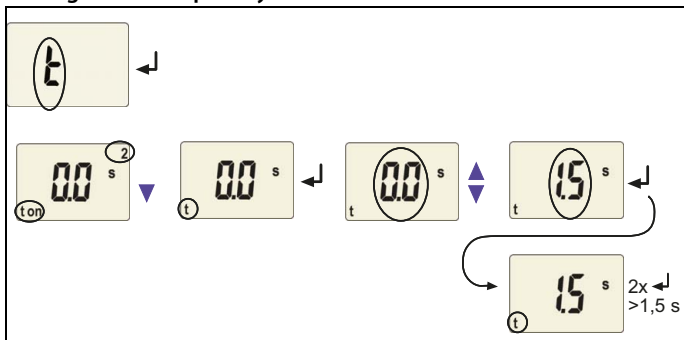


5.5.8 Setting the time delays

The following delays can be set:

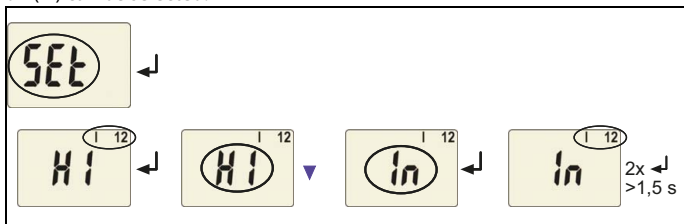
- start-up delay t (0...10 s) when the device is being started

Setting the start-up delay t



5.5.9 Changing from overcurrent operation to window operation

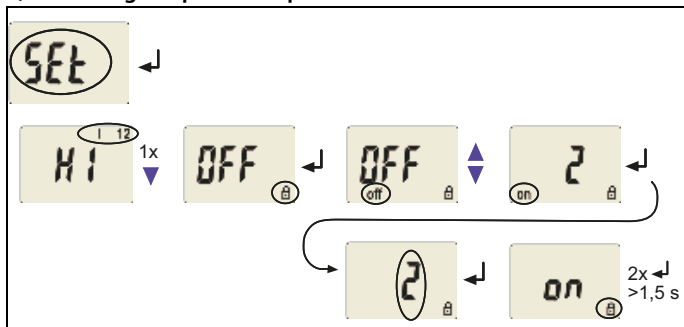
Use this menu item to set whether the response values of the device apply to overcurrent (HI) or undercurrent operation (Lo). In addition, window operation (In) can be selected.



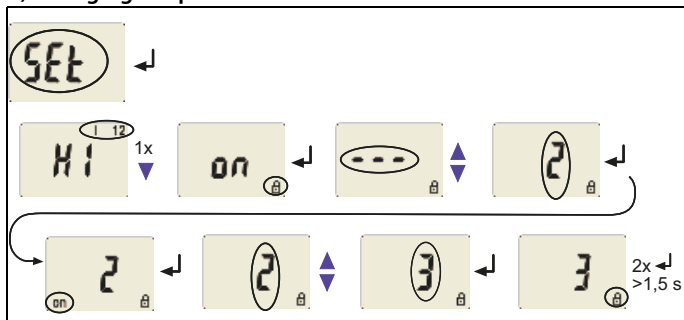
5.5.10 Factory setting and password protection

Use this menu to activate the password protection, to change the password or to deactivate the password protection. In addition, you can reset the device to its factory settings.

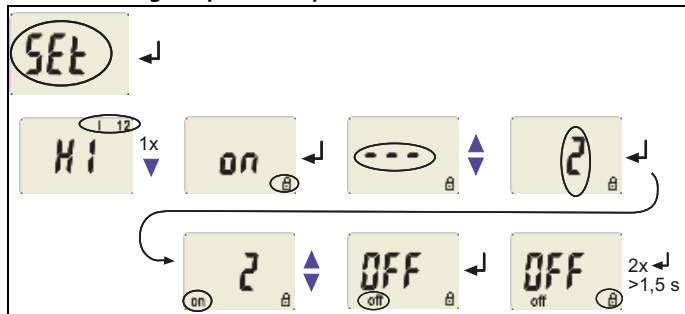
a) Activating the password protection



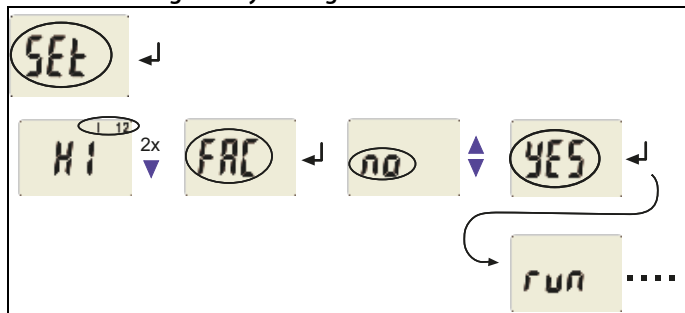
b) Changing the password



c) Deactivating the password protection

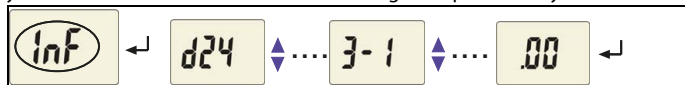


5.5.11 Restoring factory settings



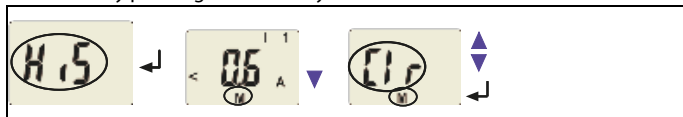
5.5.12 Device information query (Example)

This function is used to query the software (1.xx) version. After activating this function, data will be displayed as a scrolling text. Once one pass is completed you can select individual data sections using the Up/Down keys.



5.5.13 History memory query

The history memory can be selected via the menu HiS. Use the Up and Down keys to view the next display. If Clr and M is flashing, the history memory can be cleared by pressing the Enter key.



5.6 Commissioning

Prior to commissioning, check proper connection of the residual current monitor.

5.7 Factory setting



Response value $I_{\Delta n2}$:	30 mA (I2)
Response value $I_{\Delta n1}$:	50 % (I1)
Hysteresis:	15 %
Fault memory M:	activated
100% reference related to the analogue interface:	Response value I2
start-up delay:	$t = 0.5$ s
Password:	0, deactivated (Off)

5.8 Error codes

Should, contrary to all expectations, a device error occur, error codes will appear on the display. Typical error codes are described below:

Error code	Meaning
E.01	Fault CT connection monitoring Appropriate action: Check CT connection for short-circuit or interruption. After eliminating the fault, the error code will be automatically deleted.
E.02	Fault CT connection monitoring during manual self test. Appropriate action: Check CT connection for short-circuit or interruption. After eliminating the fault and anew self-test or anew device start and anew self-test or anew device start, the error code will be automatically deleted.
E...	Error codes > 02 occurs: Appropriate action: Carry out a reset. Reset the device to factory setting. After eliminating the fault, the error code will be automatically deleted. If the fault continues to exist, please contact the Bender Service.

6. Technical data

6.1 Data in tabular form

()* = factory setting

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

RCMA420-DM-D-1:

Rated insulation voltage	100 V
Overtoltage category/ pollution degree.....	III/3
Rated impulse voltage	2,5 kV

RCMA420-DM-D-2:

Rated insulation voltage	250 V
Overtoltage category/ pollution degree.....	III/3
Rated impulse voltage.....	4 kV

Supply voltage

RCMA420-DM-D-1:

Supply voltage range U_s	AC 24...60 V, DC 24...78 V
Operating range U_s	AC 16...72 V / DC 9.6...94 V
Frequency range U_s	DC, 42...460 Hz

RCMA420-DM-D-2:

Supply voltage range U_s	AC/DC 100...250 V
Operating range U_s	AC/DC 70...300 V
Frequency range U_s	42...460 Hz

Protective separation (reinforced insulation) between..... (A1, A2) - (k/l, T/R) - (M+, μ A, V)

Voltage test according to IEC 61010-1

.....	2.21 kV
-------	---------

Power consumption

.....	$\leq 6,5$ VA
-------	---------------

CT circuit

External measuring current transformer

.....	W20AB, W35AB(P), W60AB(P) series
-------	----------------------------------

Rated insulation voltage (measuring current transformer)

.....	800 V
-------	-------

Operating characteristic acc. to IEC 62020 and IEC/TR 60755

.....	Type B
-------	--------

Frequency range

.....	0...2000 Hz
-------	-------------

Measuring range AC

.....	3 mA...1.5 A
-------	--------------

Measuring range DC	3 ... 600 mA
Relative uncertainty (overcurrent) for $f \leq 2 \text{ Hz}$ or $\geq 16 \text{ Hz}$	0 ... -35 %
Relative uncertainty (overcurrent) for $f > 2 \text{ Hz}$... $< 16 \text{ Hz}$	-35 % ... +100 %
Relative uncertainty (undercurrent) for $f \leq 2 \text{ Hz}$ or $\geq 16 \text{ Hz}$	0 ... -35 %
Relative uncertainty (undercurrent) for $f > 2 \text{ Hz}$... $< 16 \text{ Hz}$	-35 % ... +100 %
Operating uncertainty	0 ... 35 %

Response values

Rated residual operating current $I_{\Delta n1}$ (prewarning, AL1)	50 ... 100 % $\times I_{\Delta n2}$, (50 %)*
Rated residual operating current $I_{\Delta n2}$ (Alarm, AL2)	AC / DC 10 mA ... 500 mA (30 mA)*
Hysteresis	10 ... 25 % (15%)*

Specified time

start-up delay t	0 ... 10 s (0.5 s)*
--------------------------	---------------------

Displays, memory

Display range, measured value AC	0 ... 1.5 A
Display range, measured value DC	0 ... 600 mA
Error of indication	$\pm 17.5 \%$ / ± 2 digit
Measured-value memory for alarm value	data record measured values
Password	off / 0 ... 999 (off)*
Fault memory	on / off (on)*

Cable lengths for measuring current transformers

Connection WX ... (see ordering information on page 39)	1 m / 2.5 m / 5 m / 10 m
or alternatively: single wire $6 \times 0.75 \text{ mm}^2$	0 ... 10 m

Inputs/outputs

Cable length for external test / reset button	0 ... 10 m
Voltage output:	
No-load voltage (terminals open)	\leq DC 20 V
Voltage output	DC 0 ... 10 V
Load	$\geq 1 \text{ k}\Omega$
Resolution	50 mV
Actuating time $1 \times I_{\Delta n}$	$> 1,8 \text{ s}$
Actuating time $5 \times I_{\Delta n}$	$> 360 \text{ ms}$

Current outputs:

Short-circuit current ≤ 30 mA, short-circuit proof

Current output **DC 0/4...20 mA**

Load $\leq 500 \Omega$

Resolution 0,1 mA

Actuating time $1 \times I_{\Delta n}$ $> 1,8$ s

Actuating time $5 \times I_{\Delta n}$ > 360 ms

Current output **DC 0...400 μ A**

Load $\leq 12,5$ k Ω

Resolution 2 μ A

Actuating time $1 \times I_{\Delta n}$ $> 1,8$ s

Actuating time $5 \times I_{\Delta n}$ > 360 ms

Environment / EMC

EMC IEC 62020

Operating temperature -25 °C ... $+55$ °C

Classification of climatic conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3) 3K5 (except condensation and formation of ice)

Transportation (IEC 60721-3-2) 2K3 (except condensation and formation of ice)

Storage (IEC 60721-3-1) 1K4 (except condensation and formation of ice)

Classification of mechanical conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3) 3M4

Transportation (IEC 60721-3-2) 2M2

Storage (IEC 60721-3-1) 1M3

Connection

For UL application use 60/70 °C copper conductors only

Connection type **screw-type terminals**

Connection properties:

rigid/ flexible/ conductor sizes 0.2...4/0.2...2.5 mm² / AWG 24...12

Multi-conductor connection (2 conductors with the same cross section):

rigid, flexible 0.2...1.5/0.2...1.5 mm²

Stripping length 8...9 mm

Tightening torque 0.5...0.6 Nm

Connection type	push-wire terminals
Connection properties:	
Rigid	0.2 .. 2.5 mm ² (AWG 24 .. 14)
Flexible without ferrules	0.75 .. 2.5 mm ² (AWG 19 .. 14)
Flexible with ferrules	0.2 .. 1.5 mm ² (AWG 24 .. 16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

Other

Operating mode continuous operation

Mounting position	display oriented
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP20
Enclosure material	polycarbonate
Flammability class	UL94 V-0
DIN rail mounting acc. to	IEC 60715
Screw fixing	2 x M4 with mounting clip
Software version	D242 V1.2x
Weight	≤ 160 g

() * = factory setting

6.2 Standards, approvals and certifications



6.3 Ordering information

	RCMA420-DM-1	RCMA420-DM-2
Response range $I_{\Delta n}$	10...500 mA	10...500 mA
Rated frequency	0...2000 Hz	0...2000 Hz
Supply voltage U_s^*	DC 9.6 V...94 V / AC 42...460 Hz, 16...72 V	DC 70...300 V / AC 42...460 Hz, 70...300 V
Art. No. : (B 7... = push-wire terminal)	B 7404 3003 B 9404 3003	B 7404 3008 B 9404 3008
*Absolute values of the voltage range		

External measuring current transformers

Type	Inside diameter (mm)	Residual operating current ranges	Art. No.
W20AB	20	10...500 mA	B 9808 0008
W35AB	35	30...500 mA	B 9808 0016
W35ABP	35		B 9808 0051
W60AB	60		B 9808 0026
W60ABP	60		B 9808 0052

Measuring current transformer connecting cable

Type	Length (m)	Art. No.
WX100	1	B 9808 0503
WX250	2,5	B 9808 0504
WX500	5	B 9808 0505
WX1000	10	B 9808 0506

Accessories RCMA420-DM

Mounting clip for screw fixing (1 piece per device) B 9806 0008

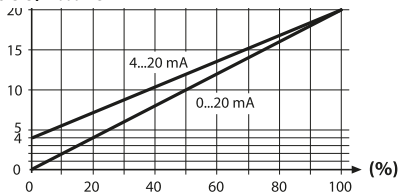
Accessories measuring current transformers

Snap-on mounting for DIN rail: W20AB /W35AB(P)B 9808 0501

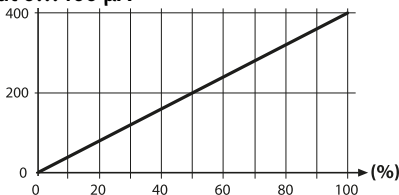
Snap-on mounting for DIN rail: W60AB(P)B 9808 0502

6.4 Current and voltage curves of the analogue interface

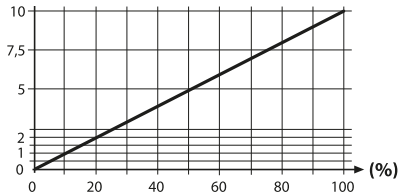
Current output 0/4...20 mA



Current output 0...400 μ A



Current output 0...10 V



INDEX

A

- Adjustable parameters, list 23
- Automatic self test 16

D

- Deleting the fault alarms 22
- Device features 15
- Display elements in use 21
- Display in standard mode 24

E

- ENTER key 22
- Error codes 40
- Example of parameter setting 26

F

- Factory setting 17, 33
- Function 15
- Functional faults 16

H

- How to use this manual 7

I

- Installation and connection 19
- Intended use 14
- Interface options 18

L

- LED Alarm 1 lights 22
- LED Alarm 2 lights 22

M

- Manual self test 16
- Menu
 - AL (response values) 23
 - HiS (history memory for the first alarm value) 23
 - InF (hard and software version) 23
 - out (output control) 23
 - Set (device control) 23
 - t (timing check) 23
- Menu structure, overview 23

O

- Operating elements, function 22
- Operation and setting 21
- Ordering information 39

P

- Parameter query and setting, overview 24
- Parameter setting
 - Activating or deactivating the password protection 31
 - Changeover from overcurrent operation to window operation 30
 - Select output voltage range of the

- analogue interface 28
- Selecting the output current range of the analogue interface 28
- Set response values 27
- Setting the time delays 30

Password protection 17

R

Reset button 22

Residual current monitoring in window discriminator mode 17

Response delay ton 17

S

Select analogue interface, 28

Select the appropriate parameter for response values

- 25

Service 8

Set response values

- Hysteresis 27
- Overcurrent ($> I$) 27

Set the analogue interface 29

Starting delay t 17

Starting the menu mode 22

Support 8

T

Technical data 35

Test button 22

Training courses 10

W

Window operation 30

Wiring diagram 20

Work activities on electrical installations 13
workshops 10



Bender GmbH & Co. KG

P.O. Box 1161 • 35301 Gruenberg • Germany
Londorfer Strasse 65 • 35305 Gruenberg • Germany
Tel.: +49 6401 807-0 • Fax: +49 6401 807-259
E-Mail: info@bender.de • www.bender.de

Photos: Bender archives



BENDER Group