



EN Manual

CMD420-DM

CMD421-DM



Current monitoring device with analogue output signal for monitoring of 3AC currents with current transformer for overcurrent **or** undercurrent

or in window mode for overcurrent **and** undercurrent

Software version CMD420-DM: D287 V1.1x

Software version CMD421-DM: D294 V1.1x



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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)
Fax: +49 6401 807-784**, -785** (sales)
E-mail: +49 6401 807-789
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 0 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 current monitoring device CMD420-DM resp. CMD421-DM monitors three-phase or also three different single-phase AC systems for undercurrent **or** overcurrent, undercurrent **and** overcurrent with window discriminator function. For current measurement, three external standard current transformers are to be connected according to the wiring diagram. The transformation ratio ($n = x/1 \text{ A}$ resp. $n = x/5 \text{ A}$) can be set in the range from 1...2000.

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.

2.4 Information about factory setting

Page 24 provides a summary of all factory settings.

For resetting the current monitoring device to its factory setting, refer to page 39.

3. Function

3.1 Device features

- Undercurrent and overcurrent monitoring in AC systems, current monitoring with window discriminator function
- Current monitoring using standard current transformers:
x/ 1 A (CMD420-DM), x/ 5 A (CMD421-DM)
- 1 analogue output signal available as standardised current or voltage
- Digital measured value display via multi-functional LC display
- LEDs: Power On (ON), Alarm 1 (AL1) and Alarm 2 (AL2)
- Fault memory behaviour for alarm LEDs selectable
- Adjustable start-up delay
- Adjustable hysteresis for response value
- r.m.s. value measurement AC
- History memory for the operating value
- Cyclical self test
- Internal test and reset button
- Password protection to prevent unauthorised changes being made to device settings
- Sealable transparent cover
- Available with screw-type or push-wire terminals

3.2 Description of function

Once the supply voltage is applied, the start-up delay begins. Measured current values changing during this time do not influence the alarm LEDs. The devices provide two separately adjustable response values (overcurrent/undercurrent). If the measured quantity exceeds (Alarm 1) or falls below (Alarm 2) the response value, such as is the case with window discriminator function, the two alarm LEDs will light up. When the measured value exceeds

or falls below the release value (response value plus hysteresis), the alarm LEDs go out. With the fault memory activated, the alarm relays do not change their actual state until the reset button R is pressed.

3.2.1 Window discriminator function

This operating can be used to monitor the measured current for two response values overcurrent and undercurrent.

This operating mode (In) can be selected from the SEt menu.

Changing the operating mode of the current monitoring device, overcurrent mode (Hi), undercurrent mode (Lo) or window mode (In) changes the meaning of the alarm LEDs AL1 and AL2:

Communication mode	LED lights	Meaning
Hi	AL1	Prewarning overcurrent (>I)
	AL2	Alarm overcurrent (>I)
Lo	AL1	Prewarning undercurrent (<I)
	AL2	Alarm undercurrent (<I)
In	AL1	Alarm undercurrent (<I)
	AL2	Alarm overcurrent (>I)

3.2.2 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.

3.2.3 Manual self test

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. The alarm LEDs are checked during this test. While holding down the test button T, all device-relevant display elements appear on the display.

3.2.4 Malfunction

In the event of an internal malfunction, all three LEDs will flash. The error code (E01...E32) will appear on the display. In such a case please contact the Bender Service.

3.2.5 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.

3.2.6 Erasable history memory

The first alarm value to occur is written to this memory. The memory can be erased via the HiS menu.

3.2.7 Start-up delay t

After connection to the supply voltage, the LED alarm indication is delayed by the preset time t (0...300 s). The analogue output value will be outputted without a delay.

3.2.8 Analogue voltage or current output (option M)

The device provides an analogue interface with galvanic isolation, but does not provide an alarm relay. One of three output signals can be selected from the "out" menu. A certain output is permanently assigned to the signal selected from the menu, only this output may be wired:

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

For wiring details refer to the wiring diagram on page 22.

3.2.9 Menu item AnA for interface configuration

Display	Measured variable	100-% value
CMD420-DM		
> L1L2L3 0.30 A	maximum current from L1,L2 or L3	adjustable from 0.1...1 A x n
< L1L2L3 0.30 A	minimum current from L1,L2 or L3	adjustable from 0.1...1 A x n
L1 0.30 A	Current L1	adjustable from 0.1...1 A x n
L2 0.30 A	Current L2	adjustable from 0.1...1 A x n
L3 0.30 A	Current L3	adjustable from 0.1...1 A x n
> L1L2L3 I2 AL	maximum current from L1,L2 or L3	Response value I2
> L1 I2 AL	Current L1	Response value I2
> L2 I2 AL	Current L2	Response value I2
> L3 I2 AL	Current L3	Response value I2
CMD421-DM		
> L1L2L3 1.50 A	highest current from L1,L2 or L3	adjustable from 0.5...5 A x n
< L1L2L3 1.50 A	lowest current from L1,L2 or L3	adjustable from 0.5...5 A x n
L1 1.50 A	Current L1	adjustable from 0.5...5 A x n
L2 1.50 A	Current L2	adjustable from 0.5...5 A x n
L3 1.50 A	Current L3	adjustable from 0.5...5 A x n
> L1L2L3 I2 AL	highest current from L1,L2 or L3	Response value I2
> L1 I2 AL	Current L1	Response value I2
> L2 I2 AL	Current L2	Response value I2
> L3 I2 AL	Current L3	Response value I2

The menu item "AnA" is used to configure the 100-% value of the analogue interface. The 100-% value of the output current resp. the output voltage can

either be set within the response value range listed in the table or can be set in relation to the response value I2.

The column "Display" in the table above shows the phase-related measurement possibilities. In the column "measuring quantity" the displays are explained. The column "100-% value" shows details about the setting range or configuration in relation to the response value.

The setting of the analogue interface via the menu is described from page 35 onwards.

3.2.10 Password protection (on, OFF)

With the password protection activated (on), settings can only be made subject to the correct password being entered (0...999).

3.2.11 Factory setting FAC

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

3.2.12 Transformation ratio of the current transformers

The transformation ratio for the current transformers has to be set as factor n in the menu "Set".

CMD420-DM requires current transformers with a transformation ratio of $n = x/1A$.

CMD421-DM requires current transformers with a transformation ratio of $n = x/5A$.

The actual primary current can be calculated by multiplying the measured current by factor n and indicated on the display.

Transformation ratio		Resolution of the display
Factor n	Resolution of the settings	
1...9	1	0,01 A
10...99	1	00.1 A
100...990	10	001 A
1.00...2.00 k	0.05 k	0.01 kA

In addition, the set factor n directly affects the minimum and maximum adjustable response values in the alarm menu. The factor is the multiplier of the nominal response range!

Adjustable response value = nominal response range x factor n

If the calculation of the adjustable response value results in a value of more than three digits, the first three digits indicated are not rounded.

Factor n	Response value range CMD420-DM	
	min.	max.
1...9	0.10...1.00 A	0.90...9.00 A
10...99	1.0...10.0 A	9.90...99.0 A
100...990	10...100 A	99.0...990 A
1.00...2.00 k	0.10...1.00 kA	0.20...2.00 kA

Factor n	Response value range CMD421-DM	
	min.	max.
1...9	0.50...5.00 A	4.50...45.0 A
10...99	5.0...50.0 A	49.5...495 A
100...990	50...500 A	495 A...4.95 kA
1.00...2.00 k	0.50...5.00 kA	1.00...10.0 kA

The resolution of the adjustable response range is calculated as follows:

Resolution of setting thresholds = factor n / 100

4. Installation, connection and commissioning



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.

4.1 Installing the device

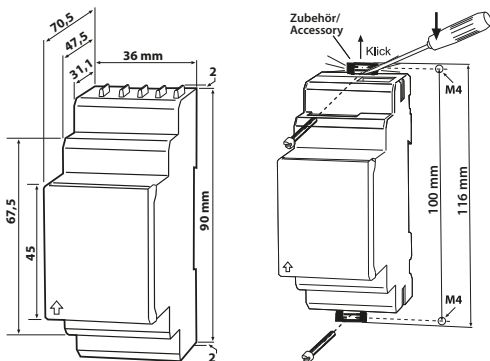


Fig. 4.1: Dimension diagram and drawing for screw fixing

Mounting on DIN rail:

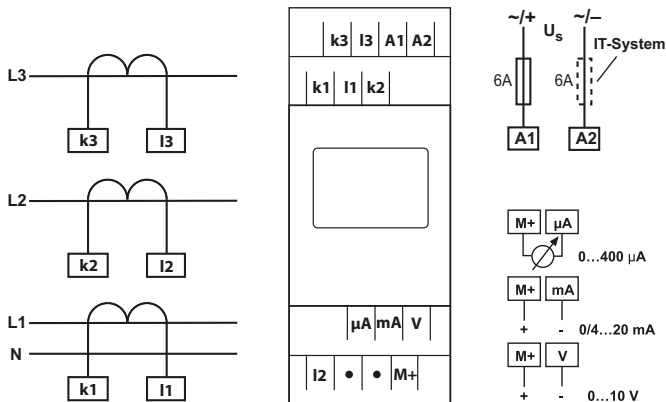
Snap the rear mounting clip of the device into place in such a way that a safe and tight fit is ensured.

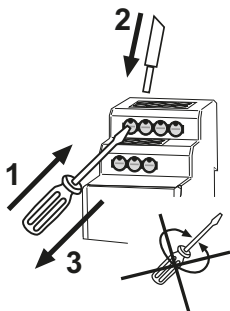
Screw fixing:

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

4.2 Connection of the device

Connect the device according the wiring diagram.





Connect the conductor to the push-wire terminals according to the schematic diagram.

Terminal	Connections
A1, A2	Connection to supply voltage
k1, I1 k2, I2 k3, I3	Connection to the conductors to be monitored using current transformers
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

4.3 Commissioning

Checks must be carried out prior to commissioning to ensure that the current monitoring device has been connected correctly. Then perform a functional test.



CAUTION

Incorrect connections can lead to personal injury and damage to equipment or property!



The maximum permissible measuring current and the overload capability of the measuring inputs k, I have to be taken into consideration!

4.4 Factory setting



CMD420-DM

<i>Response value overcurrent I1 (prewarning)</i>	0.15 A (50 % of I2)
<i>Response value overcurrent I2 (alarm)</i>	0.30 A
<i>100-% value of the analogue output</i>	$I > 0.30 \text{ A}$

CMD421-DM

<i>Response value overcurrent I1 (prewarning)</i>	0.75 A (50 % of I2)
<i>Response value overcurrent I2 (alarm)</i>	1.50 A
<i>100-% value of the analogue output</i>	$I > 1.50 \text{ A}$

CMD420-DM / CMD421-DM

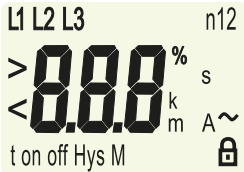

<i>Hysteresis:</i>	15 %
<i>Fault memory M:</i>	activated (on)
<i>Analogue interface type</i>	0...20 mA
<i>Start-up delay:</i>	$t = 0.5 \text{ s}$
<i>Monitoring function:</i>	Overcurrent (HI)
<i>Transformation ratio n</i>	1
<i>Password:</i>	0, deactivated (Off)

4.5 Maintenance

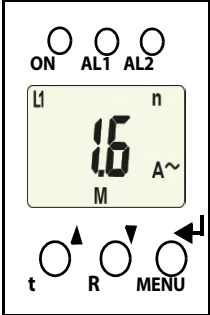
A functional test is recommended to be carried out at regular intervals. It is preferable to check correct alarm indication by means of a current fault. Also check that the terminal connections are mechanically secure.

5. Operation and configuration

5.1 Display elements in use

Display elements in use	Element	Mode
	L1, L2, L3	Values of the measurement inputs k1/I1, k2/I2, k3/I3
	n	Transformation ratio factor for external current transformer
	< I12 > I12	Undercurrent I1 or I2 Overcurrent I1 or I2
	t	Start-up delay t
	I Hys %, Hys	Response value hysteresis in %; Hys in standard mode: Measured value in the hysteresis range according to alarm
	M	Fault memory active
		Password protection enabled


5.2 Function of the operating elements

Device front	Element	Mode
	ON	Power On LED, green
	AL1	LED Alarm 1 lit up (yellow): Response value 1 reached
	AL2	LED Alarm 2 lit up (yellow): Response value 2 reached
	n 1.6 A M	Transformation ratio $n > 1$; $I = 1.6 \text{ A}$ = value across the measure- ment input $k1/I1$; Fault memory active
	t	Test button ($> 1.5 \text{ s}$): to indicate the display elements in use, to start a self test;
	▲	Up button ($< 1.5 \text{ s}$): Menu items/values
	R ▼	Reset button ($> 1.5 \text{ s}$): Deleting the fault memory; Down button ($< 1.5 \text{ s}$): Menu items/values
MENU ◀	MENU button ($> 1.5 \text{ s}$): Starting the menu mode; Enter button ($< 1.5 \text{ s}$): Confirm menu item, submenu item and value. Enter button ($> 1.5 \text{ s}$): Move to the next higher menu level (back)	

5.3 Menu structure

All adjustable parameters are listed in the columns "Menu" and "Adjustable parameters". A display-like representation is used to illustrate the parameters in the column Menus. The 100-% value of the analogue output can be changed in the submenu AnA. The different functions of the analogue output are to be activated or deactivated.

Menu	Sub Menu	Menu item	Activation	Adjustable parameter
AL (response values)	→	> I2	(HI)	Overcurrent (alarm)
		> I1	(HI)	Overcurrent (prewarning)
		I Hys		Hysteresis < I21, > I21
out (output control)	→	M	ON	Fault memory
		I, U	-	Select current or voltage output
	AnA Analogue outp.: 100% reference	>I <I (Lx)	ON	100% reference related to the user-defined current value (phase-dependent, see table on page 18)
		> I2 AL (Lx)	off	100% reference related to response value I2 (Alarm 2) (phase-dependent, see table on page 18)
t (timing check)	→	t	-	Start-up delay

Menu	Sub Menu	Menu item	Activation	Adjustable parameter
Set (device control)	→	I 12	HI	Selectable parameters: Hi= overcurrent, In = window function, Lo = undercurrent
		n	1	Transformation ratio factor external current transformer
			off	Set parameters via password
		FAC	-	Factory setting visual inspection
		SYS	-	Function locked
InF	→		-	Display software version
HiS	→	Clr	-	History memory for the first alarm value, erasable

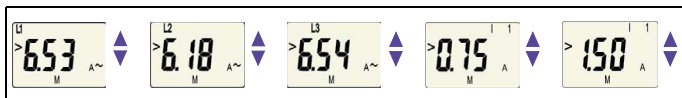
5.4 Display in standard mode

By default, the currently measured current of measuring channel L1 is displayed. By pressing the Down button the following values can be queried consecutively:

- Current of measuring channel L2
- Current of measuring channel L3
- Response value I1 (prewarning)
- Response value I2 (alarm)

Pressing the Up button shows the corresponding values in the reverse order.

You can also press the Enter button to return from the response value display to the measured value display.

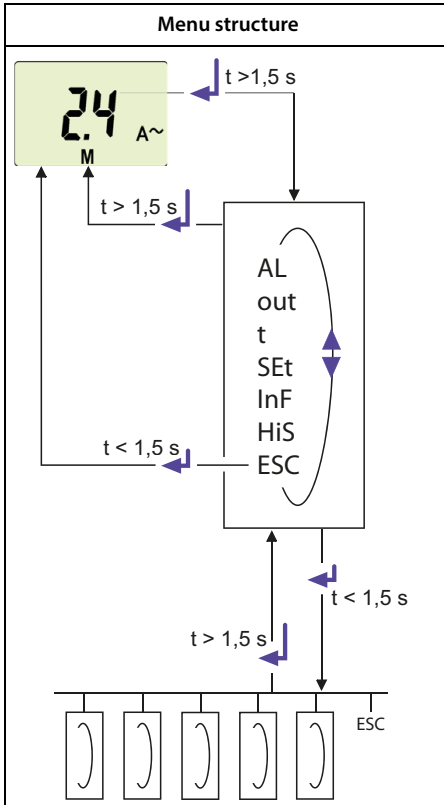


In the standard mode, the currently set measured values and response values can be displayed using the Up and Down buttons.

5.5 Display in menu mode

5.5.1 Parameter query and setting: overview

Menu item	Adjustable parameter
AL	Response value query and setting: <ul style="list-style-type: none"> – Alarm I2 (AL2), (undercurrent, overcurrent or window function can be set in the SEt/I menu) – Prewarning I1 (AL1), (X % of I2) – Specify the hysteresis of the response values: Hys I12
out	Configure the fault memory and the alarm relays: <ul style="list-style-type: none"> – Activate/deactivate the fault memory or select con mode – Select output signal (I/U) – Select 100% reference related to the output signal (AnA)
t	<ul style="list-style-type: none"> – Start-up delay t
Set	Set parameters for device control: <ul style="list-style-type: none"> – Select the appropriate parameter for response values: overcurrent (HI), undercurrent (Lo) or window function (In) – Set the transformation ratio (n) for the current transformer – Activate or deactivate password protection, change password – Restore factory settings – Service menu SyS blocked
InF	Query software version
HiS	Query the alarm value saved first
ESC	Go to the next highest menu level (back)



Parameter settings

An example is given below on how to change the alarm response value for overcurrent > I1. It is presumed that the option overcurrent (HI) has been selected in the SEt/I menu (factory setting). Proceed as follows:

1. Keep the "MENU / Enter" button pressed 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 appears.
3. Use the Down button to select the parameter response value I1. The parameter I1 flashes, in addition the associated percentage value for prewarning of I2 appears.
4. Confirm with Enter. The current value for prewarning appears on the flashing display.
5. Use the Up or Down button to set the appropriate prewarning value. Confirm with Enter. I1 flashes.
6. You can exit the menu by:
 - pressing the Enter button 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 of the display which can be configured are flashing! These segments are highlighted by an oval in the illustrations below. Press and hold down the "MENU button" > 1.5 s to enter menu mode.

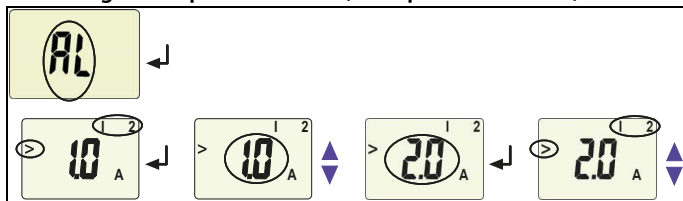
5.5.2 Changeover from overcurrent to undercurrent mode or to window mode

The operating mode can be set in the SEt/I12 menu using the parameters HI, Lo and In. By default, overcurrent operation (HI) is set. Refer to page 36 for a detailed description on how to change over to the window mode.

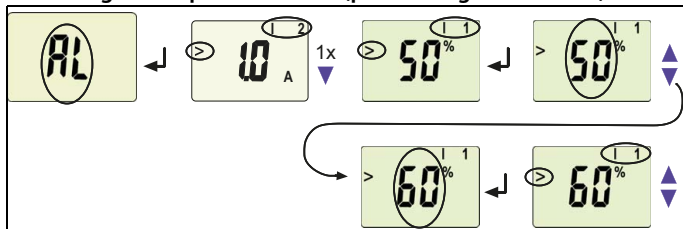
5.5.3 Response value setting for overcurrent:

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

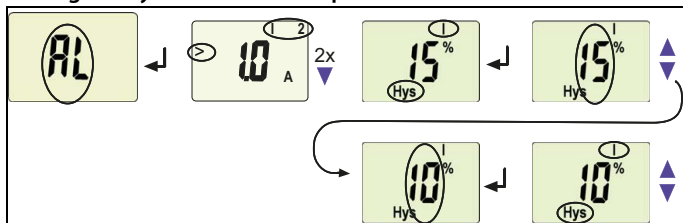
Increasing the response value I2 (Example: overcurrent)



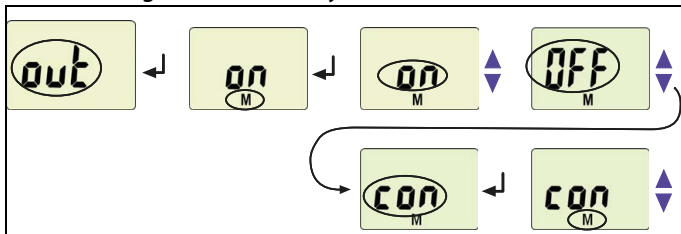
Increasing the response value I1 (prewarning overcurrent)



Setting the hysteresis of the response value

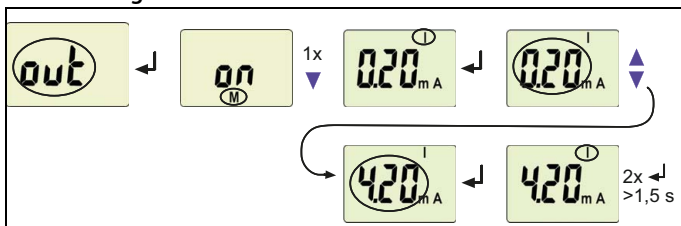


5.5.4 Setting the fault memory to con mode

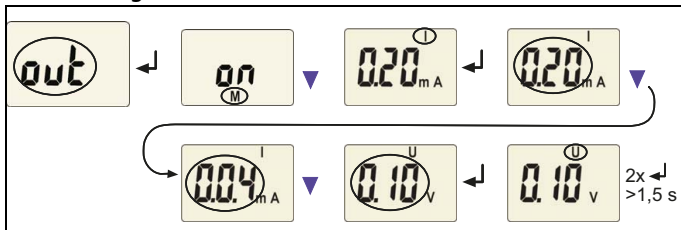


5.5.5 Selecting the type of analogue interface

Select analogue interface I = 4...20 mA



Select analogue interface U = 0...10 V



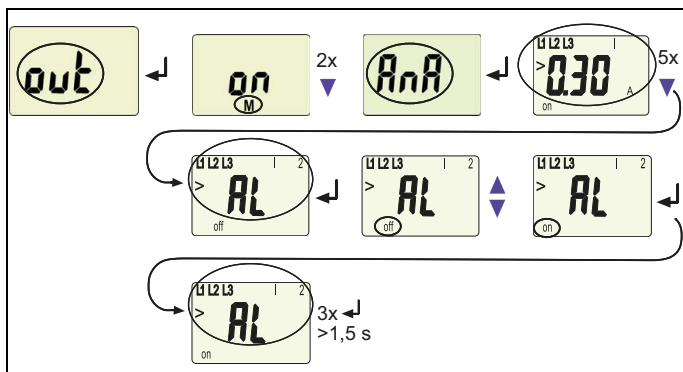
5.5.6 Set the 100-% reference for the analogue interface

Set here whether the 100% value of the output signal is to be related to the response value I2 () (AL) or to a freely configurable value.

Factory setting = value related to the highest freely configurable current of L1, L2 or L3 with 0.30 A (CMD420-DM) resp. 1.5 A (CMD421-DM).

The freely configurable values for CMD420-DM are between 0.1 and 1 A, for CMD421-DM between 0.5 and 5 A.

The following example shows how the 100%-reference value is changed from the freely configurable highest current value, predefined for L1, L2 or L3 to response value AL.

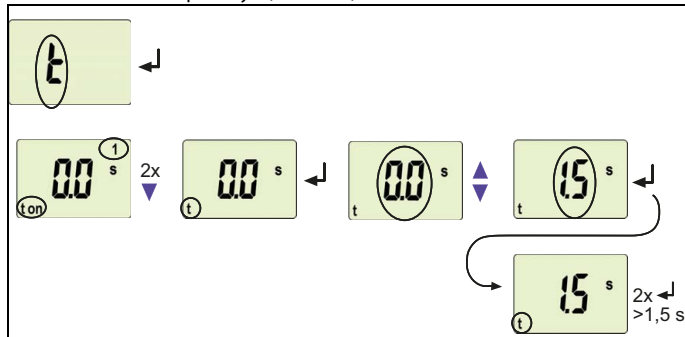


By activating (on) the menu item "> L1L2L3 I2 AL", the previously activated menu item "> L1L2L3 I 0.30 A" will automatically be deactivated.

For additional information, refer to "Chapter 3.2.9 Menu item AnA for interface configuration".

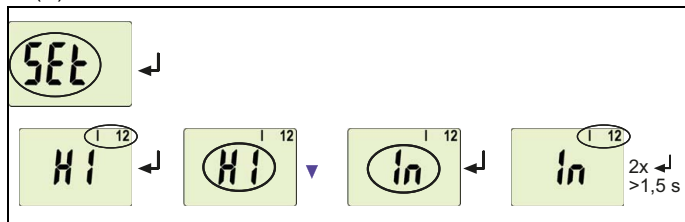
5.5.7 Setting the start-up delay t

You can set a start-up delay t (0...300 s) for device start.

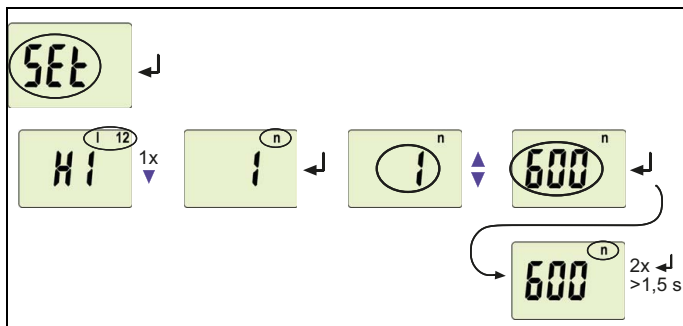


5.5.8 Changing from overcurrent operation to window operation

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.



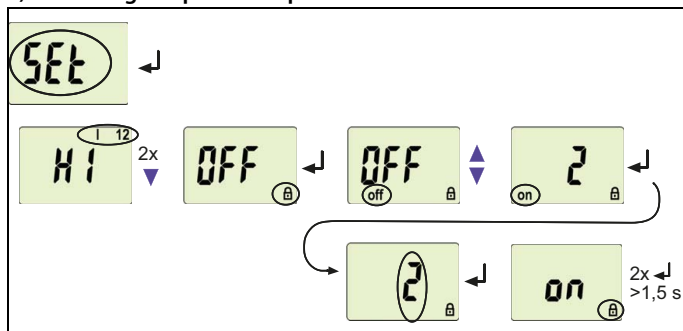
5.5.9 Setting the transformation ratio for external current transformer



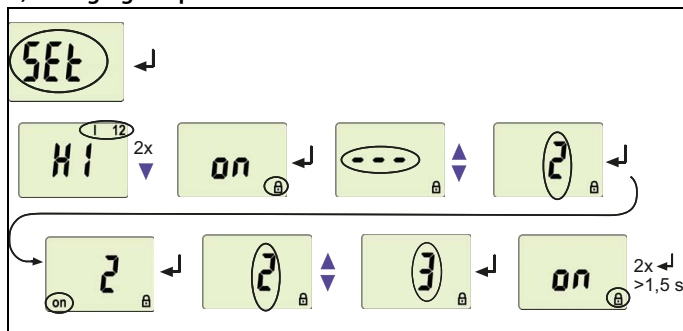
5.5.10 Factory setting and password protection

This menu can be used to activate password protection, to modify the password or to deactivate password protection. It is also where the device can be reset to the factory settings.

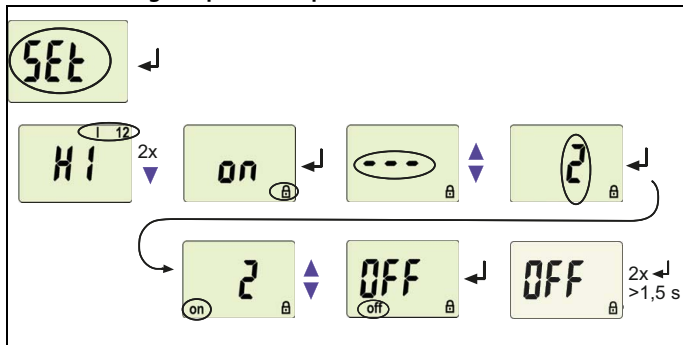
a) Activating the password protection



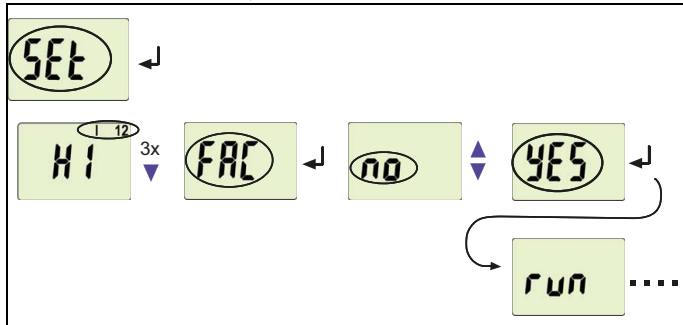
b) Changing the password



c) Deactivating the password protection

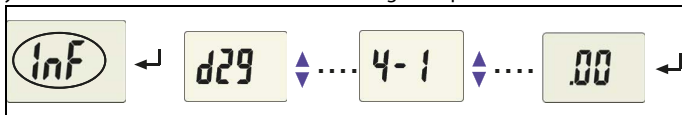


5.5.11 Restoring factory settings



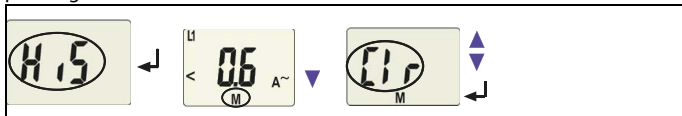
5.5.12 Device information query

This function is used to query the software version (1.xx). 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 buttons.



5.5.13 History memory query

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



6. Technical data

6.1 Data in tabular form

()* = factory setting

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

Rated insulation voltage.....	AC 250 V
Rated impulse voltage/pollution degree	6 kV / III
Protective separation (reinforced insulation) between.....	(A1, A2) - (M+, μ A, mA, V)
Voltage test acc. to IEC 61010-1	3.536 kV
.....
Rated insulation voltage.....	AC 250 V
Rated impulse voltage/pollution degree	4 kV / III
Basic insulation between:.....	(k1, I1, k2, I2, k3, I3) - (A1, A2), (M+, μ A, mA, V)
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

CMD420-DM-D-1, CMD421-DM-D-1:
Supply voltage U_s	AC 16...72 V / DC 9.6...94 V
Frequency range U_s	15...460 Hz
CMD420-DM-D-2, CMD421-DM-D-2:
Supply voltage U_s	AC / DC 70...300 V
Frequency range U_s	15...460 Hz
Power consumption	\leq 4 VA

Measuring circuit CMD420-DM

Nominal measuring range (r.m.s. value) $n = 1$	AC 0...1 A
Overload capability, continuous.....	2 A
Overload capability < 5 s	5 A
Load per measuring input	50 m Ω
Rated frequency f_n	42...460 Hz

Response values CMD420-DM

Undercurrent $I_{Lo} < I$ (Alarm 2) $n = 1$	AC 0.1 ... 1 A (0.3 A)*
Undercurrent $I_{Lo} < I$ (Alarm 1) $n = 1$	100 ... 200 % (150 %)*
.....	Take a maximum nominal current of 1 A into consideration!
Overcurrent $I_{Hi} > I$ (Alarm 2) $n = 1$	AC 0.1 ... 1 A (0.3 A)* (Hi)*
Overcurrent $I_{Hi} > I$ (Alarm 1) $n = 1$	50 ... 100 % (50 %)* (Hi)*
Window $I_{In} > I$ (Alarm 2) $n = 1$	AC 0.1 ... 1 A (0.3 A)*
Window $I_{In} < I$ (Alarm 1) $n = 1$	50 ... 100 % (50 %)*
External current transformer	x/1 A
Transformation ratio factor n	1 ... 2000 (1)*
Relative uncertainty in the range 42 ... 460 Hz	± 5 %, ± 2 digits
Hysteresis	3 ... 40 % (15 %)*

Measuring circuit CMD421-DM

Nominal measuring range (r.m.s. value)	AC 0 ... 5 A
Overload capability, continuous	7.5 A
Overload capability < 5 s	for screw-type terminal connection 20 A
.....	for push-wire terminal connection 12 A
Load per measuring input	3 m Ω
Rated frequency f_n	42 ... 460 Hz

Response values CMD421-DM

Undercurrent $I_{Lo} < I$ (Alarm 2) $n = 1$	AC 0.5 ... 5 A (1.5 A)*
Undercurrent $I_{Lo} < I$ (Alarm 1) $n = 1$	100 ... 200 % (150 %)*
.....	Take a maximum nominal current of 5 A into consideration!
Overcurrent $I_{Hi} > I$ (Alarm 2) $n = 1$	AC 0.5 ... 5 A (1.5 A)* (Hi)*
Overcurrent $I_{Hi} > I$ (Alarm 1) $n = 1$	50 ... 100 % (50 %)* (Hi)*
Window $I_{In} > I$ (Alarm 2) $n = 1$	AC 0.5 ... 5 A (1.5 A)*
Window $I_{In} < I$ (Alarm 1) $n = 1$	50 ... 100 % (50 %)*
External current transformer	x/5 A
Transformation ratio n	1 ... 2000 (1)*
Relative uncertainty in the range 42 ... 460 Hz	± 5 %, ± 2 digits
Hysteresis	3 ... 40 % (15 %)*

Time response

Start-up delay t_{start}	0...300 s (0.5 s)*
Resolution of setting t (0...10 s)	0.1 s
Resolution of setting t (10...99 s)	1 s
Resolution of setting t (100...300 s)	10 s
Operating time t_{ae}	≤ 130 ms
Response time t_{an}	$t_{\text{an}} = t_{\text{ae}}$
Device release time t_{re}	≤ 135 ms
Release time t_{off}	$t_{\text{off}} = t_{\text{re}}$
Recovery time t_{b}	≤ 300 ms

Displays, memory

Display	LC display, multifunctional, not illuminated
Display range, measured value (r.m.s. value) x transformation ratio n	CMD420: AC 0...1 A x n
.....	CMD421-DM: AC 0...5 A x n
Operating uncertainty in the range 42...460 Hz	±5 %, ±2 digits
Measured-value memory (HiS) for the first alarm value	data record measured values
Password	on/off / 0...999 (OFF)*
Fault memory (M) alarm LEDs	on/off/con (on)*

Outputs, analogue

Voltage output:

Open circuit voltage (terminals open)	≤ DC 20 V
Voltage output	DC 0...10 V
Load	≥ 1 kΩ

Current outputs:

Short-circuit current	≤ 30 mA, short-circuit proof
Current output	DC 0/4...20 mA
Load	≤ 500 Ω
Current output	DC 0...400 μA
Load	≤ 12.5 kΩ
Tolerance of the analogue outputs	±10 %

Environment/EMC

EMC.....	IEC 61326-1
Operating temperature	-25...+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

Connection type.....	screw-type terminals
Connection properties:.....	
rigid / flexible	0.2...4 / 0.2...2.5 mm ² (AWG 24...12)
Multi-conductor connection (2 conductors with the same cross section):	
rigid / flexible	0.2...1.5 / 0.2...1.5 mm ² (AWG 24...16)
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

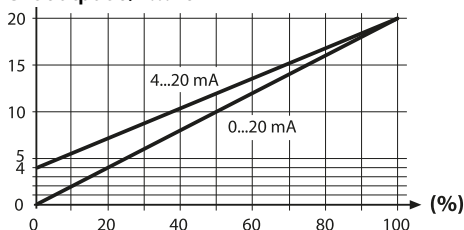
Operating mode	continuous operation
Position.....	any position
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
Flammability class	UL94 V-0

DIN rail mounting acc. to.....	IEC 60715
Screw fixing	2 x M4 with mounting clip
Software version CMD420-DM	D287 V1.1x
Software version CMD421-DM	D294 V1.1x
Weight	≤ 150 g

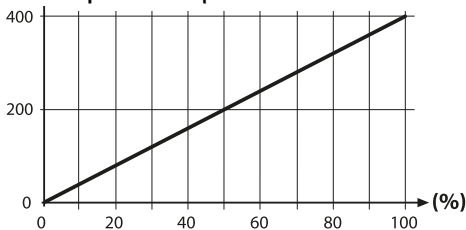
()* = factory setting

6.2 Current and voltage curves of the analogue interface

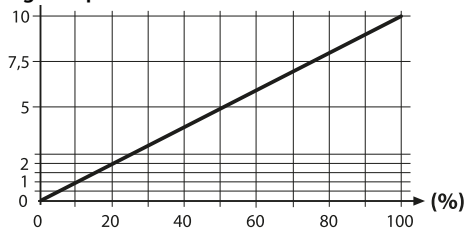
Current output 0/4...20 mA



Current output 0...400 μ A



Voltage output 0...10 V



6.3 Standards, approvals and certifications



6.4 Label for modified versions

There will only be a label in this field, if the device is different from the standard version.



6.5 Ordering details

Device type	Supply voltage U_S^*	Response value	Art. No.
CMD420-DM-1 (push-wire terminals)	AC 16...72 V DC 9.6 V...94 V DC, 15...460 Hz	0.1...1 A x n	B73060010
CMD420-DM-1	AC 16...72 V DC 9.6 V...94 V DC, 15...460 Hz	0.1...1 A x n	B93060010
CMD420-DM-2 (push-wire terminals)	AC/DC 70...300 V DC, 15...460 Hz	0.1...1 A x n	B73060011
CMD420-DM-2	AC/DC 70...300 V DC, 15...460 Hz	0.1...1 A x n	B93060011
CMD421-DM-1 (push-wire terminals)	AC 16...72 V DC 9.6 V...94 V DC, 15...460 Hz	0.5...5 A x n	B73060012
CMD421-DM-1	AC 16...72 V DC 9.6 V...94 V DC, 15...460 Hz	0.5...5 A x n	B93060012
CMD421-DM-2 (push-wire terminals)	AC/DC 70...300 V DC, 15...460 Hz	0.5...5 A x n	B73060013
CMD421-DM-2	AC/DC 70...300 V DC, 15...460 Hz	0.5...5 A x n	B93060013
*Absolute values of the voltage range			
Mounting clip for screw mounting (1 piece per device, accessories)			B 9806 0008

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