EN Manual

BENDER
The Power in Electrical Safety©

GM420

Loop monitor
to monitor the PE conductor in AC systems
Software version: D268 V1.0x

GM420_D00112_01_M_XXEN/07.2016

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

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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 **medium risk of danger** that can lead to **death** or **serious injury** 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 Grünberg

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.

1.8 Fast commissioning of the loop monitor in AC systems

If you are already familiar with the function of loop monitoring, you can reduce the time for commissioning and connection using this brief description.

7. Check that the PE conductor to be monitored is operated in an AC system. In addition, check that the resistance of the conductor loop is ≤ 66 Ω and that the extraneous voltage is U_f < 12 V. This is the precondition for an automatic setting of the response values (Preset) after the first connection to the supply voltage.
   When the loop resistance is > 66 Ω, a response value of 100 Ω will automatically be set.
8. Make sure that the loop monitor is in the delivery status (factory setting has not been changed). In case of doubt, restore the factory setting (page 36).
9. When the conditions 1 and 2 are satisfied, you can connect the loop monitor according to the wiring diagram (page 22). Once the device is connected to the supply voltage, the device determines the loop resistance R_m and automatically sets the response value > R for the loop resistance R_m:

   Response value (> R) = (R_m + 0.5 Ω) x 1.5

   Example:
   R_m = 2.5 Ω
   Resulting response value: (2.5 Ω + 0.5 Ω) x 1.5 = 4.5 Ω
10. The currently measured loop resistance between the terminals E and KE appears on the display. In addition, you can query the existing extraneous voltage U_f using the UP and DOWN keys.

For detailed information about the preset function refer to page 16.
Page 38 provides a summary of all factory settings.
If you want to reset the loop monitor to its factory settings, refer to the description on page 36.

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 loop monitor of the GM420 series is designed to monitor the PE conductor in AC systems. The extraneous voltage U_f between the terminals E and KE must not exceed AC 12 V. The ohmic resistance of the conductor loop and the existing extraneous AC voltage U_f will be indicated on the display.
Measurement results can be adversely affected by DC extraneous voltage U_f occurring during the resistance measurement process.

Separate supply voltage U_s is required.

3. Function

3.1 Device features

- Loop monitoring of the PE conductor in AC systems
- Loop resistance measurement and indication in the range of 0…100 Ω. The extraneous voltage U_f must not exceed A 12 V.
- Measurement and indication of an existing extraneous voltage U_f of AC 0…50V, even when the resistance measuring circuit has been disconnected to provide protection.
- Measuring current I_m = DC 20 mA
- Preset function:
  Automatic setting of the response value for the loop resistance R_m (> R)
- r.m.s. value measurement of the extraneous AC voltage U_f (> U)
- Start-up delay, response delay and delay on release
- Adjustable switching hysteresis for R and U
- Measured value display via multi-functional LC display
- Alarm indication via LEDs (AL1, AL2) and changeover contacts (K1, K2)
- N/C or N/O operation selectable
- Password protection against unauthorized parameter changing
- Fault memory can be deactivated

3.2 Function

Once the supply voltage is applied, the start-up delay t is activated. Measured resistance and voltage values changing during this time do not influence the switching state of the alarm relays.
The devices provide two individually adjustable measuring channels (loop resistance/extraneous voltage U_f). When the measuring quantity exceeds the response value (Alarm 1) or falls below the response value (Alarm 2), the time of the response delays $t_{on\ 1/2}$ begins. When the response delay has elapsed, the alarm relays switch and the alarm LEDs light. When the measuring value

exceeds or falls below the release value (response value plus hysteresis) after the alarm relays have switched, the selected release delay t_{off} begins. When t_{off} has elapsed, the alarm relays switch back to their original state. With the fault memory activated, the alarm relays do not change their actual state until the reset button R is pressed.

3.2.1 Preset function

After connecting the device for the first time, the response value for the loop resistance (Alarm 1) is automatically set once only to the following value:
Response value loop resistance
(> R) = (R_m + 0.5 Ω) x 1.5

GM420		
Extraneous voltage > U (U_f)	**Preset operating range**	**Response value > R**
AC 25 V	0 Ω…∞ Ω	(R_m + 0.5 Ω) x 1.5 max. 100 Ω

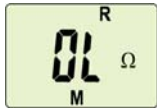
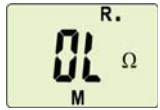
If the measured resistance value is > 66 Ω, the response value will automatically be set to 100 Ω.
If loop resistances of approx. ≥ 1 kΩ exist, the preset function will be ineffective. Hence, the previous response value will remain. The message "AL not SEt" appears on the display. If you exit "AL not SEt" with Enter, the response value will be set to 100 Ω.
For details on how to change the response value manually refer to page 29.
After restoring the factory settings, the preset function is automatically active again. Also refer to page 36.
During operation, the preset function can be started manually via the menu SEt. Also refer to page 37.

3.2.2 Protected measuring circuit

During the loop resistance measurement, the existing extraneous voltage must not exceed specified values. If the extraneous voltage exceeds the limit values, the measuring circuit will be disconnected (Overload OL). This protective mechanism will also be activated when the loop resistance values are too high.

A separate measuring circuit ensures that extraneous voltages U_f (>U) of 1…50 V will be monitored!

The table below shows the respective switching thresholds and the corresponding messages shown on the display:

U_f (> U) R_m (> R)	Display	Meaning:
≥ 12 V / ≥ ca. 1 kΩ		The measuring circuit has been deactivated by the device software.
≥ 15 V / ≥ approx. 5 kΩ		The measuring circuit has been additionally deactivated by the device hardware. (additional R).

If the extraneous voltage U_f falls below values ≤ 10 V, the loop resistance measuring circuit will be activated again, provided that the measured loop resistance does not exceed the limit of approx. 1 kΩ.

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 hour. During the self test internal functional faults are detected and will appear in form of an error code on the display. The alarm relays are not checked during this test.
By default, K1 signals the faults detected.

3.2.4 Manual self test

After pressing the internal test button for > 1.5 s, a self test is performed by the device. During this test, functional faults will be determined and appear in form of an error code on the display. The alarm relays are not checked during this test.
While the test button T is pressed and held down, all device-related display elements are indicated on the display.

3.2.5 Functional faults

If an internal functional fault occurs, all three LEDs flash. An error code will appear on the display (E01…E32).
For example, E08 means: Incorrect internal calibration. In such a case please contact the Bender Service.

3.2.6 Fault memory

The fault memory can be deactivated. A stored fault can be deleted by pressing the reset button "R".

3.2.7 Assigning alarms to the alarm relays K1/K2

Different alarm categories can be assigned to the alarm relays K1/K2 via the menu "out".

3.2.8 Time delays *t*, t_{on} and t_{off}

The times *t*, t_{on} and t_{off}, described below, delay the output of alarms via LEDs and relays.

Start-up delay *t*

After connection to the supply voltage, the alarm indication is delayed by the preset time *t* (0…99 s).

Response delay t_{on}

When the response value is reached, the loop monitor requires the response time t_{an} until the alarm is activated.
A preset response delay t_{on} (0…99 s) adds up to the device-related operating time t_{ae} and delays alarm signalling (total delay time $t_{an} = t_{ae} + t_{on}$).
If the fault does not continue to exist before the time of the response delay has elapsed, an alarm will not be signalled.

Delay on release t_{off}

When no alarm exists after deactivating the fault memory, the alarm LEDs go out and the alarm relays switch back to their original state. The release delay (0…99 s) allow to maintain the alarm state for the selected period.

3.2.9 Password protection (on, OFF)

After activating the password protection (on), settings are only possible when the correct password (0…999) has been entered. If you cannot operate your device because you cannot remember your password, please contact info@bender-service.com.

3.2.10 Factory setting FAC

After activating the factory setting, all settings previously changed are reset to delivery status. In addition, the preset function allows automatic adaptation of the response value in relation to the loop resistance.

3.2.11 Erasable history memory

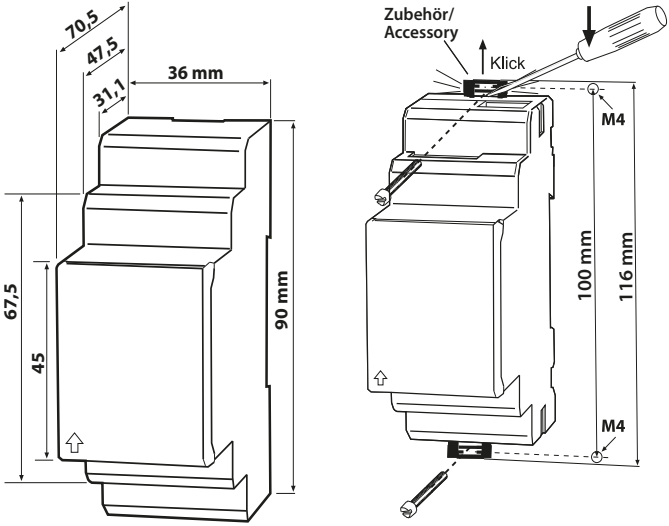
The first alarm value that occurs will be stored in this memory. Subsequent alarms do not overwrite this "old" value. The memory can be cleared using the Clr key in the menu HiS.

4. Installation and connection

DANGER

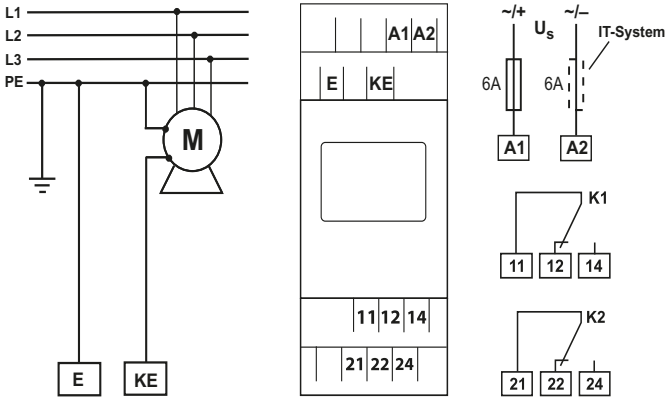
Ensure safe isolation from supply in the installation area. Observe the installation rules for live working.

General dimension diagram and drawing for screw fixing



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 is 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.

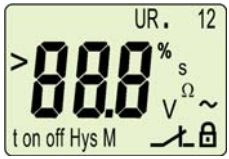


Terminal	Connections
A1, A2	Connection to supply voltage U_s
E **KE**	Connection to PE conductor (equivalent to functional earth) Connection to monitoring conductor E.
11, 12, 14	Alarm relay K1
21, 22, 24	Alarm relay K2

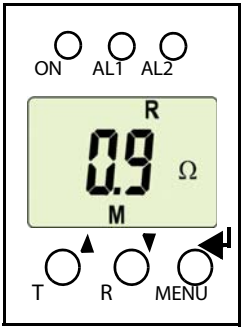
5. Operation and setting

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
	> R > U~	Loop resistance (Alarm 1) Extraneous voltage (Alarm 2)
	1, r1 R2, r2	Alarm relay K1 Alarm relay K2
	R, U Hys %	Response value hysteresis as %
	OL	Response value (that is non-adjustable) is exceeded (Overload)
	ton1 ton2 t toff	Response delay t_{on1} (K1) Response delay t_{on2} (K2) Start-up delay t Delay on release t_{off} K1, K2
	M	Fault memory active
		Operating mode of the relays K1, K2
		Password protection activated

5.2 Function of the operating elements

Device front	Element	Function
	**ON**	Power On LED, green
	AL1 **AL2**	LED Alarm 1 lights (yellow): Response value > R exceeded LED Alarm 2 lights (yellow): Response value > U reached
	0.9 Ω **M**	Display in standard mode: R_m = 0.9 Ω; 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

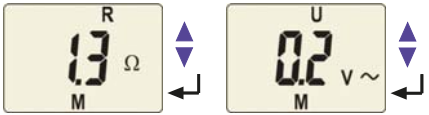
All adjustable parameters are listed in the columns "menu item" and "adjustable parameters". A display-like representation is used to illustrate the parameters in the column menu item. Different alarm categories can be assigned to the alarm relays K1, K2 via the submenus r1, r2. This is done by activation or deactivation of the respective function.

Menu	Submenu:	Menu item	Activation	Adjustable parameter
AL (response values)	→	> R	-	Loop resist. in Ω (Alarm 1)
		R Hys	-	Hysteresis, > R
		> U	-	Extran. voltage (Alarm 2)
		U Hys	-	Hysteresis, extran. voltage
out (output control)	→	M	ON	Fault memory (on, off)
		1	-	Operating mode K1 (n.o.)
		2	-	Operating mode K2 (n.o.)
	r1 (K1: (assignment alarm category)	1 Err	ON	Device error at K1
		r1 > R	ON	Loop resistance at K1 too high
		1 OL	ON	Measuring current disconnection at K1
		r1 > U	off	Extran. voltage at K1
		1 tES	off	Manual device test at K1
	r2 (K2: (assignment alarm category)	2 Err	off	Device error at K2
		r2 > R	off	Loop resistance at K2 too high
		2 OL	off	Measuring current disconnection at K2
		r2 > U	ON	Extraneous voltage K2
		2 tES	off	Manual device test at K2

t (timing check)	→	t on 1		Response delay K1
		t on 2		Response delay K2
		t		Start-up delay
		t off		Delay on release K1/K2
Set (device control)	→	🔒		Parameter setting via password
		FAC		Restore factory settings
		PrE		Manual preset
		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 resistance between the terminals E and KE is indicated on the display.



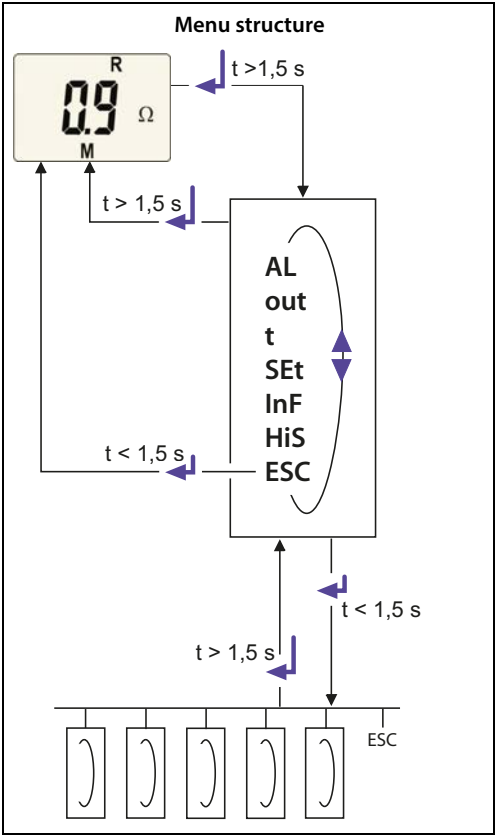
In the standard mode, the currently measured values of the loop resistance or extraneous voltage can be displayed by using the Up and Down keys.

In order to change the default display, confirm your choice with Enter.

5.5 Display in menu mode

5.5.1 Parameter query and setting: Overview

Menu item	Adjustable parameter
AL	Response values query and setting: – Loop resistance: > R (AL1) – Hysteresis of the response value: Hys > R – Extraneous voltage: > U (AL2) – Hysteresis of the response value: Hys > U
out	Configuration of the fault memory and the alarm relay: – Activating/deactivating the fault memory – Select N/O operation (n.o.) or N/C operation (n.c.) individually for each K1/K2 – Assign the alarm categories loop resistance, extraneous voltage or device error individually to each K1/K2 (1, r1 / 2, r2).
t	Setting delays: – Response delay t_{on1}/t_{on2} – Start-up delay t – Delay on release t_{off} (LED, relay)
Set	Device control parameter setting: – Enable or disable password protection, change the password – Restore factory setting; – Starting preset function PrE; – 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
R
0.9
Ω
M
t >1,5 s
t > 1,5 s
AL
out
t
SEt
InF
HiS
ESC
t < 1,5 s
t < 1,5 s
t > 1,5 s
ESC

Parameter settings

An example is given below on how to change the alarm response value for the loop resistance > R. Proceed as follows:

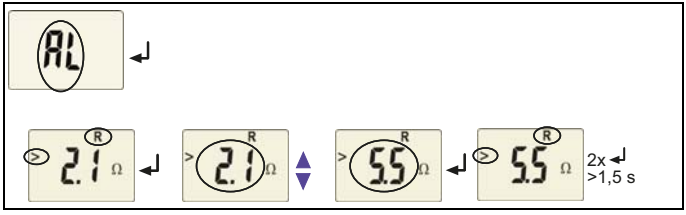
1. Press the MENU/Enter key for more than 1.5 seconds. The flashing short symbol AL appears on the display.
2. Confirm with Enter. The symbols > R flash.
3. Confirm with Enter. the current value for Ω flashes.
4. Use the Up or Down key to set the appropriate response value. Confirm with Enter. > R flashes.
5. 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.

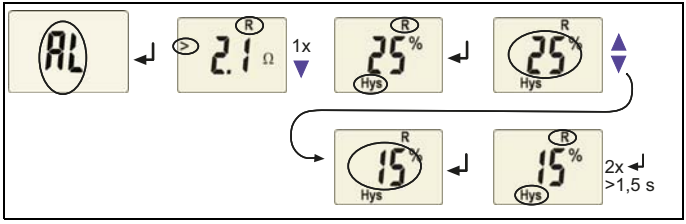
5.5.2 Setting the response values for loop resistance and the associated hysteresis

Set the resistance value at which an alarm is to be signalled.

Setting the response value for the loop resistance



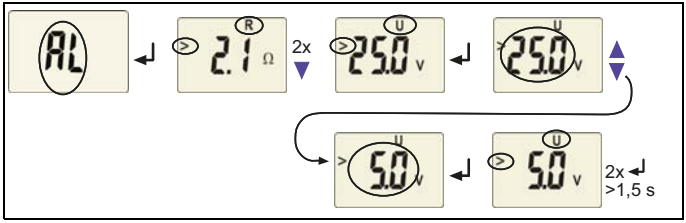
Setting the hysteresis of the resistance response value



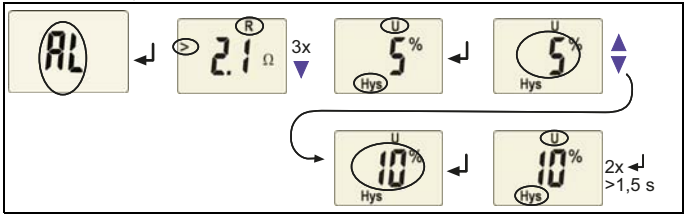
5.5.3 Setting the response values for extraneous voltage and hysteresis

Set the extraneous voltage response value at which an alarm is to be signalled.

Setting the extraneous voltage response value (> U)

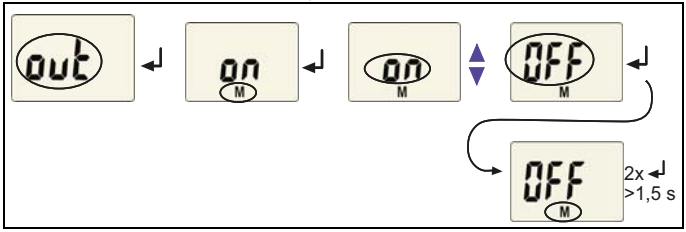


Setting the hysteresis for extraneous voltage

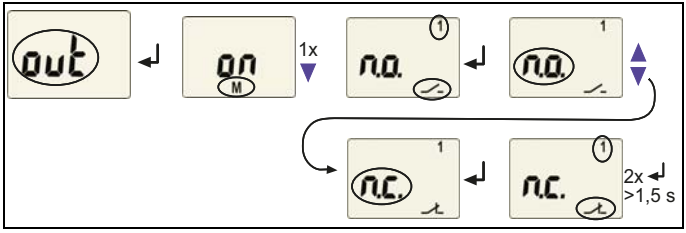


5.5.4 Setting the fault memory and operating mode of the alarm relays

Deactivating the fault memory



Setting the alarm relay K1 to N/C operation (n.c.)

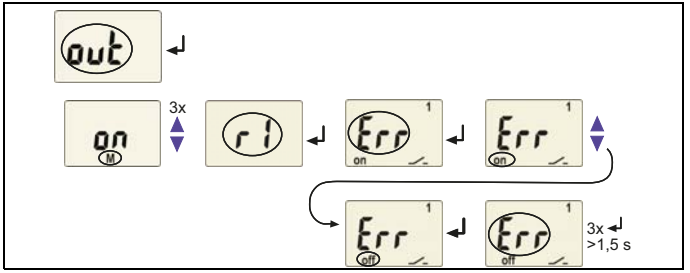


5.5.5 Assigning alarm categories to the alarm relays

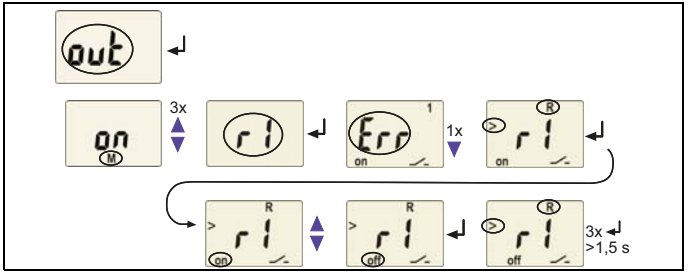
Loop resistance, extraneous voltage and device-related errors can be assigned to the alarm relays K1 (r1, 1) and K2 (r2, 2). By default, K1 signals an alarm in case of too high loop resistance. K2 signals an alarm in case of too high extraneous voltage U_f.

A few assignment examples for alarm relay K1 are illustrated below:

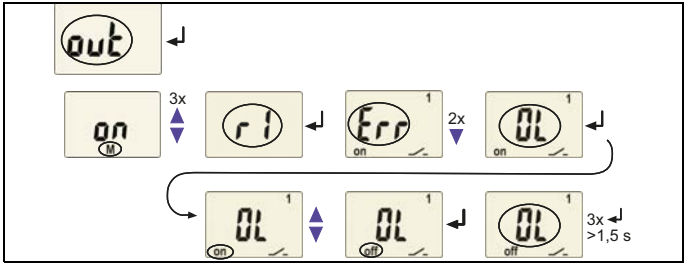
Alarm relay K1: Deactivating the category device error



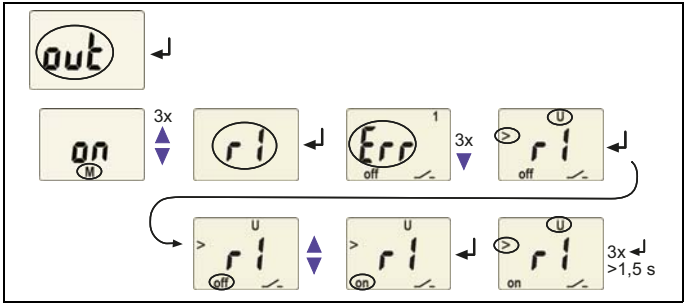
Alarm relay 1: Deactivating the category loop resistance



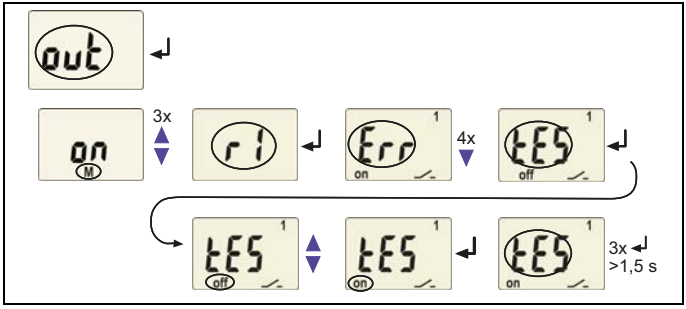
Alarm relay 1: Deactivating the category measuring current disconnection



Alarm relay 1: Activating the category extraneous voltage



Alarm relay 1: Activating the category manual self test



CAUTION

When an alarm relay (K1/K2) has been deactivated in the menu, an alarm will not be signalled by the respective changeover contact! An alarm will only be indicated by the respective alarm LED (AL1/AL2)!

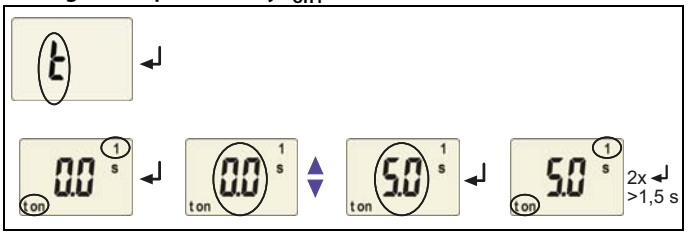
5.5.6 Setting time delays

Use this segment to set a

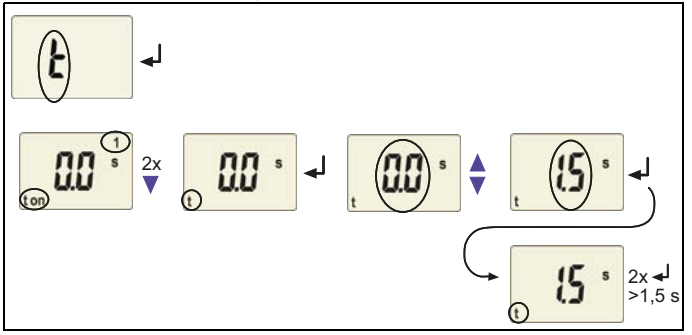
- response delay t_{on1} (0…99 s) for K1
- response delay t_{on2} (0…99 s) for K2
- starting delay t (0…99 s) when starting the device
- common release delay t_{off} (0…99 s) for K1, K2

This setting is only relevant when the fault memory M is deactivated.
The operating steps for the setting of the response delay t_{on1} and the start-up delay t are illustrated by way of example.

Setting the response delay t_{on1}



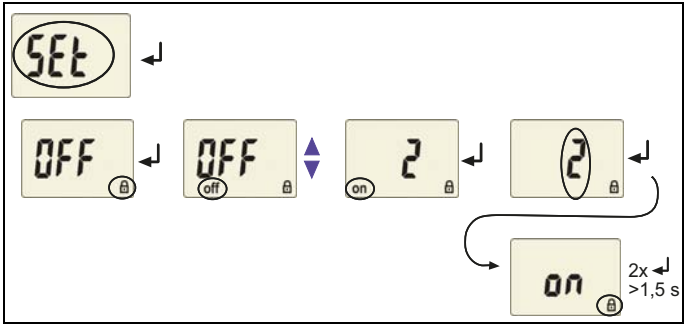
Setting the start-up delay t



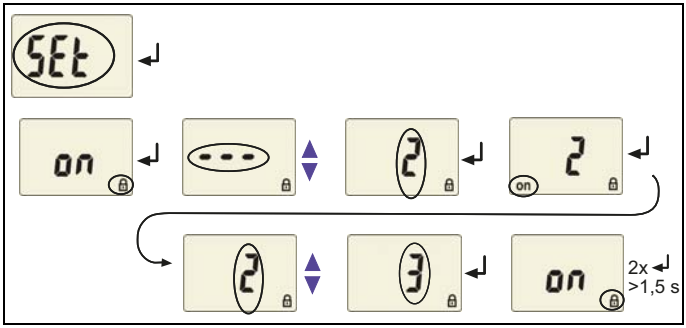
5.5.7 Factory setting and password protection

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.

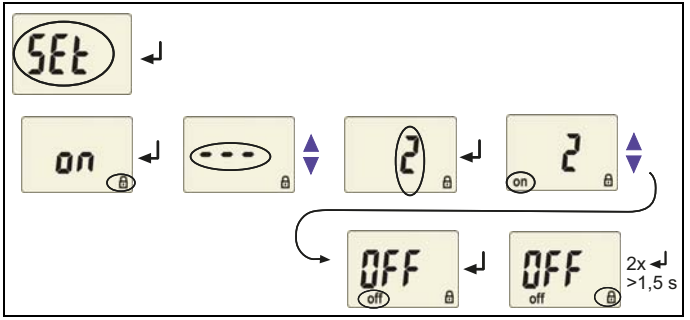
a) Activating the password protection



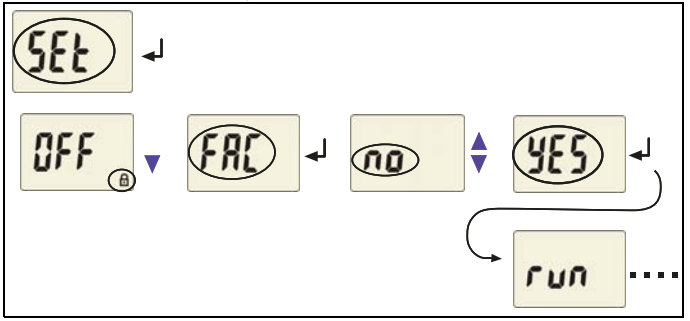
b) Changing the password



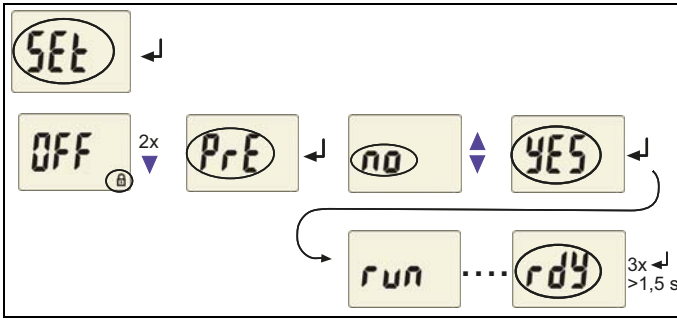
c) Deactivating the password protection



5.5.8 Restoring factory setting



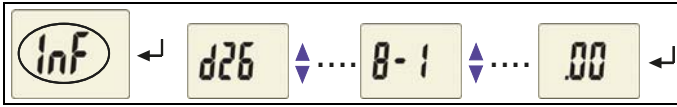
5.5.9 Manual activation of the preset function



If loop resistances of approx. ≥ 1 kΩ exist, the preset function will be ineffective. The message "AL not SEt" appears on the display.

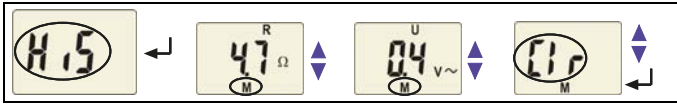
5.5.10 Device information query

This function is used to query the hardware (d…) and software (1.xx) versions. 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.



5.5.11 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 is flashing, the history memory can be cleared by pressing the Enter key.



5.6 Preset function/ factory setting

On initial commissioning, a pre-defined response value in relation to the measured resistance value R_m is automatically set:
Response value loop resistance: (> R) = (R_m + 0,5 Ω) x 1.5

Hysteresis (R Hys):	*25 %*
Extraneous voltage (> U)	*25 V*
Hysteresis (U Hys):	*5 %*
Fault memory M:	*ON*
Operating mode K1 (> R):	*N/O operation (n.o.)*
Operating mode K2 (> U):	*N/O operation (n.o.)*
Start-up delay:	*t = 0 s*
Response delay:	*t_{on1} = 0 s*
	t_{on2} = 0 s
Delay on release:	*t_{off} = 0.5 s*
Password:	*0, Off*

5.7 Commissioning

Prior to commissioning, check proper connection of the GM420.

After connecting a brand-new GM420 to the supply voltage, the loop resistance response value is automatically set by the internal preset function:
(> R) = (R_m + 0,5 Ω) x 1.5

(R_m = measured loop resistance)

6. Technical data GM420…

( )* = factory setting

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

Rated insulation voltage ..... 400 V
Rated impulse voltage/pollution degree ..... 4 kV / III
Protective separation (reinforced insulation) between ..... (A1, A2) - (E ,KE) - (11-12-14) - (21-22-24)
Voltage test acc. to IEC 61010-1:
(E ,KE) - [(A1-A2), (11-12-14)] ..... 3.32 kV
(E ,KE) - (21-22-24) ..... 2.21 kV
(A1- A2) - (11-12-14) - (21-22-24) ..... 2.21 kV

Supply voltage

GM420-D-1:
Supply voltage U_s ..... AC 16…72 V / DC 9.6…94 V
Frequency range U_s ..... 15…460 Hz
GM420-D-2:
Supply voltage U_s ..... AC/DC 70…300 V
Frequency range U_s ..... 15…460 Hz
Power consumption ..... ≤ 3.5 VA

Measuring circuit

Loop resistance R_m:
Measuring range R_m ..... 0…100 Ω
Measuring current I_m ..... DC 20 mA
Measuring voltage U_m ..... ≤ DC 24 V
Extraneous voltage U_f:
Measuring range U_f ..... AC 0…50 V
Nominal frequency f_n ..... 42…460 Hz
Disconnection of the measuring loop U_f ..... ≥ 12 V
Reclosing of the measuring loop ..... ≤ 10 V
Permissible extraneous voltage U_f ..... ≤ 440 V
Permissible extraneous DC voltage, without influence on the measurement ..... DC 0 V

Response values

Loop resistance (> R) (Alarm 1) ..... 0.1…100 Ω
Resolution of setting R 0.1…10 Ω ..... 0.1 Ω
Resolution of setting R 10…100 Ω ..... 1 Ω
Preset function:
Loop resistance (> R) ..... = ((R$_m$ + 0.5 Ω) x 1.5) *
Relative percentage error 0…1 Ω ..... ±20 %, ±1 digit
Relative percentage error 1…10 Ω ..... ±5 %, ±1 digit
Relative percentage error 10…100 Ω ..... ±5 %, ±1 digit
Hysteresis (> R) ..... 1…40 % (25 %)*
Extraneous voltage U_f (> U) (Alarm 2) ..... 1…50 V (25 V)*
Resolution of setting U_f 1…50 V ..... 0.5 V
Relative percentage error U_f (> U) in the range 50/60 Hz ..... ±2 %, ±1 digit
Relative percentage error U_f (> U) in the range 42…460 Hz ..... ±10 %, ±1 digit
Hysteresis > U ..... 1…40 % (5 %)*

Specified time

Start-up delay ..... 0…99 s (0 s)*
Response delay $t_{on1/2}$ ..... 0…99 s (0 s)*
Release delay t_{off} ..... 0…99 s (0.5 s)*
Operating time t_{ae} when the loop is open (R > 50 kΩ) ..... ≤ 40 ms
Operating time t_{ae} when the loop is closed (> R) ..... ≤ 500 ms
Operating time t_{ae} if extraneous voltage U_f (> U) and overload (OL) exist ..... ≤ 100 ms
Response time t_{an} ..... $t_{an} = t_{ae} + t_{on1/2}$
Recovery time t_b ..... ≤ 300 ms
Recovery time t_b after protective disconnection ..... ≤ 1 s

Displays, memory

Display ..... LC display, multi-functional, not illuminated
Display range, measured value R_m ..... 0…100 Ω
Display range, measured value U_f ..... AC 0…50 V
Operating error, loop resistance 0…1 Ω ..... ±20 %, ±1 digit
Operating error, loop resistance 1…100 Ω ..... ±5 %, ±1 digit
Operating error, voltage in the range 50/60 Hz ..... ±2 %, ±1 digit
Operating error, voltage in the range 42…460 Hz ..... ±10 %, ±1 digit
History memory (HiS) for the first alarm value ..... data record measured values

Password ..... off / 0 . . . 999 (off)*
Fault memory (M) alarm relay ..... on / off (on)*

Switching elements

Number of changeover contacts ..... 2 x 1 (K1, K2)
Operating principle ..... N/C operation / N/O operation
.... K1: Err, > R, OL, > U, tES (device error, loop resistance, measuring current disconnection: N/O operation n.o.)*
..... K2: Err, > R, OL, > U, tES (overvoltage: N/O operation n.o.)*
Electrical service life under rated operating conditions,
number of cycles 10000
Contact data acc. to IEC 60947-5-1:

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

Minimum contact load ..... 1 mA at AC / DC ≥ 10 V

Environment / EMC

Environment/EMC
EMC ..... EN 61326-1
Ambient temperatures:
Operating temperature ..... -25 . . . +55 °C
Transport ..... -25 . . . +70 °C
Long-term storage ..... -25 . . . +55 °C
Classification of climatic conditions acc. to IEC 60721:
Stationary use (IEC 60721-3-3) ..... 3K5 (no condensation, no formation of ice)
Transport (IEC 60721-3-2) 2K3
Long-term storage (IEC 60721-3-1) 1K4
Classification of mechanical conditions acc. to IEC 60721:
Stationary use (IEC 60721-3-3) 3M4
Transport (IEC 60721-3-2) 2M2
Long-term storage (IEC 60721-3-1) 1M3

Connection

Connection ..... screw terminals
Connection properties:
rigid/ flexible/ conductor sizes ..... 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 mm² / 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 mm² (AWG 24…14)
Flexible without ferrules ..... 0.75…2.5 mm² (AWG 19…14)
Flexible with ferrules ..... 0.2…1.5 mm² (AWG 24…16)
Stripping length ..... 10 mm
Opening force ..... 50 N
Test opening, diameter ..... 2.1 mm

Other

Operating mode ..... continuous operation
Mounting ..... any position
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 D268 V1.0x
Weight ..... ≤ 150 g
( )* =
Factory setting

6.1 Standards, approvals and certifications

6.2 Ordering information

Device type	Measuring range Loop resistance	Measuring range extraneous voltage U_f	Supply voltage U_S	Art. No.
GM420-D-1	0…100 Ω	AC 0…50 V	DC 9.6 V…94 V / AC 15…460 Hz, 16…72 V	B 9308 2001
GM420-D-2	0…100 Ω	AC 0…50 V	DC 70…300 V / AC 15…460 Hz, 70…300 V	B 9308 2002
Mounting clip for screw fixing (1 piece per device, accessories)				B 9806 0008

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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

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