EN Manual

BENDER
The Power in Electrical Safety©

# VMR420


**Ripple detector**
for monitoring of ripple voltages in DC systems
Software version: D346 V1.0x

VMR420_D00370_00_M_XXEN/07.2018


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Photos: Bender archive

# Table of Contents

# 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 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.

# 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 ripple detector VMR420 monitors the ripple voltage between the output of six-pulse rectifier circuits and the loads. The device can be used for the ripple voltage range AC 0…10 V.
The DC voltage is blocked by means of a coupling capacitor.
Separate supply voltage is required.

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 Suppression of measurement input override

*Quick DC voltage changes at the measuring input may result in an override of the AC coupled measuring circuit. This may result in false alarms!*

Such alarms can be suppressed by means of adjustable delay times $t_{on1/2}$ and $t_{off}$ (see page 17).

# 3. Function

## 3.1 Device features

- Ripple monitoring for overvoltage
- Adjustable switching hysteresis for overvoltage
- Start-up delay, response delay and delay on release
- r.m.s. value measurement AC (DC is blocked)
- Measured value display via multi-functional LC display
- Alarm signalling via LEDs (AL1, AL2) and changeover contacts (K1, K2)
- N/C operation or N/O operation selectable
- Password protection to prevent unauthorised changes being made to device settings
- Fault memory connectable, in the "con" mode, all alarm parameters remain stored in the event of failure of the supply voltage
- Start-up of the device with or without simulated alarm message

## 3.2 Function

Once the power supply is connected, the start-up delay *t* will be activated. Values of the measured nominal voltage changing during this time do not influence the switching state of the alarm relays. The device features an adjustable measuring channel for overvoltage measurement. If the measured value exceeds the response value for overvoltage, the response delays $t_{on1/2}$ will start. Once the response delay has elapsed, the alarm relays switch and the alarm LEDs light up. If the measured value falls below the release value (response value plus hysteresis) once the alarm relays have switched, the selected release delay begins $t_{off}$. When $t_{off}$ has elapsed, the alarm relay will switch back to the normal setting. If the fault memory is enabled, the alarm relays will remain in the alarm state until the reset button R is pressed.

### 3.2.1 Self test, automatic

The device automatically carries out a self test after connection to the system to be monitored and later every hour. Any internal malfunctions detected are shown on the display as error codes. The alarm relays are not switched during this test.

### 3.2.2 Self test, manual

The device runs a self test when the test button is pressed (> 1.5 s). Any internal malfunctions detected are shown on the display as error codes. The alarm relays are not switched during this test.
Whilst the test button T is pressed, all display elements available for this device are shown.

### 3.2.3 Functional fault

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.

### 3.2.4 Fault memory

The fault memory can be activated, deactivated or can be 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.

### 3.2.5 Assigning alarms to the alarm relays K/K2

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

*Alarm indication of system-related failures (e.g. supply voltage not available) or a device error, requires at least one of the alarm relays, K1 or K2, to be in N/C operation mode (n.c.). In addition, the alarm category "Err" has to be assigned to the selected alarm relay in the menu out/r1 or r2.*
*If these conditions cannot be met, periodic inspection of the VMR420 is required!*

### 3.2.6 Time delays

The times described below delay the indication of alarms via LEDs and relays.

### 3.2.7 Start-up delay

When the supply voltage $U_s$ is connected, the alarm indication will be delayed by the preset time *t* (0…300 s).

### 3.2.8 Response delay

When the response value is exceeded, the voltage relay requires the response time $t_{an}$ until the alarm is activated.
A preset response delay $t_{on}$ (0…300 s) adds up to the operating time $t_{ae}$ for this device and delays alarm indication (total delay time $t_{an} = t_{ae} + t_{on}$).
Should the fault no longer persist during the response delay, the alarm signal drops out.

### 3.2.9 Delay on release

If the alarm no longer exists during the response delay and the fault memory is deactivated, the alarm LEDs will go out and the alarm relays switch back to their initial position. The delay on release (0…300 s) serves to maintain the alarm state signal for the set duration.

### 3.2.10 Measuring range selection in relation to the response time

The VMR420 provides several measuring ranges. Depending on the setting of the response value for overvoltage, the device selects the optimum measuring range automatically. If the measured voltage exceeds the set response value and the actual measuring range, the measuring range will be not be optimised until the response time has elapsed
($t_{an} = t_{ae} + t_{on}$).

### 3.2.11 Rated system frequency

Precondition for r.m.s. value measurement is that the measuring period is a multiple of the fundamental frequency $f_n$. Use the menu Hz to set the reference value for the fundamental frequency for calculating the measuring period.
The fundamental frequency is the frequency in the AC system upstream the rectifier.

### 3.2.12 Password protection (on, OFF)

If password protection has been activated (on), settings can only be made subject to the correct password being entered (0…999). If you cannot operate your device because you cannot remember your password, please contact info@Bender-service.com.

### 3.2.13 Factory setting FAC

Activating the factory setting will reset all modified setting to the default upon delivery.

### 3.2.14 Erasable history memory

The first alarm value to occur is written to this memory.
Subsequent alarms do not overwrite this "old" value. The memory can be erased via the menu HiS with Clr.

### 3.2.15 Alarm LEDs show which relay is in the alarm state

Once the menu **LEd** has been activated, the alarm LED AL1 indicates that K1 is in the alarm state. When AL2 lights up, K2 is in the alarm state. An alarm relay cannot switch to the alarm state unless an alarm category has been assigned to it.

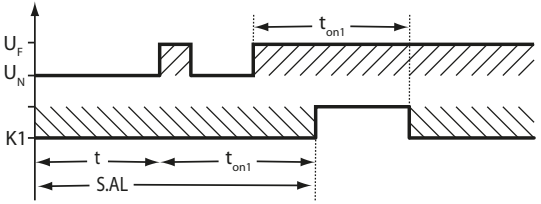
When the menu **LEd** is deactivated, AL1 indicates overvoltage.
For details about alarm category assignment to the respective relays refer to the submenu "out" description on page 27.

### 3.2.16 Starting a device using a simulated alarm S.AL

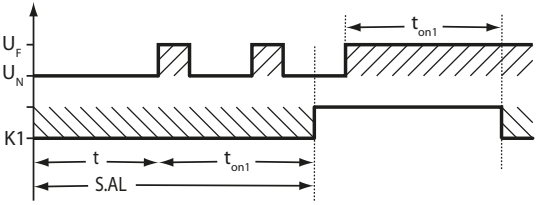
If the menu item S.AL has been activated in the out menu, K1 resp. K2 switches back to the alarm state once the supply voltage is applied. This alarm state is maintained for the set duration $t + t_{on1}$. Once this time has elapsed, K1 resp. K2 switches back to the initial position provided that no fault is detected at the measuring input.
The following diagrams show the effect of a fault occurring during a simulated alarm.

Faults at the measuring input and the resulting condition of the alarm relay K1 (K2) are shown as a hatched area.

The fault for K1 shown in the time diagram below, by way of example, has started during the S.AL phase:




The fault for K1 shown in the time diagram below, by way of example, started when the S.AL phase has elapsed:



# 4. Installation, connection and operation

**DANGER**

***Risk of electrocution due to electric shock!***

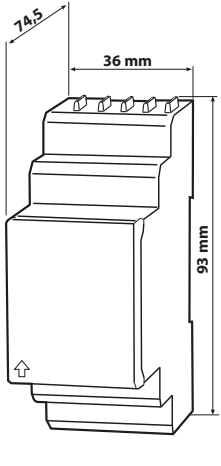
*Touching live parts of the system carries the risk of:*

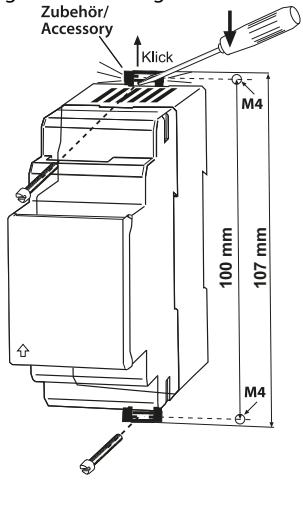
- *An electric shock*
- *Damage to the electrical installation*
- *Destruction of the device*

***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

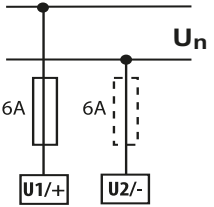
General dimension diagram and drawing for screw fixing

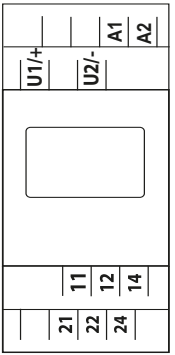


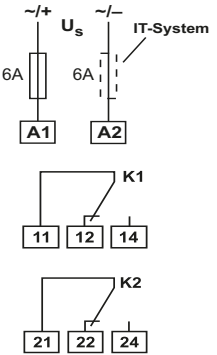



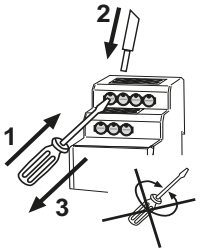
The front plate cover is easy to open at the lower part marked by an arrow.

1. **Mounting on a DIN rail**
   Snap the mounting clip at the rear of the device onto the DIN rail so that it sits securely.
   Screw fixing:
   Using a tool, position the rear mounting clips (a second mounting clip is required, see the ordering information) so that it protrudes over the enclosure. Fix the device in place with two M4 screws.
2. **Wiring**
   The device must be wired as illustrated in the wiring diagram.



| Terminal | Connections |
|---|---|
| **A1, A2** | Connection to the power supply voltage $U_s$ |
| **U1/+, U2/-** | Connection to the system to be monitored |
| **11, 12, 14** | Alarm relay K1 |
| **21, 22, 24** | Alarm relay K2 |

## 4.2 Commissioning

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

**CAUTION**

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

## 4.3 Maintenance

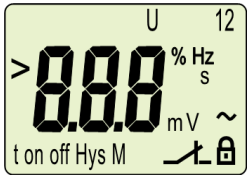
*One alarm relay of the VMR420 must work in N/C operation with the alarm category "Err" assigned to this relay, otherwise periodic inspection will be necessary!*

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

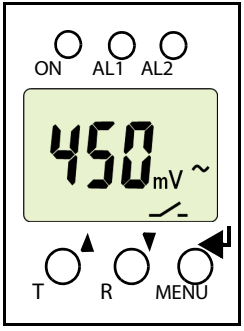
# 5. Operation and configuration

## 5.1 Available display elements

The table below gives a detailed description of the available display elements.

| Display elements | Element | Function |
|---|---|---|
|  | > U | Overvoltage |
| | R1, r1,<br>R2, r2 | Alarm relay K1,<br>Alarm relay K2 |
| | U Hys,<br>% | Response value hysteresis as % |
| | Hz | Nominal frequency in Hz |
| | ton1,<br>ton2,<br>t,<br>toff | Response delay $t_{on1}$ (K1),<br>Response delay $t_{on2}$ (K2)<br>Start-up delay t,<br>Delay on release $t_{off}$ for K1, K2 |
| | M | Fault memory active |
| | | Operating mode of the relays K1, K2; resp. LEDs AL1/AL2 indicate the alarm state of K1/K2 |
| | | Password protection active |

## 5.2 Getting to know the user interface

| Device front | Element | Function |
|---|---|---|
|  | **ON** | Green Power On LED |
| | **AL1,**<br>**AL2** | **Menu item LEd deactivated:**<br>Yellow alarm LED 1 lights:<br>Response value > U exceeded<br>Alarm LED 2: not used |
| | **AL1,**<br>**AL2** | **Menu item LEd activated:**<br>Yellow alarm LED 1 lights:<br>K1 indicates an alarm as defined by the user<br>Yellow alarm LED 2 lights:<br>K2 indicates an alarm as defined by the user |
| | **450 mV** | Display in standard mode:<br>Ripple voltage *U* = 450 mV |
| | **T,** ▲ | Test button (> 1.5 s):<br>Indication of the useable display elements, starting a self test;<br>Up button (< 1.5 s):<br>Menu items/values |
| | **R,** ▼ | Reset button (> 1.5 s):<br>Delete the fault memory;<br>Down button (< 1.5 s):<br>Menu items/values |
| | **MENU,** ↵ | MENU button (> 1.5 s):<br>Start the menu mode;<br>Enter button (< 1.5 s):<br>Confirm menu item, submenu item and value.<br>Enter button (> 1.5 s):<br>back to the next higher menu level |

## 5.3 Menu structure

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

| Menus | Sub menu | Menu item | Activation | Adjustable parameters |
|---|---|---|---|---|
| **AL** (response - values) | → | > U | – | Overvoltage (Alarm 1) |
| | | U Hys | – | Hysteresis (> U) |
| **out** (output control) | → | M | OFF | Fault memory (on, con, off) |
| | | 1 | – | Operating mode K1 (n.c.) |
| | | 2 | – | Operating mode K2 (n.o.) |
| | | LEd | ON | LEDs signal relay in alarm state |
| | r1 (K1: (assignment alarm category) | 1 Err | ON | Device error at K1 |
| | | r1 > U | OFF | Overvoltage K1 |
| | | 1 S.AL | OFF | Start with alarm during t + ton1 |
| | r2 (K2: (assignment alarm category) | 2 Err | OFF | Device error K2 |
| | | r2 > U | ON | Overvoltage K2 |
| | | 2 S.AL | OFF | Start with alarm during t + ton2 |

| Menu | Sub menu | Menu item | Activation | Adjustable parameter |
|---|---|---|---|---|
| **t** (timing check) | → | ton1 | – | Response delay K1 |
| | | ton2 | – | Response delay K2 |
| | | t | – | Start-up delay |
| | | toff | – | Delay on release K1/K2 |
| **Set** (device control) | → | Hz | – | Select rated system frequency ($f_n$) |
| | | 🔒 | OFF | Set parameters via password |
| | | FAC | – | Restore factory settings |
| | | SYS | – | Function locked |
| **InF** | → | | – | Display hard / software version |
| **HiS** | → | Clr | – | History memory for the first alarm value, erasable |

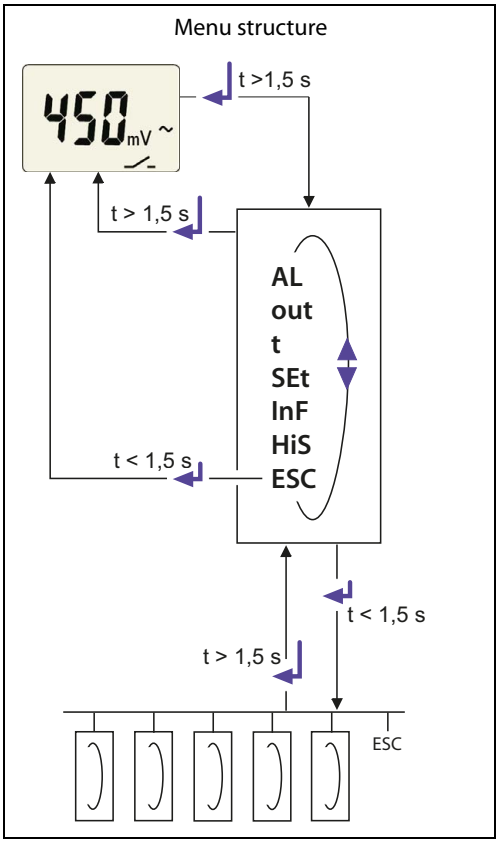
## 5.4 Display in standard mode

In the standard mode, the ripple voltage applied across the terminals U1/+ and U2/- is indicated.

## 5.5 Display in menu mode

### 5.5.1 Query and set parameters: Overview

| Menu | Adjustable parameter |
|---|---|
| **AL** | Query and set response values:<br>– Overvoltage: > U<br>– Hysteresis of the response value: Hys U |
| **out** | Configuration of the fault memory and the alarm relays:<br>– Activate/deactivate the fault memory or select con mode<br>– Select N/O operation (n.o.) or N/C operation (n.c.) individually for each K1/K2<br>– Assign the alarm category overvoltage or device error to 1/K2 (1, r1 / 2, r2)<br>– AL1/AL2 indicate that K1/K2 are in the alarm state, menu LEd activated |
| **t** | Delay setting:<br>– Response delay $t_{on1}$/$t_{on2}$<br>– Start-up delay $t$<br>– Delay on release $t_{off}$ (LED, relay) |
| **Set** | Set parameters for device control:<br>– Set rated system frequency $f_n$<br>– Activate/deactivate password protection, change the password<br>– Restore factory settings;<br>– Service menu SyS is locked |
| **InF** | Query hard and software version |
| **HiS** | Query the alarm value saved first |
| **ESC** | Move to the next higher menu level (back) |


Menu structure
450
mV
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

How to change the alarm response value for overvoltage is described as an example. Proceed as follows:

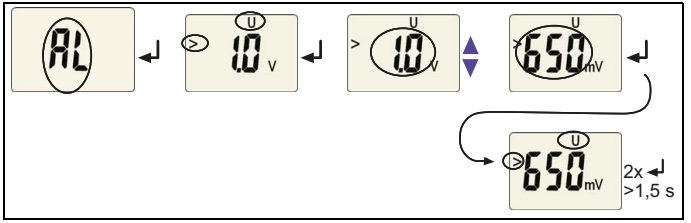
1. Press and hold down the MENU/Enter button for more than 1.5 seconds. The flashing short symbol AL appears on the display.
2. Confirm with Enter. The parameter > U flashes.
3. Confirm with Enter. The associated value in V appears on a flashing display.
4. Use the Up or Down button to set the appropriate response value. Confirm with Enter. > U flashes.
5. You can exit the menu by:
   - Pressing the Enter button for more than 1.5 seconds to reach the next higher level or
   - to select the menu item ESC and confirm with Enter to reach the next higher level.

*The areas of the display which can be configured flash! This is indicated by an oval marker in the illustrations below. Press and hold down the MENU button > 1.5 s to enter menu mode.*

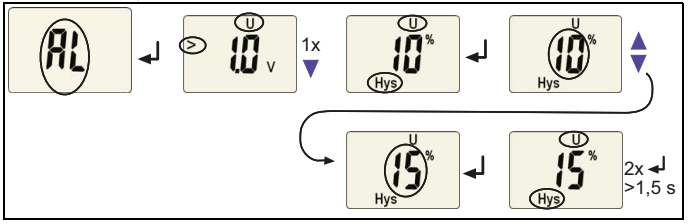
### 5.5.2 Setting the response value for overvoltage and hysteresis

This is where you determine the voltage value at which an alarm is to be signalled.

**Setting the overvoltage response value > U**

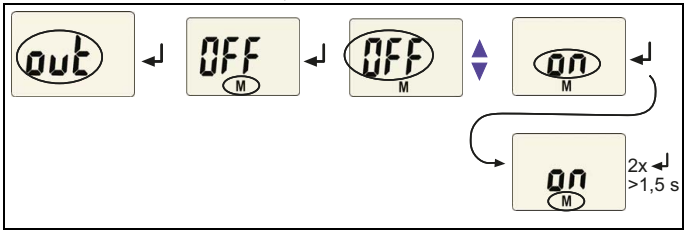



**Setting the hysteresis of the voltage response values**

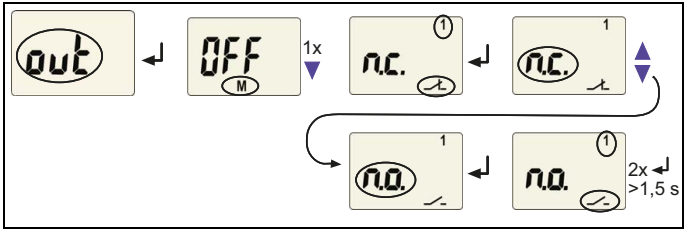


### 5.5.3 Setting the fault memory and operating principle of the alarm relays

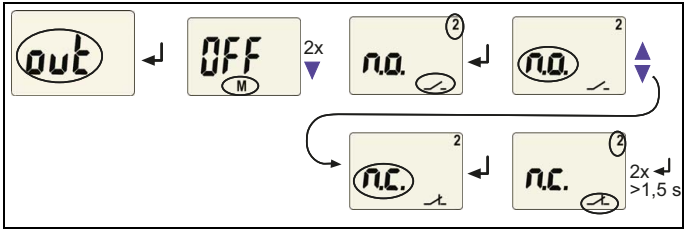
**Activating the fault memory**



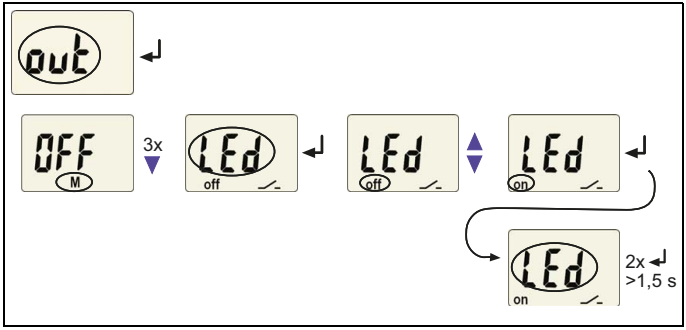

**Setting the alarm relay K1 to N/O operation (n.o.)**




**Setting alarm relay K2 to N/C operation (n.c.)**



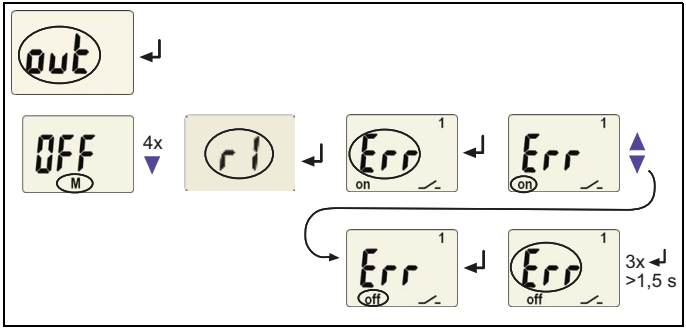
The alarm state of K1/K2 is to be indicated by the LEDs AL1/AL2



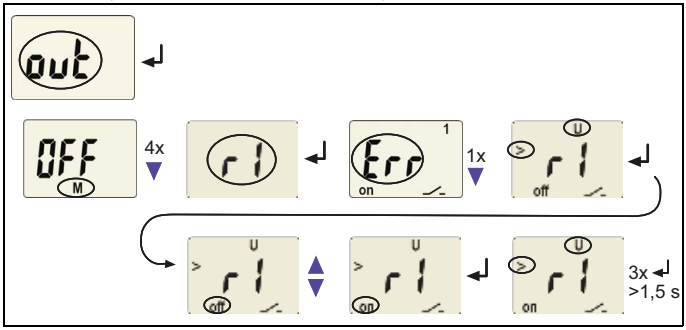

### 5.5.4 Assigning alarm categories to alarm relays

Overvoltage faults and the voltage relay's internal errors can be assigned to the alarm relays K1 (r1, 1) and K2 (r2, 2). K1 is set at the factory to signal device errors, K2 is set to signal overvoltage.
A few assignment examples for alarm relay K1 are illustrated below:

Alarm relay K1: Deactivating the category device error

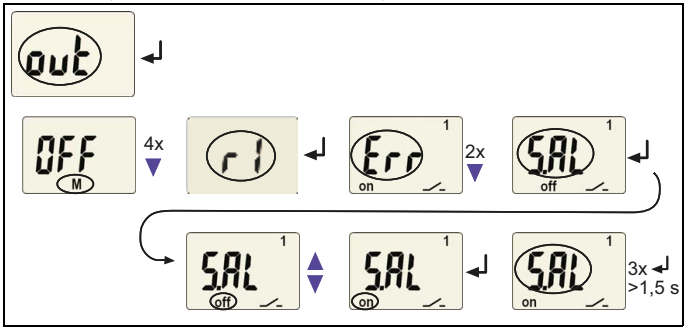


**Alarm relay 1: Activating the category overvoltage**




*Deactivating an alarm relay (K1/K2) via the menu prevents an alarm being indicated by the respective changeover contact! An alarm will be indicated by the respective alarm LED (AL1/AL2) only!*
*This only applies to the out menu setting LEd = off!*

**Alarm relay 1: Activating the category simulated alarm**

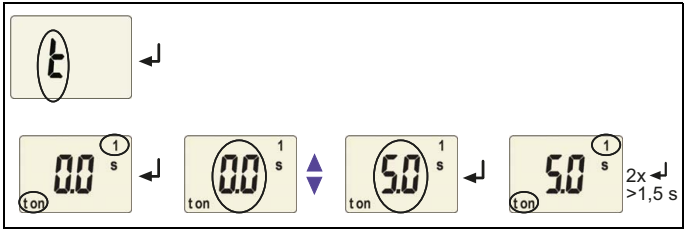



### 5.5.5 Setting delay times

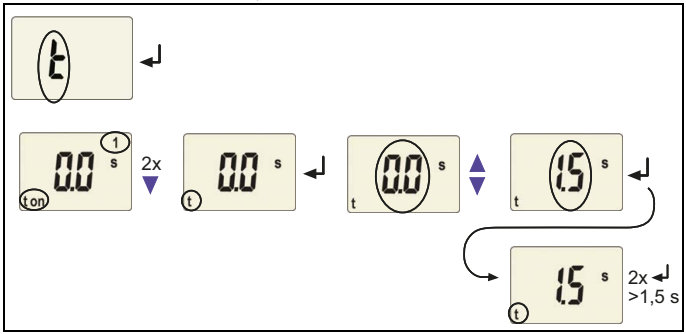
Use this segment to set a response delay $t_{on1}$ (0…300 s) for K1, and $t_{on2}$ (0…300 s) for K2, a start-up delay *t* (0…300 s) for device start, as well as a common delay on release $t_{off}$ (0…300 s) for K1 and K2.

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.

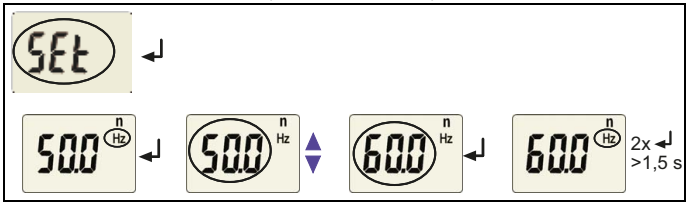
**Setting the response delay**



**Setting the start-up delay**



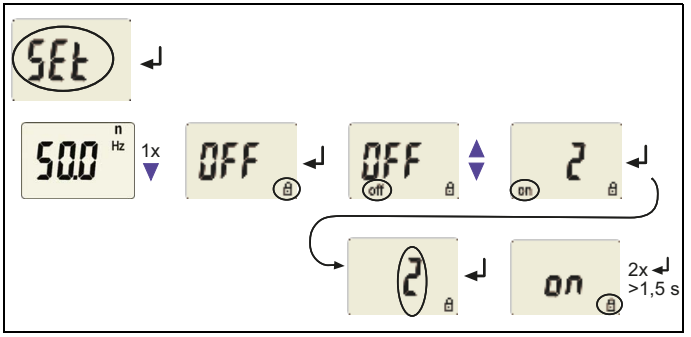

### 5.5.6 Setting the rated system frequency



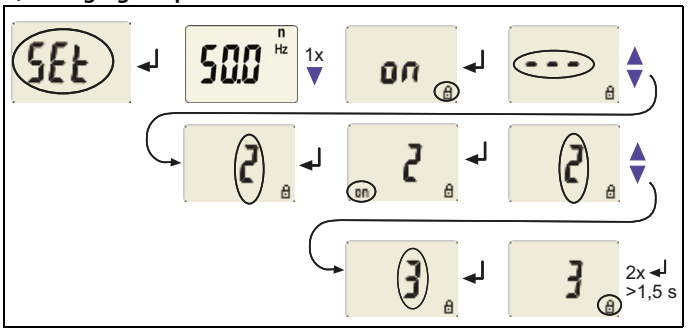

### 5.5.7 Password protection and factory setting

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.

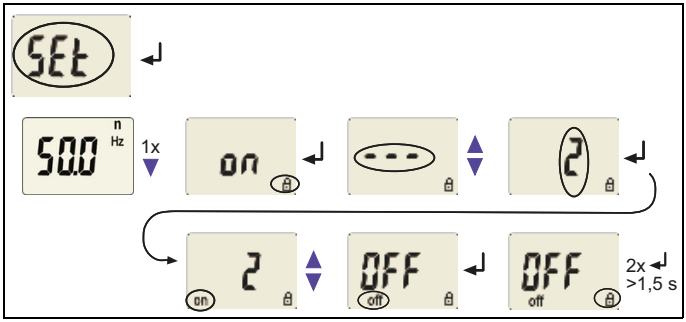
a) Activating the password protection



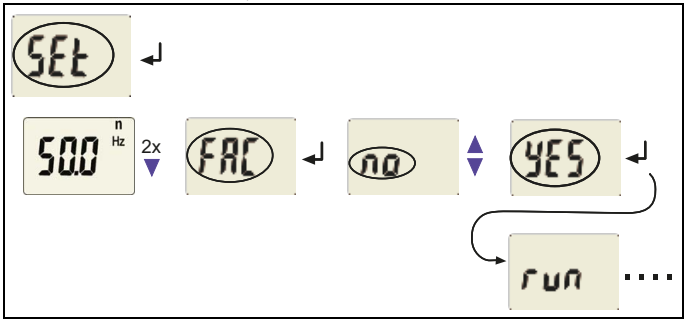

**b) Changing the password**



c) Deactivating the password protection

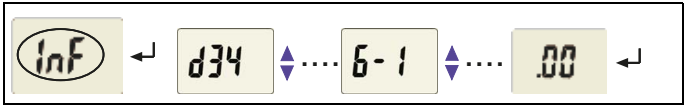



### 5.5.8 Restoring factory settings



### 5.5.9 Querying device information

Use this menu 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 keys.




### 5.5.10 Querying the history memory

Select the history memory via the HiS menu HiS. Press the Up and Down buttons to go to the next menu. If Clr is flashing, the history memory can be cleared by pressing the Enter button.

## 5.6 Factory setting

| | |
|---|---|
| *Overvoltage > U* | *1.00 V* |
| *Hysteresis U* | *10 %* |
| *Fault memory M* | *OFF* |
| *Mode of operation K1 (Err)* | *N/C operation (n.c.)* |
| *Mode of operation K2 (> U)* | *N/O operation (n.o.)* |
| *AL1/AL2 indicate the alarm state of K1/K2 (LEd)* | *on* |
| *Alarm to K1/K2 (S.AL) when the device is started* | *OFF* |
| *Start-up delay* | *t = 1 s* |
| *Response delay* | $t_{on1} = 1$ *s* |
| | $t_{on2} = 1$ *s* |
| *Delay on release* | $t_{off} = 1$ *s* |
| *Rated system frequency* | $f_n = 50$ *Hz* |
| *Password* | *0, OFF* |

# 6. Technical data VMR420

( )* = factory setting

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

Rated insulation voltage ..... AC 320 V
Rated impulse voltage/pollution degree ..... 6 kV / III
Protective separation (reinforced insulation) between ..... (A1, A2) - (11, 12, 14), (21, 22, 24)
Protective separation (reinforced insulation) between ..... (U1/+, U2/-) - (11, 12, 14)
Voltage test according to IEC 61010-1 ..... 3.536 kV

Rated insulation voltage ..... AC 320 V
Rated impulse voltage/pollution degree ..... 4 kV / III
Basic insulation between ..... (U1/+, U2/-) - (A1, A2), (21, 22, 24)
Basic insulation between ..... (11, 12, 14) - (21, 22, 24)
Voltage test according to IEC 61010-1 ..... 2.21 kV

### Supply voltage

VMR420-D-1-EL:
Supply voltage $U_S$ ..... AC 16...72 V / DC 9.6...94 V
Frequency range $U_S$ ..... 15...460 Hz
Power consumption ..... ≤ 3.5 VA

### Measuring circuit

Measuring range ripple voltage (r.m.s. value) ..... AC 0...10 V
Voltage at the measuring input $U_n$ ..... ≤ AC 300 V ≥ 40 Hz / ≤ DC 300 V / peak ≤ 400 V
Rated frequency $f$ ..... 40...360 Hz
Rated system frequency $f_n$ ..... 40...70 Hz (50 Hz)*
Resolution of setting $f_n$ ..... 0.1 Hz

### Response values

Overvoltage > $U$ ..... AC 10 mV...2.4 V (1.0 V)*
Resolution of setting $U$ < 1 V ..... 10 mV
Resolution of setting $U$ > 1 V ..... 100 mV
Relative uncertainty $U$ ≤ 600 mV ..... ±5 %, ±2 mV

Relative uncertainty $U$ > 600 mV ..... ±5 %, ±50 mV
Hysteresis $U$ ..... 10 . . . 40 % (10 %)*
Resolution of setting hysteresis ..... 1 %

## Time behaviour

Start-up delay $t$ ..... 0 . . . 300 s (1 s)*
Response delay $t_{on1/2}$ ..... 0 . . . 300 s (1 s)*
Delay on release $t_{off}$ ..... 0 . . . 300 s (1s)*
Resolution of setting $t$, $t_{on1/2}$, $t_{off}$ (0 . . . 10 s) ..... 0.1 s
Resolution of setting $t$, $t_{on1/2}$, $t_{off}$ (10 . . . 99 s) ..... 1 s
Resolution of setting $t$, $t_{on1/2}$, $t_{off}$ (100 . . . 300 s) ..... 10 s
Operating time voltage $t_{ae}$ ..... ≤150 ms
Response time $t_{an}$ ..... $t_{an} = t_{ae} + t_{on1/2}$
Recovery time $t_b$ ..... ≤ 400 ms

## Displays, memory

Display ..... LC display, multi-functional, not illuminated
Display range, measured value ..... AC 0 . . . 10 V
Operating uncertainty, voltage ..... ±5 %, ±2 digits
History memory (HiS) for the first alarm value ..... data record measured values
Password ..... Off / 0 . . . 999 (OFF)*
Fault memory (M) alarm relay ..... on / off / con (off)*

## Switching elements

Number of changeover contacts ..... 2 x 1 (K1, K2)
Operating principle ..... N/C operation / N/O operation
..... K1: Err, > U, S.AL (error: N/C operation n.c.)*
..... K2: Err, > U, S.AL (overvoltage > U: N/O operation n.o.)*
AL1/AL2 indicate the alarm state of K1/K2 ..... on / off (on)*
Electrical service life under rated operating conditions ..... 10000 switching cycles
Contact data acc. to IEC 60947-5-1:
Utilisation 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 rating ..... 1 mA at AC/DC ≥10 V

## Environment/EMC

EMC ..... IEC 61326
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

Connection ..... **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 $mm^2$ / 0.2 . . . 1.5 $mm^2$
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 DIN EN 60529, internal components ..... IP30
Degree of protection DIN EN 60529, terminals ..... IP20
Enclosure material ..... polycarbonate
Flammability class ..... UL94 V-0

DIN rail mounting acc. to ..... IEC 60715
Screw mounting ..... 2 x M4 with mounting clip
Software version ..... D346 V1.0x
Weight ..... ≤ 150 g
( )* = factory setting

## 6.1 Standards, approvals and certifications

## 6.2 Ordering information

| Device type | Nominal voltage $U_n$* | Supply voltage $U_s$* | Art. No. |
|---|---|---|---|
| **VMR420-D-1-EL** (push-wire terminals) | DC 0…300 V | DC 9.6 V…94 V / AC 15…460 Hz, 16…72 V | on request |
| **VMR420-D-1-EL** | DC 0…300 V | DC 9.6 V…94 V / AC 15…460 Hz, 16…72 V | B93010014 |
| *Absolute values of the voltage range | | | |
| Mounting clip for screw fixing (1 piece per device, accessories) | | | B98060008 |

## 6.3 Label for modified versions

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

# INDEX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