VMD422/VMD422H

Three-phase voltage and frequency relays for CHPs, wind, hydroelectric and photovoltaic power systems in accordance with DIN V VDE V 0126-1-1

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BENDER

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for CHPs, wind, hydroelectric and photovoltaic power systems
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VMD422/VMD422H

Device features

- VMD422 with separate supply voltage
  VMD422H is supplied by the system being monitored
- Undervoltage, overvoltage and underfrequency and overfrequency monitoring in 3(N)AC systems AC 0…400/230 V
- Monitoring of overvoltage by average determination of the latest 10-minute measuring interval
- Asymmetry, phase failure and phase sequence monitoring
- Factory preset according to DIN V VDE V 0126-1-1
- Adjustable start-up delay and delay on release
- Adjustable switching hysteresis for the voltage
- r.m.s. value measurement (AC)
- Digital measured value display via multi-functional LC display
- LEDs: Power On, Alarm 1, Alarm 2
- Measured value memory for operating value
- Continuous self monitoring
- Internal test/reset button
- Two separate alarm relays (one changeover contact each)
- N/C operation, fault memory deactivated
- Password protection for device settings
- Sealable transparent cover
- Two-module enclosure (36 mm)
- Push-wire terminal (two terminals per connection)
- RoHS compliant

Approvals

Product description

When feeding power into the public grid, voltage and frequency monitoring in accordance with DIN V VDE V 0126-1-1 is required to ensure mains decoupling of private electricity generation systems >30 kW (such as CHPs, wind, hydrodynamic and photovoltaic power plants).

The three-phase VMD422 series voltage relays continuously monitor the voltage and frequency at the point of feed-in in 3AC/3NAC systems and activate an alarm relay within 180 ms (response values according to VDEW guideline "Generator at the public low-voltage grid") if voltage and frequency exceed upper and lower limits. An overvoltage (> $U2$), measured as average value over a 10-minute period, will cause the alarm relay to switch.

The voltages are measured as r.m.s. values. In addition asymmetry, phase failure and phase sequence are monitored.

The response values are preset acc. to DIN V VDE V 0126-1-1 and a password is required to adjust them to the permissible values specified in the standard in order to meet the operator's particular requirements.

The currently measured values are continuously shown on the LC display. The measured value required to trigger the alarm relay is stored. Due to adjustable start-up delay and delay on release, the network operator's specific requirements can be considered such as device-specific start-up procedures, short-time voltage fluctuations etc.

The VMD422 version requires a separate supply voltage, whereas the VMD422H version draws its supplies from the system.

Typical applications

- Monitoring of automatic switching points between parallel-connected private electricity generation systems and the public low voltage grid
- Applications according to the German standard DIN V VDE V 0126-1-1 (VDE V 0126-1-1): 2006-02
- Universally applicable for photovoltaic systems > 30 kW, CHPs (Combined Heat and Power plants), wind power stations and hydroelectric power plants

Function

Once the supply voltage is applied, the start-up delay begins. Measured voltage and frequency values being changed during this start-up period t do not influence the alarm LEDs and the state of the alarm relays.

The devices utilise several separately adjustable measuring channels (overvoltage/undervoltage, overfrequency/underfrequency). When the measured value exceeds or falls below the response value, the alarm relays switch and the alarm LEDs light up. When the measuring value exceeds or falls below the release value (response value plus hysteresis) after the alarm relays have switched, the selected release time "t_{off}" begins. When "t_{off}" has elapsed, the alarm relays switch back to their initial position. When the fault memory is activated, the alarm relays remain in alarm position until the reset button R is pressed. On voltage recovery, the alarm message remains active until the set start-up delay "t" has elapsed.
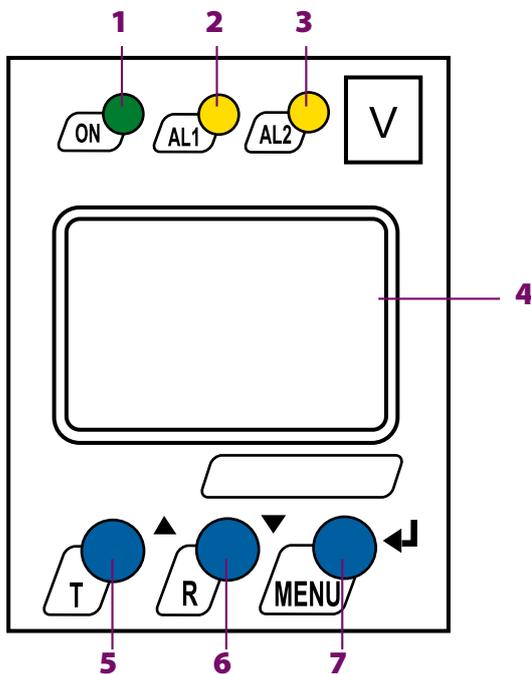
1 - Power On LED "ON" (green): Lights up when voltage is available and when the device is in operation or flashes in case of system fault alarm

2 - Alarm LED "AL1" (yellow): Lights up in case of the following fault messages: > $U$1/> $U$2 (10 minute average determination)

3 - Alarm LED "AL2" (yellow): Lights up in case of the following fault message: < U

Both the alarm LEDs "AL1" and "AL2" light up in case of the following fault messages: < f/> f/Asy/PHS, or flash in case of system fault alarm

4 - Display: Displays operating information

5 - Test-button "T": UP (< 1.5 s)/TEST (> 1.5 s):

The UP button is used to increase input values or to navigate through the menu.

The test button is used to start a manual self test.

6 - Reset button "R": DOWN (< 1.5 s)/Reset (> 1.5 s):

The DOWN button is used to decrease input values or to navigate through the menu.

The reset button is used to activate a manual reset.

7 - Enter button (< 1.5 s)/MENU (> 1.5 s):

The Enter button is used to save input data and changed data.

Press the "MENU" button to call up the menu system

Press the ESC button > 1.5 s in the menu mode
to abort an action or to return to the previous menu level.

Operating elements

| Nominal system voltage U_n	Supply voltage U_S*		Type	Art. No.
3(N)AC	AC	DC		
400/230 V, 40…65 Hz	70…300 V, 15…460 Hz	70…300 V	VMD422-D-2	B 7301 0011
	U_n		VMD422H-D-3	B 7301 0012

Device version with screw terminals on request.
*Absolute values of the voltage range

Accessories

Type designation	Art. No.
Mounting clip for screw mounting (one clip per device)	B 9806 0008

Wiring diagram VMD422

Wiring diagram VMD422H
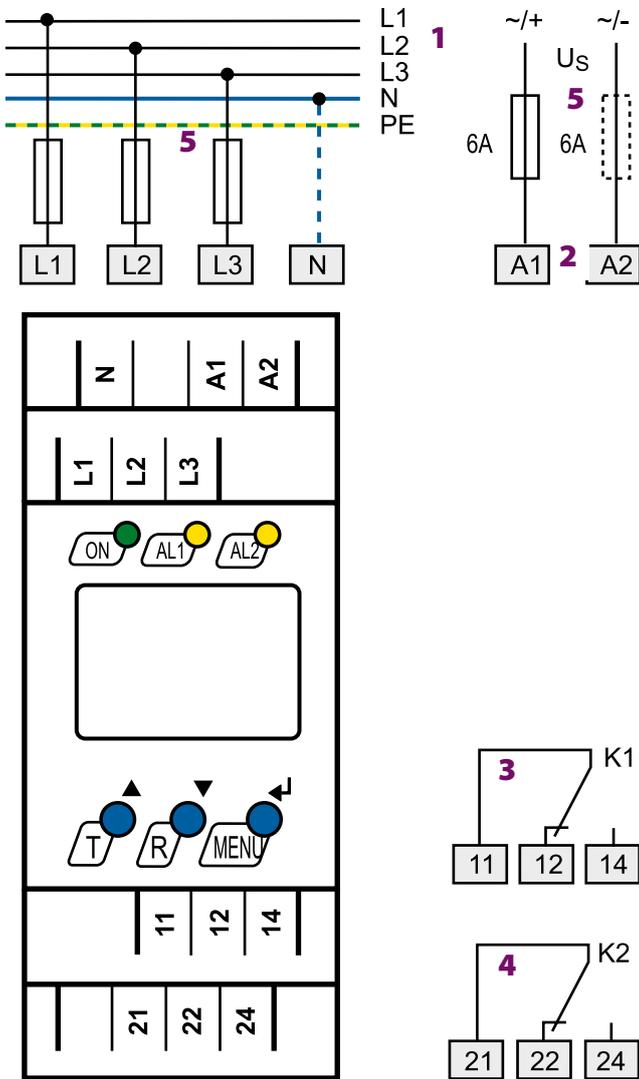
1 - Connection to the system being monitored

2 - Supply voltage U_S (see ordering information)

3 - Alarm relay K1: For < U/> $U$1/< f/> f/Asy

4 - Alarm relay K2: For < U/> $U$1/> $U$2/< f/> f/Asy/PHS/ERROR

5 - Fuse as line protection.

   6 A fuse recommended. If being supplied from an IT system, both lines have to be protected by a fuse.
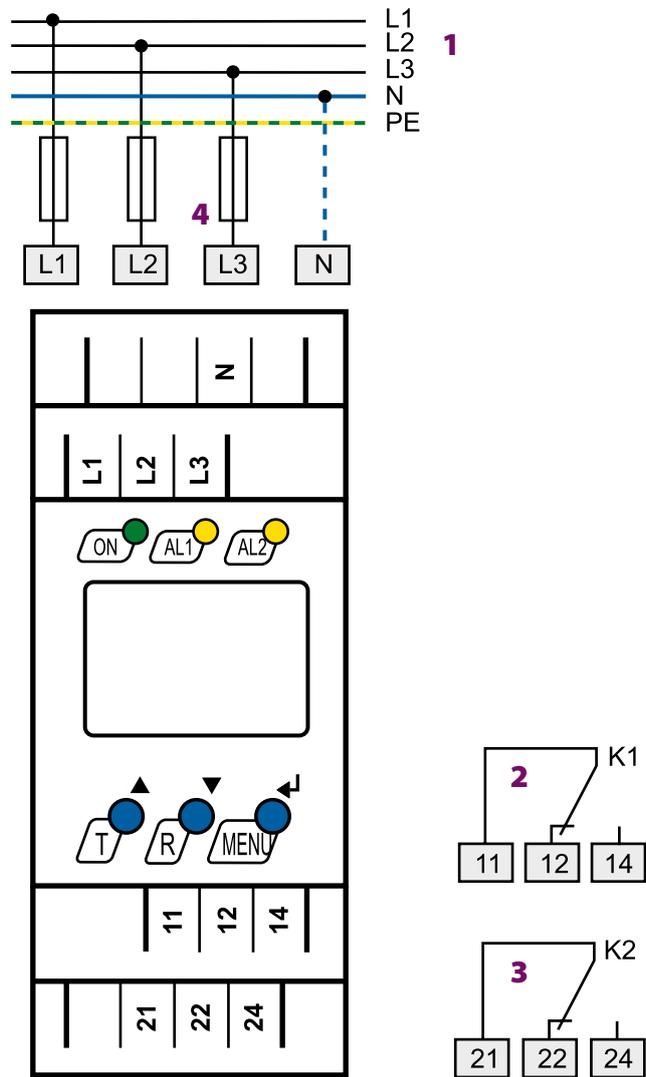
1 - Connection to the system being monitored and to the supply voltage

2 - Alarm relay K1: For < U/> $U$1/< f/> f/Asy

3 - Alarm relay K2: For < U/> $U$1/> $U$2/< f/> f/Asy/PHS/ERROR

4 - Fuse as line protection

Technical data

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) - (N, L1, L2, L3) - (11, 12, 14) - (21, 22, 24)	

Voltage test according to IEC 61010-1:

VMD422 and VMD422H:	
(N, L1, L2, L3) - (A1, A2), (11, 12, 14)	3.32 kV
(N, L1, L2, L3) - (21, 22, 24)	2.21 kV
VMD422:	
(A1, A2) - (11, 12, 14) - (21, 22, 24)	2.21 kV

Supply voltage

VMD422-D-2:	
Supply voltage U_S	AC/DC 70…300 V
Frequency range U_S	15…460 Hz
Power consumption	≤ 3.5 VA
VMD422H-D-3:	
Supply voltage U_S	U_n
Power consumption	≤ 5 VA

Measuring circuit

Measuring range (r.m.s. value) (L-N)	AC 0…288 V
Measuring range (r.m.s. value) (L-L)	AC 0…500 V
Rated frequency f_n	40…65 Hz
Frequency display range	10…500 Hz

Response values

Type of distribution system	3(N)AC/3 AC (3(N)AC)*
Undervoltage < U (Alarm 2) (measurement method: 3Ph/3n)	
	AC 320…380 V/184…218 V (3n: AC 184 V)*
Overvoltage > $U$1 (Alarm 1) (measurement method: 3Ph/3n)	
	AC 423…460 V/244…264 V (3n: AC 264 V)*
Overvoltage > $U$2 (Alarm 1) (measurement method: 3Ph/3n)	
	AC 440…460 V/253…264 V (3n: AC 253 V)*
Overvoltage $U$2	10-minute average determination
Resolution of setting U	1 V
Asymmetry, permanently set	(30 %)*
Phase failure	detection of asymmetry
Phase sequence, permanently set	(on, clockwise rotation)*
Relative uncertainty, voltage at 50 Hz	±1.5 %, ±1 digit
Hysteresis U	1…5 % (5 %)*
Underfrequency < Hz	47.5…49.8 Hz (47.5 Hz)*
Overfrequency > Hz	50.2…52.0 Hz (50.2 Hz)*
Resolution of setting f	0.1 Hz
Hysteresis, frequency Hys Hz, permanently set	(0.1 Hz)*
Relative uncertainty, frequency 40…65 Hz	±0.1 %, ±1 digit

Specified time

Start-up delay t	0…300 s (30 s)*
Delay on release t_{off}	0…300 s (30 s)*
Resolution of setting t, t_{off} (0…10 s)	0.1 s
Resolution of setting t, t_{off} (10…99 s)	1 s
Resolution of setting t, t_{off} (10.0…300 s)	10 s
Operating time voltage t_{ae}	≤ 180 ms
Operating time frequency t_{ae}	≤ 180 ms
Response time t_{an}	$t_{an} = t_{ae} + t_{on1/2}$
Recovery time t_b	≤ 300 ms
Discharging time energy backup on power failure for VMD422H	≥ 2.5 s
Charging time energy backup for VMD422H	≤ 60 s

Displays, memory

Display	LC display, multifunctional, not illuminated
Display range measured value	AC/DC 0…500 V
Operating uncertainty, voltage at 50 Hz	±1.5 %, ±1 digit
Operating uncertainty, frequency 40…65 Hz	±0.1 %, ±1 digit
History memory (HiS) for the first alarm value	data record measured values
Password	Off/on/0…999 (on/126)*
Fault memory (M) alarm relay	on/off/con (OFF)*

Switching elements

Number	2 x 1 changeover contacts (K1, K2)
Operating mode K1/K2, permanently set	N/C operation n.c
K1: (undervoltage < U, overvoltage > $U$1, asymmetry Asy, underfrequency < Hz, overfrequency > Hz, N/C operation n.c.)*	
K2: (device error Err, undervoltage < U, overvoltage > $U$1, asymmetry Asy, underfrequency < Hz, overfrequency > Hz, phase sequence PHS , overvoltage > $U$2, N/C operation n.c.)*	
Electrical endurance, number of cycles	10000
Fault memory	on/off /con (OFF)*

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 ºC…+55 ºC
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (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
Transport (IEC 60721-3-2)	2M2
Storage (IEC 60721-3-1)	1M3

Connection

Connection	push-wire terminals
Connection properties:	
rigid	0.2…2.5 mm²/AWG 24…14
flexible without ferrule	0.2…2.5 mm²/AWG 24…14
flexible with ferrule	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 mounting	2 x M4 with mounting clip
Software version	D313 V3.0x
Operating manual	TGH1431
Weight VMD422	≤ 150 g
Weight VMD422H	≤ 240 g

( )* = factory setting

Dimension diagram XM420 (VMD422)

Dimensions in mm

Open the front plate cover in direction of arrow!

Screw mounting

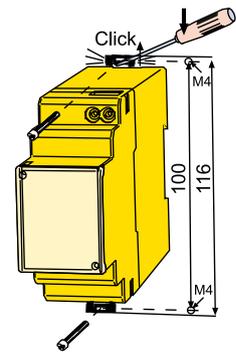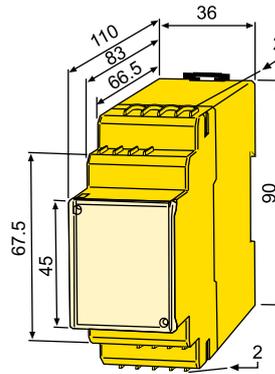Note: The upper mounting clip must be ordered separately (see ordering information)
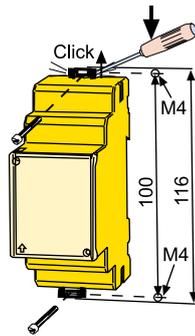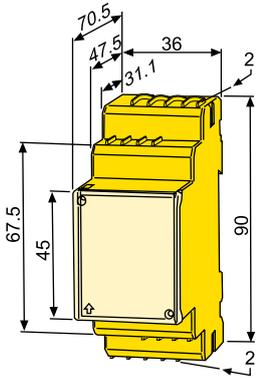
Dimension diagram XM420 (VMD422H)

Dimensions in mm

Open the front plate cover in direction of arrow!

Screw mounting

Note: The upper mounting clip must be ordered separately (see ordering information)

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