LINETRAXX® VMD421H
Multi-functional voltage relay for 3(N)AC systems, frequency/overvoltage/undervoltage, phase, phase failure, asymmetry
**Device features**

- Undervoltage, overvoltage and frequency monitoring in 3(N)AC systems 70…300/288 V
- Without external supply voltage
- Integrated energy backup
- Asymmetry, phase failure and phase sequence monitoring
- Various monitoring functions selectable \(<U, >U, <f, >f\)
- Start-up delay, response delay, delay on release
- Adjustable switching hysteresis
- r.m.s. value measurement (AC+DC)
- Digital measured value display via multi-functional LC display
- Preset function (automatic setting of basic parameters)
- 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 or N/O operation and fault memory behaviour selectable
- Password protection for device setting
- Sealable transparent cover
- Two-module enclosure (36 mm)
- Push-wire terminal (two terminals per connection)
- RoHS compliant

**Product description**

The multi-functional VMD421 series voltage relay is designed to monitor the frequency, undervoltage and overvoltage and the voltage between two threshold values (window discriminator function) in 3(N)AC systems. The voltages are measured as r.m.s. values. The currently measured value is continuously shown on the LC display. The measured value required to trigger the alarm relay is stored. Due to adjustable response times, installation-specific characteristics, such as device-specific start-up procedures, short-time voltage fluctuations, etc. can be considered. The devices are supplied by the system being monitored and utilise an internal energy backup.

**Typical applications**

- Monitoring of voltage-sensitive machines and electrical installations
- Switching machinery and equipment on and off at a certain voltage level
- Monitoring of stand-by and emergency supply systems
- Supply voltage monitoring of portable loads
- Protection of three-phase motors against phase failure and phase open-circuit
- Transformer protection, asymmetrical load can be recognised

**Function**

Once the supply voltage is applied, the start-up delay \(t\) begins. Measured voltage and frequency values changing during this time do not influence the switching state of the alarm relays.

The devices feature two separately adjustable measuring channels (overvoltage/undervoltage). When the measuring quantity exceeds the response value ("Alarm 1") or falls below the response value ("Alarm 2"), the time of the response delays \(\text{ton}_{1/2}\) begins. Once the response delay has elapsed, 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 \(t_{\text{off}}\) begins. When \(t_{\text{off}}\) 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. When the fault memory is set to continuous mode, the alarm parameters remain stored, even on failure of the supply voltage.

**Energy backup**

Also in the event of complete power failure of the system being monitored, the delay times are effective during the energy backup time. When the fault memory is set to continuous mode, the alarm parameters remain stored, even on failure of the supply voltage.

**Preset function**

After connecting the device for the first time, the nominal system voltage will be determined (PrE run), and the response values for overvoltage and undervoltage as well as for under-frequency and overfrequency will automatically be set. When no voltage is determined within a nominal system voltage range (PrE run), the response values will be set to the minimum or maximum voltage. In this case, the message "AL not SET" appears on the display. As long as no button is pressed, a nominal system voltage is being searched cyclically (PrE run). If a button is pressed, the search will be interrupted and the message "AL not SET" disappears. In this case, the appropriate response values have to be set in the menu. When activating the frequency monitoring function, the preset frequency will automatically be stored.
1 - Power On LED "ON" (green), lights when the supply voltage is applied or flashes in the event of system fault alarm

2 - Alarm LED "AL1" (yellow), lights when the set response value $U_{\text{f}}<f_{\text{f}}>/f_{\text{f}}/\text{Asy}/\text{PHS}$ is exceeded and flashes in the event of system fault alarm

3 - Alarm LED "AL2" (yellow), lights when value falls below the set response value $U_{\text{f}}<f_{\text{f}}>/f_{\text{f}}/\text{Asy}/\text{PHS}$ and flashes in the event of system fault alarm

4 - Multi-functional LC display

5 - Test button "T":
   Arrow up button: To change the measured value display, move upwards in the menu or to change parameters.
   To call up the self test: press the button $>1.5$ s

6 - Reset button "R":
   Arrow down button: to change the measured value indication, move downwards in the menu or to change parameters
   To delete stored alarms: press the button "T" $>1.5$ s

7 - "MENU" button:
   Enter button: to confirm the measured value indication or to confirm changed parameters press the button "T" $>1.5$ s
   Press the ESC button $>1.5$ s to abort an action or to return to the previous menu level

1 - Connection to the system/load to be monitored
2 - Alarm relay "K1":
   Configurable for $U_{\text{f}}<f_{\text{f}}>/f_{\text{f}}/\text{Asy}/\text{PHS}/\text{ERROR}$
3 - Alarm relay "K2":
   Configurable for $U_{\text{f}}<f_{\text{f}}>/f_{\text{f}}/\text{Asy}/\text{PHS}/\text{ERROR}$
4 - Fuse as line protection.
   6 A fuse recommended. If being supplied from an IT system, both lines have to be protected by a fuse.
Timing diagram voltage monitoring

Timing diagram phase failure, phase sequence, asymmetry
Technical data

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

- Rated insulation voltage: 400 V
- Rated impulse voltage/pollution degree: 4 kV/3
- Overvoltage category: III
- Protective separation (reinforced insulation) between (N, L1, L2, L3) - (11, 12, 14) - (21, 22, 24)
- Voltage test acc. to IEC 61010-1:
  - (N, L1, L2, L3) - (11, 12, 14): 3.32 kV
  - (N, L1, L2, L3) - (21, 22, 24): 2.21 kV

Supply voltage

- Supply voltage $U$:
  - none (internally supplied by $U_0$)
- Power consumption: ≤ 6 VA

Measuring circuit

- Measuring range (r.m.s. value) (L-L) AC 0…500 V
- Measuring range (r.m.s. value) (L-N) AC 0…288 V

Response values

- Type of distribution system: 3(N)AC/3AC (3AC)*
- Operating frequency for: 
  - n = 230/120 V: 253/132 V
  - n = 400/208 V: 440/229 V
- Relative uncertainty, frequency in the range of 15…460 Hz: ±0.2 %, ±1 digit
- Time response:
  - Start-up delay $t_{on1/2}$: 0…300 s (0.5 s)*
  - Operating time, voltage $t_{on}$: 0…300 s (0.5 s)*
  - Discharging time energy backup on power failure: 2.5 s
  - Changing time energy storage: 60 s
  - Recovery time $t_{recovery}$: ≤ 300 ms

Displays, memory

- Display: LC display, multifunctional, not illuminated
- Display range measured value: AC/DC 0…500 V
- Display range measured value: AC 0…288 V
- Operating uncertainty, voltage at 50/60 Hz: ±1.5 %, ±2 digits
- Operating uncertainty, voltage in the range 15…460 Hz: ±3 %, ±2 digits
- Operating uncertainty, frequency in the range of 15…460 Hz: ±0.2 %, ±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/con (on)*

Switching elements

- Number of changeover contacts: (K1, K2)
- Operating principle:
  - N/C operation n.o. / N/O operation n.o.
- Utilisation category: AC 13 AC 14 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 61326-1
- Operating temperature: -25…+55 °C
- Classification of climatic conditions acc. to IEC 60723:
  - Stationary use (IEC 60721-3-3): 3K5 (no condensation, no formation of ice)
  - Long-term storage (IEC 60721-3-3): 1K4
  - Transport (IEC 60721-3-3): 2M2
  - Long-term storage (IEC 60721-3-3): 1M3

Connection

- Connection type: push-wire terminals
- Connection properties:
  - rigid: 0.2…2.5 mm² (AWG 24…14)
  - flexible with ferrule: 0.2…2.5 mm² (AWG 24…16)
- Stripping length: 10 mm
- Opening force: 50 N
- Test opening, diameter: 2.1 mm

Other

- Operating mode: continuous operation
- Mounting position: vertically, see dimension diagram
- Degree of protection, internal components (IEC 60529): IP30
- Degree of protection, terminals (IEC 60529): IP30
- Enclosure material: polycarbonate
- Screw mounting: 2 x M4 with mounting clip
- DIN rail mounting acc. to DIN rail mounting acc. to IEC 60715
- Flammability class: UL94 V-0
- Classification of climatic conditions acc. to IEC 60721:
  - Stationary use (IEC 60721-3-3): 3M4
  - Transport (IEC 60721-3-3): 2M2
  - Long-term storage (IEC 60721-3-3): 1M3
- Classification of mechanical conditions acc. to IEC 60721:
  - Stationary use (IEC 60721-3-3): 3M4
  - Transport (IEC 60721-3-3): 2M2
  - Long-term storage (IEC 60721-3-3): 1M3
- Classification of climatic conditions acc. to IEC 60721:
  - Operating temperature: -25…+55 °C
  - Degree of protection, internal components (IEC 60529): IP30
  - Degree of protection, terminals (IEC 60529): IP30
  - Enclosure material: polycarbonate
  - Screw mounting: 2 x M4 with mounting clip
  - DIN rail mounting acc. to IEC 60715
  - Flammability class: UL94 V-0
- Classification of mechanical conditions acc. to IEC 60721:
  - Stationary use (IEC 60721-3-3): 3M4
  - Transport (IEC 60721-3-3): 2M2
  - Long-term storage (IEC 60721-3-3): 1M3

Password: Off/0…999 (OFF)*

Fault memory (M) alarm relay: on/off/con (on)*

Weight: ≤ 240 g

( )* = factory setting
### Ordering information

<table>
<thead>
<tr>
<th>Nominal system voltage $U_n$</th>
<th>Type designation</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3(N)AC 70…500 V, 15…460 Hz</td>
<td>VMD421H-D-3</td>
<td>B 7301 0007</td>
</tr>
</tbody>
</table>

Device version with screw terminals on request.

1) Absolute values

#### Accessories

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting clip for screw mounting (1 piece per device)</td>
<td>B 9806 0008</td>
</tr>
</tbody>
</table>

#### Dimension diagram XM421

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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