

## VME420

### Multi-functional monitoring relays for overvoltage, undervoltage and frequency monitoring in AC/DC systems with external supply voltage



VME420

#### Device features

- Monitoring AC/DC systems for undervoltage, overvoltage and frequency in the voltage range of 0...300 V
- Different monitoring functions selectable < U, > U or < U/> U, < f, > f or < 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 assignment 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 (gold-plated relay contacts), 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)
- Indication of the system frequency
- RoHS-compliant

#### Approvals



#### Product description

The voltage relays of the VME420 series are designed to monitor the frequency, undervoltage, overvoltage and the voltage between two threshold values (window discriminator function) in AC and DC systems. The voltages are measured as r.m.s. values. The currently measured value is continuously shown on the LC display. The measured value leading to the activation of the alarm relays will be stored. Due to adjustable response times, installationspecific characteristics, such as device-specific start-up procedures, short-time voltage fluctuations, etc. can be considered. Device version VME420 requires an external supply voltage.

#### Typical applications

- Single-phase voltage and frequency monitoring of machines and electrical installations
- Earth fault monitoring in medium-voltage systems via voltage transformers
- Monitoring of battery systems
- Switching on and switching off at a certain voltage level

#### Function

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

The devices provide 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 "t<sub>on1/2</sub>" begins. Once 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<sub>off</sub>" begins. When "t<sub>off</sub>" has elapsed, the alarm relays switch back to their initial position.

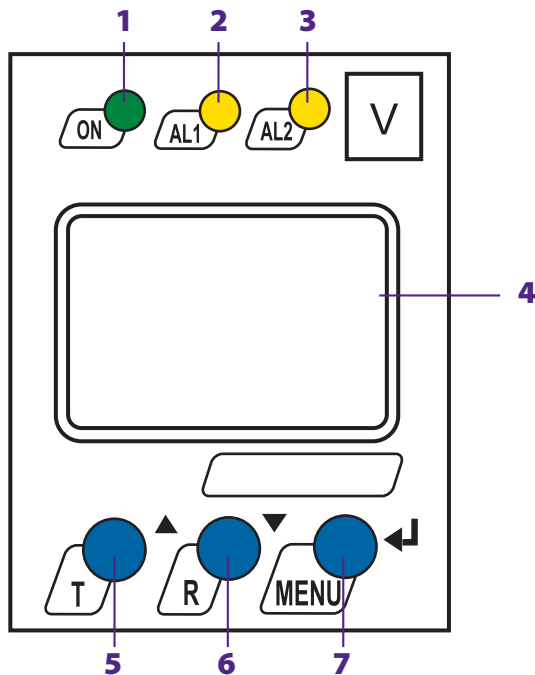
When the fault memory is activated, the alarm relays remain in the alarm state until the reset button R is pressed. When the fault memory is set to continuous mode, the alarm parameters remain stored, even on failure of the supply voltage.

#### 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 underfrequency 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 key is pressed, a nominal system voltage is being searched cyclically (PrE run). If a key 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 applied.

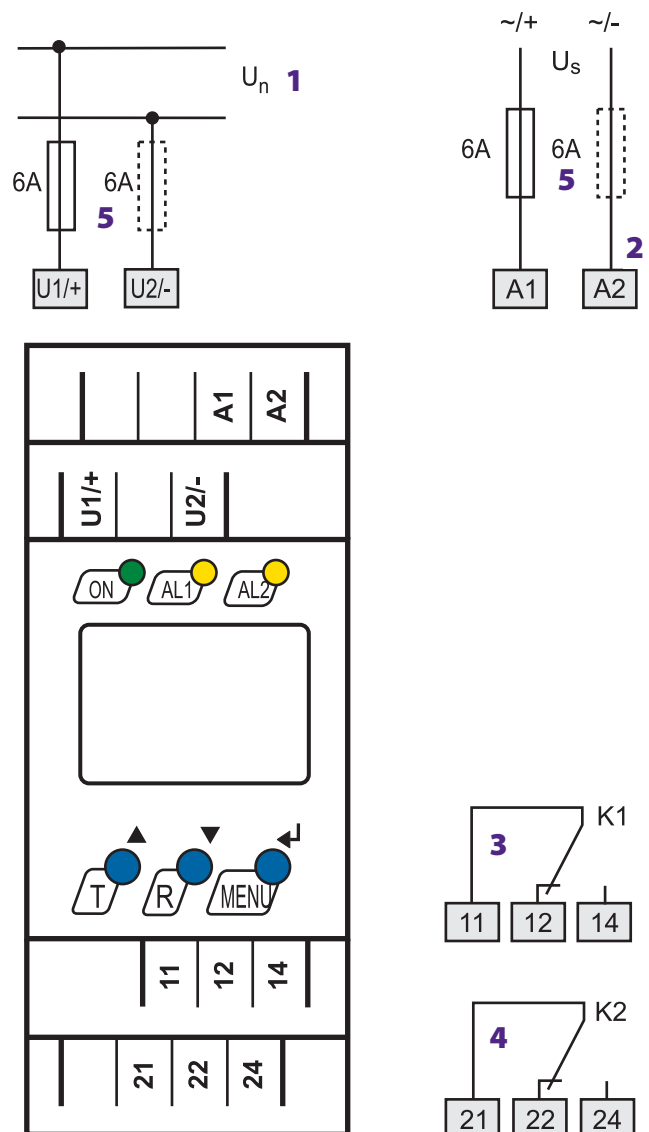


Operating elements



- 1 - LED Power On "ON" (green); lights when supply voltage is applied and flashes in the event of system fault alarm.
- 2 - Alarm LED "AL1" (yellow), lights when the set response value  $> U / < f / > f$  is exceeded and flashes in the event of system fault alarm.
- 3 - Alarm LED "AL2" (yellow), lights when the value falls below the set response value  $< U / < f / > f$  and flashes in the event system fault alarm.
- 4 - Multi-functional LC display.
- 5 - Test button "T": UP key: To change the measured value display, move downwards in the menu or change parameters.  
To call up the self test: Press the key  $> 1.5$  s
- 6 - Reset "R" button: DOWN key: To change the measured value display, move downwards in the menu or change parameters.  
Delete stored alarms: Press the key  $> 1.5$  s
- 7 - MENU key: Enter key: To confirm the measured value display or change parameters.  
To call up the menu system: Press the key  $> 1.5$  s  
Press ESC key  $> 1.5$  s: to abort an action or to return to the previous menu level.

Wiring diagram



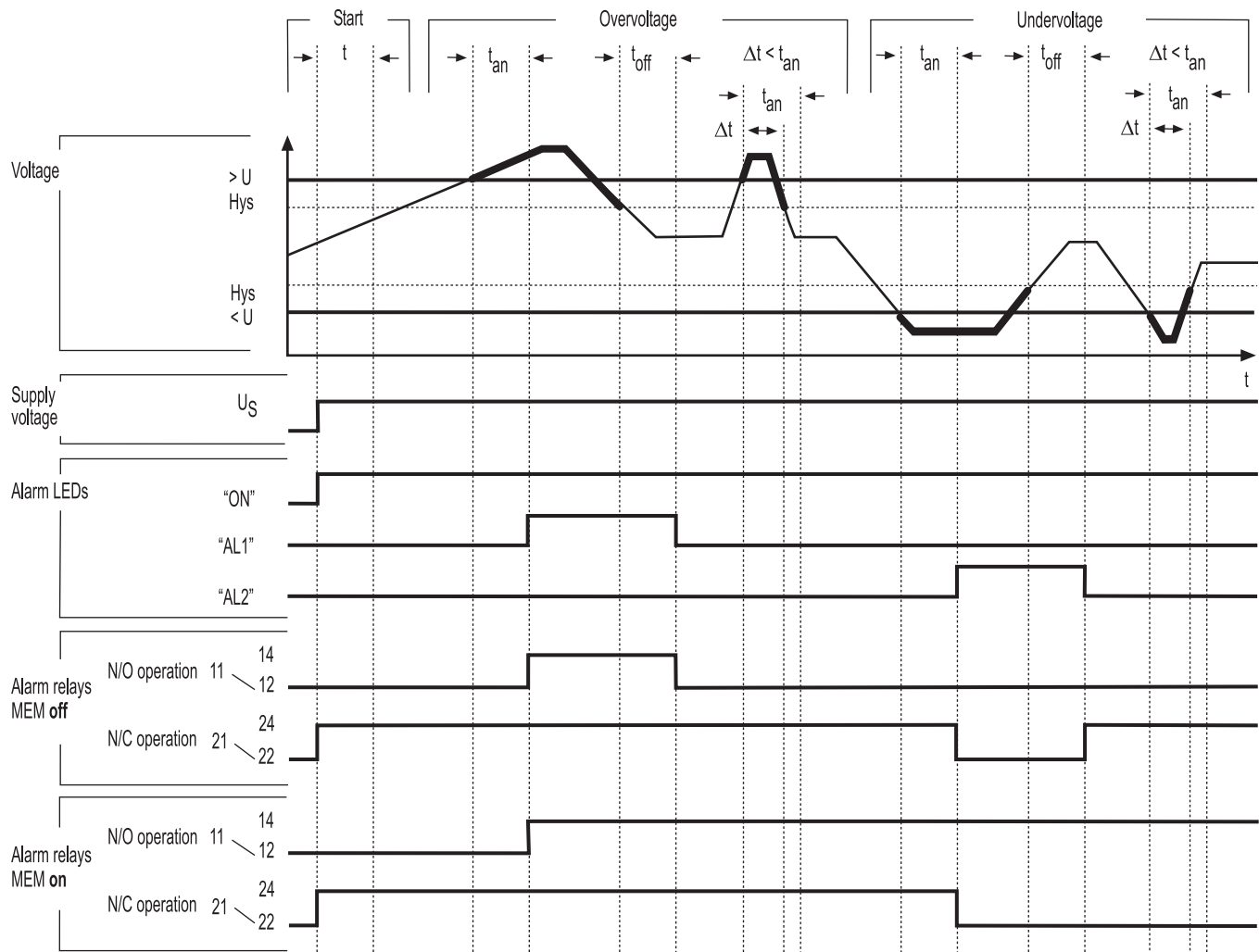
- 1 - Connection to the system/load being monitored
- 2 - Supply voltage  $U_s$  (see ordering information)
- 3 - Alarm relay K1: Configurable  $f < U / > U / < f / > f$  / ERROR
- 4 - Alarm relay K2: Configurable  $f < U / > U / < f / > f$  / ERROR
- 5 - Line protection according to IEC 60364-4-43  
A 6 A fuse is recommended. If being supplied from an IT system, both lines have to be protected by a fuse.

| Ordering information |   |   |                 |                   |             |
|----------------------|---|---|-----------------|-------------------|-------------|
| Type                 | Supply voltage $U_s^*$                    | Nominal system voltage $U_n^*$          | Display range   | Response value    | Art. No.    |
| VME420-D-1           | DC 9.6...94 V / AC 15...460 Hz 16...72 V  | DC 0...300 V / AC 15...460 Hz 0...300 V | AC/DC 0...300 V | AC / DC 6...300 V | B 7301 0001 |
| VME420-D-2           | DC 70...300 V / AC 15...460 Hz 70...300 V | DC 0...300 V / AC 15...460 Hz 0...300 V | AC/DC 0...300 V | AC / DC 6...300 V | B 7301 0002 |

Device version with screw-type terminals on request.  
\* absolute values

| Accessories   |             |
|---|-------------|
| Type  | Art No.     |
| Mounting clip for screw fixing (1 piece per device) | B 9806 0008 |

**Timing diagram voltage monitoring**



$t$  - Start-up delay

$t_{an}$  - Response time

$t_{off}$  - Delay on release

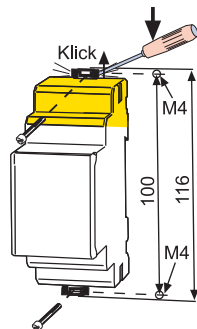
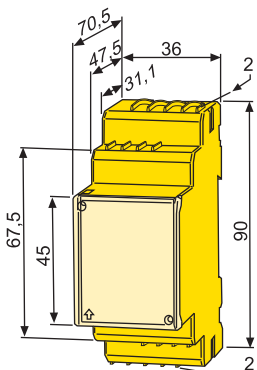
**Dimension diagram XM420**

Dimensions in mm

Open the front plate cover in direction of arrow!

**Screw fixing**

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



**Technical data monitoring relay VME420 for undervoltage, overvoltage and frequency monitoring**
**Insulation coordination acc. to IEC 60664-1 / IEC 60664-3**

|   |              |
|---|--------------|
| Rated insulation voltage  | 250 V        |
| Rated impulse voltage/pollution degree  | 2.5 kV / III |
| Protective separation (reinforced insulation) between:<br>(A1, A2) - (U1/+, U2/-) - (11-12-14) - (21-22-24) |              |
| Voltage test acc. to IEC 61010-1  | 2.21 kV      |

**Supply voltage**
**VME420-D-1:**

|                       |                              |
|-----------------------|------------------------------|
| Supply voltage $U_s$  | AC 16...72 V / DC 9.6...94 V |
| Frequency range $U_s$ | 15...460 Hz                  |

**VME420-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**

|                                |                   |
|--------------------------------|-------------------|
| Measuring range (r.m.s. value) | AC / DC 0...300 V |
| Rated frequency $f_n$          | DC, 15...460 Hz   |
| Frequency display range        | 10...500 Hz       |

**Response values**

|   |                                      |
|---|--------------------------------------|
| Undervoltage < U (Alarm 2)  | AC / DC 6...300 V                    |
| Overvoltage > U (Alarm 1)   | AC / DC 6...300 V                    |
| Resolution of setting U 6.0...49.9 V                                      | 0.1 V                                |
| Resolution of setting U 50...300 V  | 1 V                                  |
| Preset function:  |                                      |
| Undervoltage < U = (0.85 $U_n$ )* for $U_n = 230 V / 120 V / 60 V / 24 V$ | 196 V / 102 V / 51 V / 20.4 V        |
| Overvoltage > U = (1.1 $U_n$ )* for $U_n = 230 V / 120 V / 60 V / 24 V$   | 253 V / 132 V / 66 V / 26.4 V        |
| Relative percentage error voltage at 50/60 Hz                             | ± 1.5 %, ± 2 digits                  |
| Relative percentage error in the voltage range 15...460 Hz                | ± 3 %, ± 2 digits                    |
| Hysteresis U  | 1...40 % (5 %)*                      |
| Underfrequency < Hz   | 10...500 Hz                          |
| Overfrequency > Hz  | 10...500 Hz                          |
| Resolution of setting f 10.0...99.9 Hz                                    | 0.1 Hz                               |
| Resolution of setting f 100...500 Hz                                      | 1 Hz                                 |
| Preset function:  |                                      |
| Underfrequency for $f_n = 16.7 Hz / 50 Hz / 60 Hz / 400 Hz$               | 16.2 Hz / 49.5 Hz / 59.5 Hz / 399 Hz |
| Overfrequency for $f_n = 16.7 Hz / 50 Hz / 60 Hz / 400 Hz$                | 17.2 Hz / 50.5 Hz / 60.5 Hz / 401 Hz |
| Hysteresis frequency Hys Hz   | 0.2...2 Hz (0.2 Hz)*                 |
| Relative percentage error in the frequency range 15...460 Hz              | ± 0.2 %, ± 01 digits                 |

**Specified time**

|                                   |  |
|-----------------------------------|--|
| Start-up delay t                  | 0...99 s (0 s)*                                  |
| Response delay $t_{on1/2}$        | 0...99 s (0 s)*                                  |
| Delay on release $t_{off}$        | 0...99 s (0.5 s)*                                |
| Operating time voltage $t_{ae}$   | DC/AC 16.7 Hz: ≤ 130 ms, AC 42...460 Hz: ≤ 70 ms |
| Operating time frequency $t_{ae}$ | AC 15...460 Hz: ≤ 310 ms                         |
| Response time $t_{an}$            | $t_{an} = t_{ae} + t_{on1/2}$                    |
| Recovery time $t_b$               | ≤ 300 ms   |

**Displays, memory**

|  |   |
|--|---|
| Display  | LC display, multi-functional, not illuminated |
| Display range measured value                                 | AC/DC 0...300 V                               |
| Operating error voltage at 50/60 Hz                          | ±1.5 %, ±2 digits                             |
| Relative percentage error in the voltage range 15...460 Hz   | ±3 %, ±2 digits                               |
| Relative percentage error in the frequency range 15...460 Hz | ±0.2 %, ±1 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 (on)*                          |

**Switching elements**

|  |   |
|--|---|
| Number of changeover contacts  | 2 x 1 (K1, K2)  |
| Operating principle  | N/C or N/O operation  |
|  | K2: Err, < U, > U, < Hz, > Hz (undervoltage < U: N/C operation n.c.)* |
|  | K1: Err, < U, > U, < Hz, > Hz (overvoltage > U: N/O operation n.o.)*  |
| Electrical service life under rated operating conditions, number of cycles | 10 000  |
| 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**

|  |  |
|--|--|
| EMC  | IEC 61326-1                                    |
| 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) |
| 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 mm <sup>2</sup> (AWG 24...14) |
| Flexible without ferrules | 0.2...2.5 mm <sup>2</sup> (AWG 24...14) |
| Flexible with ferrules    | 0.2...1.5 mm <sup>2</sup> (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                |
| Product standard                                      | IEC 61010-1 and according to IEC 60255-6 |
| Operating manual                                      | TGH1399                                  |
| Weight  | ≤ 150 g                                  |

( )\* = factory setting