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VME421H Series

Digital Voltage, Frequency, Asymmetry, and Phase Loss Relay
For Single-Phase AC and DC Systems

Technical Bulletin

NAE1032041 / 03.2013

VME421H

Voltage and Frequency Relay , Line Powered for Single-Phase AC and DC Systems

VME421H

Device features

- Undervoltage, overvoltage, underfrequency, and overfrequency relay for AC/DC systems:
  9.6…150 V (VME421H-D-1)
  70…300 V (VME421H-D-2)
- Powered by line being monitored, no external supply voltage necessary
- Integrated energy backup
- Various alarms may be individually enabled/disabled and assigned to separate output contacts
- Start-up delay, response delay, delay on release
- Adjustable switching hysteresis
- RMS value measurement (AC + DC)
- Digital LCD display with real-time readings and onboard menu
- LEDs: Power On, Alarm 1, Alarm 2
- Memory stores last alarm value
- Non-volatile memory for settings
- Continuous self monitoring
- Internal test/reset button
- Two separate SPDT relays (gold-plated relay contacts)
- Normally energized or normally de-energized operation
- Latching or non-latching operation
- Password protection for device setting
- Sealable transparent cover
- Two-module enclosure (36 mm)
- RoHS compliant

Approvals

Product description

The VME420 series monitors overfrequency, underfrequency, overvoltage, and undervoltage in AC and DC systems. Voltages are measured as RMS values. Each alarm may be individually activated or deactivated based on the system requirements. Three separate time delays (startup delay, alarm response delay, and delay on release) allow the VME420 to be tailored to specific applications. Two SPDT alarm contacts may be separately assigned individual alarms.

The digital LCD display shows the currently read value in real-time. When an alarm is activated, the value is stored in the device's history. The VME421H is powered by the system it is monitoring, and includes an internal energy backup. Consult the VME420 series for a version powered by an external supply voltage.

Typical applications

- General purpose single-phase AC and DC voltage and frequency monitoring of ma chines and electrical installations
- Monitoring of battery systems
- Dump load controller
- Window voltage monitoring (simultanous overvoltage and undervoltage monitoring)

Function

Once the supply voltage is applied, the startup delay "t" is activated. Measured voltage and frequency values that may cause an alarm will not activate until after the startup delay is complete.

Each type of alarm may be assigned an individual value. Two separate alarm states ("R1" and "R2") may then be assigned any combination of these alarms to trip their respective contacts. When any alarm has been activated, the respone delay "$t_{on1/2}$" will activate. Once the response delay has elapsed, if the alarm is still active, the appropriate contact will trip and the alarm LEDs light. Once the alarm has cleared, the delay on release "t_{off}" begins. Once this delay has elapsed and the alarm is still cleared, the appropriate contact will switch back.

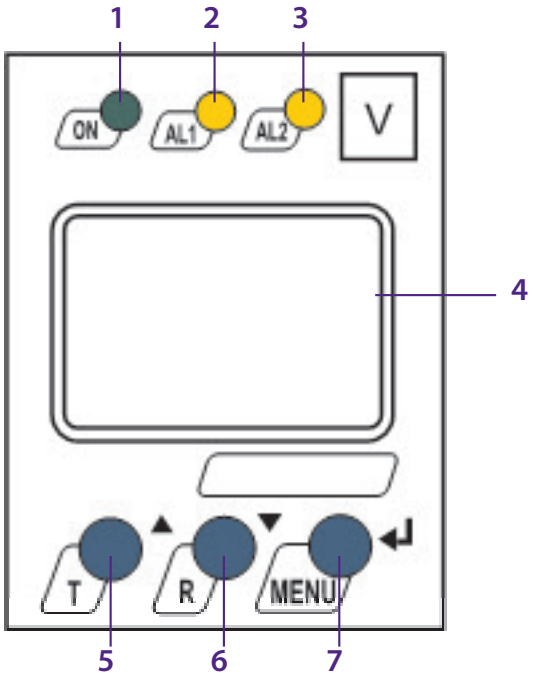
If the device is set to operate in latching mode ("fault memory"), the device must be manually reset if it goes into alarm. If it is set to non-latching mode, the alarm will automatically clear itself. Regardless of this setting, the last alarm value will be stored in the device's onboard history. Device settings are stored in non-volatile memory and will remain set even with a loss of supply voltage.

In the event of a complete power failure of the system being monitored, the delay times will still run while the energy backup is active.

Preset function

After connecting the device for the first time, this optional feature will determine the nominal system voltage and response values for overvoltage, undervoltage, overfrequency, and underfrequency will be automatically set. These settings may be changed once the preset is run. The preset function may be re-run at a later time via the device's onboard menu.

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 overvoltage alarm or a frequency alarm is active, and flashes in the event of system fault alarm.

3 - Alarm LED "AL2" (yellow), lights when the undervoltage alarm or a frequency alarm is active, and flashes in the event system fault alarm.

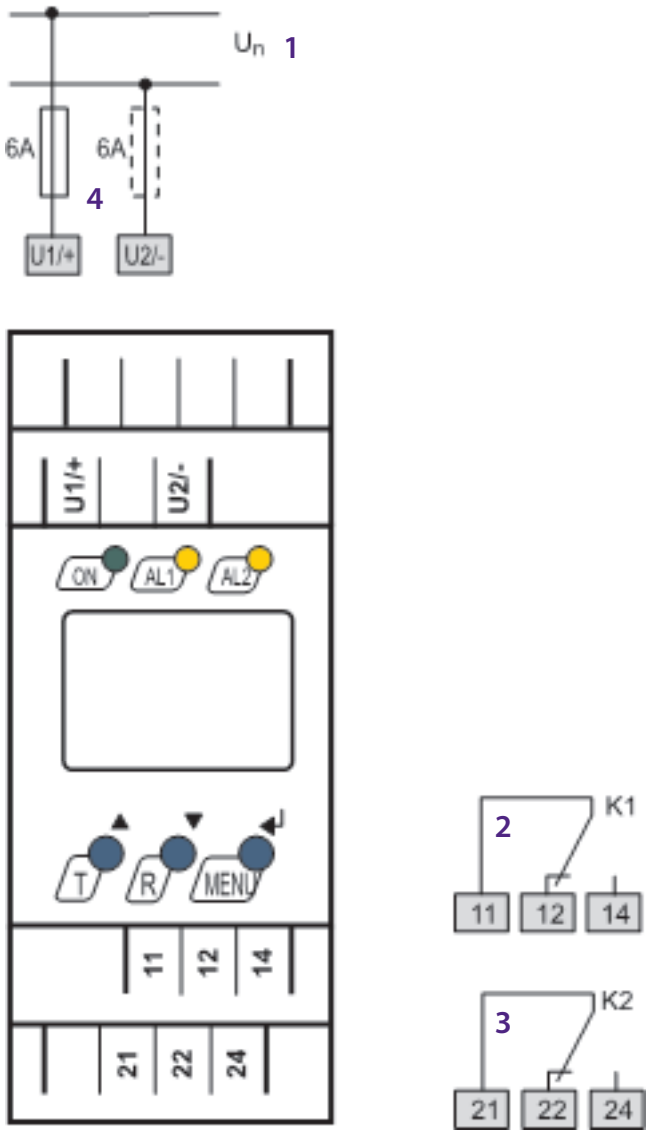
4 - Multi-functional LCD display

5 - Test button "T": UP key: Change displayed value, move downwards in the menu or change parameters.
Holding for > 1.5 s initiates a self-test.

6 - Reset "R" button: DOWN key: Change displayed value, move downwards in the menu or change parameters.
Holding for > 1.5s resets the device.

7 - MENU key: Enter key: Confirms / changes parameters.
When on the main screen, holding for > 1.5 s enters the main menu.
When in the menu, holding for > 1.5 s cancels an action or moves back a step in the menu structure.

Wiring diagram



1 - Connection to the system/load being monitored

2 - Alarm relay K1: Configurable for all available alarms

3 - Alarm relay K2: Configurable for all available alarms

4 - Recommended fuse for line protection

Ordering information

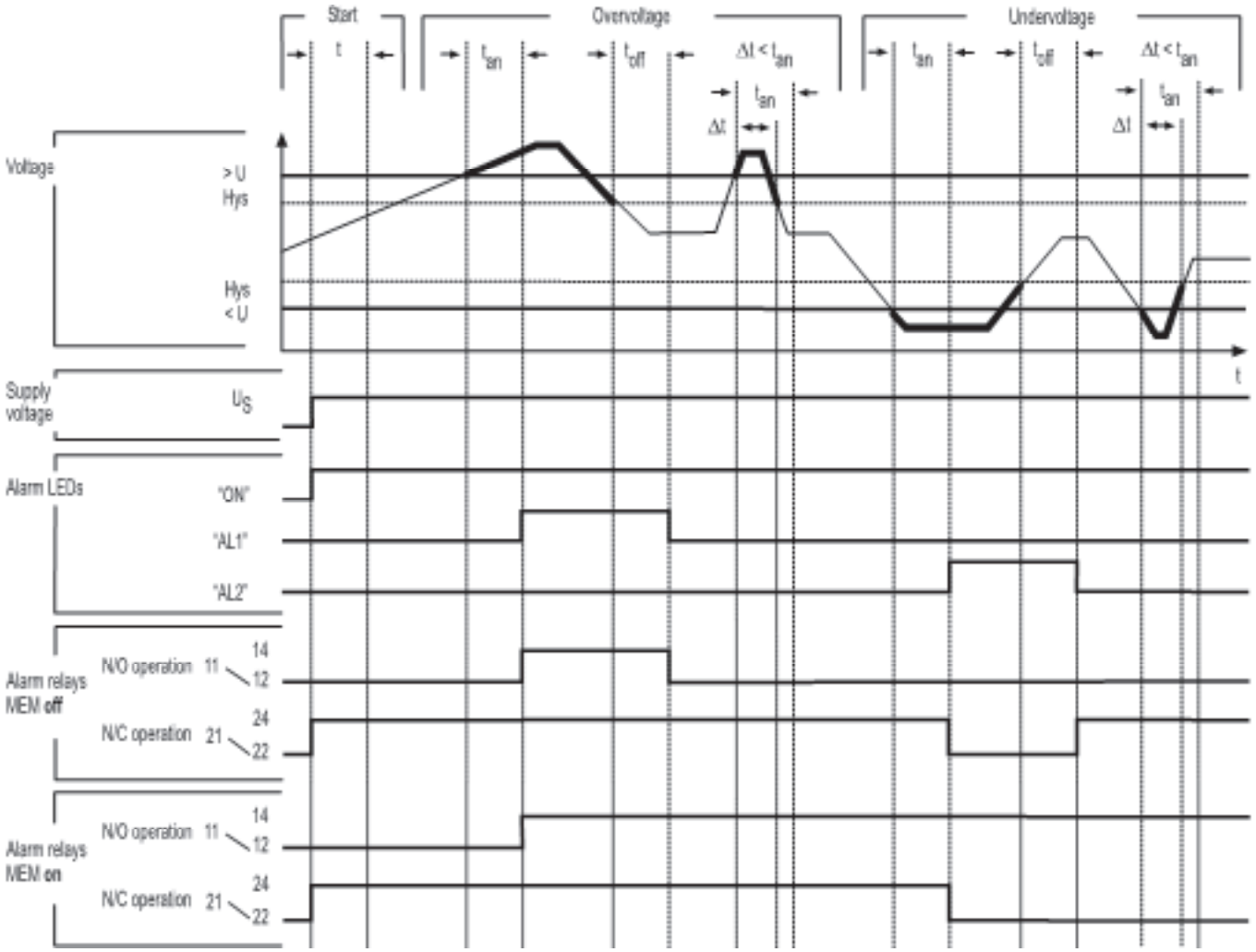
Type	Supply voltage U_S	Nominal system voltage U_n*	Display range	Response value	Art. No.
VME421H-D-1	--	DC 9.6…150 V / AC 15…460 Hz 9.6…150 V	AC / DC 9.6…150 V	AC / DC 9.6…150 V	B 9301 0003
VME421H-D-2	--	DC 70…300 V / AC 15…460 Hz 70…300 V	AC / DC 70…300 V	AC / DC 70…300 V	B 9301 0004

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

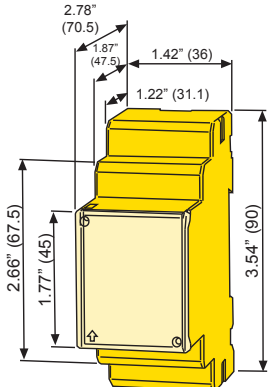
Sample timing diagram: Voltage monitoring



t - Start-up delay **t_{an} -** Response time **t_{off} -** Delay on release

Dimensions

Dimensions in inches (mm)



Technical data: VME421H Voltage and Frequency Relay

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:	(U1/+, U2/-) - (11-12-14) - (21-22-24)
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

VME421H-D-1:	
Supply voltage U_S	none (internally supplied by U_n)
VME421H-D-2:	
Supply voltage U_S	none (internally supplied by U_n)
Power consumption	≤ 4 VA

Measuring circuit

Measuring range (r.m.s.) (VME421H-D-1)	AC / DC 0…150 V
Measuring range (r.m.s.) (VME421H-D-2)	AC / DC 0…300 V
Rated frequency f_n	DC, 15…460 Hz
Frequency range	10…500 Hz**

Response values

VME421H-D-1:	
Undervoltage < U (Alarm 2)	AC / DC 9.6…150 V
Overvoltage > U (Alarm 1)	AC / DC 9.6…150 V
Preset function:	
Undervoltage < U (0.85 U_n)* for U_n = 120 V/ 60 V/ 24 V	102 V / 51 V / 20.4 V
Overvoltage > U (1.1 U_n)* for U_n = 120 V/ 60 V/ 24 V	132 V / 66 V / 26.4 V
Resolution of setting U 9.6…49.9 V	0.1 V
Resolution of setting U 50…150 V	1 V
VME421H-D-2:	
Undervoltage < U (Alarm 2)	AC / DC 70…300 V
Overvoltage > U (Alarm 1)	AC / DC 70…300 V
Resolution of setting U 70…300 V	1 V
Preset function:	
Undervoltage < U (0.85 U_n)* for U_n = 230 V / 120 V	196 V / 102 V
Overvoltage > U (1.1 U_n)* for U_n = 230 V / 120 V	253 V / 132 V
VME421H…:	
Relative uncertainty voltage at 50/60 Hz	± 1.5 %, ± 2 digits
Relative uncertainty voltage in the range of 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	15.7 Hz / 49 Hz / 59 Hz / 399 Hz
Overfrequency for f_n = 16.7 Hz / 50 Hz / 60 Hz / 400 Hz	17.7 Hz / 51 Hz / 61 Hz / 401 Hz
Hysteresis frequency Hys Hz	0.1…2 Hz (0.2 Hz)*
Relative uncertainty frequency in the range of 15…460 Hz	± 0.2 %, ± 1 digit

Specified time

Start-up delay	0…300 s (0 s)*
Response delay $t_{on1/2}$	0…300 s (0 s)*
Release delay t_{off}	0…300 s (0.5 s)*
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}	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}	$t_{an} = t_{ae} + t_{on1/2}$
Discharging time energy backup on power failure (VME421H-D-1)	≥ 3 s
Discharging time energy backup on power failure (VME421H-D-1)	≥ 2.5 s at f_n < 42 Hz
Discharging time energy backup on power failure (VME421H-D-2)	≥ 4 s at DC 70 V ≥ 6 s at DC 80 V / AC 70 V
Charging time energy backup (VME421H-D-1)	≤ 60 s
Charging time energy backup (VME421H-D-2)	≤ 120 s
Recovery time t_b	≤ 300 ms

Displays, memory

Display	LCD display, multi-functional, not illuminated
Display range, measuring value (VME421H-D-1)	AC/DC 0…150 V
Display range, measuring value (VME421H-D-2)	AC/DC 0…300 V
Operating uncertainty at 50/60 Hz	± 1.5 %, ± 2 digits
Operating uncertainty voltage in the range of 15…460 Hz	± 3 %, ± 2 digits
Operating uncertainty in the frequency range 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	2 x 1 (K1, K2)
Operating principle	Normally energized / Normally de-energized operation K2: Err, < U, > U, < Hz, > Hz, S.AL (undervoltage < U: N/E operation n.c.)* K1: Err, < U, > U, < Hz, > Hz, S.AL (overvoltage > U: N/D operation n.o.)*
Electrical service life under rated operating conditions	10000 switching operations

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 rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	IEC 61326
Operating temperature	-13 °F…+131 °F (-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 type	push-wire terminals
Connection properties:	
rigid	0.2…2.5 mm² (AWG 24…14)
Flexible without ferrules	0.2…2.5 mm² (AWG 24…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
Position	any position
Degree of protection DIN EN 60529, internal components	IP30 (NEMA 1)
Degree of protection DIN EN 60529, terminals	IP20 (NEMA 1)
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 VME421H-D-1	D236 V2.2x
Software version VME421H-D-2	D237 V2.2x
Weight	≤ 240 g

( )* = factory setting

** = Technical data are only guaranteed within the operating range of the rated frequency (15…460 Hz).

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