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GM420

Digital Ground Continuity Relay
For AC Systems

Technical Bulletin

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GM420

Ground continuity monitor
For AC systems

GM420

Device features

- Ground continuity monitoring in AC and deenergized systems
- Loop resistance and extraneous voltage monitoring
- Powered by external supply voltage
- Start-up delay, response delay, delay on release
- Adjustable switching hysteresis
- Digital LCD display with real-time readings and onboard menu
- Automatic preset function available when first connecting device
- LEDs: Power On, Alarm 1, Alarm 2
- Memory stores last triggered value
- Non-volatile memory for settings
- Continuous self monitoring
- Internal test/reset button
- Two separate SPDT alarm relays (gold-plated relay contacts)
- Normally energized or normally deenergized operation
- Latching or non-latching operation
- Password protection for device setting
- Sealable transparent cover
- Two-module enclosure (36 mm)
- RoHS compliant

Approvals

c UL us LISTED

Description

The GM420 monitors the loop resistance of ground conductors in AC systems and in deenergized systems. The GM420 has three types of alarms: Loop resistance (0 to 100 Ω), overload (a very high resistance or break in the loop), and an extraneous voltage between the two terminals of 12 V. The loop resistance is displayed on the device's digital display in real-time. All settings are changed in the device's onboard menu.

Applications

- Loop monitoring of motors
- General ground conductor monitoring
- Monitoring of trailer ground cables

Function

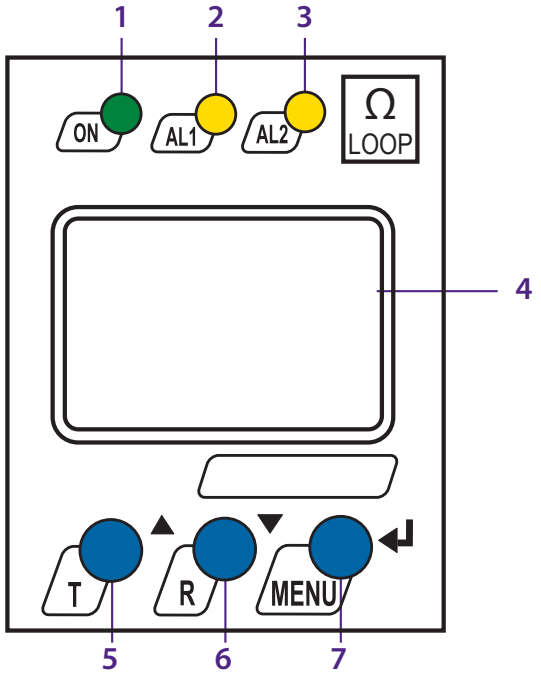
Once the supply voltage is applied, the startup delay "t" is activated. Alarm values will not trigger the device's alarm during this time period. When the loop resistance or the extraneous voltage exceeds the set response value, the response delay "$t_{on1/2}$" will activate. Once the response delay has elapsed, the alarm lights will activate and the contacts will switch state. Once the alarm clears, the delay on release "t_{off}" will activate. Once this delay has elapsed and the alarm is still cleared, the alarm lights will clear and the contacts will switch back to the normal state.

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. The last triggered alarm value will be stored in the device's onboard history. Device settings are stored in non-volatile memory and will remain even with a loss of supply voltage.

Preset function

After connecting the device for the first time, this optional feature will determine the nominal loop resistance for the circuit. If the measured loop resistance is greater than 66 Ω during the preset process, the response value will automatically be set to 100 Ω. These settings may be changed after the preset is complete. The preset function may be re-run at a later time via the device's menu.

Operating elements



1 - Power On LED “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, frequency, asymmetry, or phase loss alarm is active, and flashes in the event of a system fault alarm.

3 - Alarm LED “AL2” (yellow), lights when the undervoltage, frequency, asymmetry, or phase loss alarm is active, and flashes in the event of a system fault alarm.

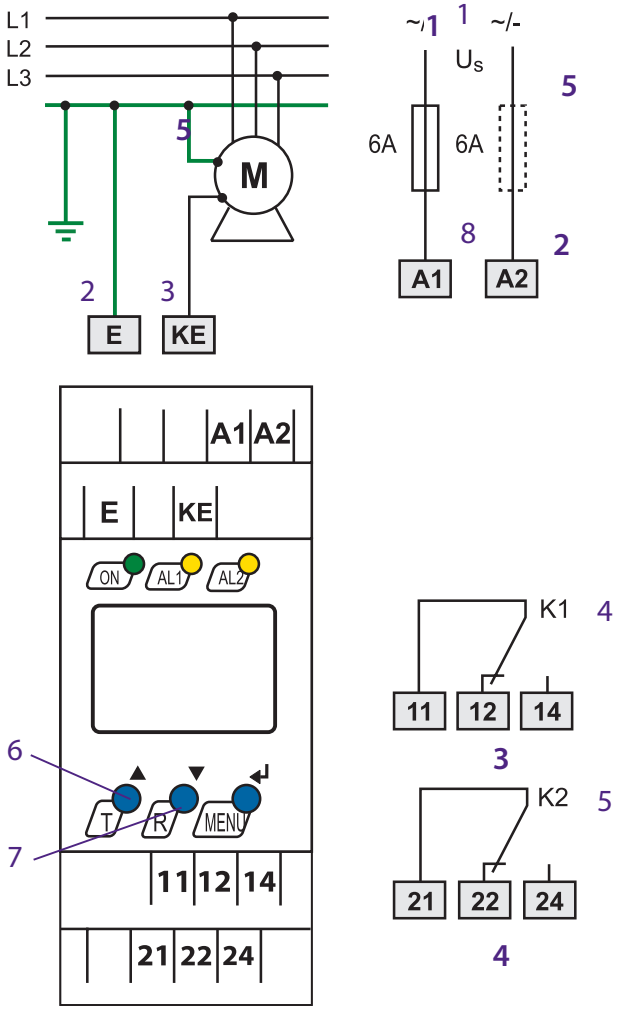
4 - Multi-functional LCD display

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 - Supply voltage U_S (see ordering information)

2 - Ground connection

3 - Pilot wire connection to ground / clamp / load

4 - Alarm relay K1: Configurable for all available alarms

5 - Alarm relay K2: Configurable for all available alarms

6 - Test button

7 - Reset button

8 - Recommended fusing for line protection

Ordering information

Part number	Supply voltage U_S*	Loop resistance measuring range	Ordering number
GM420-D-1	DC 9.6…94 V / AC 15…460 Hz 16…72 V	0…100 Ω	B 9308 2001
GM420-D-2	DC 70…300 V / AC 15…460 Hz 70…300 V	0…100 Ω	B 9308 2002

* absolute values

Technical Data

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

Rated voltage	AC 400 V
Rated impulse voltage / pollution degree	4 kV / 3
Protective Separation (reinforced insulation (A1, A2) - (E, KE) - (11, 12, 14) - (21, 22, 24)	
Voltage tests to IEC 61010-1:	
(E, KE) - [(A1, A2), (11, 12, 14)]	3.32 kV
(E, KE) - (21, 22, 24)	2.21 kV
(A1, A2) - (11, 12, 14) - (21, 22, 24)	2.21 kV

Supply voltage

Supply voltage U_S	AC/DC 70…300 V
Frequency range of U_S	15…460 Hz
Power consumption	≤ 3.5 VA

Measuring circuit

Loop resistance R_m:	
Measuring range R_m	0…100 Ω
Measuring current I_m	DC 20 mA
Measuring voltage U_m	≤ DC 24 V
Extraneous voltage U_f:	
Measuring range U_f	AC 0…50 V
Rated frequency f_n	42…460 Hz
Measuring loop disconnection at U_f	≥ 12 V
Measuring loop reconnection	≤ 10 V
Extraneous voltage U_f	≤ 440 V
Permissible extraneous DC voltage without measurement influence	DC 0 V

Response values

Loop resistance > Alarm 1	0.1…100 Ω
Resolution of setting R = 0…10 Ω	0.1 Ω
Resolution of setting R = 10…100 Ω	1 Ω

Time behavior

Start-up delay t	Adjustable 0…99 s
Response delay $t_{on1/2}$	Adjustable 0…99 s
Delay on release t_{off}	Adjustable 0…99 s

Operating time

t_{ae} in case of open loop connection (R > 50 k Ω)	≤ 40 ms
t_{ae} in case of closed loop connection (>R)	≤ 500 ms
t_{ae} in case of extraneous voltage (> V) and overload (OL)	≤ 100 ms
Response time t_{an}	$t_{an} = t_{ae} + t_{on1/2}$
Recovery time t_{an}	≤ 300 ms
Recovery time t_{ab} after disconnection for safety reasons	≤ 1 s

Switching elements

Number of switching elements					2 SPDT contacts
Operating principle, adjustable					normally energized or de-energized operation
Electrical service life under rated operating conditions					10,000 switching cycles
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
Fault memory behavior					Latching or non-latching operation

General data

Operating mode	continuous duty
Mounting	any position
Protection class, internal components (IEC 60529)	IP30, NEMA 1
Protection class, terminals (IEC 60529)	IP20, NEMA 1
Enclosure material	polycarbonate
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94V-0
Weight	≤ 0.33 lb (150 g)

Environment / EMC

EMC	IEC 61326
Operating temperature	- 13 °F…+ 131 °F (- 25 °C…+ 55 °C)
Climatic class 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)
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions IEC 60721	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-time storage (IEC 60721-3-1)	1M3

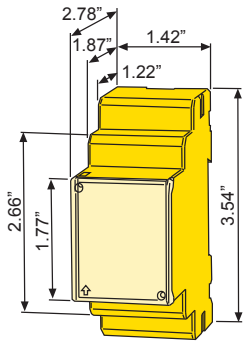
Connections

Connection type specification for:	Screw terminals
Rigid/flexible conductor sizes	AWG 24…12 / 24…14
Stripped length	0.31…0.35 in (8…9 mm)
Tightening torque	0.36…0.44 ft-lb (0.5…0.6 N-m)
Connection type specification for:	Push-wire terminals
Rigid/flexible conductor sizes	AWG 24…14
Flexible with core end sleeve	AWG 24…16

Dimensions

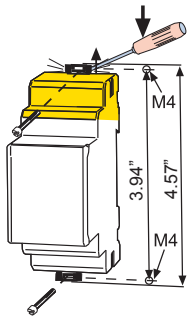
Dimensions in inches

Open the front plate cover in direction of arrow.



Screw fixing

Note: Additional clip required for screw mounting (see ordering information).



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