Power factor monitoring (cosφ) in 1- or 3-phase mains

G4CM690V16ATL20 230VAC

Part No. 2394601

Loadmonitors - GAMMA series

Monitoring of inductive and capacitive consumers

Multifunction

Temperature monitoring of the motor winding

Reset-key, Fault latch

Recognition of disconnected consumers as „good“ or „fault“ state

Suitable for VFI (10 to 100Hz)

Supply voltage 230 V a.c.

2 change over contacts

Width 45mm

Industrial design

Read and understand these instructions before installing, operating or maintaining the equipment.

Danger!
Never carry out work on live parts! Danger of fatal injury! The product must not be used in case of obvious damage. To be installed by an authorized person.

Technical data

1. Functions

Load monitoring (cosφ) of inductive and capacitive consumers in 1- or 3-phase mains with adjustable thresholds (cosφ1, cosφ2), timing for start-up supression and tripping delay separately adjustable, selectable fault latch, temperature monitoring of the motor winding with max. 6 PTC, reset-key and the following functions which are selectable by means of rotary switch:

2MIN	Minimum monitoring
2MIN+I< ON	Minimum monitoring and recognition of disconnected consumers (relay ON if I<)
2MIN+I< Inv.	Minimum monitoring and recognition of disconnected consumers (relay OFF if I< Inv.)
2MAX	Maximum monitoring
2MAX+I< ON	Maximum monitoring and recognition of disconnected consumers (relay ON if I<)
2MAX+I< Inv.	Maximum monitoring and recognition of disconnected consumers (relay OFF if I< Inv.)
WIN	Monitoring the window between MIN and MAX
WIN+I< ON	Monitoring the window between MIN and MAX and recognition of disconnected consumers (relay ON if I<)
WIN+I< Inv.	Monitoring the window between MIN and MAX and recognition of disconnected consumers (relay OFF if I< Inv.)
MIN/MAX	Minimum- and maximum monitoring
MIN/MAX+I< ON	Minimum- and maximum monitoring and recognition of disconnected consumers (relay ON if I<)
MIN/MAX+I< Inv.	Minimum- and maximum monitoring and recognition of disconnected consumers (relay OFF if I< Inv.)

2. Time ranges

	Adjustment range	
Start-up suppression time:	3s	180s
Tripping delay:	1s	50s

3. Indicators

Green LED U/t ON:	indication of supply voltage
Green LED U/t flashes:	indication of start-up suppression time
Yellow LED I=0 ON/OFF:	indication of disconnected consumers
Red LED Failure ON:	indication of failure of the corresponding threshold cosφ1 or/and cosφ2
Red LED Failure flashes:	indication of tripping delay of the corresponding threshold cosφ1 or/and cosφ2
Red LED Temp ON/OFF:	indication of overtemperature
Yellow LED Rel 1 ON/OFF:	indication of relay output Rel 1
Yellow LED Rel 2 ON/OFF:	indication of relay output Rel 2

4. Mechanical design

Self-extinguishing plastic housing, IP rating IP40
Mounted on DIN-Rail TS 35 according to EN 60715
Mounting position: any
Shockproof terminal connection according to VBG 4 (PZ1 required), IP rating IP20

Tightening torque:	max. 1Nm
Terminal capacity:	
1 x 0.5 to 2.5mm²	with/without multicore cable end
1 x 4mm²	without multicore cable end
2 x 0.5 to 1.5mm²	with/without multicore cable end
2 x 2.5mm²	flexible without multicore cable end

5. Input circuit

Supply voltage:	
230V a.c.	terminals A1-A2 (galvanically seperated)
Tolerance:	-15% to +15%
Rated frequency:	50/60Hz
Rated consumption:	3.5VA (3W)
Duration of operation:	100%
Reset time:	500ms
Ripple and noise:	-
Drop-out voltage:	>30% of the supply voltage
Overvoltage category:	III (in accordance with IEC 60664-1)
Rated surge voltage:	4kV

6. Output circuit

2 potential free change over contacts

Rated voltage:	250V a.c.
Switching capacity:	1250VA (5A / 250V a.c.)
If the distance between the devices is less than 5mm!	
Rated voltage:	2000VA (8A / 250V a.c.)
If the distance between the devices is greater than 5mm!	
Fusing:	5A fast acting
Mechanical life:	20 x 10^6 operations
Electrical life:	2 x 10^5 operations at 1000VA resistive load
Switching capacity:	max. 60/min at 100VA resistive load max. 6/min at 1000VA resistive load (in accordance with IEC 60947-5-1)
Withstand voltage across open contacts:	$1000V_{eff}$ a.c.
Overvoltage category:	III (in accordance with IEC 60664-1)
Rated surge voltage:	4kV

7. Measuring circuit

Measuring ranges:	reversible between 8A (4,8kW) and 16A (19,6kW)
Wave form:	
AC Sinus:	10 to 100Hz
Measuring input voltage:	terminals L1-L2-L3
1-phase load:	85 to 690V a.c.
3-phase load:	3~ 85 to 690/400V
Overload capacity:	
1-phase load:	796V a.c.
3-phase load:	3~ 796/460V a.c.
Input resistance:	1.25MΩ
Measuring input current:	terminals i-k
Measuring range 8A:	1 to 8A
Measuring range 16A:	2 to 16A (for I>16A distance >5mm)
Overlaod capacity:	20A permanent 128A (8x16A) maximum 7 seconds, Cooldown for minimum 2 minutes!

Technical data

I< - recognition:
Current flow interruption:
Measuring range 8A: 200mA
Measuring range 16A: 400mA
Current flow recognition:
Measuring range 8A: 240mA
Measuring range 16A: 480mA
Switching threshold:
Switching threshold cosφ1: 0.3 to 1 (inductive)
1 to 0.3 (capacitive)
Switching threshold cosφ2: 0.3 to 1 (inductive)
1 to 0.3 (capacitive)
Hysteresis: approx. 5% (cosφ)

Temperature monitoring:
Terminals: T1-T2 (max. 6 PTC)
Initial resistance: <1.5kΩ
Response value (Relais in on-position): ≥3.6kΩ
Release value (Relais in off-position): ≤1.8kΩ
Disconnection (short circuit thermistor): no
Measuring voltage T1-T2: ≤7.5V at R ≤4.0kΩ
(in accordance with EN 60947-8)
Overvoltage category: III (in accordance with IEC 60664-1)
Rated surge voltage: 4kV

8. Control contact Y (equipotential with measuring circuit)
Function: latch (terminal Y1-Y2 bridged)
Loadable: no
Control pulse length: -
Reset: normally closed contact in the input circuit

9. Accuracy
Base accuracy: ±3% (of maximum scale value)
Frequency response: ±0.025% / Hz
Adjustment accuracy: ≤5% (of maximum scale value)
Repetition accuracy: ±2%
Voltage influence: -
Temperature influence: ≤0.02% / °C

10. Ambient conditions
Ambient temperature: -25 to +55°C
(in accordance with IEC 60068-1)
-25 to +40°C (in accordance with UL 508)
Storage temperature: -25 to +70°C
Transport temperature: -25 to +70°C
Relative humidity: 15% to 85%
(in accordance with IEC 60721-3-3
class 3K3)
Pollution degree: 2 (in accordance with EN 60255-27)
Vibration resistance: class 1 (in accordance with EN 60255-22-1)
Shock resistance: class 1 (in accordance with EN 60255-22-2)

Functions

When the supply voltage U is applied (green LED U/t illuminated) the output relays Rel 1 and Rel 2 switches into on-postion (yellow LED Rel 1 and Rel 2 illuminated) and the set interval of the start-up suppression time (Start) begins (green LED U/t flashes). Changes of the measured power factor during this period don‘t affect the state of the output relays Rel 1 and Rel 2. After the interval has expired the green LED U/t illuminates steadily.

Applies to all cases of applications: The adjusted threshold cosφ1 always has to be adjusted more to the right than cosφ2. Otherwise both output relays switch into off-position (both red LEDs Failure flash alternately).
The following specifications should avoid incorrect settings:

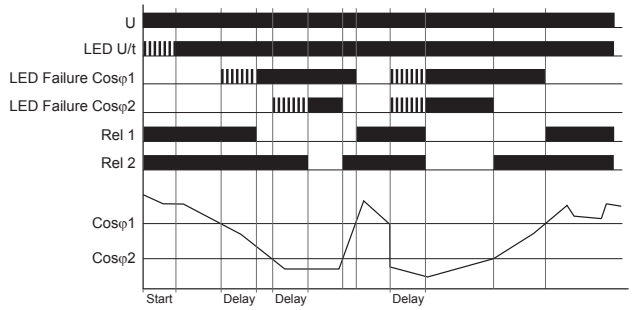
Monitoring of inductive loads: Both thresholds have to be adjusted in the left half (IND) of the cosφ-scale.

Monitoring of capacitive loads: Both thresholds have to be adjusted in the right half (KAP) of the cosφ-scale.

Monitoring of loads that can be both inductive as well as capacitive: cosφ1 has to be adjusted in the right half (KAP) and cosφ2 in the left half (IND) of the cosφ-scale

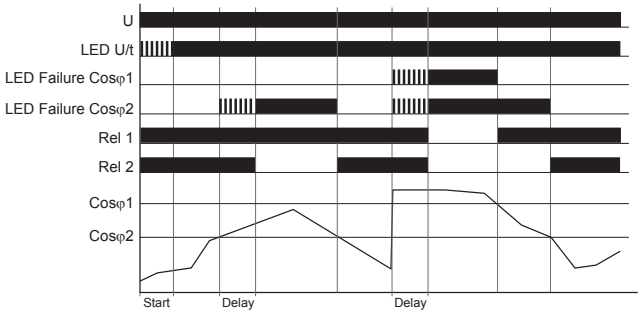
For the selection of the monitoring function it has to be taken into account that disconnected consumers effect that a measured cosφ = 1 is assumed. A measured cosφ = 0.95 up to 1 is assumed as cosφ = 1 by the device.

Minimum monitoring (2MIN) for inductive loads
When the measured power factor falls below the value adjusted at the cosφ1-regulator (e.g. electronic load of motor drops), the set interval of the tripping delay (Delay) begins (red LED Failure of the corresponding threshold cosφ1 flashes). After the interval has expired (red LED Failure of the corresponding threshold cosφ1 illuminated), the output relay Rel 1 switches into off-position (yellow LED Rel 1 not illuminated).
When the measured power factor exceeds the value adjusted at the cosφ2-regulator, the set interval of the tripping delay (Delay) begins (red LED Failure of the corresponding threshold cosφ2 flashes). After the interval has expired (red LED Failure of the corresponding threshold cosφ2 illuminated), the output relay Rel 2 switches into off-position (yellow LED Rel 2 not illuminated).
As soon as the measured power factor exceeds the adjusted value at the corresponding regulator cosφ1 or cosφ2 (red LED Failure of the corresponding threshold cosφ1 or cosφ2 not illuminated), the output relay Rel 1 or Rel 2 switches into on-position again (yellow LED Rel 1 or Rel 2 illuminated).



Minimum monitoring (2MIN) for capacitive loads
The function 2MIN can also be used to monitor capacitive loads. In this case the monitoring function doesn‘t applies if the power factor falls below the selected threshold but applies if the power factor falls below the corresponding phase angle.

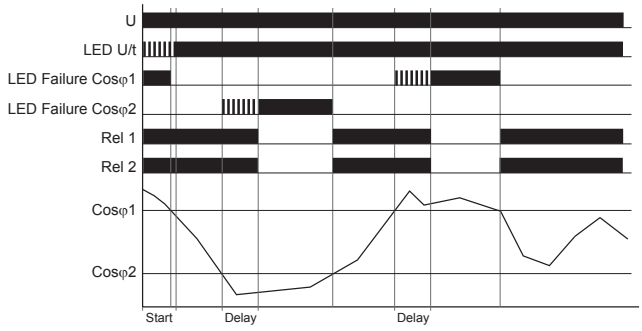
Maximum monitoring (2MAX) for inductive loads
When the measured power factor exceeds the value adjusted at the cosφ2-regulator (e.g. electronic load of motor increases), the set interval of the tripping delay (Delay) begins (red LED Failure of the corresponding threshold cosφ2 flashes). After the interval has expired (red LED Failure of the corresponding threshold cosφ2 illuminated), the output relay Rel 2 switches into off-position (yellow LED Rel 2 not illuminated).
When the measured power factor exceeds the value adjusted at the cosφ1-regulator, the set interval of the tripping delay (Delay) begins (red LED Failure of the corresponding threshold cosφ1 flashes). After the interval has expired (red LED Failure of the corresponding threshold cosφ1 illuminated), the output relay Rel 1 switches into off-position (yellow LED Rel 1 not illuminated).
As soon as the measured power factor falls below the adjusted value at the corresponding regulator cosφ1 or cosφ2 (red LED Failure of the corresponding threshold cosφ1 or cosφ2 not illuminated), the output relay Rel 1 or Rel 2 switches into on-position again (yellow LED Rel 1 or Rel 2 illuminated).



Maximum monitoring (2MAX) for capacitive loads
The function 2MAX can also be used to monitor capacitive loads. In this case the monitoring function doesn‘t applies if the power factor exceeds the selected threshold but applies if the power factor exceeds the corresponding phase angle.

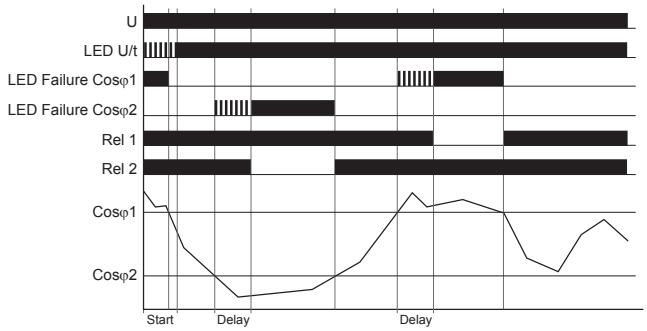
Functions

Window function (WIN) for inductive loads
When the measured power factor falls below the value adjusted at the cosφ2-regulator (e.g. electronic load of motor drops), the set interval of the tripping delay (Delay) begins (red LED Failure of the corresponding threshold cosφ2 flashes). After the interval has expired (red LED Failure of the corresponding threshold cosφ2 illuminated), the output relays Rel 1 and Rel 2 switches into off-position (yellow LED Rel 1 and Rel 2 not illuminated). The output relays Rel 1 and Rel 2 switches into on-position again (yellow LED Rel 1 and Rel 2 illuminated), as soon as the the measured power factor exceeds the adjusted value at the cosφ2-regulator (red LED Failure of the corresponding threshold cosφ2 not illuminated).
When the measured power factor exceeds the value adjusted at the cosφ1-regulator, the set interval of the tripping delay (Delay) begins (red LED Failure of the corresponding threshold cosφ1 flashes). After the interval has expired (red LED Failure of the corresponding threshold cosφ1 illuminated), the output relays Rel 1 and Rel 2 switches into off-position (yellow LED Rel 1 and Rel 2 not illuminated). As soon as the measured power factor falls below the value adjusted at the cosφ1-regulator (red LED Failure of the corresponding threshold cosφ1 not illuminated) the output relays Rel 1 and Rel 2 switches into on-position again (yellow LED Rel 1 and Rel 2 illuminated).



Window function (WIN) for capacitive loads
The function WIN can also be used to monitor capacitive as well as inductive/capacitive loads. In this case cosφ1 monitors the more capcitive part and cosφ2 the more inductive part of the window.
Within this window the output relays Rel1 and Rel2 remain in on-position. If the measured power factor falls below or exceeds the adjusted window both output relays switch into off-position.

Minimum- and maximum monitoring (MIN/MAX) for inductive loads
When the measured power factor falls below the value adjusted at the cosφ2-regulator (e.g. electronic load of motor drops), the set interval of the tripping delay (Delay) begins (red LED Failure of the corresponding threshold cosφ2 flashes). After the interval has expired (red LED Failure of the corresponding threshold cosφ2 illuminated), the output relay Rel 2 switches into off-position (yellow LED Rel 2 not illuminated). The output relay Rel 2 switches into on-position again (yellow LED Rel 2 illuminated), as soon as the the measured power factor exceeds the adjusted value at the cosφ2-regulator (red LED Failure of the corresponding threshold cosφ2 not illuminated).
When the measured power factor exceeds the value adjusted at the cosφ1-regulator, the set interval of the tripping delay (Delay) begins (red LED Failure of the corresponding threshold cosφ1 flashes). After the interval has expired (red LED Failure of the corresponding threshold cosφ1 illuminated), the output relay Rel 1 switches into off-position (yellow LED Rel 1 not illuminated). As soon as the measured power factor falls below the value adjusted at the cosφ1-regulator (red LED Failure of the corresponding threshold cosφ1 not illuminated) the output relay Rel 1 switches into on-position again (yellow LED Rel 1 illuminated).



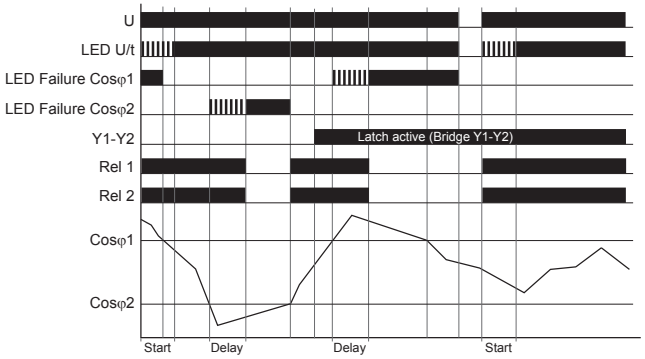
Minimum- and maximum monitoring (MIN/MAX) for capacitive loads
The function MIN/MAX can also be used to monitor capacitive as well as inductive/capacitive loads. In this case cosφ1 monitors the more capcitive part and cosφ2 the more inductive part of the window.
Within this window the output relays Rel1 and Rel2 remain in on-position. If the measured power factor falls below or exceeds the adjusted window both output relays switch into off-position.

Fault latch
The fault latch can be activated via bridge between the terminals Y1 and Y2.
If the fault latch is activated and a failure has occured (red LED of the corresponding threshold or red LED Temp illuminated), the failure can only be reset if no fault is active any more and by interrupting the supply voltage, by pressing the reset-key or by opening the bridge. After resetting the failure and re-applying to the supply voltage, the output relays Rel 1 and Rel 2 switch into on-position again and the measuring cycle begins with the set interval of the start-up suppression time (Start).

Note:
The fault latch remains active inspite of a I=0 recognition!

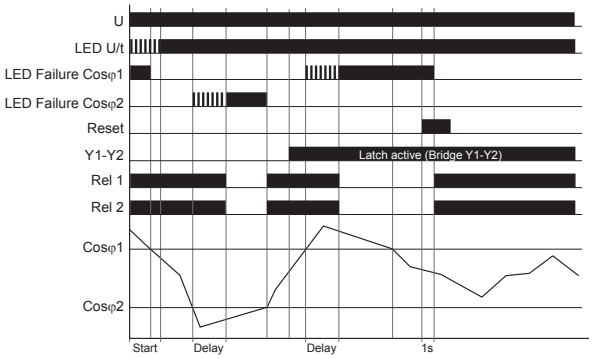
Example: Window function (WIN) - Resetting the fault latch by interrupting the supply voltage

WIN+L



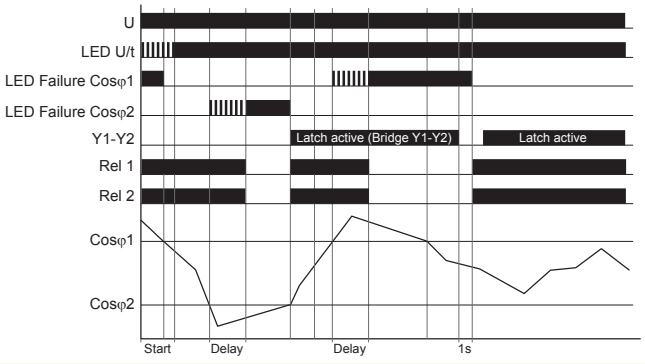
Example: Window function (WIN) - Resetting the fault latch by pressing the reset-key for minimum 1 second

WIN+L



Example: Window function (WIN) - Resetting the fault latch by opening the bridge between Y1 and Y2

WIN+L



Functions

Recognition of disconnected consumers

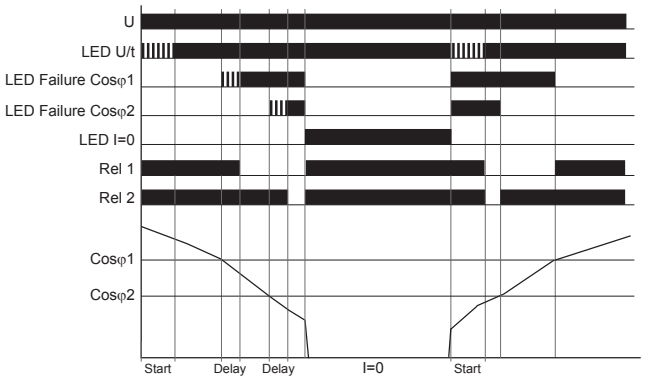
The following applies for functions, where the I=0 recognition is activated:

When the current flow between i and k is interrupted (yellow LED I=0 illuminated) and the minimum-, window- or minimum- and maximum function is activated (2MIN+I=0, WIN+I=0, MIN/MAX+I=0), the output relays Rel 1 and Rel 2 remains into on-position (yellow LED Rel 1 and LED Rel 2 illuminated).

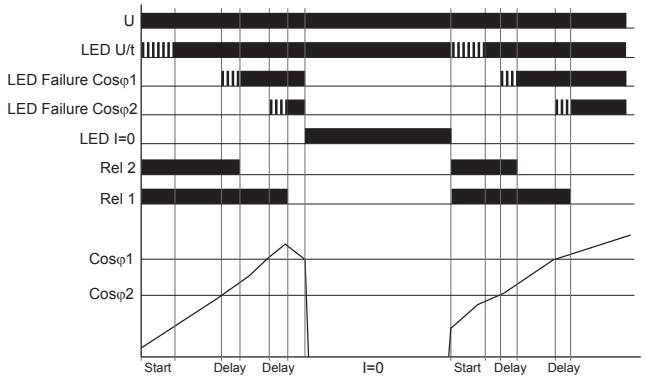
When the maximum function is activated (2MAX+I=0), the output relays Rel 1 and Rel 2 switches into off-position (yellow LED Rel 1 and LED Rel 2 not illuminated).

When the current flow restores, the measuring cycle is restarted with the set interval of the start-up suppression time (Start) (green LED U/t flashes).

I=0 with minimum monitoring (2MIN+I=0)



I=0 with maximum monitoring (2MAX+I=0)



The following applies for functions, where the inverted I=0 recognition is activated:

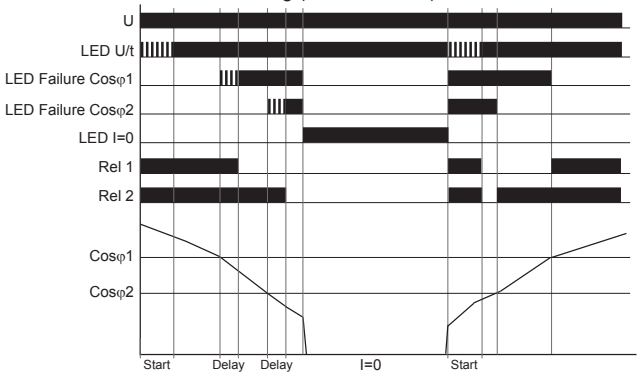
When the current flow between i and k is interrupted (yellow LED I=0 illuminated), the output relays behaves inverse to the above mentioned function.

If the minimum-, window- or minimum- and maximum function (2MIN+I=0 Inv., WIN+I=0 Inv., MIN/MAX+I=0 Inv.) is activated, the output relays Rel 1 and Rel 2 switches into off-position (yellow LED Rel 1 and LED Rel 2 not illuminated).

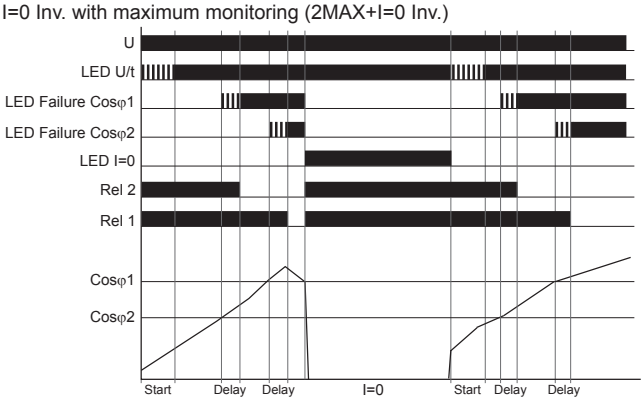
When the maximum function is activated (2MAX+I=0 Inv.), the output relays Rel 1 and Rel 2 remains in on-position (yellow LED Rel 1 and LED Rel 2 illuminated).

When the current flow restores, the measuring cycle is restarted with the set interval of the start-up suppression time (Start) (green LED U/t flashes).

I=0 Inv. with minimum monitoring (2MIN+I=0 Inv.)



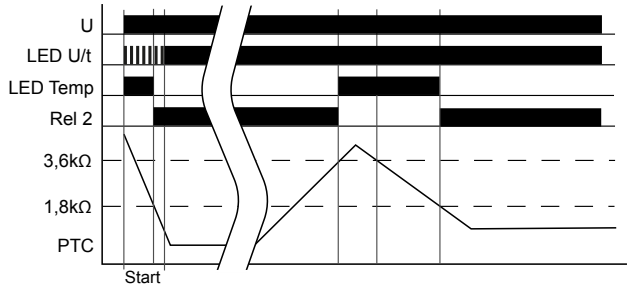
I=0 Inv. with maximum monitoring (2MAX+I=0 Inv.)



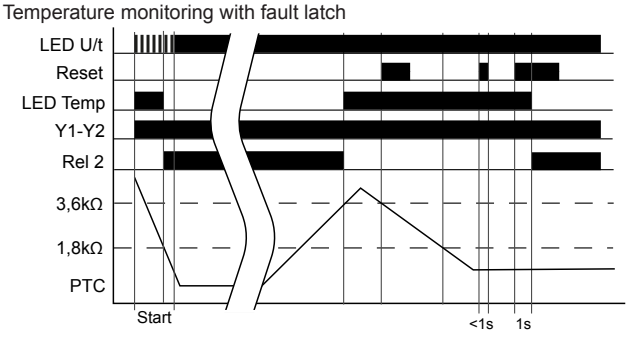
Temperature monitoring of the motor winding

If the supply voltage U is applied (green LED U/t illuminated) and the cumulative resistance of the PTC-circuit is less than 3.6kΩ (standard temperature of the motor), the output relay Rel 2 switches into on-position if no other failure is applied! When the comulative resistance of the PTC-circuit exceeds 3.6kΩ (at least one of the PTCs has reached the cut-off temperature), the output relay Rel 2 switches into off-position (yellow LED Rel 2 not illuminated) and a failure will be indicated (red LED Temp illuminated). The output relay Rel 2 switches into on-position again (yellow LED Rel 2 illuminated) respectively the failure will be cancelled (red LED Temp not illuminated), if the cumulative resistance drops below 1.8kΩ by cooling down of the PTC. If the fault latch is activated, a press of th reset-key is required to cancel the temperature failure.

Temperature monitoring without fault latch



Temperature monitoring with fault latch



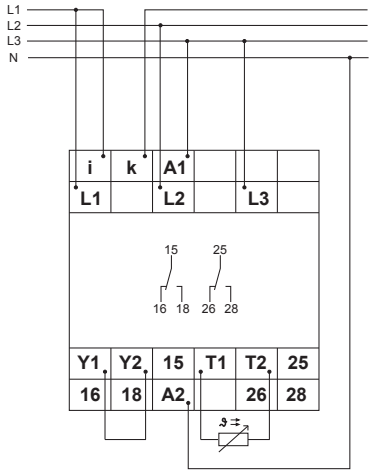
Note: If the output relay Rel 2 should switch into on-position again, no other failure should be applied!

G4CM690V16ATL20 230VAC

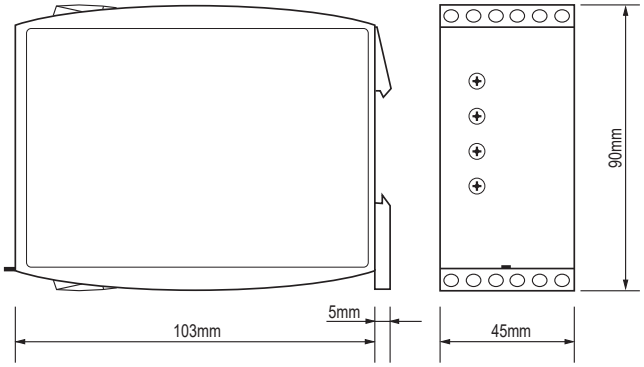
Part No. 2394601

Connections

Connected 3~ 230/400V with supply voltage 230V a.c. with fault latch and temperature monitoring sensor I_N<16A



Dimensions



This device is subject to the Waste Electrical and Electronic Equipment Regulation (WEEE) and may not be disposed of with normaldomestic waste. The device is made of materials that can be recycled by specialized recycling companies. The device must bedisposed of according to the national electronic scrap regulations.

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