VARIMETER
Current Relay
MK 9053N

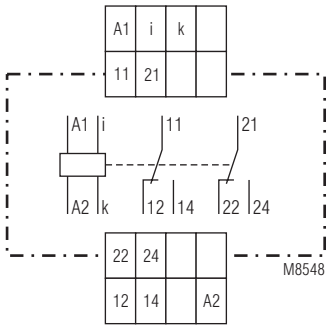
Translation of the original instructions

0280768

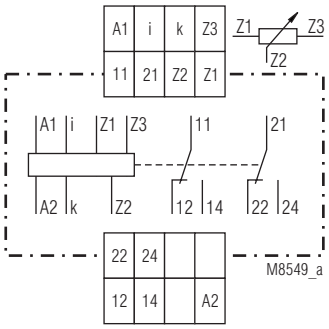
Product Description

The current relay MK 9053N of the VARIMETER series monitors single phase DC or AC voltage systems. The adjustment is made via potentiometers on the front of the device. Early recognition and preventive maintenance avoid interruptions of electrical plants and provides a higher operational and plant safety.

Circuit Diagrams



MK 9053N



MK 9053N/1_ _

Connection Terminals

Terminal designation	Signal description
A1, A2	Auxiliary voltage
i, k	Current measuring input
11, 12, 14	1st changeover contact
21, 22, 24	2nd changeover contact
at MK 9053/1_ _: Z1, Z2, Z3	Remote potentiometer for response value

Safety Notes

Please observe when connecting a remote potentiometer to MK 9053N/1_ _:

WARNUNG

Measuring circuit and remote potentiometer not galvanically separated. The voltage on on measuring circuit i, k / PE has connection to the remote potentiometer. The remote potentiometer has to be connected volt- and ground-free.

Your Advantages

- Preventive maintenance
- For better productivity
- Quicker fault locating
- Precise and reliable

Features

- According to IEC/EN 60255-1, IEC/EN 60947-1
- To: Monitor DC and AC
- Measuring ranges from 2 mA up to 10 A
- High overload possible
- Input frequency up to 5 kHz
- Galvanic separation between auxiliary circuit - measuring ciruit
- With start-up delay
- With time delay, up to max. 100 sec
- As option with remote potentiometer
- As option with manual reset
- Option with fixed settings possible
- LED indicators for operation and contact position
- As option with pluggable terminal blocks for easy exchange of devices
  - With screw terminals
  - Or with cage clamp terminals
- Width: 22.5 mm

Approvals and Markings

1) Approval not for all variants

Applications

- Monitoring current in AC or DC systems
- For industrial and railway applications

Function

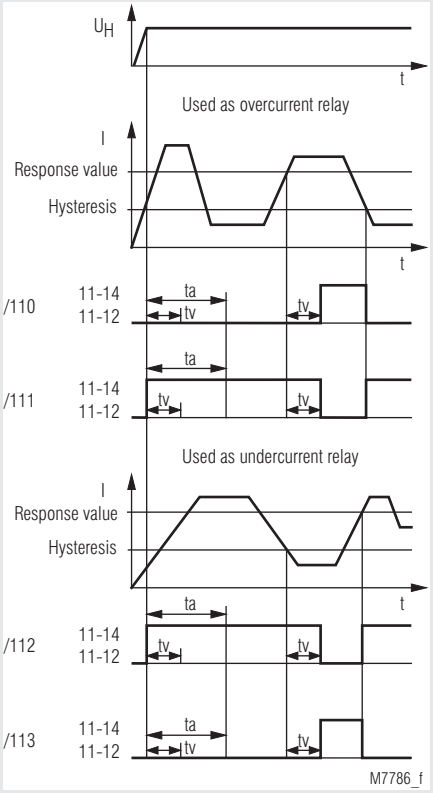
The relays measure the arithmetic mean value of the rectified measuring current. The AC units are adjusted to the r.m.s value. They have settings for response value and hysteresis. The units work as overcurrent relays but can also be used for undercurrent detection. The hysteresis is dependent on the response value.

2 time delays are possible in different variants:
The start up delay t_a operates only when connecting the auxiliary supply. It disables tripping e.g. caused by an increased starting current of a motor. The response delay t_v is active after exceeding a response value. On overcurrent relays the delay is active when the current goes over the tripping value, on undercurrent relays when the current drops below the hysteresis value.

Indicators

Green LED:	On, when auxiliary supply connected
Yellow LED:	On, when output relay acitvated

Function Diagram with Start-up Delay



On model MK 9053N/6_ _ with manual reset the contacts remain in the fault state after detecting a fault or after to has elapsed. The contacts are reset by disconnecting the supply voltage.

Technical Data

Input (i, k)

MK 9053N with 1 Measuring range for AC **a n d** DC

Measuring range[1]		RM (internal measu-ring resistor (shunt)	max. perm. cont. current		max. permiss. current 3 s On, 100 s Off
AC	DC		Device mount. without distance	with 5 mm dis-tance	
2 - 20 mA	1.8 - 18 mA	1.5 Ω	0.5 A	0.7 A	1 A
20 - 200 mA	18 - 180 mA	0.15 Ω	1.5 A	2 A	4 A
30 - 300 mA	27 - 270 mA	0.1 Ω	2 A	2.5 A	8 A
50 - 500 mA	45 - 450 mA	0.1 Ω	2 A	2.5 A	8 A
0.1- 1 A	0.09 - 0.9 A	30 mΩ	3 A	4 A	8 A
0.5- 5 A	0.45 - 4.5 A	6 mΩ	8 A	11 A	20 A
1 - 10 A	0.9 - 9 A	3 mΩ	12 A	15 A	20 A

[1] DC or AC current 50 ... 5000 Hz
(Other frequency ranges of 10 ... 5000 Hz, e.g. 16 $^2/_3$ Hz on request)

Extending of measuring range: For DC currents exceeding the largest measuring range, the measuring range 15 ... 150 mV or 6 ... 60 mV of the BA 9054 and MK 9054N can be used with external shunt. For AC current exceeding the largest measuring range a current transformer can be used. For Example with secondary winding of 1 A or 5 A. The nominal load of the CT should be ≥ 0.5 VA.

Measuring principle: Arithmetic mean value

Adjustment: The AC-devices can also monitor DC current. The scale offset in this case is: ($\overline{I} = 0.90\ I_{eff}$)

Temperature influence: < 0.05 % / K

Setting Ranges

Setting

Response value: Infinite variable 0.1 I_N ... 1 I_N relative scale

Hysteresis

At AC: Infinite variable 0.5 ... 0.98 of setting value

At DC: Infinite variable 0.5 ... 0.96 of setting value

Accuracy:

Response value at

Potentiometer right stop (max): 0 .... + 8 %

Potentiometer left stop (min): - 10 .... + 8%

Repeat accuracy

(constant parameter): ≤ ± 0.5 %

Recovery time

At devices with manual reset (Reset by braking of the auxiliary voltage)

MK 9053N/6_ _: ≤ 1 s (dependent to function and auxiliary voltage)

Time delay t_v: Infinite variable at logarythmic scale from 0 ... 20 s, 0 ... 30 s, 0 ... 60 s, 0 ... 100 s setting 0 s = without time delay

Start-up delay t_a: 0.1 ... 20 s; 0.1 ... 60 s; 0.1 ... 100 s

Auxiliary voltage U_H (A1, A2) for wide voltage range

Nominal voltage	Voltage range	Frequency range
AC/DC 24 ... 80 V	AC 18 ... 100 V	45 … 400 Hz; DC 48 % W
	DC 18 ... 130 V	W ≤ 5 %
AC/DC 80 ... 230 V	AC 40 ... 265 V	45 … 400 Hz; DC 48 % W
	DC 40 ... 300 V	W ≤ 5 %

Nominal consumption: 4 VA; 1.5 W at AC 230 V Rel. energized
1 W at DC 80 V Rel. energized

Technical Data

Output

Contacts:	2 changeover contacts	
Thermal current I_{th}:	2 x 4 A	
Switching capacity		
to AC 15:	1.5 A / AC 230 V	IEC/EN 60947-5-1
to DC 13:	1 A / DC 24 V	IEC/EN 60947-5-1
Electrical life		
at 2 A, AC 230 V cos φ = 1:	10^5 switching cycles	
Short-circuit strength		
max. fuse rating:	6 A gG / gL	IEC/EN 60947-5-1
Mechanical life:	20 x 10^6 switching cycles	

General Data

Operating mode:	Continuous operation	
Temperature range		
Operation:	- 40 ... + 50°C (higher temperature with limitations on request)	
Storage:	- 40 ... + 70°C	
Altitude:	≤ 2000 m	
Clearance and creepage distances		
Rated impulse voltage / pollution degree:	4 kV / 2	IEC 60664-1
EMC		
Electrostatic discharge:	8 kV (air)	IEC/EN 61000-4-2
HF irradiation		
80 MHz ... 1 GHz:	20 V/m	IEC/EN 61000-4-3
1 GHz ... 2.7 GHz:	10 V/m	IEC/EN 61000-4-3
Fast transients:	4 kV	IEC/EN 61000-4-4
Surge voltages		
Between		
wires for power supply:	2 kV	IEC/EN 61000-4-5
Between wire and ground:	4 kV	IEC/EN 61000-4-5
HF wire guided:	10 V	IEC/EN 61000-4-6
Interference suppression:	Limit value class B	EN 55011
Degree of protection		
Housing:	IP 40	IEC/EN 60529
Terminals:	IP 20	IEC/EN 60529
Housing:	Thermoplastic with V0 behaviour according to UL subject 94	
Vibration resistance:	Amplitude 0.35 mm frequency 10 ... 55 Hz	IEC/EN 60068-2-6
Climate resistance:	40 / 060 / 04	IEC/EN 60068-1
Terminal designation:		EN 50005
Wire connection		
Screw terminals		
(integrated):	1 x 4 mm² solid or 1 x 2.5 mm² stranded ferruled (isolated) or 2 x 1.5 mm² stranded ferruled (isolated) or 2 x 2.5 mm² solid	
Insulation of wires or sleeve length:	8 mm	
Plug in with screw terminals		
max. cross section for connection:	1 x 2.5 mm² solid or 1 x 2.5 mm² stranded ferruled (isolated)	
Insulation of wires or sleeve length:	8 mm	
Plug in with cage clamp terminals		
max. cross section for connection:	1 x 4 mm² solid or 1 x 2.5 mm² stranded ferruled (isolated)	
min. cross section for connection:	0.5 mm²	
Insulation of wires or sleeve length:	12 $^{\pm 0.5}$ mm	
Wire fixing:	Plus-minus terminal screws M3.5 box terminals with wire protection or cage clamp terminals	
Stripping length:	10 mm	
Fixing torque:	0.8 Nm	
Mounting:	DIN-rail	IEC/EN 60715
Weight:	150 g	

Dimensions

Width x height x depth:	22.5 x 90 x 97 mm

CCC-Data

Thermal current I_{th}:	4 A	
Switching capacity		
to AC 15:	1,5 A / AC 230 V	IEC/EN 60 947-5-1
to DC 13:	1 A / DC 24 V	IEC/EN 60 947-5-1

Technical data that is not stated in the CCC-Data, can be found in the technical data section.

Standard Type

MK 9053N.12/010 AC 0.5 ... 5 A AC/DC 80 ... 230 V t_v 0 ... 20 s t_a 0.1 ... 20 s
Article number: 0063176

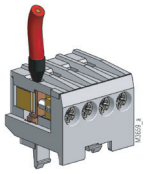
- For Overcurrent monitoring
- Measuring range:: AC 0.5 ... 5 A
- Auxiliary voltage U_H: AC/DC 80 ... 230 V
- Time delay by t_v: 0 ... 20 s
- Start up delay t_a: 0.1 ... 20 s
- Width: 22.5 mm

Ordering Example for Variants

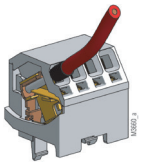
MK 9053N _ _ /_ _ _ AC 0,1 ... 1 A AC/DC 80 ... 230 V 0 ... 20 s 0,1 ... 20 s

- Start up delay t_a
- Time delay t_v
- Auxiliary voltage
- Measuring range
- 10 Overcurrent relay energized on trip
- 11 Overcurrent relay de-energized on trip
- 12 Undercurrent relay de-energized on trip
- 13 Undercurrent relay energized on trip
- 0 Standard version without remote potentiometer
- 1 Standard version with remote potentiometer (response-value) Z1, Z2, Z3 for 470 kΩ **at this version there is no potentiometer for the response value**
- 6 With manual reset, resetting by disconnecting the power supply
- Type of terminals
  Without indication: terminal blocks fixed, with screw terminals
  PC (plug in cage clamp): pluggable terminal blocks with cage clamp terminals
  PS (plug in screw): pluggable terminal blocks with screw terminals
- Type

Options with Pluggable Terminal Blocks



Screw terminal
(PS/plugin screw)

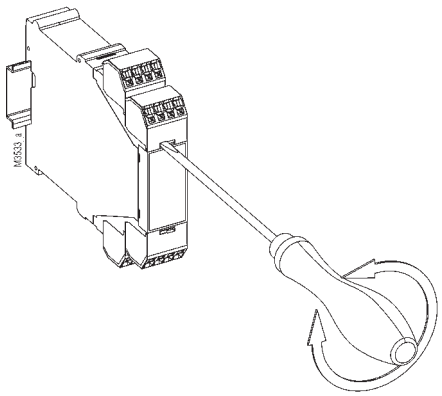


Cage clamp
(PC/plugin cage clamp)

Notes

Removing the terminal blocks with cage clamp terminals

1. The unit has to be disconnected.
2. Insert a screwdriver in the side recess of the front plate.
3. Turn the screwdriver to the right and left.
4. Please note that the terminal blocks have to be mounted on the belonging plug in terminations.



Accessories

AD 3: Remote potentiometer 470 KΩ
Article number: 0050174

Setting

Example:
Current relay AC 0.5 ... 5 A

AC according to type plate:
i.e. the unit is calibrated for AC
0.5 ... 5 A = measuring range

Response value AC 3 A
Hysteresis AC 1.5 A

Settings
Upper potentiometer: 0.6 (0.6 x 5 A = 3 A)
Lower potentiometer: 0.5 (0.5 x 3 A = 1.5 A)

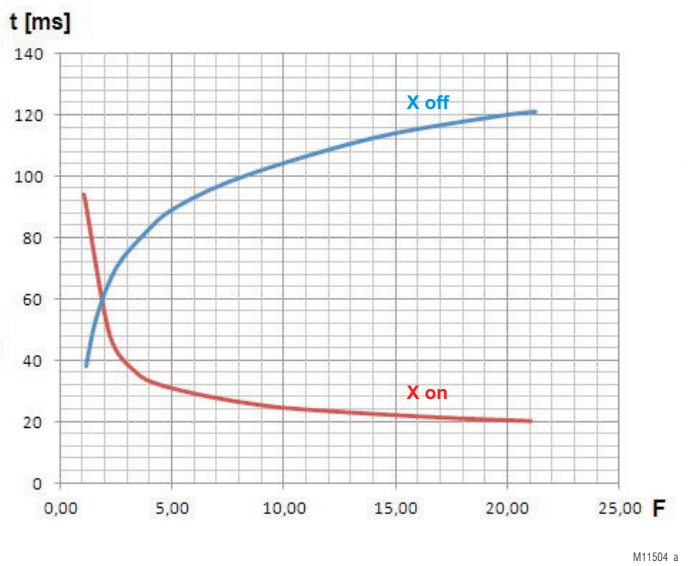
The AC - devices can also monitor DC current. The scale offset in this case is: $\overline{I} = 0.90 \times I_{eff}$

AC 0.5 ... 5 A is equivalent to DC 0.45 ... 4.5 A

Response value DC 3 A
Hysteresis DC 1.5 A

Settings
Upper potentiometer: 0.66 (0.66 x 4.5 A = 3 A)
Lower potentiometer: 0.5 (0.5 x 3 A = 1.5 A)

Characteristic



Time delay of measuring circuit

X on: Measured value rise $F = \frac{\text{Measured value (after rise of measured value)}}{\text{Setting value}}$

X off: Measured value drops $F = \frac{\text{Mesaured value (befor measured value drops)}}{\text{Setting value (hysteresis)}}$

The diagram shows the typical delay of a standard devices depending on the measured values "X on and X off" at sudden rise or drop of the signal. At slow change of the measured value the delay is shorter.
The total reaction time of the device results from the adjustable delay t_v and the delay created by the measuring circuit.

The diagram shows an average delay. The delay times could differ on the different variants.

Example for "X on" (overcurrent detection with MK 9053N/010):
Adjusted setting value X on = 2 A.
Due to a stalled motor the current rises suddenly to 10 A.

$$F = \frac{\text{Measured value (after rise of measured value)}}{\text{Setting value}} = \frac{10\ A}{2\ A} = 5$$

Reading from the diagram:
The output relay switches on after 31 ms at a setting t_v=0.

Example for "X off" (undercurrent detection with MK 9053N/012):
Adjusted hysteresis setting value is 10 A.
The current drops suddenly from 23 A to 0 A.

$$F = \frac{\text{Mesaured value (befor measured value drops)}}{\text{Setting value (hysteresis)}} = \frac{23\ A}{10\ A} = 2.3$$

Reading from the diagram:
The output relay switches off after 70 ms at a setting t_v=0.