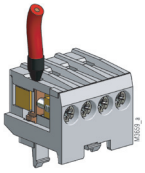
VARIMETER
Voltage Relay
BA 9054, MK 9054N

0221541

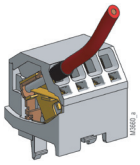
BA 9054

MK 9054N

Options with Pluggable Terminal Blocks



Screw terminal
(PS/plugin screw)

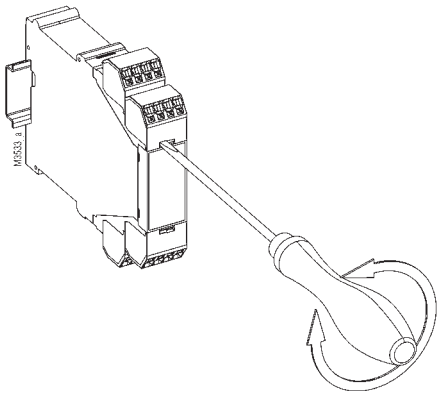


Cage clamp
(PC/plugin cage clamp)

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.



Your Advantages
- Protection against defect by overvoltage
- Preventive maintenance
- For better productivity
- Quicker fault locating
- Precise and reliable

Features
- According to IEC/EN 60 255, DIN VDE 0435-303, IEC/EN 60 947-1
- to: monitor DC and AC
- BA 9054 with measuring ranges from 15 mV to 1000 V
- MK 9054N with measuring ranges from 15 mV to 500 V
- High overload possible
- Input frequency up to 5 kHz
- Galvanic separation between Auxiliary Circuit – measuring ciruit
- Auxiliary supply AC/DC; BA 9054 with AC
- BA 9054 optionally with start-up delay (MK = standard)
- with time delay, up to max. 100 sec
- BA 9054 optionally with safe separation to IEC/EN 61140
- MK 9054N optionally with remote potentiometer
- As option with manual reset
- LED indicators for operation and contact position
- MK 9054N as option with pluggable terminal blocks for easy exchange of devices
  - with screw terminals
  - or with cage clamp terminals
- Width MK 9054N: 22.5 mm
  Width BA 9054: 45 mm

Approvals and Marking

Canada / USA

A025518

* see variants
[1] pending

Applications

Monitoring voltage in AC or DC systems

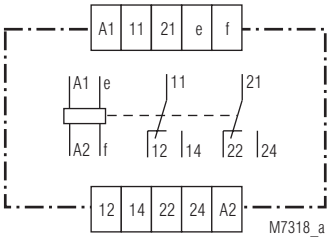
Function

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

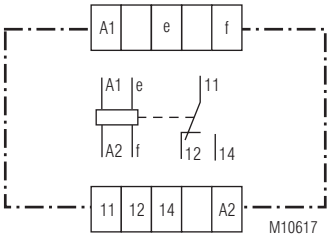
Indicators

green upper LED:	on, when auxiliary supply connected
yellow lower LED:	on, when output relay acitvated

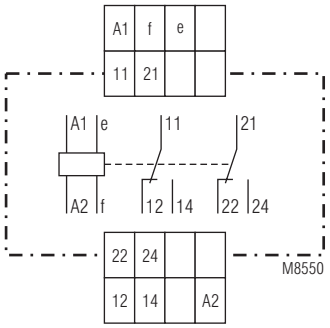
Circuit Diagrams



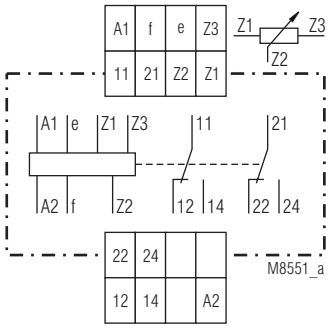
BA 9054



BA 9054/_ 2 _

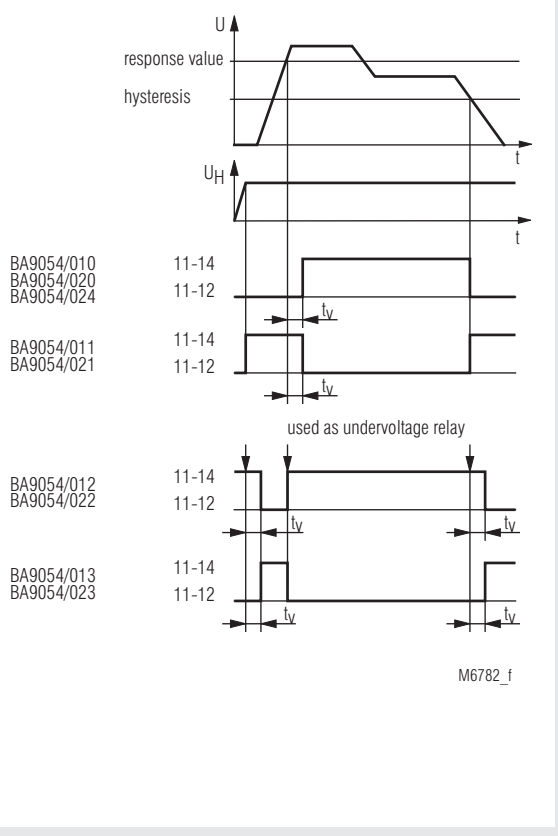


MK 9054N

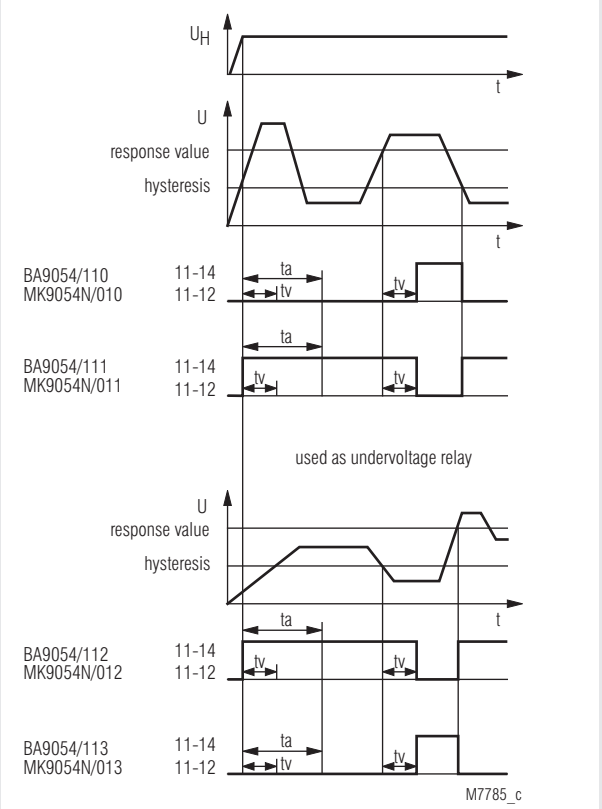


MK 9054N/1_ _

Function Diagram without Start-up Delay



Function Diagram with Start-up Delay



Version BA 9054/_1_: 2 changeover contacts
Version BA 9054/_20, /_21, /_22, /_23, /_24: 1 changeover contact, measuring range ≥ 70 ... 700 V
At version BA 9054/6__ 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.

Input (e, f)

BA 9054 with 1 Measuring range for AC **a n d** DC			
Measuring range[1]		internal resistance	max. permissible contin. voltage
AC	DC		
6 ... 60 mV	5.4 ... 54 mV	20 kΩ	10 V
15 ... 150 mV	13.5 ... 135 mV	40 kΩ	100 V
50 ... 500 mV	45 ... 450 mV	270 kΩ	250 V
0.5 ... 5 V	0.45 ... 4.5 V	500 kΩ	300 V
1 ... 10 V	0.9 ... 9.0 V	1 MΩ	300 V
5 ... 50 V	4.5 ... 45 V	2 MΩ	500 V[2]
25 ... 250 V	22.5 ... 225 V	2 MΩ	500 V[2]
50 ... 500 V	45 ... 450 V	2 MΩ	500 V[2]
70 ... 700 V[3]	63 ... 630 V	3 MΩ	700 V[4]
100 ... 1000 V[3]	90 ... 900 V	3 MΩ	1000 V[4]

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

[2] at Overvoltage category II: 600 V

[3] only with BA 9054/_20; /_21; /_22; /_23; /_24
(Version: 1 changeover contact)

[4] at overvoltage category II: 1000 V

Please note:
Measuring ranges 6 ... 60 mV only available at variant BA 9054/080
(Using only for current sensing via shunt!)

MK 9054N with 1 Measuring range for AC **a n d** DC			
Measuring range[1]		internal resistance	max. permissible contin. voltage
AC	DC		
6 ... 60 mV	5.4 ... 54 mV	20 kΩ	10 V
15 ... 150 mV	13.5 ... 135 mV	40 kΩ	100 V
50 ... 500 mV	45 ... 450 mV	270 kΩ	250 V
0.5 ... 5 V	0.45 ... 4.5 V	500 kΩ	300 V
1 ... 10 V	0.9 ... 9.0 V	1 MΩ	300 V
5 ... 50 V	4.5 ... 45 V	2 MΩ	500 V[2]
25 ... 250 V	22.5 ... 225 V	2 MΩ	500 V[2]
50 ... 500 V	45 ... 450 V	2 MΩ	500 V[2]

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

[2] Not suitable for 400 / 690 V-mains (systems)

Please note:
To avoid measuring mistakes, on units with mV input the input must always be terminated. In addition screened wires should be used..

Measuring ranges 6 ... 60 mV + 15 ... 150 mV
(Using only for current sensing via shunt!)

Measuring principle: arithmetic mean value
Adjustment: The AC-devices can also monitor DC-voltage. The scale offset in this case is ($\overline{U} = 0.90\ U_{eff}$)
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: ≤ ± 0.5 %
Recovery time
at devices with manual reset
(Reset by braking
of the auxiliary voltage)
BA 9054/6_ _; MK 9054N/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:
BA 9054/1 _ _: 1 ... 20 s; 1 ... 60 s; 1 ... 100 s, adjustable on logarithmic scale. t_a is started when the supply voltage is connected. During elapse of time the output contact is in good state
MK 9054N: 0.1 ... 20 s; 0.1 ... 60 s; 0.1 ... 100 s

Auxiliary Circuit BA 9054 and MK 9054N

Auxiliary voltage U_H (A1, A2)
BA 9054, Nominal voltage: AC 24, 42, 110, 127, 230, 400 V
Voltage range: 0.8 ... 1.1 U_H
Nominal frequency: 50 / 60 Hz
Frequency range: ± 5 %
Nominal consumption: 2.5 VA

BA 9054, MK 9054N:		
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 %

BA 9054		
Nominal voltage	**Voltage range**	**Frequency range**
DC 12 V	DC 10 ... 18 V	battery voltage

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

Output

Contacts
BA 9054: 2 changeover contacts
MK 9054N: 2 changeover contacts
Thermal current I_{th}: 2 x 5 A or 1 x 8 A
Switching capacity
to AC 15:
NO contact: 3 A / AC 230 V IEC/EN 60 947-5-1
NC contact: 1 A / AC 230 V IEC/EN 60 947-5-1
Electrical life IEC/EN 60 947-5-1
BA 9054
to AC 15 at 3 A, AC 230 V: 5 x 10^5 switching cycles
MK 9054N:
to AC 15 at 3 A, AC 230 V: 10^5 switching cycles
Short-circuit strength
max. fuse rating: 6 AgL IEC/EN 60 947-5-1
Mechanical life
BA 9054: 50 x 10^6 switching cycles
MK 9054N: 30 x 10^6 switching cycles

Technical Data

General Data

Operating mode:	Continuous operation	
Temperature range:	- 40 ... + 60°C	
Clearance and creepage distances		
rated impuls voltage / pollution degree		
BA 9054:	6 kV / 2	IEC 60 664-1
MK 9054N	4 kV / 2	IEC 60 664-1
EMC		
Electrostatic discharge:	8 kV (air)	IEC/EN 61 000-4-2
HF irradiation:	10 V/m	IEC/EN 61 000-4-3
Fast transients:	4 kV	IEC/EN 61 000-4-4
Surge voltages between		
wires for power supply:	2 kV	IEC/EN 61 000-4-5
between wire and ground:	4 kV	IEC/EN 61 000-4-5
Interference suppression:	Limit value class B	EN 55 011
Degree of protection		
Housing:	IP 40	IEC/EN 60 529
Terminals:	IP 20	IEC/EN 60 529
Housing:	Thermoplastic with V0 behaviour according to UL subject 94	
Vibration resistance:	Amplitude 0.35 mm frequency 10 ... 55 Hz	IEC/EN 60 068-2-6
Climate resistance:	40 / 060 / 04	IEC/EN 60 068-1
Terminal designation:		EN 50 005
Wire connection		
BA 9054:	2 x 2.5 mm² solid or 2 x 1.5 mm² stranded wire with sleeve	
MK 9054N:		
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		
BA 9054:	Flat terminals with self-lifting clamping piece	IEC/EN 60 999-1
MK 9054N:	Plus-minus terminal screws M3.5 box terminals with wire protection or cage clamp terminals	
Mounting:	DIN-rail	IEC/EN 60 715
Weight		
BA 9054:	AC-device: 280 g AC/DC-fdevice: 200 g	
MK 9054N:	150 g	

Dimensions

Width x height x depth	
BA 9054:	45 x 75 x 120 mm
MK 9054N:	22.5 x 90 x 97 mm

Standard Types

BA 9054/010 AC 25 ... 250 V AC 230 V
Article number: 0053639
- for Overcurrent monitoring
- Measuring range: AC 25 ... 250 V
- Auxiliary voltage U_H: AC 230 V
- Time delay t_v by $U_{an:}$ 0 ... 20 s
- Width: 45 mm

BA 9054/012 AC 25 ... 250 V AC 230 V
Article number: 0053711
- for Undercurrent monitoring
- Measuring range: AC 25 ... 250 V
- Auxiliary voltage U_H: AC 230 V
- Time delay t_v by U_{ab}: 0 ... 20 s
- Width: 45 mm

MK 9054N.12/010 AC 25 ... 250 V AC/DC 80 ... 230 V t_v 0 ... 20 s t_a 0.1 ... 20 s
Article number:
- for Overcurrent monitoring
- Measuring range: AC 25 ... 250 V
- Auxiliary voltage U_H: AC/DC 80 ... 230 V
- Time delay t_v by $U_{an:}$: 0 ... 20 s
- Start up delay t_a: 0.1 ... 20 s
- Width: 22.5 mm

Variants

BA 9054_11:	same as BA 9054010 but with inverted relay output (see Function Diagram) with time delay by I_{an}
BA 9054/_13:*	same as BA 9054/012 but with inverted relay output (see Function Diagram) with time delay by I_{ab}
BA 9054/_21:	same as BA 9054/_11 but with Measuring range ≥ 70 ... 700 V, 1 C/O
BA 9054/_22:	same as BA 9054/_12 but with Measuring range ≥ 70 ... 700 V, 1 C/O
BA 9054/_23:	same as BA 9054/_13 but with Measuring range ≥ 70 ... 700 V, 1 C/O
BA 9054/_24:	same as BA 9054/_10 but with Measuring range ≥ 70 ... 700 V, 1 C/O
BA 9054/61:	with UL approval, only with 1 current range up to 10 A, U_H max. AC 120 V
BA 9054/1_ _:	with start-up delay t_a
BA 9054/2_ _:	with safe electrical separation of input- and output circuit, accroding to DIN/EN 61140;
Measuring range to max. 250V:	**DIN/EN 60947-1; 4 kV/2 in relation of overvoltage category III with basic insulation to DIN/EN 60664-1 of 4 kV**
Measuring range to max 500V:	**overvoltage category II with basic insulation to 2.5kV**
BA 9054/3_ _:	with 5 µm gold plated contacts
BA 9054/5_ _:	with forcibly guided contacts
BA 9054/6_ _:	with manual reset, resetting by disconnecting the power supply
MK 9054N/_11:	with time delay t_v by U_{an}
MK 9054N/_13:*	with time delay t_v by U_{ab}
MK 9054N/0_ _:	standard version without remote potentiometer
MK 9054N/1_ _:	with remote potentiometer für 470 kΩ

* The units BA 9054/_13, MK 9054N/_13 are normally used for undervoltage. The delay starts when the voltage drops under the hysteresis value.

Ordering example for variants

BA 9054 /_ _ _ AC 25 ... 250 V AC 24 V 0 ... 20 s 1 ... 20 s

- Start up delay t_a
- Time delay t_v
- Auxiliary voltage
- Measuring range
- Variant, if required
- Type

MK 9054N _ _ /_ _ _ AC 25 ... 250 V 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 overvoltage relay open circuit operation
- 11 overvoltage relay closed circuit operation
- 12 undervoltage relay open circuit operation
- 13 undervoltage relay closed circuit operation
- 0 standard version without remote potentiometer
- 1 standard version with remote potentiometer (resp. value) Z1, Z2, Z3 for 470 kΩ
- 6 general definition with manual reset function
- 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

Accessories

AD 3:	Remote potentiometer 470 kW (article number 0050174)

Setting

Example:
Voltage relay BA 9054 / MK 9054N AC 25 ... 250 V

AC according to type plate:
i.e. the unit is adjusted to AC voltage
25 ... 250 V = measuring range

Response value AC 150 V
Hysteresis AC 75 V

Settings:

upper potentiometer:	0.6	(0.6 x 250 = 150 V)
lower potentiometer:	0.5	(0.5 x 150 = 75 V)

The AC-devices can also monitor DC current. The scale offset in this case is: $\overline{U} = 0.9 \times U_{eff.}$

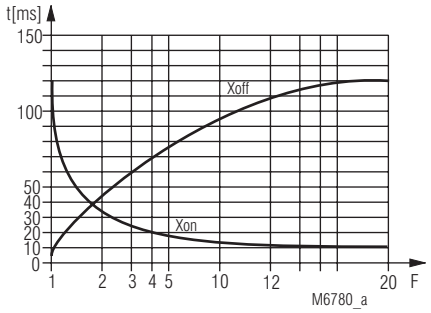
AC 25 ... 250 V is equivalent to DC 22.5 ... 225 V

Response value DC 150 V
Hysteresis DC 75 V

Settings:

upper potentiometer:	0.67	(0.67 x 225 = 150 V)
lower potentiometer:	0.5	(0.5 x 150 = 75 V)

Characteristics



Switching delay

The characteristic shows the switching delay depending on the values of X_{on} - X_{off} when switching the current on or off. A slow current change reduces the delay.

$$F = \frac{\text{U applied}}{\text{U setting}}$$