

# Monitoring technique

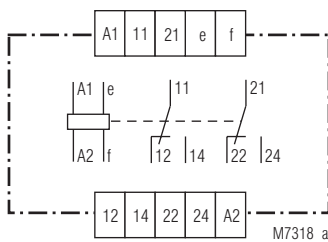
## Voltage relay BA 9054, MK 9054N varimeter

Now available with new features

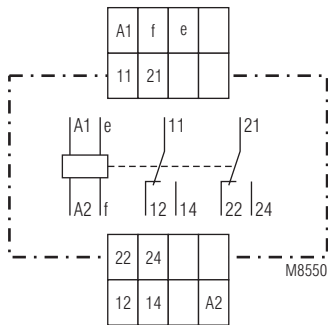


- According to IEC/EN 60 255, DIN VDE 0435-303
- to monitor DC and AC voltage
- Measuring ranges from 15 mV to 500 V
- High overload possible
- **Input frequency up to 5 kHz**
- with time delay
- LED indicators for operation and contact position
- BA 9054 optionally with galvanic separated DC auxiliary supply
- MK 9054 optionally with remote potentiometer
- **BA 9054 as option with start-up delay**
- **BA 9054 as option with manual reset**
- Width MK 9054N: 22,5 mm
- Width BA 9054: 45 mm

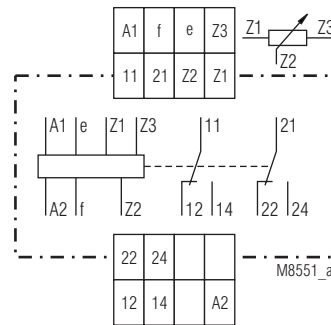
### Circuit diagrams



BA 9054



MK 9054N



MK 9054N/1\_

### Approvals and marking



### Applications

Monitoring voltage in AC or DC systems

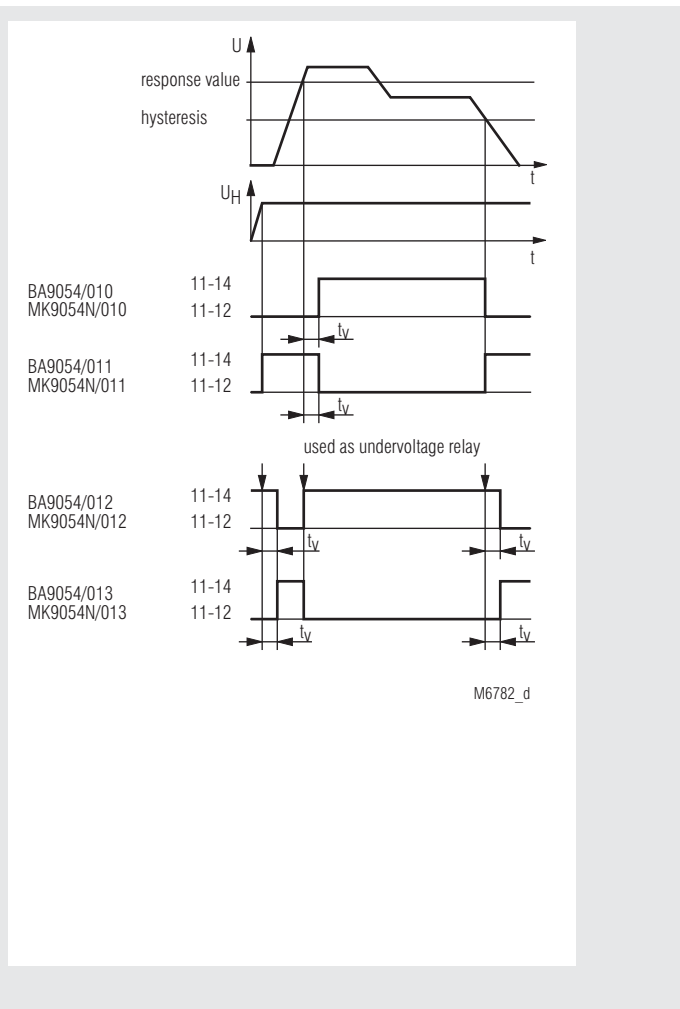
### Function

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.

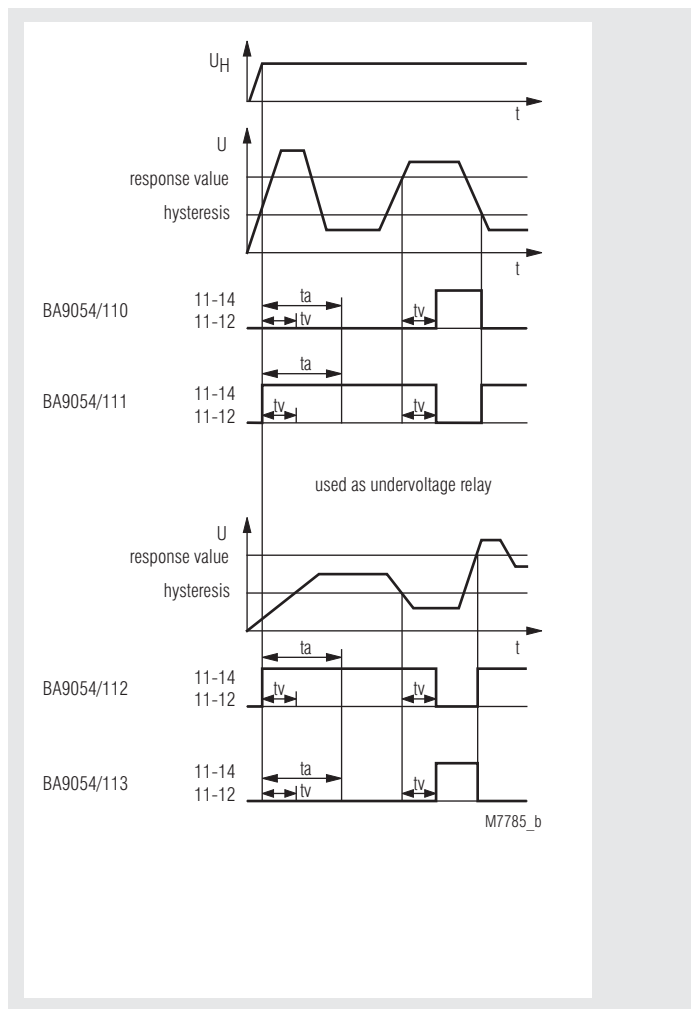
### Indicators

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

### Function diagram without start-up delay



### Function diagram with start-up delay



On model 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.

### Technical data

#### Input

BA 9054 with 1 Measuring range for AC <b>and</b> DC			
Measuring range <sup>1)</sup>		internal resistance	max. permissible continuous voltage
AC	DC		
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 kΩ	300 V
5 - 50 V	4,5 - 45 V	2 MΩ	500 V <sup>2)</sup>
25 - 250 V	22,5 - 225 V	2 MΩ	500 V <sup>2)</sup>
50 - 500 V	45 - 450 V	2 MΩ	500 V <sup>2)</sup>
70 - 700 V <sup>3)</sup>	63 - 630 V	3 MΩ	700 V <sup>4)</sup>
100 - 1000 V <sup>3)</sup>	90 - 900 V	3 MΩ	1000 V <sup>4)</sup>

<sup>1)</sup> DC or AC voltage 50 ... 5000 Hz  
(Other frequency ranges of 10 ... 5000 Hz, e. g. 16 <sup>2</sup>/<sub>3</sub> Hz, on request)

<sup>2)</sup> at Overvoltage category II: 600 V

<sup>3)</sup> only with BA 9054/\_20; /\_21; /\_22; /\_23; /\_24  
(model: 1 changeover contact)

<sup>4)</sup> at overvoltage category II: 1000 V

MK 9054 with 1 Measuring range for AC <b>and</b> DC			
Measuring range <sup>1)</sup>		internal resistance	max. permissible continuous voltage
AC	DC		
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 <sup>2)</sup>
25 - 250 V	22,5 - 225 V	2 MΩ	500 V <sup>2)</sup>
50 - 500 V <sup>2)</sup>	45 - 450 V	2 MΩ	500 V <sup>2)</sup>

<sup>1)</sup>DC or AC voltage 50 ... 60 Hz (to be ordered)

<sup>2)</sup> not for 400 / 690 V-(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.

**Technical data**

**Measuring principle:** arithmetic mean value  
**Adjustment:** The AC-devices can also monitor DC-voltage. The scale offset in this case is: ( $\bar{U} = 0,90 U_{eff}$ )  
**Temperature influence:** < 0,05 % / K

**Setting ranges**

**Setting:**  
**Response value:** infinite variable  $0,1 U_N \dots 1 U_N$   
 relative scale  
**Hysteresis:** infinite variable 0,5 ... 0,98 of setting value  
**Accuracy:**  $\leq \pm 0,5 \%$   
**Time delay  $t_v$ :** infinite variable at logarithmic scale from 0 - 20 s, 0 - 30 s, 0 - 60 s, 0 - 100 s  
 Setting 0 s = without time delay

**Start-up delay**

BA 9054/1\_\_ : 1 ... 20 s; 1 ... 60 s; 1 ... 100 s, adjustable on logarithmic scale.  
 $t_a$  is started by connecting the auxiliary supply. During start-up time the contact is in "good" state.

**Auxiliary circuit****Auxiliary voltage  $U_H$  (A1, A2)**

BA 9054: AC 24, 110, 127, 230, 400 V  
 AC/DC 24 ... 60 V, AC/DC 110 ... 230 V, DC 12 V

MK 9054N: AC 24, 42, 110, 127, 230 V, DC 12 V

**Voltage range:** 0,8 ... 1,1  $U_H$   
 DC (battery operated): 0,8 ... 1,3  $U_H$

**Nominal consumption:**

BA 9054: approx 2,5 VA  
 MK 9054N: approx. 2,0 VA

**Nominal frequency:** 50 / 60 Hz

**Frequency range:**  $\pm 5 \%$

**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<sup>5</sup> switching cycles

MK 9054N:

to AC 15 at 3 A, AC 230 V: 10<sup>5</sup> switching cycles

**Short-circuit strength**

**max. fuse rating:** 6 AgL IEC/EN 60 947-5-1

**Mechanical life**

BA 9054: 50 x 10<sup>6</sup> switching cycles

MK 9054N: 30 x 10<sup>6</sup> switching cycles

**Technical data****General data**

**Operating mode:** Continuous operation

**Temperature range:**

BA 9054: - 40 ... + 60°C

MK 9054N: - 20 ... + 60°C

**Clearance and creepage distances**

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 IEC/EN 60 068-2-6

frequency 10 ... 55 Hz

20 / 060 / 04 IEC/EN 60 068-1

EN 50 005

**Climate resistance:****Terminal designation:****Wire connection**

BA 9054: 2 x 2,5 mm<sup>2</sup> solid or  
 2 x 1,5 mm<sup>2</sup> stranded wire with sleeve  
 DIN 46 228-1/-2/-3/-4

MK 9054N: 1 x 4 mm<sup>2</sup> solid or  
 1 x 2,5 mm<sup>2</sup> stranded wire with sleeve  
 or 2 x 1,5 mm<sup>2</sup> stranded wire with sleeve  
 DIN 46 228-1/-2/-3/-4

**Wire fixing:** Flat terminals with self-lifting  
 clamping piece IEC/EN 60 999-1  
 DIN rail IEC/EN 60 715

**Mounting:****Weight:**

BA 9054: AC-device: 270 g

AC/DC-device: 200 g

MK 9054N: 175 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 Overvoltage monitoring
  - Measuring range: AC 25 ... 250 V
  - Auxiliary voltage  $U_H$ : AC 230 V
  - time delay by  $U_{an}$ : 0 ... 20 s
  - Width: 45 mm

BA 9054/012 AC 25 ... 250V AC 230 V

- Article number: 0053711
- for Undervoltage monitoring
  - Measuring range: AC 25 ... 250 V
  - Auxiliary voltage  $U_H$ : AC 230 V
  - time delay by  $U_{ab}$ : 0 ... 20 s
  - Width: 45 mm

MK 9054N/010 AC 25 ... 250 V AC 230 V 0 ... 20 s

- Article number: 0054098 stock item
- for Overvoltage monitoring
  - Measuring range: AC 25 ... 250 V
  - Auxiliary voltage  $U_H$ : AC 230 V
  - Time delay by  $U_{an}$ : 0 ... 20 s
  - deenergised on undervoltage
  - Width: 22,5 mm

MK 9054N/012 AC 25 ... 250 V AC 230 V 0 ... 20 s

- Article number: 0056073 stock item
- for Undervoltage monitoring
  - Measuring range: AC 25 ... 250 V
  - Auxiliary voltage  $U_H$ : AC 230 V
  - time delay by  $U_{ab}$ : 0 ... 20 s
  - deenergised on undervoltage
  - Width: 22,5 mm

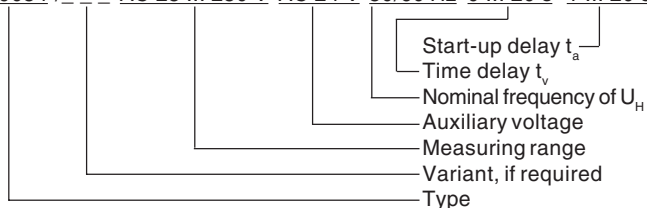
## Variants

- BA 9054/\_11: BA 9054/010 but with inverted relay output (see Function diagram) with time delay by  $U_{an}$
- BA 9054/\_13\*: BA 9054/012 but with inverted relay output (see Function diagram) with time delay by  $U_{ab}$
- BA 9054/61: BA 9054/\_01 with UL approval
- BA 9054/0\_\_ : standard version without options
- BA 9054/1\_\_ up to BA 9054/6\_\_ : with start-up delay
- BA 9054/2\_\_ : with safe separation according to VDE 106, not possible for auxiliary supply AC/DC
- BA 9054/3\_\_ : with 5µm gold plated contacts
- BA 9054/5\_\_ : with positive guided contacts
- BA 9054/6\_\_ : with manual reset, resetting by disconnecting the power supply
- MK 9054N/61: with UL approval (Canada/USA)
- MK 9054N/\_11: deenergised on overvoltage
- MK 9054N/\_13\*: energised on undervoltage
- MK 9054N/0\_\_ : standard version without remote potentiometer
- MK9054N/1\_\_ : with remote potentiometer for 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 50/60 Hz 0 ... 20 s 1 ... 20 s



## Accessories

- for MK 9054N
- ET 4752-143: Marking plate
- AD 3: Remote potentiometer 470 kΩ (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:  $\bar{U} = 0,9 \times U_{eff}$ .

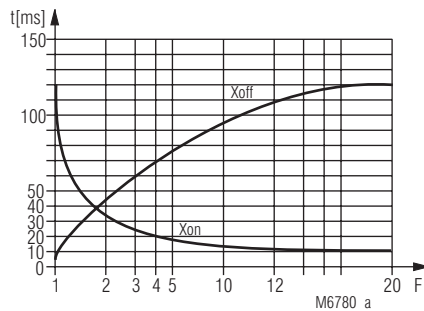
AC 25 ... 250 V is equivalent to DC 22,5 ... 225 V

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.

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