

VARIMETER Voltage Relay BA 9054

Translation
of the original instructions



Your Advantages

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

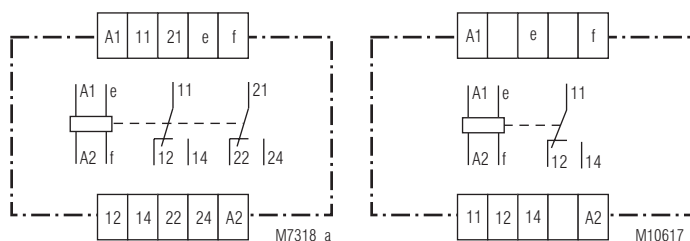
Features

- According to IEC/EN 60255-1, IEC/EN 60947-1
- To: Monitor DC and AC
- With measuring ranges from 15 mV to 1000 V
- High overload possible
- Input frequency up to 5 kHz
- Galvanic separation between Auxiliary Circuit – measuring circuit
- Auxiliary supply AC and AC/DC
- Optionally with start-up delay
- With time delay, up to max. 100 sec
- Optionally with safe separation to IEC/EN 61140 (on request)
- As option with manual reset
- LED indicators for operation and contact position
- Width: 45 mm

Product Description

The voltage relay BA 9054 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.

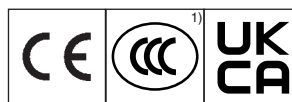
Circuit Diagrams



BA 9054

BA 9054/_ 2 _

Approvals and Markings



¹⁾ Approval not for all variants

Applications

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

Connection Terminals

Terminal designation	Signal description
A1, A2	Auxiliary voltage
e, f	Voltage measuring input
11, 12, 14	1st changeover contact
21, 22, 24	2nd changeover contact

Function

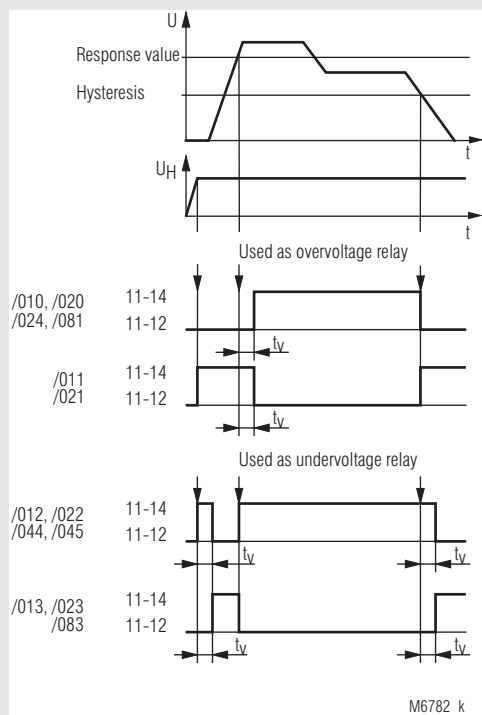
The relays measure the arithmetic mean value of the rectified measuring voltage. The AC units are adjusted to the r.m.s value. They have settings for response value and hysteresis. The units work as overvoltage relays but can also be used for undervoltage detection. The hysteresis is dependent on the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

2 time delays are possible in different variants:
The start up delay t_a operates only when connecting the auxiliary supply. The response delay t_v is active after exceeding a response value. On overvoltage relays the delay is active when the voltage goes over the tripping value, on undervoltage relays when the voltage drops below the hysteresis value.

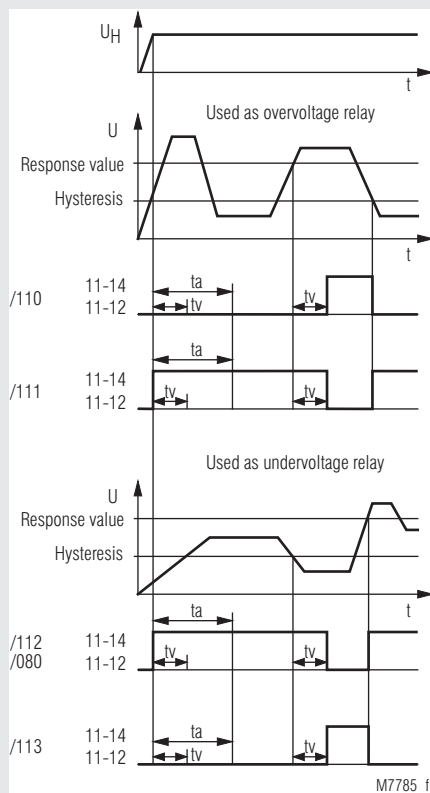
Indicators

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



Version BA 9054/_1_: 2 changeover contacts

Version BA 9054/_20, /_21, /_22, /_23, /_24: 1 changeover contact, measuring range $\geq 70 \dots 700 \text{ V}$

At version BA 9054/6__ with manual reset the contacts remain in the fault state after detecting a fault or after t_a has elapsed. The contacts are reset by disconnecting the supply voltage.

Technical Data			
Input (e, f)			
With 1 Measuring range for AC and DC			
Measuring range ¹⁾		Internal resistance	Max. permissible contin. voltage
AC	DC		
6 ... 60 mV ^{3) 4) 5)}	5.4 ... 54 mV ^{3) 4) 5)}	20 kΩ	10 V
15 ... 150 mV ^{3) 4)}	13.5 ... 135 mV ^{3) 4)}	40 kΩ	100 V
50 ... 500 mV ³⁾	45 ... 450 mV ³⁾	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
25 ... 250 V	22.5 ... 225 V	2 MΩ	500 V
50 ... 500 V	45 ... 450 V	2 MΩ	500 V
70 ... 700 V ²⁾	63 ... 630 V ²⁾	3 MΩ	1000 V
100 ... 1000 V ²⁾	90 ... 900 V ²⁾	3 MΩ	1000 V
¹⁾ DC or AC voltage 50 ... 5000 Hz (Other frequency ranges of 10 ... 5000 Hz, e.g. 16 ²⁾ / ₃ Hz on request) ²⁾ Only with BA 9054/_20; /_21; /_22; /_23; /_24 (Version: 1 changeover contact) ³⁾ To avoid measuring mistakes, twisted/shielded wires must always be used at the measuring input for device versions with an mV measuring range. ⁴⁾ Using only for current sensing via shunt! ⁵⁾ Measuring ranges 6 ... 60 mV (only available at variant BA 9054/08_).			
Please note: - ≤ 600 V: Overvoltage category III - > 600 V: Overvoltage category II			

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
 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): $\pm 0.5 \%$
Recovery time
 at devices with manual reset
 (Reset by braking of the auxiliary voltage)
 BA 9054/6_ _ : ≤ 1 s
 (dependent to function and auxiliary voltage)
Time delay t_d : Infinite variable at logarithmic scale
 from 0 ... 20 s, 0 ... 30 s, 0 ... 60 s,
 0 ... 100 s, 0 ... 300 s
 setting 0 s = without time delay
Start-up delay t_a :
 BA 9054/1 _ _ : 1 ... 20 s, 1 ... 30 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

Auxiliary voltage U_H (A1, A2)

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	$W \leq 5 \%$
AC/DC 80 ... 230 V	AC 40 ... 265 V	45 ... 400 Hz; DC 48 % W
	DC 40 ... 300 V	$W \leq 5 \%$

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

Technical Data			
Auxiliary voltage U _H (A1, A2) for mono voltages			
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		
Output			
Contacts:	2 changeover contacts		
Thermal current I _{th} :	2 x 5 A		
Switching capacity			
to AC 15:			
NO contact:	2 A / AC 230 V	IEC/EN 60947-5-1	
Variants /_20 to /_24			
(Version: 1 changeover contact)			
To AC 15:			
NO contact:	3 A / AC 230 V	IEC/EN 60947-5-1	
NC contact:	1 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 3 A, AC 230 V cos φ = 1:	2 x 10 ⁵ switching cycles		
Short-circuit strength			
max. fuse rating:	6 A gG / gL	IEC/EN 60947-5-1	
Mechanical life:	30 x 10 ⁶ switching cycles		
General Data			

Classification to DIN EN 50155

Vibration and shock resistance: Category 1, Class B IEC/EN 61373
Service temperature classes: OT1, OT2 compliant
OT3 and OT4 with operational limitations
Protective coating of the PCB: No

CCC-Data

Thermal current I_{th} : 5 A

Switching capacity

to AC 15: 2 A / AC 230 V IEC/EN 60947-5-1
To DC 13: 1 A / DC 24 V IEC/EN 60947-5-1



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

Standard Types

BA 9054/010 AC 25 ... 250 V AC/DC 80 ... 230 V
Article number: 0053642
• For Overvoltage 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
• Width: 45 mm

BA 9054/012 AC 25 ... 250 V AC/DC 80 ... 230 V
Article number: 0053714
• For Undervoltage monitoring
• Measuring range: AC 25 ... 250 V
• Auxiliary voltage U_H : AC/DC 80 ... 230 V
• Time delay t_v by U_{ab} : 0 ... 20 s
• Width: 45 mm

Varianten

BA 9054/820: AC 70 ... 700 V AC/DC 80 ... 230 V
article number: 0069637
like BA 9054/020,
Temperature range
Operation: - 40 ... + 60 °C
Operation: - 40 ... + 70 °C
(OT4 according to DIN EN 50155 with the following restrictions)

*) - Device mounted

Measuring voltage at e/f max. AC/DC 300 V
Auxiliary voltage at A1(+)/A2 max. DC 110 V
Overvoltages only temporary
Contact current max. AC 5 A

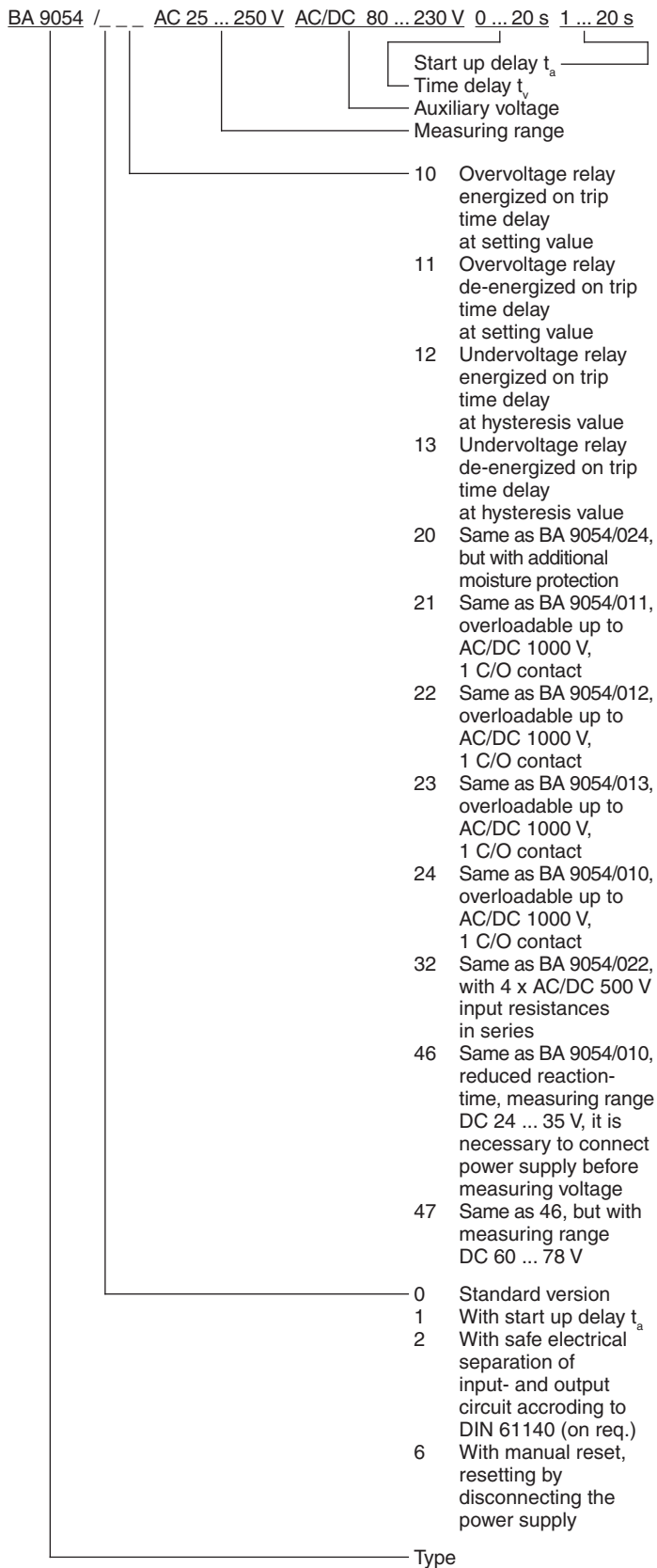
- Device mounted

Measuring voltage at e/f max. AC/DC 700 V;
Auxiliary voltage at A1(+)/A2 max. AC 110 V / DC 130 V
Overvoltages only temporary
Contact current max. AC 1 A

- Device mounted with 1 cm distance

Measuring voltage at e/f max. AC/DC 300 V;
Auxiliary voltage at A1(+)/A2 max. DC 110 V
Overvoltages only temporary
Contact current max. AC 2 A

Ordering Example for Variants



Setting

Example:

Voltage relay 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 V = 150 V)

Lower potentiometer: 0.5 (0.5 x 150 V = 75 V)

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

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

Response value DC 150 V

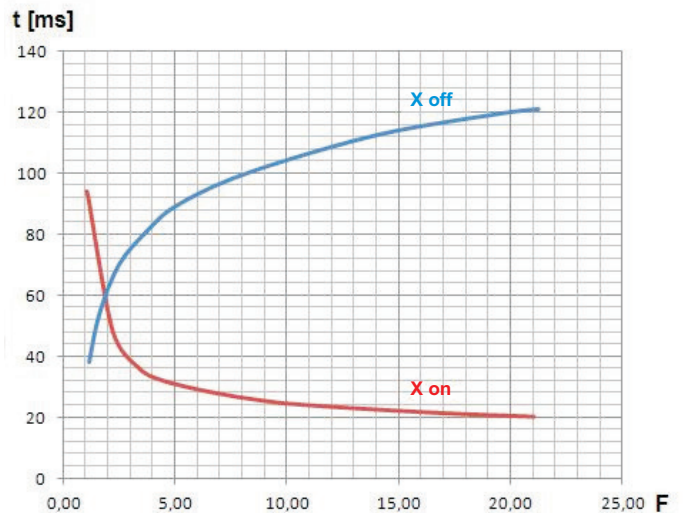
Hysteresis DC 75 V

Settings

upper potentiometer: 0.66 (0.66 x 225 V = 150 V)

Lower potentiometer: 0.5 (0.5 x 150 V = 75 V)

Characteristic



M11504_a

Time delay of measuring circuit

X on: Measured value rises $F = \frac{\text{Meas. value (after rise of meas. value)}}{\text{Setting value}}$

X off: Measured value drops $F = \frac{\text{Meas. value (befor meas. value drops)}}{\text{Setting value (hysteresis)}}$

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" (overvoltage detection with BA 9054/010):

Adjusted setting value X on = 230 V.

Caused by a missing neutral the voltage rises suddenly to 400 V

$$F = \frac{\text{Measured value (after rise of meas. value)}}{\text{Setting value}} = \frac{400 \text{ V}}{230 \text{ V}} = 1.74$$

Reading from the diagram:

The output relay switches on after 64 ms at a setting $t_v = 0$.

Example for "X off" (undervoltage detection with BA 9054/012):

Adjusted hysteresis setting value is 100 V.

Caused by a broken wire the voltage drops suddenly from 230 V to 0 V.

$$F = \frac{\text{Measured value (befor meas. value drops)}}{\text{Setting value (hysteresis)}} = \frac{230 \text{ V}}{100 \text{ V}} = 2.3$$

Reading from the diagram:

The output relay switches off after 70 ms at a setting $t_v = 0$.

