



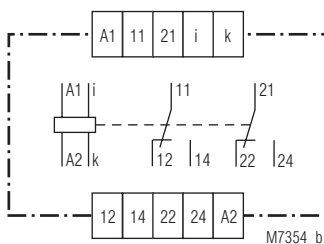
Your Advantages

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

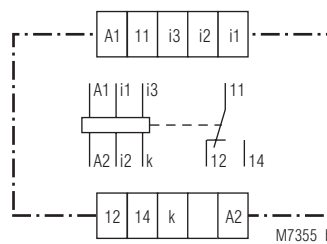
Features

- According to IEC/EN 60 255, DIN VDE 0435-303, IEC/EN 60 947-1
- Monitoring of DC and AC
- With measuring ranges from 2 mA to 25 A
- Optionally with 3 measuring ranges 0.1 up to 25 A
- High overload possible
- Input frequency up to 5 kHz
- Galvanic separation between auxiliary circuit - measuring circuit
- Auxiliary supply AC/DC; BA 9053 with AC
- Optionally with start-up delay
- with time delay, up to max. 100 sec
- Optionally with safe separation to IEC/EN 61140
- As option with manual reset
- LED indicators for operation and contact position
- Width 45 mm

Circuit Diagrams



BA 9053



BA 9053/4__ z. B.:
Terminals i1/k: 0.1 ... 1 A
Terminals i2/k: 0.5 ... 5 A
Terminals i3/k: 1 ... 10 A

Approvals and Markings



* see variants

Applications

Monitoring current in AC or DC systems

Connection Terminals

Terminal designation	Signal designation
A1, A2	Auxiliary voltage
i, k	Current 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 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.

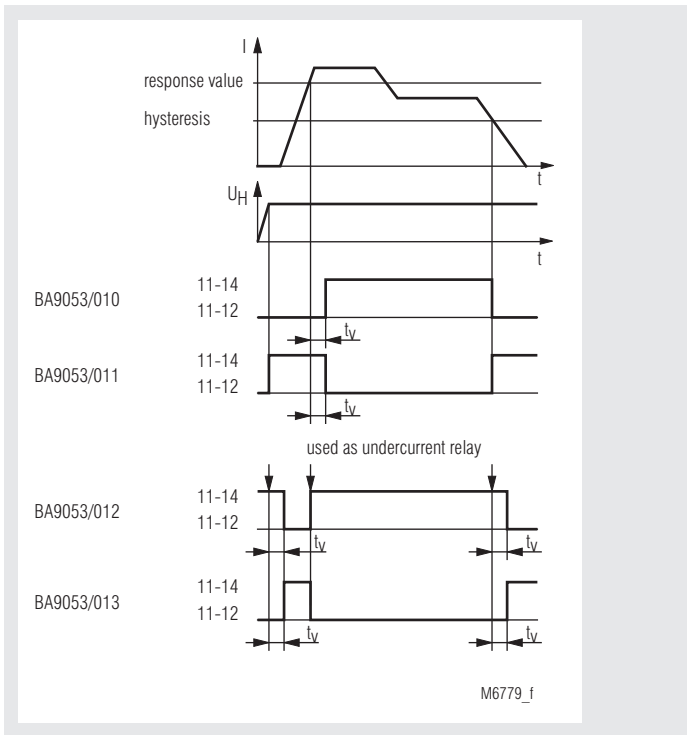
2 time delays are possible in different variants:

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_r 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.

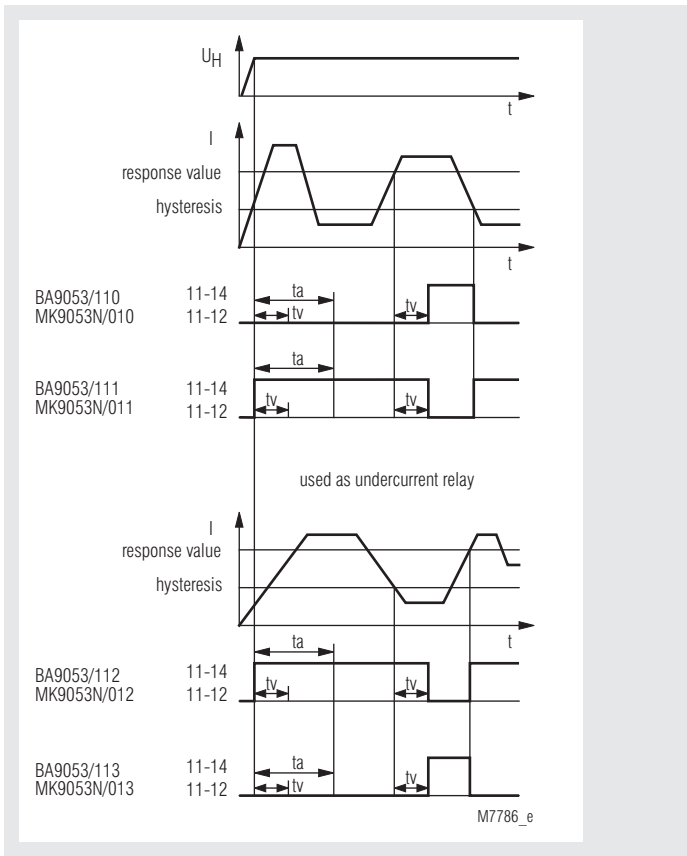
Indicators

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

Function Diagram without Start-up Delay



Function Diagram with Start-up Delay



On model BA 9053/6__ 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 (i, k)

BA 9053 for AC and DC				
Measuring range ^{*)}		internal resistance	max. perm. cont. current	max. perm. current 3 s On, 100 s Off
AC	DC			
2 - 20 mA	1.8 - 18 mA	1.5 Ω	0.7 A	1 A
20 - 200 mA	18 - 180 mA	0.15 Ω	2 A	4 A
30 - 300 mA	27 - 270 mA	0.1 Ω	2.5 A	8 A
50 - 500 mA	45 - 450 mA	0.1 Ω	2.5 A	8 A
80 - 800 mA	72 - 720 mA	40 mΩ	4 A	12 A
0.1 - 1 A	0.09 - 0.9 A	30 mΩ	4 A	12 A
0.5 - 5 A	0.45 - 4.5 A	6 mΩ	10 A	30 A
1 - 10 A	0.9 - 9 A	3 mΩ	20 A	40 A
1.5 - 15 A	1.35 - 13.5 A	3 mΩ	25 A	40 A
2 - 20 A	1.8 - 18 A	3 mΩ	25 A	40 A
2.5 - 25 A	2.25 - 22.5 A	3 mΩ	25 A	40 A

^{*)} DC or AC current 50 ... 5000 Hz
(other frequency ranges of 10 ... 5000 Hz, e.g. 16 ²/₃ Hz on request)

BA 9053/4__ with 3 measuring ranges:

Range:	Terminals i1/k	Terminals i2/k	Terminals i3/k
AC 20 mA / 200 mA / 1A:	AC 2.0 ... 20 mA	AC 20 ... 200 mA	AC 0.1 ... 1 A
	DC 1.8 ... 18 mA	DC 18 ... 180 mA	DC 0.09 ... 0.9 A
AC 1 / 5 / 10A:	AC 0.1 ... 1 A	AC 0.5 ... 5 A	AC 1.0 ... 10 A
	DC 0.09 ... 0.9 A	DC 0.45 ... 4.5 A	DC 0.9 ... 9 A
AC 5 / 10 / 25A:	AC 0.5 ... 5 A	AC 1.0 ... 10 A	AC 2.5 ... 25 A
	DC 0.45 ... 4.5 A	DC 0.9 ... 9 A	DC 2.25 ... 22.5 A

Extending of measuring range:

For DC-current higher then the highest measuring range the voltage relay measuring range 15 ... 150 mV or 6 ... 60 mV can be used with external Shunt.
For AC current higher then the highest measuring range can be used a current transformer e. g. with secondary winding of 1 A or 5 A together with BA 9053.
The nominal load of the CT should be ≥ 0.5 VA.

Measuring principle: Adjustment:

arithmetic mean value
The AC - devices can also monitor DC current. The scale offset in this case is:
($I = 0.90 I_{eff}$)
< 0.05 % / K

Temperature influence:

Setting Ranges

Setting

Response value: infinite variable $0.1 I_N \dots 1 I_N$
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 %

Adjustment by rotational potentiometer on the front panel of the device is not calibrated. For accurate adjustment it is necessary to use an external measuring instrument.

Repeat accuracy:

$\leq \pm 0.5 \%$

Recovery time

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

BA 9053/6__:

≤ 1 s
(dependent to function and auxiliary voltage)
infinite variable at logarithmic scale
from 0 ... 20 s, 0 ... 30 s, 0 ... 60 s, 0 ... 100 s
setting 0 s = without time delay

Time delay t_v :

Start-up delay t_a :

BA 9053/1 __:

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

Technical Data**Auxiliary Circuit****Auxiliary voltage U_H (A1, A2)**

Nominal voltages: AC 24, 42, 110, 127, 230, 400 V
Voltage range: 0.8 ... 1.1 U_H
Nominal frequency: 50 / 60 Hz^H
Frequency range: ± 5 %
Nominal consumption: 2.5 VA
 4 VA; 1.5 W at AC 230 V Rel. energized
 1 W at DC 80 V Rel. energized

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 %
DC 12 V	DC 10 ... 18 V	battery voltage

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 60 947-5-1
 NC contact: 1 A / AC 230 V IEC/EN 60 947-5-1
 to DC 13: 1 A / DC 24 V IEC/EN 60 947-5-1
Electrical life
 to AC 15 at 3 A, AC 230 V: 5 x 10⁵ switch. cycl. IEC/EN 60 947-5-1
Short-circuit strength
max. fuse rating: 6 AgL IEC/EN 60 947-5-1
Mechanical life: 50 x 10⁶ switching cycles

General Data

Operating mode: Continuous operation
Temperature range:
 ≤ 10 A: - 40 ... + 60°C
 ≥ 15 A: - 40 ... + 50°C
Storage
Climate class in accordance to IEC60721 (without condensation and icing):
 Long term storage: 1K4 IEC60721-3-1
 Transport: 1K3 IEC60721-3-2
 Stationary use: 3K5 IEC60721-3-3
Mechanical stress in accordance to IEC60721:
 Long term storage: 1M3 IEC60721-3-1
 Transport: 2M2 IEC60721-3-2
 Stationary use: 3M4 IEC60721-3-3
Clearance and creepage distances
 rated impulse voltage / pollution degree
 meas. range ≤ 10 A: 6 kV / 2 IEC 60 664-1
 meas. range ≥ 15 A: 4 kV / 2 IEC 60 664-1
EMC tested according to railway standard EN 50155
 Electrostatic discharge: 8 kV (air) IEC/EN 61 000-4-2
 HF irradiation
 80 MHz ... 1 GHz: 20 V/m IEC/EN 61 000-4-3
 1 GHz ... 2.7 GHz: 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
Climate resistance
 ≤ 10 A: 40 / 060 / 04 IEC/EN 60 068-1
 ≥ 15 A: 40 / 050 / 04 IEC/EN 60 068-1
Terminal designation: EN 50 005
Wire connection: 2 x 2.5 mm² solid or 2 x 1.5 mm² stranded wire with sleeve
Wire fixing: Flat terminals with self-lifting clamping piece IEC/EN 60 999-1
Mounting: DIN-rail IEC/EN 60 715

Technical Data**Weight**

AC-device: 280 g
 AC/DC-device: 200 g

Dimensions

Width x height x depth: 45 x 75 x 120 mm

UL-Data

Auxiliary voltage U_H (A1, A2): AC 24, 42, 48, 110, 115, 120 V
Thermal current I_{th} : 2 x 5 A
Clearance and creepage distances: 4 kV / 2 IEC 60 664-1
HF irradiation
 (80 MHz ... 2.7 GHz) 10 V/m IEC/EN 61 000-4-3
Switching capacity: Pilot duty B150
Ambient temperature: - 40 ... + 60°C



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

CCC-Data**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 Types

BA 9053/010 AC 0.5 ... 5 A AC 230 V
 Article number:
 • for Overcurrent monitoring
 • Measuring range: AC 0.5 ... 5 A
 • Auxiliary voltage U_H : AC 230 V
 • Time delay by I_{an} : 0 ... 20 s
 • Width: 45 mm

BA 9053/012 AC 0.5 ... 5 A AC 230 V
 Article number:
 • for Undercurrent monitoring
 • Measuring range: AC 0.5 ... 5 A
 • Auxiliary voltage U_H : AC 230 V
 • Time delay by I_{ab} : 0 ... 20 s
 • Width: 45 mm

Accessories

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

Setting

Example:
 Current relay BA 9053 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: $T = 0.90 \times I_{eff}$

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)

Ordering example for variants

BA 9053 / /61 AC 1...10 A AC 24 V 0...20 s 1...100 s

Start up delay t_a
Time delay t_r
Auxiliary voltage
Measuring range

With UL-approval

- 10 Overcurrent relay energized on trip time delay at setting value
- 11 Overcurrent relay de-energized on trip time delay at setting value
- 12 Undercurrent relay energized on trip time delay at hysteresis value
- 13 Undercurrent relay de-energized on trip time delay at hysteresis value

- 0 Standard version
- 1 With start up delay t_a
- 2 With safe electrical separation of input- and output circuit according to DIN 61140

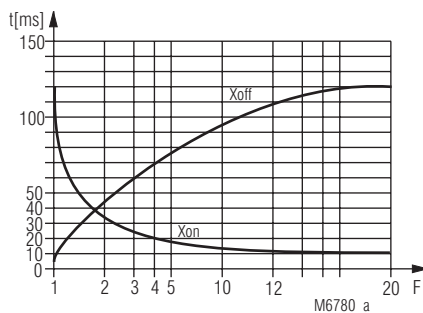
Meas. range up to ≤ 10 A:
DIN EN 60947-1; 4 kV/2
in relation of over-voltage category III
with basic insulation
to DIN EN 60664-1
of 4 kV;

Meas. range up to ≥ 15 A:
overvoltage category II
with basic insulation
of 2.5 kV

- 3 With 5 μ m gold plated contacts
- 4 With 3 current ranges 1 C/O contact
- 431 With 3 current ranges 1 C/O contact, with safe separation up to 10 A
- 5 With forcibly guided contacts
- 6 With manual reset, resetting by disconnecting the power supply

Type

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.

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

Maintenance, repair and disposal

Maintenance and repairs

- The device contains no parts that require maintenance.
- In case of failure, do not open the device but send it to manufacturer for repair.

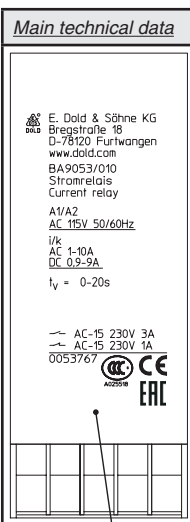
Regular checks

- In addition to the tests during set up, a functional test must be made in regular intervals (at minimum annually) and after all maintenance work.
- By use in room temperature we recommend an exchange of the module after 8 years

Disposal

- Unserviceable devices that cannot be repaired must be disposed in accordance with the relevant country-specific waste disposal regulations.

Product appearance



Sticker
- Year / Month of production
- Data for internal use

