Current measuring relay

- For monitoring the upper and lower limit values of single phase voltages
- 2 designs, each with measuring ranges between AC/DC 2 and 500 mA or 0.1 and 15 A
- Sinusoidal, square, delta waveforms
- 10 time ranges: no delay, 0.1 s to 3 h for the ON-delay time
- Frequency range of the measuring variable between 45 and 400 Hz
- Multi-functional: Open-circuit or closed-circuit principle; hysteresis 3 % or 10 % from the setpoint

Applications

- Monitoring of current levels
- Monitoring of power requirements
- Monitoring of frequency drives
- Monitoring of analog correcting variables
- Monitoring of heating elements

Functions

The current measuring relay SUM 1001 is a monitoring relay for single-phase voltages. The measured value is fed in through different terminals (see table I) according to the desired measuring range. With the setpoint potentiometer, the response value can be adjusted analogically within the pre-selected measuring range. The on-time delay can be adjusted with the time range switch and the time setpoint potentiometer (see table II).

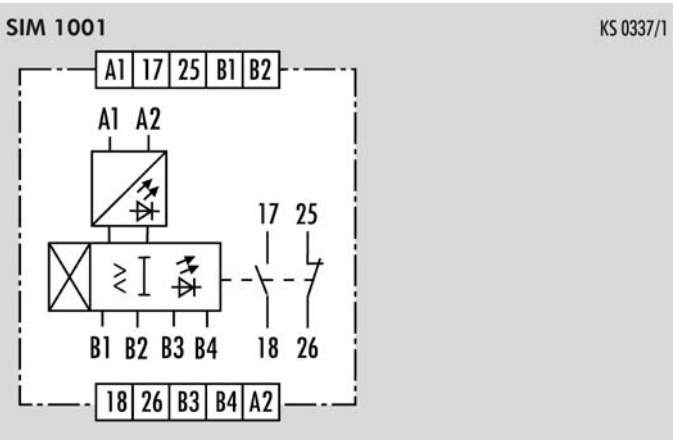
Function of the open-circuit principle

After applying the supply voltage and transgression of the lower or upper limit values (depending on the selected function – see table III) of the pre-selected response value, the output relay switches into the ON position. This occurs either according to the pre-selected ON-delay time or immediately. The transgression of the limit values (underflow or overrange) of the response value, according to the selected function, by at least 3 % or 10 % (hysteresis) causes the output relay to switch back into the OFF position.

Function of the closed-circuit principle

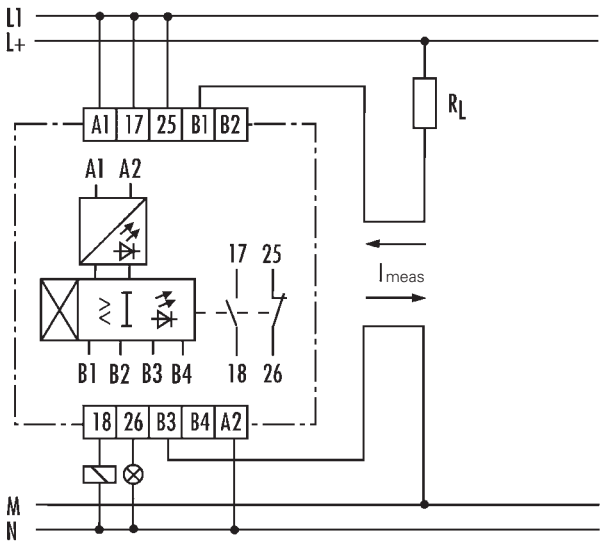
After applying the supply voltage, the relay switches into the ON position after t_B. The transgression of the lower or upper pre-selected limit values, according to the selected function, causes the output relay to switch back into the OFF position depending on the pre-selected ON-delay time. Depending on the pre-selected hysteresis (3 % or 10 %), the output relay switches back into the ON position after the corresponding transgression of the lower or upper response value.

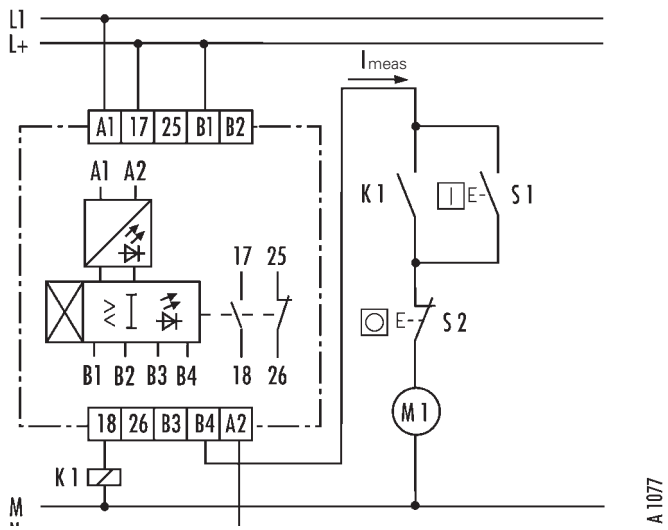
Circuit diagram



Notes

- The power supply is electrically isolated from the measuring circuit and is displayed by LED SUPPLY.
- The measured value is recorded with an integrated full wave rectifier. Therefore it is possible, in certain ranges, to monitor non-sinusoidal currents (e.g. currents with harmonic, square or delta voltages ranging between 45 and 400 Hz).
- With AC, the devices evaluate the rectifier value calibrated on the root-mean-square of a sine voltage.
- With DC measuring values, a rectification is performed and the mean value is monitored.
- With NO DELAY and simultaneous active function overrange (> V), the monitoring relays will respond to the instantaneous value of the monitoring variable at a certain threshold and cause the output relay to switch into "quick time" (see Technical Data).
- Disconnect the connection cables of the voltage measuring relay prior to performing an insulation or voltage test.





Application examples

Setting example NMI 1001 2 – 500 mA:

Setpoint (response value)	AC/DC 50 mA
ON-delay time	210 s
Function	overrange, open-circuit principle, 3 % hysteresis

Table I:
- Measuring range 2 (terminals B1 and B3)
- Potentiometer setpoint set to 0.5 (0.5 x measuring range end value 100 mA) = 50 mA (setpoint)

Table II:
- Time range end value 300 s
- Time potentiometer setpoint set to 0.7 (0.7 x time range end value 300 s) = 210 s (ON-delay time)

Table III:
- Function > A ⨍ 3 %
- Function selector in position 4

If the measuring value exceeds the setpoint of 50 mA, the LED TRIPPED will begin to flash. After the pre-selected ON-delay time of 210 s, the output relay switches into the ON position and the LED TRIPPED burns continuously. If the actual measuring value falls below the setpoint minus the hysteresis of 3 %, the output relay will switch back into the OFF position. If it falls below the measured value before the pre-selected ON-delay time is reached, the LED TRIPPED will extinguish (see Function diagram 1).

Setting example SIM 1001 0.1 – 15 A:

Setpoint (response value)	AC/DC 12 A
ON-delay time	without
Function	underflow, closed-circuit principle, 10 % hysteresis

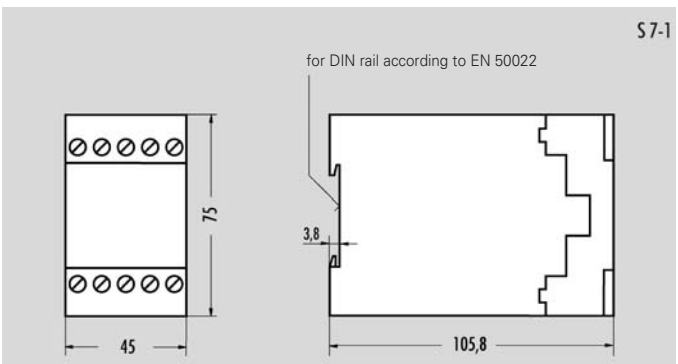
Table I:
- Measuring range 3 (terminals B1 and B4)
- Potentiometer setpoint set to 0.8 (0.8 x measuring range end value 15 A) = 12 A (setpoint)

Table II:
- Time range end value NO DELAY
- Potentiometer setpoint set to any value = without ON-delay time

Table III:
- Function < A ⨍ 10 %
- Function selector in position 8

If the measured value falls below the setpoint of 12 A, the output relay will switch into the OFF position without an ON-delay time, and the LED TRIPPED will light. If the actual measured value exceeds the setpoint plus the hysteresis of 10 %, the output relay will switch into the ON position. The LED TRIPPED will extinguish (see Function diagram 4).

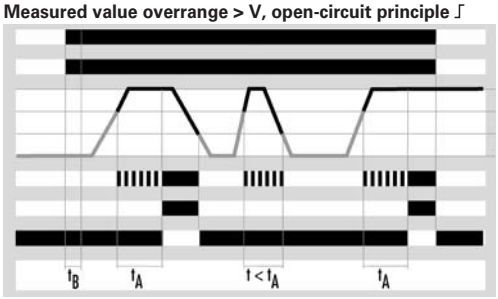
Dimension diagram



Function diagram

SIM 1001 **FD 0242-5-1 W1**

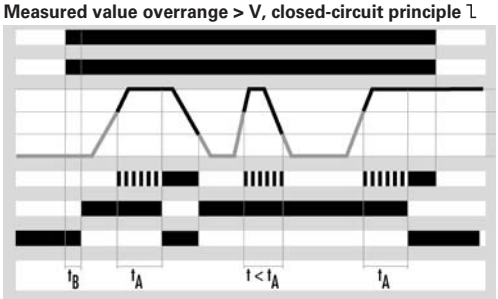
Measured value overrange > V, open-circuit principle ⎍



t_A = adjustable ON-delay time
t_B = availability time of measurement after power supply switch-on

FD 0242-5-2 W1

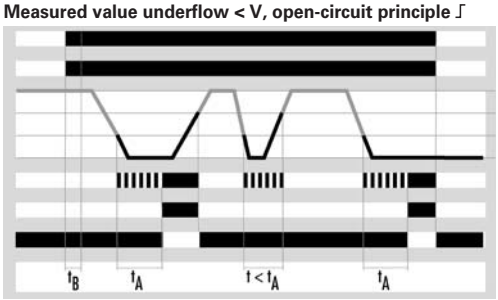
Measured value overrange > V, closed-circuit principle ⎎



t_A = adjustable ON-delay time
t_B = availability time of measurement after power supply switch-on

FD 0242-5-3 W1

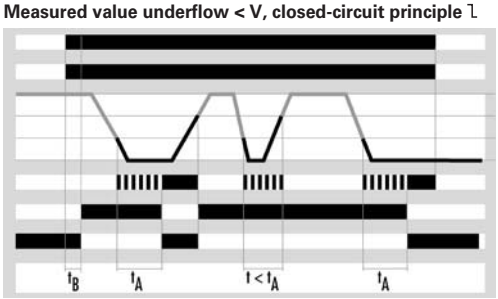
Measured value underflow < V, open-circuit principle ⎍



t_A = adjustable ON-delay time
t_B = availability time of measurement after power supply switch-on

FD 0242-5-4 W1

Measured value underflow < V, closed-circuit principle ⎎



t_A = adjustable ON-delay time
t_B = availability time of measurement after power supply switch-on

Settings

Table Ia SIM 1001 2 – 500 mA

	Response value range	Connection	Internal resistance	Frequency
1	2 – 20 mA AC/DC	B1 – B2	2.5 Ω	45 – 400 Hz
2	10 – 100 mA AC/DC	B1 – B3	500 mΩ	45 – 400 Hz
3	50 – 500 mA AC/DC	B1 – B4	100 mΩ	45 – 400 Hz

	Permissible overcurrent			Maximum fusing (slow)
	continuous	max. 3 s break 100 s	max. 10 s break 100 s	
1	0.05 A	0.2A	0.5 A	0.1 A
2	0.25 A	1 A	2.5 A	0.4 A
3	1.25 A	5 A	12 A	2.5 A

Table Ib SIM 1001 0.1 – 15 A

	Response value range	Connection	Internal resistance	Frequency
1	0.1 – 1 A AC/DC	B1 – B2	50 mΩ	45 – 400 Hz
2	0.5 – 5 A AC/DC	B1 – B3	10 mΩ	45 – 400 Hz
3	1.5 – 15 A AC/DC	B1 – B4	3.33 mΩ	45 – 400 Hz

	Permissible overcurrent			Maximum fusing (slow)
	continuous	max. 3 s break 100 s	max. 10 s break 100 s	
1	2.5 A	10 A	25 A	5 A
2	12.5 A	50 A	125 A	16 A
3	21 A	50 A	125 A	25 A

Table II:

Time range	Value		
1 s	0.1 s to	1 s	Operation of the time switch or the function switch during the timing period will immediately terminate the timing operation.
3 s	0.3 s to	3 s	
10 s	1 s to	10 s	
30 s	3 s to	30 s	
100 s	10 s to	100 s	
300 s	30 s to	300 s	
1000 s	100 s to	1000 s	
1 h	0.1 h to	1 h	
3 h	0.3 h to	3 h	
NO DELAY		no delay	

Table III

Switch Function	Monitoring	Principle of output relay	Hysteresis
> A ⎍ 3 %	Overrange	Open-circuit principle	3 %
> A ⎎ 3 %	Overrange	Closed-circuit principle	3 %
< A ⎍ 3 %	Overrange	Open-circuit principle	3 %
< A ⎎ 3 %	Overrange	Closed-circuit principle	3 %
> A ⎍ 10 %	Overrange	Open-circuit principle	10 %
> A ⎎ 10 %	Overrange	Closed-circuit principle	10 %
< A ⎍ 10 %	Underflow	Open-circuit principle	10 %
< A ⎎ 10 %	Underflow	Closed-circuit principle	10 %

Overview of the devices/Part numbers

Type	Measuring range	Rated voltage		Part number	Std. Pack
SIM 1001	AC/DC 2 – 500 mA	AC 24 V	50 – 60 Hz	R3.185.0280.0	1
		AC 115 V	50 – 60 Hz	R3.185.0270.0	1
		AC 230 V	50 – 60 Hz	R3.185.0210.0	1
	AC/DC 0.1 – 15 A	AC 24 V	50 – 60 Hz	R3.185.0250.0	1
		AC 42 V	50 – 60 Hz	R3.185.0230.0	1
		AC 115-120 V	50 – 60 Hz	R3.185.0240.0	1
		AC 230-240 V	50 – 60 Hz	R3.185.0200.0	1

Interface

Technical data		SIM 1001		
Type of function according to DIN EN 60255-6:11.94		Current measuring relay with open-circuit and closed-circuit principle		
Function control		1 green LED, 1 red LED		
Function diagram		FD 0242-5-1 W1 – FD 0242-5-4 W1		
Power supply circuit				
Rated voltage U_N	AC	**24 V**	**115 V**	**230 V**
Rated consumption set to 50 Hz and U_N (AC)		2.5 VA	2.5 VA	2.5 VA
Rated consumption set to 50 Hz and U_N (AC)		2.3 W	2.3 W	2.3 W
Maximum inrush current set to U_N (< 1 ms)		1.2 A	0.25 A	0.13 A
Rated frequency		50 – 60 Hz		
Operating voltage range		0.8 – 1.1 x U_N		
Parallel loads permissible		yes		
Measuring circuit (DC or sinusoidal measuring voltage)				
Electrical isolation from power supply circuit		yes		
Setting / Number of measuring ranges		analog / 3		
Setting ranges Measuring circuit – Response values		see Table I		
Setting ranges Measuring circuit – Hysteresis values		approx. 3 % and approx. 10 % of the response value, adjustable		
ON-delay time		see Table II		
Dispersion		≤ ± 0.5 %		
Influence of the supply voltage		≤ ± 0.05 % / % ΔU_N		
Influence of the ambient temperature		≤ ± 0.05 % / KΔT		
Rated frequency range of the measured value		45 – 400 Hz AC, DC		
Minimum pulse length of the measured value		25 ms with overrange/underflow of the DC response value		
Minimum pulse length of the measured value at NO DELAY		1 ms with 1.5 times overrange of the DC response value		
Time circuit				
Mean value of the fault		< 5 % of the end value		
Dispersion		≤ ± 0.2 % + ≤ 50 ms		
Influence of the supply voltage		≤ ± 0.02 % / % ΔU_N		
Influence of the ambient temperature		≤ ± 0.005 % / KΔT		
Output circuit				
Contact assignment		1 normally closed, 1 normally open		
Contact material		Ag alloy, gold-plated		
Rated operating voltage U_n		AC/DC 230/230 V		
Max. continuous current I_n per contact		5 A		
Application category according to EN 60947-5-1:1991		AC-15: U_e 230 V AC, I_e 3 A		
		DC-13: U_e 24 V DC, I_e 2 A		
Short circuit protection; max. fuse insert class gG		6 A		
Permissible switching frequency		≤ 6000 switching cycles/h		
Mechanical life		30 x 10^6 switching cycles		
Response time set to NO-DELAY and > V (AC 50 Hz)		≤ 80 ms	at 1.05 times	the response value of the measured value
		≈ 25 ms	at 1.3 times	the response value of the measured value (quick time)
Response time set to NO-DELAY and > V (DC)		≤ 50 ms	at 1.1 times	the response value of the measured value
		≈ 15 ms	at 1.6 times	the response value of the measured value (quick time)
Release time set to NO-DELAY and > V		≈ 30 ms	after 1.1 times	the response value of the measured value
		≤ 150 ms	after 1.6 times	the response value of the measured value
Release time set to 0.1 s to 3 h		≈ 30 ms	after 1.1 times	the response value of the measured value
		≈ 35 ms	after 1.6 times	the response value of the measured value
Minimum pulse time of output relay		> 100 ms, during elapse of the minimum pulse time, this is reset when the relay is energized again		
Availability time of measurement after power ON		≤ 100 ms		
General information				
Creepage distances and clearances between the circuits		according to DIN VDE 0110-1:04.97		
Rated impulse voltage		5 kV		
Overvoltage category		III		
Pollution degree		3 outside, 2 inside		
Rated voltage		500 V AC		
Test voltage U_{eff} 50 Hz according to DIN VDE 0110-1, table A.1		2.7 kV		
Protection degree housing/terminals according to DIN VDE 0470 sec. 1:11.92		IP 40 / IP 20		
Noise immunity according to IEC 61000-4		Test severity 3		
Ambient temperature, operating range		-20 – +60 °C		
Dimension diagram		S 7-1		
Circuit diagram		KS 0337/1		
Connector cross sections fine-stranded / solid		2 x 0.75 – 1.5 mm² / 2 x 0.75 – 2.5 mm²		
or fine-stranded with ferrules		1 or 2 x 0.5 – 1.5 mm²		
Permissible tightening torque		0.8 – 1 Nm		
Weight		0.3 kg		
Accessories		–		
Approvals				