Power Electronics

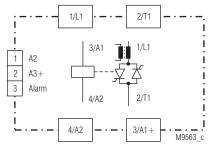
POWERSWITCH Semiconductor Relay / - Contactor With Load Circuit Monitoring PH 9270





- · AC semiconductor relay /-contactor
- · With integrated load circuit monitoring
- Settable load limit value
- According to IEC/EN 60947-4-3
- Load current 40 A, AC 51
- Switching at zero crossing
- 2 anti-parallel thyristors
- DCB technology (direct bonding method) for excellent heat transmission properties
- Two-colours LED status indicator
- Touch protection IP20
- PLC compatible alarm output (PNP; NPN on request)
- As option closed circuit operation or open circuit operation
- As option with optimized heat sink, for DIN rail mounting
- Width 45 mm

Circuit Diagram



PH 9270.91

Indication

The LED "A1/A2" shows the state of the control input yellow: controlled semiconductor relays off: not controlled semiconductor relays

The LED "Alarm" shows the state of the unit

green: no failure

red: failure (thyristor defective with open or short circuit,

open load, current value to high or to low or

supply voltage < 100 V AC) no auxiliary voltage (A3+/A2)

Approvals and Markings



Notes

off:

Overtemperature protection

Optionally, the semiconductor relay has an overtemperature protection to monitor the temperature of the heat sink. For this purpose, a thermal switch (NC contact) can be inserted into therespective pocket at the bottom of the semiconductor relay. As soon as the temperature of the heat sink exceeds for example 100°C, the thermal switch opens. For thermal protection of the semiconductorrelay, a thermal switch of UCHIYA type UP62 - 100 can be installed.

Applications

For high frequency wear free and noiseless switching of

- heating systems
- motors
- valves*
- lighting systems

The semiconductor switches at zero crossing. The integrated load monitoring provides fast fault finding e.g. broken load elements (part load failure), broken load circuit, overcurrent, missing load voltage, blown fuse and thyristor faults.

The PH 9270 is suitable for many applications e. g. extrusion machines for plastic and rubber, packaging machines, solder lines, machines in food industry.

* On overcurrent monitoring a start up delay must be integrated in the control.

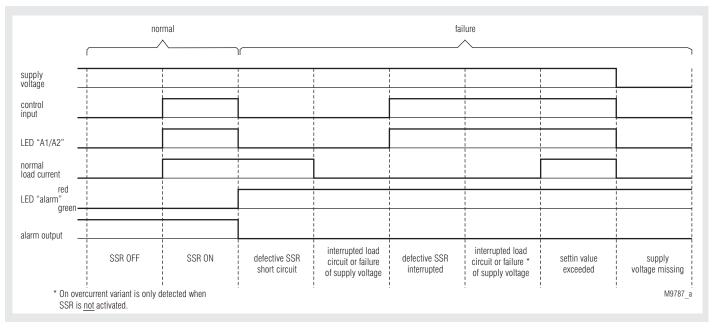
Function

The semiconductor relay PH 9270 monitors with applied auxiliary voltage (A3+/A2) the load voltage and the load current. On broken load circuit, deviations of the load current from setting value or defective semiconductor an alarm output is controlled. The failure state is indicated on an 2-color LED (see Function Diagrams).

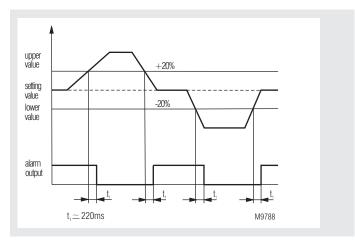
The PH 9270 with 2 antiparallel connected thyristors switches at zero crossing. When connecting the control voltage the semiconductor is switched on with the next zero crossing of the sinusoidal voltage. After disconnecting the control voltage the semiconductor switches off with the next zero crossing of the load current.

As option the PH 9270 is available with heat sink for DIN rail mounting and immediately "ready to use". In addition the heat dissipation is optimised.

Function Diagram



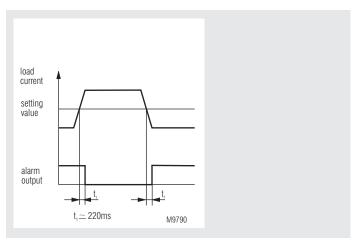
Normal operation and failure status



Over- / Undercurrent detection variant /000



Undercurrent detection variant /001



Overrcurrent detection variant /002

Technical Data

Output

Forward-voltage [V]

at nominal curren: 1.4 Off-state voltage [V/ μ s]: 500 Rate of rise of current [A/ μ s]: 100 Measuring range: 0,5 ... 40 A

Response value: continously variable Hysteresis: 2 % of response value

Themperature Data

Thermal resistance junction - housing [K/W]: 0.5 Thermal resistance housing - ambient [K/W]: 12 Junction temperature [$^{\circ}$ C]: \leq 125

Alarm Output

Auxiliary supply A3+/A2 [V]: 20 ... 32 (DC) max. input current [mA]: 25 bei 24 V DC

PNP semiconductor outputs

max. output current [mA]: 100

Output voltage

(open) [V]: 0 (DC)

(closed) [V]: Auxiliary supply -2 V DC (max.)

Time delay [ms]: 220

Control Circuit

General Data

Operating mode: Continuous operation

Temperature range

operation: - 20 ... 40° C storage: - 20 ... 80° C

Clearance and creepage distances:

rated impulse voltage /

pollution degree: 6 kV / 3 IEC/EN 60 664-1 **EMC:** IEC/EN 61 000-6-4, IEC/EN 61 000-4-1 Electrostatic discharge (ESD): 8 kV air / 6 kV contact IEC/EN 61 000-4-2 HF irradiation: 10 V / m IEC/EN 61 000-4-3

2 kV

Fast transients: Surge voltages

between

wires for power supply: 1 kV IEC/EN 61 000-4-5 between wire and ground: 2 kV IEC/EN 61 000-4-5 HF-wire guided: 10 V IEC/EN 61 000-4-6 Interference suppression: Limit value class A IEC/EN 60 947-4-3

Degree of protection

 Housing:
 IP 40
 IEC/EN 60 529

 Terminals:
 IP 20
 IEC/EN 60 529

Vibration resistance: Amplitude 0.35 mm

Frequency 10 ... 55 Hz, IEC/EN 60-068-2-6 **Housing material**Fiberglass reinforced polycarbonate

Flame resistant: UL 94 V0

IEC/EN 61 000-4-4

Base plate: Aluminum, copper nickle-plated
Potting compound: Polyurethane

Potting compound: Polyurethane Mounting screws: M 5 x 8 mm Fixing torque: 2.5 Nm

Technical Data

Connections control input: Mounting screws M3 Pozidriv 2 PT

Fixing torque: 0.5 Nm
Wire cross section: 1.5 mm² Litze

Connections load circuit: Mounting screws M4 Pozidriv 1 PT

Fixing torque: 1.2 Nm Wire cross section: 1.0 mm² wire

Connections

monitoring circuit: Weidmüller - Omnimate Range connecting pair BL 3.50/03

(included in delivery)

Nominal insulation voltage

Control circuit – load circuit: 4 kV_{eff.} Load circuit – base plate: 4 kV_{eff.} Overvoltage category: II

Weight

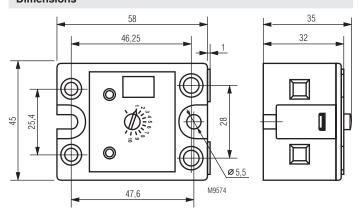
without heat sink: approx. 100 g
PH 9270.91/_ _ /01: approx. 530 g
PH 9270.91/_ _ /02: approx. 650 g

Dimensions

Width x height x depth

without heat sink: 45 x 58 x 35 mm
PH 9270.91/_ _ _ /01: 45 x 80 x 127 mm
PH 9270.91/_ _ _ /02: 45 x 100 x 127 mm

Dimensions



Accessories

PH 9260-0-12: Graphite foil 55 x 40 x 0.25 mm

to be fitted between device and heat sink, for better heat transmission Article number: 0058395

Standard Type

PH 9270.91 AC 200 ... 480 V 40 A DC 20 ... 32 V

Article number: 0060425

• Load voltage: AC 200 ... 480 V

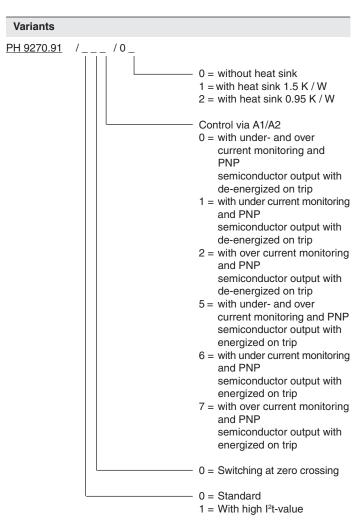
• Load current: 40 A

• Auxiliary voltage: DC 20 ... 32 V

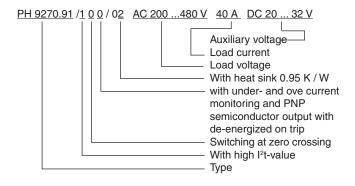
Alarm output: PNP, closed circuit operation
Monitoring: Under- and overcurrent

Width: 45 mm

^{*)} variant /1__



Ordering example for variants



Setting Facilities

Potentiometer to adjust tripping point in the range of 0.5 A up to nominal current.

Setting and Adjustment

Setting for the standard type (over- and undercurrent)

When the SSR is activated to pass the normal load current, start turning the setting knob fully anticlockwise (Alarm LED = Red), then begin to turn it clockwise until the Alarm LED changes to Green. Note the knob setting. Keep turning the knob clockwise until the Alarm LED changes to Red again. Note the knob setting. Take the average of these two settings and set the knob at this value. The SSR is now set up to detect over- and undercurrents of $\pm 20\%$. The LED should change to Green.

Setting for variant /_01 (undercurrent)

When the SSR is activated to pass the normal load current, start turning the setting knob fully clockwise (Alarm LED = Red), then begin to turn it anticlockwise until the Alarm LED turns Green. The alarm current equals the load current. Note the setting and turn the knob by 10% below the previous setting. The SSR is now set up with the necessary margins to prevent false alarms due to line voltage fluctuations. The LED should remain Green.

Setting for variant /_02 (overcurrent)

When the SSR is activated to pass the normal load current, start turning the setting knob fully anticlockwise (Alarm LED = Red), then begin to turn it clockwise until the Alarm LED turns Green. The alarm current equals the load current. Note the setting and turn the knob by 10% above the previous setting. The SSR is now set up with the necessary margins to prevent false alarms due to line voltage fluctuations. The LED should remain Green.

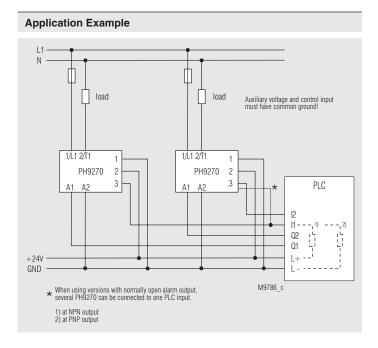
Notes on Sizing for Selection of a Heat Sink

The heat generated by the load current must be dissipated by a suitable heat sink. It is imperative that the junction temperature of the semiconductor is maintained for all potential environmental temperatures of under 125°C. For this reason, it is important to keep the thermal resistance between the base plate of the semiconductor relay and the heat sink to a minimum.

To protect the semiconductor relay effectively from excess heating, a thermally conducting paste or a graphit gasket (see Accessories) should be applied before installation to the base plate of the heat sink between semiconductor relay and heat sink.

From the table below, select a suitable heat sink with the next lowest thermal resistance. Thus, it is ensured that the maximum junction temperature of 125°C is not exceeded. The load current in relation to the environmental temperature can be seen from the table.

Selection of a Heat Sink							
Load current (A)	PH 9270 40 A Thermal resistance (K/W)						
40	1.2	1.0	0.9	0.7	0.5	0.3	
35	1.5	1.3	1.0	0.9	0.7	0.5	
30	1.9	1.6	1.4	1.1	0.9	0.7	
25	2.4	2.0	1.8	1.5	1.2	0.9	
20	3.0	2.7	2.4	2.0	1.7	1.3	
15	4.4	3.9	3.4	2.9	2.5	2.0	
10	6.9	6.0	5.4	4.7	4.0	3.3	
5	14.0	12.9	11.5	10.0	8.6	7.2	
	20	30	40	50	60	70	
	Ambient-temperature (°C)						



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