Semiconductor relay / - contactor PH 9270
with load circuit monitoring powerswitch

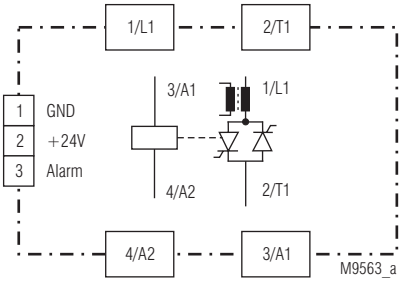
0255163

Semiconductor relay
PH 9270.91

Semiconductor contactor
PH 9270.91/000/02

- 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 cero 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
- As option with optimized heat sink, for DIN rail mounting
- Width 45 mm

Circuit diagram



PH 9270.91

Approvals and Marking

Canada / USA

* pending

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)
off: no auxiliary voltage (+24V, GND)

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.

Notes

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 beinstalled.

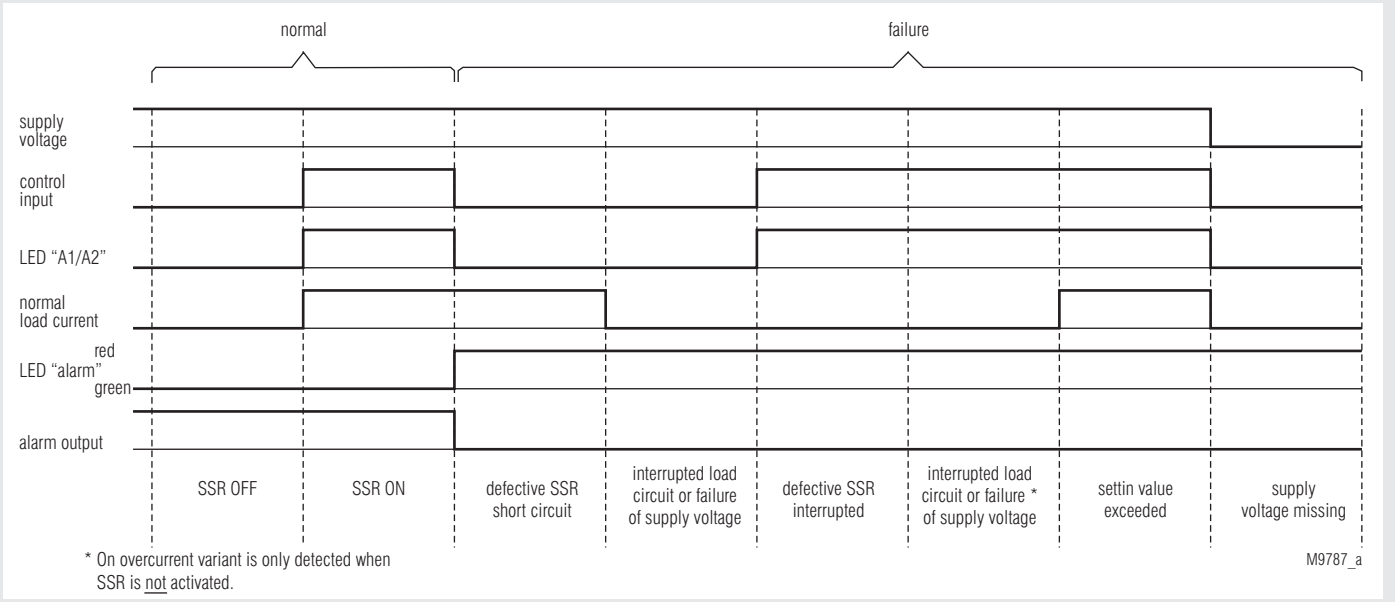
Function

The semiconductor relay PH 9270 monitors with applied auxiliary voltage (+24V, GND) 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 after the closed circuit operation is controlled. The failure state is indicated on an 2-color LED. (see function diagrams)

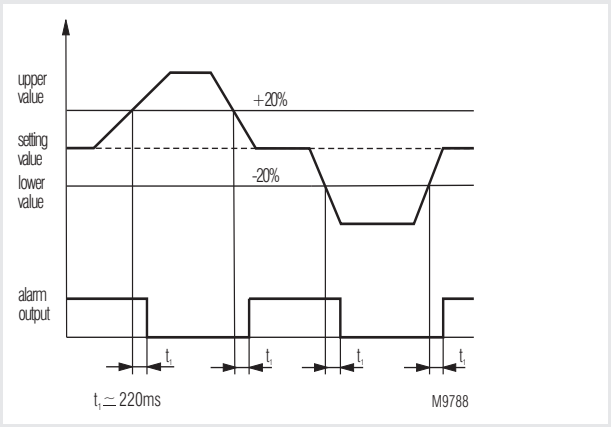
The PH 9270 with 2 antiparallel connected thyristors switches at zero crossing.
When connecting the control voltage the semiconductor is switched on with the next zero crossing of the sinusoidal voltage. After disconnecting the control voltage the semiconductor switches off with the next zero crossing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

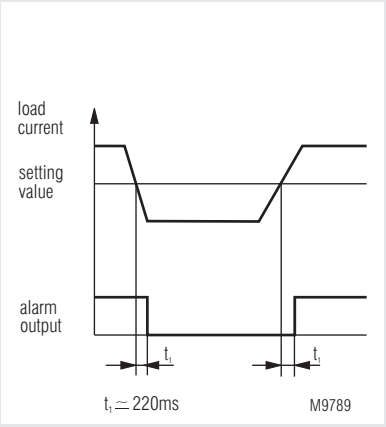
Function Diagram



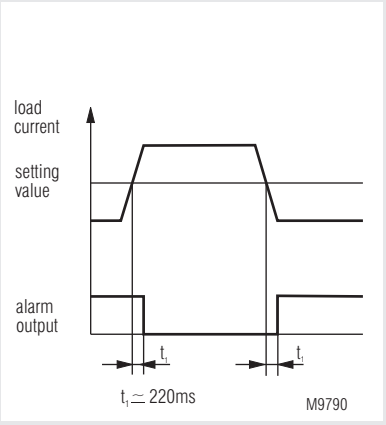
Normal operation and failure status



Over- / Undercurrent detection variant /000



Undercurrent detection variant /001



Overrcurrent detection variant /002

Technical Data

Output

Load voltage AC [V]:	200 ... 480
Frequency range [Hz]:	47 ... 63
Load current [A], (AC 51):	40
Load limit integral I^2t [A^2s]:	1800; 6600*)
Max. overload current [A] t = 10 ms:	600; 1150*)
period. underload current [A] t = 1 s:	120; 150*)
Forward-voltage [V]	
at nominal curren:	1.4
Off-state voltage [V/µs]:	500
Rate of rise of current [A/µs]:	100
Themperature Data	
Thermal resistance	
junction - housing [K/W]:	0.5
Thermal resistance	
housing - ambient [K/W]:	12
Junction temperature [°C]:	≤ 125

*) variant /1_ _

Alarm output

Hilfsspannung [V]:	20 ... 32 (DC)
PNP-Ausgang “open collector”	
max. Ausgangsstrom [mA]:	100
Verzögerungszeit [ms]:	220

Control circuit

Control voltage range [V]:	20 ... 32 (DC)
max. input current [mA]:	15 bei 24 V DC
Turn-on delay [ms]:	5 + 1/2 Periode
Turn-off delay [ms]:	20 + 1/2 Periode

General Data

Operating mode:	Continuous operation	
Temperature range		
operation:	- 20 ... 40° C	
storage:	- 20 ... 80° C	
Clearance and creepage distances:		
rated impuls 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
Fast transients:	2 kV	IEC/EN 61 000-4-4
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 bound:	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	
Base plate:	Aluminum, copper nickle-plated	
Potting compound:	Polyurethane	
Mounting screws:	M 5 x 8 mm	
Mounting torque:	2.5 Nm	
Connections control input:	Mounting screws M3 Pozidriv 2 PT	
Mounting torque:	0.5 Nm	
Wire cross section:	1.5 mm^2 Litze	
Connections load circuit:	Mounting screws M4 Pozidriv 1 PT	
Mounting torque:	1.2 Nm	
Wire cross section:	10 mm^2 wire	
Connections monitoring circuit:	Weidmüller - Omnimate Range connecting pair BL 3.50/03	

Technical Data

Nominal insulation voltage

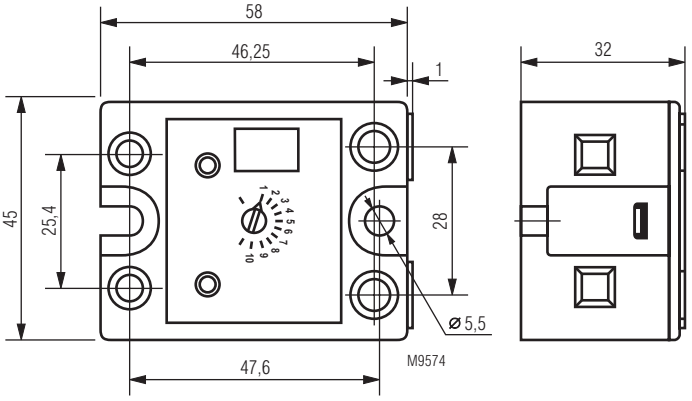
Control circuit – load circuit:	4 $kV_{eff.}$
Load circuit – floor plate:	4 $kV_{eff.}$
Overvoltage category:	II
Weight	
without heat sink:	ca. 100 g
PH 9270.91/_ _ _ /01:	ca. 530 g
PH 9270.91/_ _ _ /02:	ca. 650 g

Dimensions

Width x height x depth

without heat sink:	45 x 58 x 32 mm
PH 9270.91/_ _ _ /01:	45 x 80 x 124 mm
PH 9270.91/_ _ _ /02:	45 x 100 x 124 mm

Dimensions



Accessories

PH 9260-0-12:	Graphit gasket 55 x 40 x 0.25 mm to be fitted between device and heat sink, for better heat transmission

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
• Width:	45 mm

Variants

PH 9270.91 / _ _ _ / 0 _

- 0 = without heat sink
- 1 = with heat sink 1.5 K / W
- 2 = with heat sink 0.95 K / W

Control via A1/A2

- 0 = with under- and over current monitoring and PNP semiconductor output with de-energised on trip
- 1 with under current monitoring and PNP semiconductor output with de-energised on trip
- 2 with over current monitoring and PNP semiconductor output with de-energised on trip

- 0 Switching at zero crossing
- 1 Immediate switching

- 0 Standard
- 1 With high I^2t-value

Ordering example for variants

PH 9270.91 /100/02 AC 200 ...480 V 40 A DC 20 ... 32 V

- Auxiliary voltage
- Load current
- Load voltage
- With heat sink 0.95 K / W
- With high I^2t-value
- Type

Setting facilities

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

Setting and adjustment

Switch unit on and turn setting potentiometer until the LED Alarm lights red. Then turn potentiometer approx. 10 % back until the the LED lights green again. The unit is now set and non sensistive against voltage fluctuations.

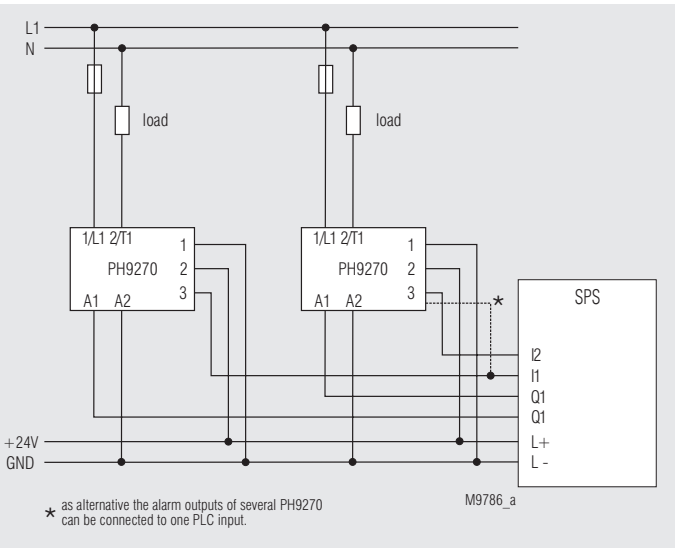
Notes on Sizing for Selection of a Heat Sink

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)					

Application example



* as alternative the alarm outputs of several PH9270 can be connected to one PLC input.