POWERSWITCH
Solid-State Relay / - Contactor
With Load Current Measurement PH 9270/003

Preliminary datasheet

0265817

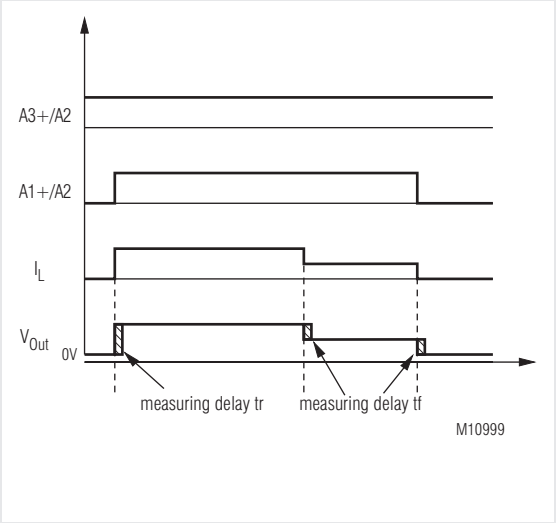
Solid-state relay
PH 9270.91/003

Solid-state contactor
PH 9270.91/003/02

Your Advantages
- Free from wearing, noiseless, economic
- High productivity by integrated monitoring functions
- Accurate AC / DC measurement up to 45 A
- Analogue output for easy working with signals to PLC or displays
- excellent EMC- performance, because of switching at zero crossing
- As option protection against thermal overload

Features
- AC solid-state relay /-contactor with load current measurement (runs value)
- Analogue output DC 0 ... 10 V
- According to IEC/EN 60947-4-3
- Nominal voltage up to AC 480 V
- Load current up to 45 A, AC-51
- Switching at zero crossing
- DCB technology (direct bonding method) for excellent heat transmission properties
- LED indicator for control
- As option with optimized heat sink, for DIN rail mounting
- Width: 45 mm

Function Diagram



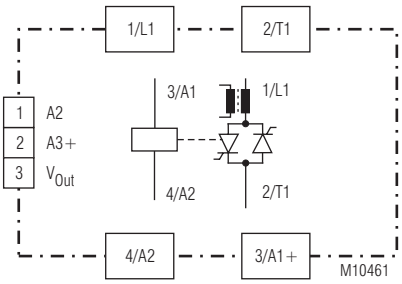
Approvals and Markings

CE

Applications

The solid-state relay switches at zero crossing and with its analogue output 0 ... 10 V. It suitable for heating applications where failures must be detected as early as possible. It allows a continuous monitoring of the load circuit and offers many solutions where fast and silent switching actions are required e.g. in plastic molding and rubber processing machines as well as in thermal forming and packaging machines and also in food industry.

Circuit Diagram



PH 9270.91/003 DC 0 ... 10 V

Function

When voltage is applied to A3+/A2 the solid-state relay PH 9270 monitors continuously the load current and transmits it to a proportional analogue output signal of either 0 ... 10 V. This signal can be easily monitored by a PLC or display module with analogue input.

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

Indication

The LED „A1/A2“ shows the state of the control input
yellow: controlled solid-state relays
off: not controlled solid-state relays

Notes

Overtemperature protection

As option, the solid-state 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 the respective 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 solid-state relay, a thermal switch of *UCHIYA* type UP62 – 100 can beinstalled.

Technical Data

Output

Load voltage AC [V]:	24 ... 240, 48 ... 480	
Frequency range [Hz]:	47 ... 63	
Load current		
measuring range [A], (AC-51):	25	45
Min. load current [A]:	0.02	
Load limit integral I^2t [A^2s]:	1800; 6600*)	
Max. overload current [A] t = 10 ms:	600; 1150*)	
Period. overload current [A] t = 1 s:	120; 150*)	
Forward-voltage [V]		
at at nominal current:	1.2	1.4
Peak reverse voltage [V]:	800 (24 ... 240 VAC), 1200 (48 ... 480 VAC)	
Off-state voltage [V/µs]:	500	
Rate of rise of current [A/µs]:	100	
Residual current at off state		
at nominal voltage		
and nominal frequency [mA]:	≤ 1	
Thermperature Data		
Thermal resistance		
junction - housing [K/W]:	0.6	0.5
Thermal resistance		
housing - ambient [K/W]:	12	
Junction temperature [°C]:	≤ 125	

*) variant /1_ _

Control Circuit

Control voltage A1+/A2:	20 ... 32 V DC
Max. input current [mA]:	10 at 24 V DC

Analogue output 0 ... 10 V

Operation voltage A3+/A2:	18 ... 32 V DC
Min. input current [mA]:	5
	(dependent to load on analogue output)
Output voltage V_{Out}:	10 V
	equivalent of measuring range (e.g. 25 A)
Min. load resistance [Ω]:	300
Min. measuring current:	1 % of measuring range
Delay of measurement tr [ms]:	< 120
Delay of measurement tf [ms]:	< 300
Measuring accuracy:	± 5 % of measuring range (nominal current)
Max. cable length [m]:	10 (twisted and shielded)

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
Fast transients:	2 kV	IEC/EN 61 000-4-4
Surge voltages		
between		
wires for power supply L1, T1:	1 kV	IEC/EN 61 000-4-5
wires A1, A2 and ground:	1 kV	IEC/EN 61 000-4-5
measuring output and ground:	1 kV	IEC/EN 61 000-4-5
wires L1, T1 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

Technical Data

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	
Fixing torque:	2.5 Nm	
Connections control circuit:	Mounting screws M3 Pozidriv 1 PT	
Fixing torque:	0.5 Nm	
Wire cross section:	1.5 mm^2 solid	
Connections load circuit:	Mounting screws M4 Pozidriv 2 PT	
Fixing torque:	1.2 Nm	
Wire cross section:	10 mm^2 solid	
Connections		
monitoring circuit:	Weidmüller - Omnimate Range	
	connecting pair BL 3.50/03	
	(included in delivery)	

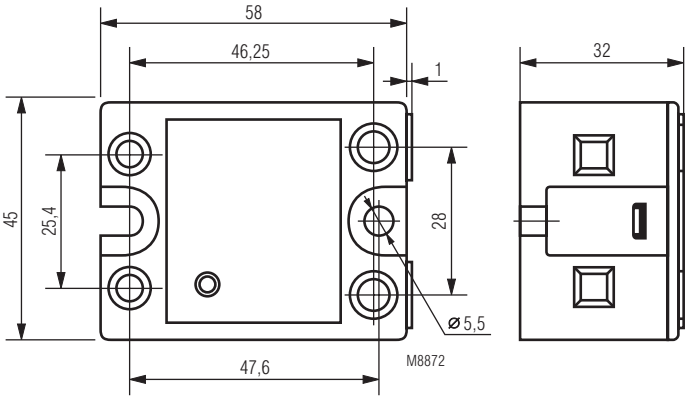
Nominal insulation voltage

Control circuit – load circuit:	4 $kV_{eff.}$
Load circuit – base plate:	4 $kV_{eff.}$
Overvoltage category:	II
Weight	
without heat sink:	approx. 110 g
PH 9270.91/_ _ _ /01:	approx. 540 g
PH 9270.91/_ _ _ /02:	approx. 650 g

Dimensions

Width x height x depth	
without heat sink:	45 x 59 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: Graphite foil 55 x 40 x 0.25 mm to be fitted between device and heat sink, for better heat transmission. Article number: 0058395

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 solid-state 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 25 A Thermal resistance (K/W)					
25.0	2.8	2.5	2.1	1.8	1.5	1.1
22.5	3.2	2.8	2.5	2.1	1.7	1.3
20.0	3.7	3.3	2.8	2.4	2.0	1.6
17.5	4.3	3.8	3.4	2.8	2.4	1.9
15.0	5.1	4.6	4.0	3.5	2.9	2.4
12.5	6.3	5.6	5.0	4.3	3.6	2.8
10.0	8.0	7.2	6.4	5.6	4.7	3.9
7.5	11.0	9.9	8.7	7.6	6.5	5.4
5.0	16.8	15.0	13.5	12.0	10.0	8.5
2.5	-	-	-	-	21.0	17.6
	20	**30**	**40**	**50**	**60**	**70**
	Ambient-temperature (°C)					

Load current (A)	PH 9270 45 A Thermal resistance (K/W)					
45	1.0	0.9	0.7	0.5	0.4	0.2
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	1.9	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)					

Standard Type

PH 9270.91/003 AC 24 ... 240 V 25 A DC 0 ... 10 V

Article number:	0062432
• Load voltage:	AC 24 ... 240 V
• Load current / measuring range:	25 A
• Analogue output:	DC 0 ... 10 V
• Width:	45 mm

Variants

PH 9270.91 / _ 0 3 / 0 _

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

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

Ordering example for variants

PH 9270.91 /103/02 AC 24 ...240 V 25 A DC 0 ... 10 V

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

Application Example