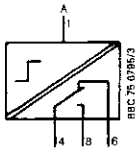


Contents

R 511	Relay output unit 250 V/7.5 A	8/2
R 512/V0	Relay output unit, 2 fold, 250 V/7.5 A	8/3
R 512.3	Relay output unit, 2 fold, 250 V/4 A, with LED	8/3
R 512.5	Relay output unit, 2 fold, 250 V/4 A, with LED	8/4
R 514.1	Relais output unit for analog signals	8/5
R 521.7	Transistor output unit 24 V—/2 A, with LED	8/6
R 521.8	Transistor output unit 24 V—/2 A, with LED	8/6
R 522.3	Transistor output unit 24 ... 48 V—/2 A, with LED	8/8
R 523.1	Transistor output unit, 2 fold, 24 V—/2 A, with LED	8/9
R 524	Transistor output unit 24 V ₀ /4 A	8/10
R 541	AC output unit 220 V~/4 A	8/11
R 542.1	AC output unit 220 V~/1 A, with LED	8/12

Relay output unit R 511



Description

The relay output R 511 is used for controlling components with high power demands. The input is electrically separated from the outputs (relay contacts). A 1-signal at the input causes the relay to respond, a 0-signal will cause it to drop out.

Make and break contacts as well as the relay coil are brought out. An RC combination is inserted between common and make contact to protect the contacts particularly for switching of inductive loads. This combination represents a limited resistance for AC voltage. For this reason a voltage – depending on the sensitivity of the instrument used – can be measured at an open contact.

For switching inductive DC loads, a clearing circuit, parallel to the component is additionally necessary, e.g. flywheel diode alone or series connection of diodes and Zener diodes.

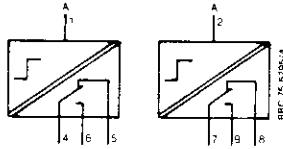
Order code for module:
Order code for circuit symbol transparency:
Order code for application:
Identifying colour:
Mechanical structure:
Weight:

GH R511 0000 V0
GH R700 1901 R6
D NG 3157 81 D
orange
single width
approx. 130 g

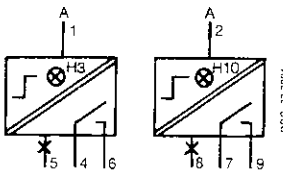
Technical data

Current consumption, 0-signal at input	5 mA
1-signal at input	60 mA
Max. permissible input voltage	65 V
Input	1 load
Fan out (breaking capacity)	
AC current at $U \leq 250$ V	1 kVA
DC current at $U \leq 30$ V	100 W
at $U \leq 250$ V	50 W
Substained thermal current I_{th2}	4 A
Max. switching voltage	250 V
Contact life, no load	10 ⁸ operations
at 220 V~, 4 A	10 ⁵ operations
max. 100 W	10 ⁶ operations
Experience shows that the service life in switching AC contactors or solenoid valves in the range between 100 ... 1200 VA and $\cos \varphi$ 0.3 ... 0.5 is	> 10 ⁶ operations
Making delay t_E	approx. 3 ms
Breaking delay t_A	approx. 7 ms
Chatter time	approx. 4 ms

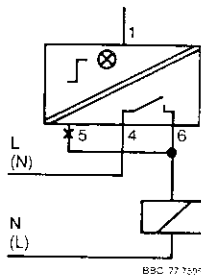
Relay output units R 512/V0 and R 512.3



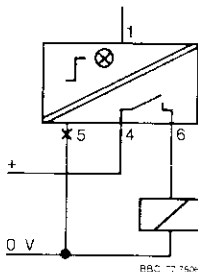
R 512/V0



R 512.3



Connection for a.c. load



Connection for d.c. load

Description

The relay output units R 512/V0 and R 512.3 are used for controlling components with high power demands. The units contain two independent relays without amplifiers. The inputs are electrically separated from the outputs (relay contacts). A 1-signal at the input causes the relay to respond, an 0-signal will cause it to drop out.

The unit **R 512/V0** has two independent changeover contacts. Between common and the make contact an RC combination is inserted to protect the contacts particularly for switching of inductive loads. For switching inductive DC loads, a clearing circuit, parallel to be component is additionally necessary, e.g. a flywheel diode alone or series connection of diodes and Zener diodes.

The unit **R 512.3** has two independent make contacts. The controlling of the contacts is indicated via the LEDs H3 resp. H10. To protect the contacts particularly for switching inductive loads, a protective circuit is built into the units. This is programmable for AC or DC voltages.

Bridge 5–6 and 8–9: protective circuit (RC) of the contacts is functional for AC components.

Bridge 5 and 8 with the zero voltage of the load. is functional for DC components.

The plus voltage must be applied to 4 and 7.

The protective circuit for both units represents a limited resistance for AC voltage. For this reason a voltage—depending on the sensitivity of the instrument used—can be measured at an open contact.

For protection of the outputs of SIGMA-tronic units a flywheel diode is connected in parallel with the coils of the output units.

Order code for module R 512/V0:
R 512.3:

GH R512 0000 V0
GH R512 0003 R1

Order code for symbol transparency R 512/V0:
R 512.3:

GH R700 1901 R28
GH R700 1901 R60

Order code for application:
Identifying colour:
Mechanical structure:
Weight:

D NG 3157 81 D
orange
single width
approx. 180 g

Technical data

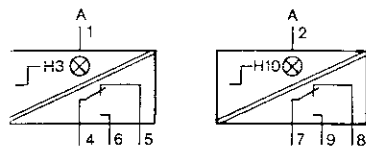
Max. permissible input voltage
Input
Fan out (breaking capacity)
AC current, at $U \leq 250$ V
DC current, at $U \leq 30$ V
at $U \leq 250$ V
Substained thermal current I_{th2}
Max. switching voltage
Contact life ① , no load
at 220 V/4 A
Making delay t_E
Breaking delay t_A
Chatter time

R 512/V0 | R 512.3

	24 V \pm 20 %
	38 loads 30 loads
	1 kVA
	100 W
	50 W
	4 A
	250 V
	approx. 10^8 operations
	approx. 10^5 operations
	approx. 3 ms
	approx. 7 ms
	approx. 4 ms

① Experience shows that the service life in switching AC contactors or solenoid valves in the range between 100 – 1200 VA and $\cos \varphi = 0.3 - 0.5$ is $> 10^6$ operations.

Relay output unit R 512.5



Description

The relay output unit R 512.5 serves to drive loads with high power requirements. The unit comprises independent relays without preamplifier. The inputs are electrically isolated from the outputs (relay contacts). A 1 signal at the inputs causes energization of the relays and a 0 signal causes de-energization.

A normally open and a normally closed contact and the roots of the relays are routed to the outside. An RC combination is connected both between the root and normally open contact as well as between the root and normally closed contact for protection of the contacts, above all when switching inductive loads. A quenching circuit parallel to the load, for example a free running diode alone or a series connection of a diode and Zener diode, is additionally necessary for switching inductive DC loads.

The protective wiring of the switching contacts of both functional units represents a finite resistance for AC voltage. For this reason, the voltage can be measured at one open contact, depending on the sensitivity of the instrument used.

Free running diodes are parallel connected to the relay coils of the output units to protect the output in the preceding SIGMA-tronic unit.

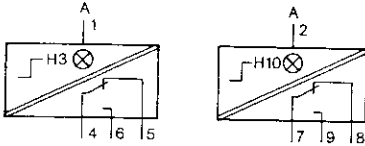
A 1 signal at input A is indicated by the red LED H3 respectively H10.

Order code for module:	GH R512 0500 R1
Order code for circuit symbol transparency:	GH R700 1901 R89
Order code for application:	D NG 3157 81 D
Identifying colour:	orange
Mechanical structure:	single width
Weight:	approx. 150 g

Technical data

Max. permissible input voltage	24 V ± 20%
Input load	30 loads
Output load capacity (switching capacity)	
AC, in the case of $U \leq 250$ V	1 kVA
DC, in the case of $U \leq 30$ V	100 W
in the case of $U \leq 250$ V	50 W
Constant current I_{th2}	4 A
Maximum switching voltage	250 V
Contact service life, unloaded	approx. 10^7 operations
at 220 V/4 A	approx. 10^5 operations
According to experience, the service life of contacts when switching AC contactors or solenoid valves within the range of 100... 1000 VA and $\cos \varphi = 0.3 \dots 0.5$ is	> 10^6 operations
Switch-on delay t_E	approx. 3 ms
Switch-off delay t_A	approx. 7 ms
Chatter time	approx. 4 ms

Relay output unit for analog signals R 514.1



Description

The relay switching stage R 514.1 is used for switching low power and analog signals. The unit comprises two functional units without preamplifier. The inputs are electrically isolated from the outputs (relay contacts). A 1-signal at inputs causes energization of the relays and a 0-signal causes de-energization.

The input R 514.1 has two independent changeover contacts. In order to protect the contacts against excessive currents when switching on capacitors or long leads, a resistor of 10 Ohm/0.25 W is connected in the wire to centre contact. This resistor is mounted on solder terminals and can, for example, be replaced by a wire strap. A 1-signal at input A is indicated by the red LED H3 or H10, respectively.

Order code for module:

GHR 514 0100 R1

Order code for circuit symbol transparency:

GHR 700 1901

R89

Identifying colour:

orange

Mechanical structure:

single width

Weight:

approx. 150 g

Technical data

Max. permissible input voltage

24 V \pm 30%

Input loads

9 loads

Output values:

Contact

one changeover contact with 10 Ohm series resistor on centre contact

Constant current

100 mA

Peak switched current

\leq 2 A (10 ms)

Switching voltage

\leq 60 V

Contact service life

$>$ 10⁷ operations

Switch-on delay t_E

approx. 2 ms

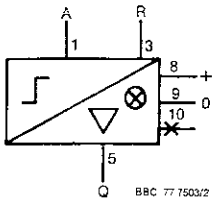
Switch-off delay t_A

approx. 2 ms

Chatter time

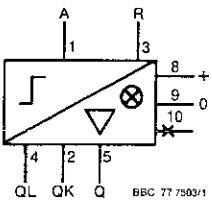
\leq 1 ms

Transistor output units R 521.7 and R 521.8



R 521.7

BBC 77 7503/2



R 521.8

BBC 77 7503/1

Description

The units R 521.7 and R 521.8 are short circuit proof transistor output units with LED indication for controlling direct current components with high power demands.

The units comprise of an amplifier with a high efficiency transistor output. Input and output are electrically coupled. There is, however, no reactive effect of the voltage switched by the output, on the input. A 1-signal at the input will cause current flow from the output transistor via the connected load to the zero busbar.

To avoid voltage peaks when switching inductive loads a protective circuit is incorporated between the output Q and the zero busbar. It comprises of a flywheel diode and a Zener diode connected in series. The switch-off delay of the component is thus reduced to a minimum. If a longer breaking delay is desired, the Zener diode can be short-circuited by a link between the terminals 9 and 10.

The terminals + and 0 serve merely to transmit the supply voltage to other SIGMA-tronic devices. The supply voltage for the transistor output units, and consequently for the connected load, is applied to the contacts 8 and 9 (+ potential to 8, zero busbar to 9). This method offers the advantage that the relatively high switching current will not cause a voltage drop in the operating voltage lines of the other devices. It is also possible to use an independent voltage source for the supply of the loads. In this case, however, the zero busbars of the two voltage sources must be connected.

Transistor output units should only be used with a smoothed DC voltage corresponding to the SIGMA-tronic system data.

The outputs of the units are short-circuit-proof but not overload-proof in accordance with DIN 57 160. Upon appearance of a short circuit the peak current is limited for a short time and the output unit switched off. An internal store is set and stops the unit from switching itself on again. After the short circuit has been cleared the built-in store can be reset via input R. Thereby the load will be switched on again provided input A carries 1-signal. If a further short circuit appears the output unit switches off again.

If a 1-signal is permanently applied to reset input R the unit resets itself following appearance and clearing of short circuits. This operation method is, according to VDE 0113, only permitted when self switch on of the connected load is not dangerous.

If the short circuit remains for a longer time the unit attempts re-switch on every few seconds.

The operating condition of the unit is indicated by an LED. The re-switch on attempts in self resetting operation is shown on the unit R 521.7 by a short blink impulse (impulse 40 ms, pause approx. 5 s).

The unit R 521.8 contains the following additional features:

The occurrence of short circuits is stored and is immediately indicated by flashing of the built in LED. A 1-signal appears simultaneously on output QK.

If, while the input is not driven, there is a short circuit from output Q to the power supply busbar U_s or if the output transistor has been destroyed by external influences to such an extent that the output constantly has a voltage independent of the drive signals, this fault is signalled (by a 1 signal) via the signalling output QL. For this type of fault the unit contains no storage facility.

Both indicating outputs QK and QL are short circuit proof and can be interconnected for building a collective indication line for more than one unit.

Order code for module R 521.7:	GH R521 0007 R1
R 521.8:	GH R521 0008 R1
Order code for circuit symbol transparency R 521.7:	GH R700 1901 R50
R 521.8:	GH R700 1901 R52
Order code for application:	D NG 3157 81 D
Identifying colour:	orange
Mechanical structure:	single width
Weight:	approx. 150 g

Technical data

	R 521.7	R 521.8
Current consumption, 0-signal at input	5 mA	10 mA
1-signal at input	12 mA	25 mA
Input load, at A	1 load	
at R	1 load	
Fan out: Indication outputs QK and QL	3 loads	
Load output Q at 24 V-, inductive or resistive	2.0 A	
	or 1.8 A + lamp 2 W	
	or 1.5 A + lamp 5 W	
	or 1.0 A + lamp 10 W	
	or lamp 18 W	
Making delay	negligible	
Max. short circuit current (current limited)	approx. 3 A	
The units can first be re-set 5 secs after the short circuit (Input R)		

Tests with connected loads showed the following breaking delay times

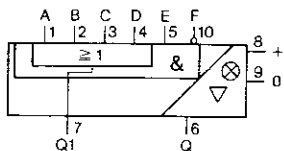
	without link	t_A with link 9–10
Solenoid valve 24 V-/1.9 A/2.0 H	7.5 ms	70 ms
Solenoid valve 24 V-/1.0 A/1.4 H	8 ms	60 ms
Contacto r HSC 53 24 V-/0.5 A/1.1 H	10 ms	50 ms

To find out the complete breaking delay time of electrical output unit and mechanical operator i.e. operating valve, the breaking delay time of both have to be added.

According to VDE 0660 contactors, solenoid valves etc. must be switched off at latest when the current has dropped to 10 % of the stated value. These times have been measured with an oscilloscope and listed in the above table.

The parallel connection of lamps to the load has the effect of increasing the breaking delay times.

Transistor output unit R 522.3



Description

The transistor output unit R 522.3 is used for controlling DC loads with high power demands. The unit comprises of an amplifier with a high efficiency transistor output. Input and output are electrically coupled. There is, however, no reactive effect of the voltage switched by the output, on the input. The fulfilled input conditions cause a flow of current from the output transistor to the zero busbar via the connected load.

For noise suppression at the input the unit has a delay of about 1.5 ms. To avoid voltage peaks when switching inductive loads, a protective circuit is incorporated between the output Q and the zero busbar. It comprises of a flywheel diode and a Zener diode connected in series. The breaking delay of the component is thus reduced to a minimum.

A 1-signal at output Q is indicated by a red LED.

The terminals + and 0 serve merely to transmit the supply voltage to other SIGMA-tronic devices. The supply voltage for the transistor output units, and consequently for the connected load, is applied to the contacts 8 and 9 (+ potential to 8, zero busbar to 9). This method offers the advantage that the relatively high switching current will not cause a voltage drop in the operating voltage lines of the other devices. It is also possible to use an independent voltage source for the supply of the loads. In this case, however, the zero busbars of the two voltage sources must be connected.

An output stage with storage characteristics can be set up by feeding output Q back to one of the inputs A to D (for further details, refer to the application).

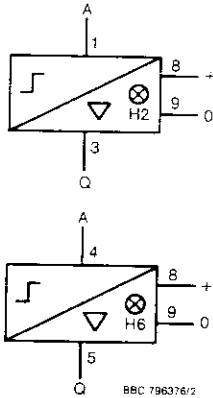
The transistor output unit should only be used with a smoothed DC voltage corresponding to the SIGMA-tronic system data.

Order code for module:	GH R522 0300 R1
Order code for circuit symbol transparency:	GH R700 1901 R83
Order code for application:	D NG 3157 81 D
Identifying colour:	orange
Mechanical structure:	single width
Weight:	approx. 130 g

Technical data

Nominal load voltage, terminals 8 and 9	24 V- or 48 V-
Input load, per input	1 load
Switch-on delay t_E	approx. 1.5 ms
Switch-off delay t_A (without connected load)	approx. 2 ms
Signalling of the output state	LED red
Current consumption	
at $U_s = 24 V-$	
0-signal at Q	2 mA
1-signal at Q	8 mA
at $U_s = 48 V-$	
0-signal at Q	6 mA
1-signal at Q	18 mA
Load output Q	
at $U_s = 24 V-$	
inductive or resistive 2 A	
or 1.8 A + lamp	2 W
or 1.5 A + lamp	5 W
or 1 A + lamp	10 W
or lamp	18 W
at $U_s = 48 V-$	
inductive or resistive 2 A	
or 1.9 A + lamp	2 W
or 1.75 A + lamp	5 W
or 1.5 A + lamp	10 W
or 1 A + lamp	18 W

Transistor output unit 2 fold, R 523.1



Description

The transistor output unit R 523.1 comprises two outputs capable of controlling d.c. loads of high capacity. A 1-signal at the input of a function causes current flow from the output transistor of the function in question, via the connected load to the zero rail. For demagnetization of inductive loads each output has connected in series with a diode and zener diode against 0 volt.

The output state of the transistor stage is indicated by LED H2 respectively H6.

The output + and 0 are simply for the transfer of the supply voltage to other SIGMA-tronic modules. The supply voltage for the internal electronic of the transistor output unit and therefore for the connected loads is applied to terminals 8 (plus) and 9 (zero rail). In this way the high switching currents in the event of a voltage drop are prevented from affecting the supply leads of other modules. If a separate supply source is used for the supply of loads, then the zero rails of both supply sources must be interconnected.

The transistor output units should only be supplied with smoothed d.c. voltage as detailed in the SIGMA-tronic system data.

Order code for module:

Order code for circuit symbol transparency:

Order code for application:

Identifying colour:

Mechanical structure:

Weight:

GH R523 0001 R1
GH R700 1901 R73
D NG 3157 81 D
orange
single width
approx. 130 g

Technical data

Current consumption, 0-signal at input
1-signal at input

Input, inputs A

Fan out, load outputs Q at 24 V-,
inductive or resistive

Note:

For thermal reasons (power loss) both outputs should not be simultaneously loaded with 2 A. In the case of simultaneous loading, the fan out of maximum 2 A for both outputs applies.

Signal delay of output unit

Signalling of the output signal

Demagnetization of inductive loads

0 mA
24 mA + load
each 1 load
each 2 A
or 1.8 A + lamp 2 W
or 1.5 A + lamp 5 W
or 1 A + lamp 10 W
or lamp 18 W

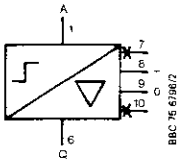
negligable

in each case 1 red LED

Value of Z-diode $U_z \approx 47$ V
(fast de-energising)

During demagnetization the relative output gives a negative voltage ($U \approx -50$ V). Therefore lamps connected in parallel to the load should be de-coupled since the high voltage can shorten the lamp life of even destroy the lamp. The diode should be connected in series with the lamp (throughput direction).

Transistor output unit R 524



Description

The transistor output unit R 524 is used for controlling DC components with high power demand. It can equally well be operated with resistive, inductive or even electric filament lamp loads with smoothed or pulsating DC voltage. Input and output are electrically coupled. A 1-signal at the input will cause current flow at output Q via the connected load to the zero busbar.

For noise suppression at the input the unit has a signal delay of a few milliseconds. To avoid high breaking peaks from inductive loads the output is equipped with a clearing circuit.

The SIGMA-tronic supply voltage is applied at terminals + and 0. The supply voltage for the connected load is applied to contact 8 (positive potential) and 9 (zero busbar). This method offers the advantage that the high switching currents do not bring about a voltage drop on the SIGMA-tronic busbars. It is also possible to use an independent voltage source for the supply of the consumers, which by a link between can also utilise unsmoothed DC supplies (rectifier operation without capacitor smoothing).

With the use of a separate supply for the components it is necessary to link 9 to 0 on one output unit only.

Order code for module:

Order code for circuit symbol transparency:

Order code for application:

Identifying colour:

Mechanical structure:

Weight:

GH R524 0000 V0

GH R700 1901 R36

D NG 3157 81 D

orange

double width

approx. 180 g

Technical data

Current consumption, 0-signal at input
1-signal at input

5 mA
10 mA

Input

1 load

Fan out at 24 V-, inductive loads
resistive loads
filament bulbs

4 A
4 A
1.7 A (40 W)

Making delay without links 7-8
with links 7-8

typ. 2.5 ms
typ. 3.5 ms

Breaking delay without links 7-8
(resistive load) with links 7-8

typ. 3.5 ms
typ. 40 ms

A link from 9 to 10 increases the de-energising time with the operation of inductive loads.

Breaking delay
(inductive load 24 V, 2 A)
without link 9-10

} without link 7-8
with link 7-8

approx. 25 ms
approx. 50 ms

Breaking delay
(inductive load 24 V, 2 A)
with link 9-10

} without link 7-8
with link 7-8

approx. 100 ms
approx. 130 ms

Voltage drop in ON position between
terminals 8 and 6

≤ 1.5 V

With parallel switching of varying load methods, the electric filament bulb current should be valued with the factor 2.5.

Specification – direct voltage on terminals 8 and 9:

Smoothed voltage

24 V- ± 30 %

Single phase rectifier link with RC-filtering
for AC current-link rectifier without filtering.

Max. ripple voltage U

4 V

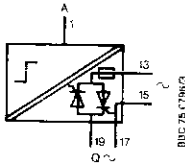
Unsmoothed, pulsating DC voltage:
Single phase rectifier link without filtering.

Transformer secondary AC voltage before
the rectifier

24 ... 30 V_{eff}

With unsmoothed DC supply voltage at terminal 8 and 9 a link from 7 to 8, independent of the method of load, must be made. With predominant filament lamp load, it is recommended for the minimisation of the switch-on surge current, that the links from 7 to 8 are also made even on smoothed voltage.

AC output unit R 541



Description

The AC output unit R 541 is used for contactless control of AC operated consumers. With a 1-signal at input A, a current will flow through the load connected to the terminals 17 and 19. An AC voltage is to be applied additionally to the terminals 13 and 15.

The unit consists of an input part with impulse generating element and an electrically separated power pack with two thyristors in anti-parallel connection as an electronic switch. The power pack and the connected load are protected by a built-in fuse.

Order code for module:

Order code for circuit symbol transparency:

Order code for application:

Identifying colour:

Mechanical structure:

Weight:

GH R541 0000 V0
GH R700 1901 R24
D NG 3157 81 D
red
double width
approx. 250 g

Technical data

Current consumption, 0-signal at input
1-signal at input

6 mA
80 mA

Input

1 load

Fan out

4 A

With an ambient temp. more than 40 °C the values given in the reduction graph (left) apply

Input AC voltage at terminals 13–15

24 ... 220 V

Holding current with energised thyristors

< 25 mA

Residual current with blocked thyristors

< 5 mA

Making delay t_E

approx. 2 ms

Grade of radio noise suppression according to VDE 0877

N

Admissible filament lamp load

approx. 1.3 A

at 220 V

300 W

at 42 V

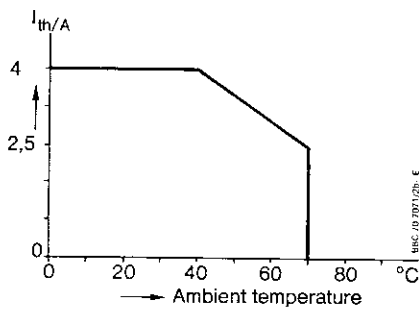
50 W

at 24 V

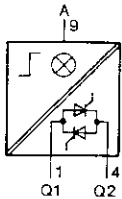
30 W

Fuses: DIN fuse links 5 x 20 mm

5 A superfast



AC output unit R 542.1



Description

The AC output unit R 542.1 serves to switch AC loads without contacts. If input A has a 1 signal, a current flows via the AC voltage applied to terminal 1 to the load connected to terminal 4.

The input section is electrically isolated from the output section (terminals Q1 and Q2). The output section consists of two anti-parallel connected thyristors as electronic switches.

An RC combination and a varistor are connected parallel to the outputs (terminals 1 and 4) to protect the thyristors. The output is not short-circuit-proof. We recommend a super quickacting fuse link 5 A or neozed 2 A as short-circuit protection.

A 1 signal at input A is indicated by a red LED.

The input signal is delayed to suppress noise signal.

Order code for module:

Order code for circuit symbol transparency:

Order code for application:

Identifying colour:

Mechanical structure:

Weight:

GH R542 0100 R1

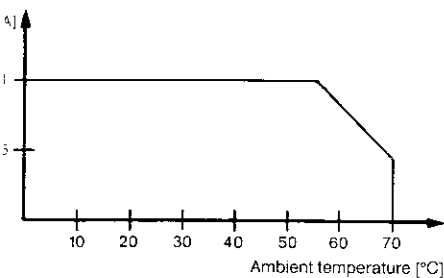
GH R700 1901 R87

D NG 3157 81 D

red

single width

approx. 120 g



Reduction curve

Technical data

Current consumption, 0 signal at the input
1 signal at the input

Input load

Output load capacity (AC11)

The values of the reduction curve (Figure on the left) apply at ambient temperatures of more than 55 °C.

Input AC voltage at terminal 1

Holding current when thyristors forward biased

Idle current when thyristors blocked

Switch-on delay t_E

Switch-off delay t_A

RFI suppression in accordance with VDE 0875

Filament lamp load

Service live

Surge current

0 mA

10 mA

1 load

1 A

90... 220 V AC

< 50 mA

< 6 mA

< 0.25 ms

< 11 ms

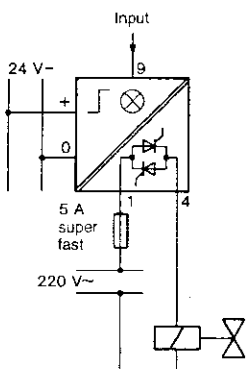
better than class N

1 A

> 10⁷ switching

operations

maximally 80 A (in the case of $t \leq 10$ ms)



AC load at nominal input voltage 220 V AC with external short-circuit protection