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Potential separator R 305.3 R1 and R2

Description

The potential separator R 305.3 converts AC and DC voltages into standard signals for the SIGMA-tronic system. The units contain two separate and independent functions.

The potential separator gives contactless and voltage free connection of input circuits, e.g. limit switches with SIGMA-tronic components. The voltage separation is carried out by an opto-coupler.

The input voltage is connected to terminals A1 and A2. The polarity is thereby arbitrary. If the input voltage exceeds the limit values shown in the table then the output Q gives a 1-signal.

The module has a trigger action, in that even with a slow alteration of the input voltage, the output signal on Q appears suddenly when the switching point is reached.

The unit is available in two versions and can be used in three voltage ranges:

	R 305.3 R1	R305.3 R2
Without links:	220 V _~	110 V _~
With links 1-2 and 5-6:	48 V _~	48 V _~
With links 1-3 and 5-7:	24 V _~	24 V _~

The function is delayed for noise suppression of input signals.

Order code for module, 220 V:
Order code for module, 110 V:
Order code for circuit transparency:

GH R305 0003 R1
GH R305 0003 R2
GH R700 1901
R63

Identifying colour:
Mechanical structure:
Weight:

yellow
single width
approx. 120 g

Technical data

Current consumption, 0-signal on Q
1-signal on Q

Input voltage range
Input current for all signal ranges

Fan out at Q

0-1 delay, DC

AC

1-0 delay, DC

AC

Permissible total capacitance of the input leads to the adjacent signal leads with signals of equal size

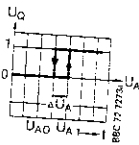
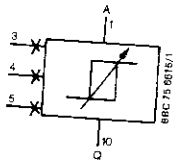
6.5 mA
25 mA
see table
≤ 10 mA
100 loads or 130 mA
approx. 3 ms
3 ... 12 ms
approx. 10 ms
approx. 10 ms
100 nF

Input signal range:

Version	Signal Voltage at A1,A2	Link	Output Q gives 1-signal in voltage range		Output Q gives 0-signal in voltage range	
			~	—	~	—
R1	220 V _~	None	176-250 V _~	±185-250 V _~	0-100 V _~	0-±120 V _~
R2	110 V _~	None	88-150 V _~	± 93-150 V _~	0- 50 V _~	0-± 60 V _~
R1 and R2	48 V _~	1-2 5-6	25- 72 V _~	± 28- 75 V _~	0- 12 V _~	0-± 16 V _~
R1 and R2	24 V _~	1-3 5-7	12- 30 V _~	±13-31.2 V _~	0- 6 V _~	0-± 8 V _~

Input voltages between the ranges for 0 and 1-signals are harmless to the unit. The output, however, shows no definite signal state.

Converter R 311



Description

The converter R 311 can convert a voltage up to 15 V— into the signal voltage of the SIGMA-tronic module. If the voltage at the input 1 is above the response threshold U_{A1} of the unit, a 1-signal will appear at the output. If the input voltage drops below the making threshold by the magnitude ΔU_A to the value U_{A0} , the output will give a 0-signal.

The response threshold can be adjusted within the range between 0 ... 15 V by means of an incorporated potentiometer.

The unit can also be used for monitoring a voltage. Since most physical quantities can also be expressed by voltages, the converter generally serves as a threshold value monitor.

The converter has a series connected delay element for noise suppression. The delay can be set in three steps by means of external links.

With an open input a 1-signal appears at output 10 when the preset threshold is < 5 V, and a 0-signal when the preset threshold is > 5 V.

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

GH R311 0000 V0
GH R700 1901 R9
yellow
single width
approx. 130 g

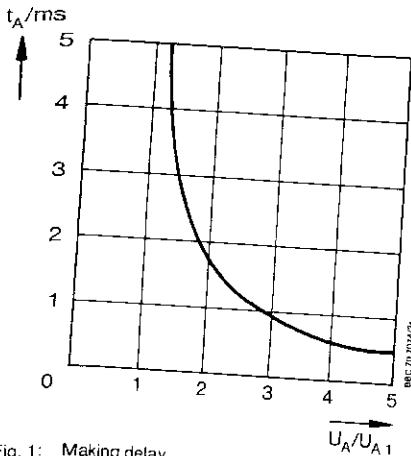


Fig. 1: Making delay
 U_A = Voltage at the input A

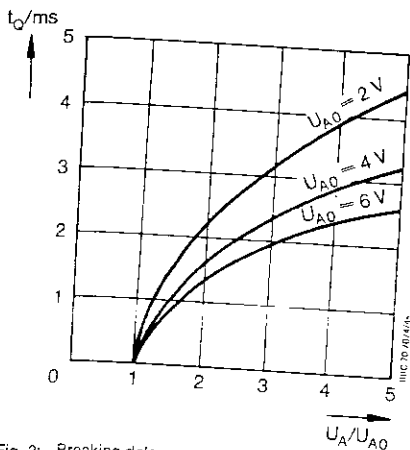


Fig. 2: Breaking delay

Technical data

Current consumption
Max. permissible input voltage
Input current at 15 V
Fan out
Making threshold, adjustable within range
Change of switching threshold at $U_S = 16.8 \dots 31.2$ V
Voltage hysteresis ΔU_A
Temperature error
Making delay, terminals 3-4, linked
Breaking delay, terminals 3-4, linked

60 mA
 ± 65 V
 < 0.5 mA
100 loads
0 ... + 15 V
approx. 0 ... - 6 %
approx. 0.7 V
approx. 0.02 V/K
Fig. 1
Fig. 2

The values for the making and breaking delays as shown in figs. 1 and 2 will change by the factors 0.1 or 0.01 resp. if the terminals 3-5 are bridged or the terminals 3, 4 and 5 remain open.

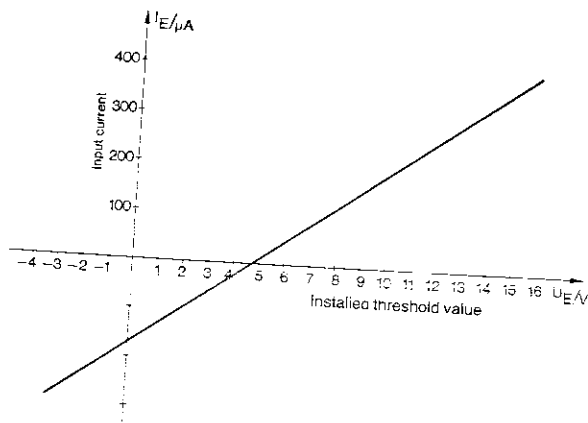
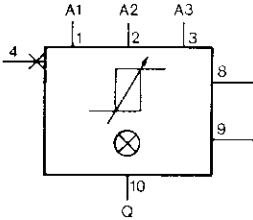


Fig. 3: Dependence of the input current I_E on installed threshold value U_E

Threshold value switch

R 312.1



Description

A voltage from 0 ... 8 V or 0 ... 16 V can be converted to a SIGMA-tronic input signal with the threshold value switch R 312.1.

The threshold for activation (top potentiometer) can be set independently from the threshold for deactivation (bottom potentiometer) with one 10-step potentiometer each. The set values can be measured at the measurement outputs terminal 8 (switch-on threshold) and terminal 9 (switch-off threshold) with respect to 0 V with a voltmeter.

The signal generator should be connected with the unit with two poles.

Voltage range 0 ... 8 V is connected to terminal 2 (+) and terminal 3 (-).

Voltage range 0 ... 16 V is connected to terminal 1 (+) and terminal 3 (-).

Terminal 3 is internally linked to the zero busbar of the unit.

If the 0 ... 16 V range is used, half the voltage values of the switching thresholds are not measured at the measurement outputs.

For reliable switching within the range from 0 ... 8 V, the switch-on threshold must be set at least 50 mV higher than the switch-off threshold and, in the range from 0 ... 16 V, this value amounts to at least 100 mV.

Normally, twisted wires suffice for transmitter wire lengths of less than 5 m and, in addition, a screened wire may be necessary (connect the screen to terminal 3). In order to improve noise suppression, the delay time can be increased by means of a link between terminal 3 and 4.

The inputs are voltage-proof within wide ranges. Thus, the transmitter voltage may be considerably greater or less (also negative voltage) than the set switching points. Thus, for selection of the input range of either 0 ... 8 V or 0 ... 16 V, it is only important in which range the switching points are to be placed.

Order code for module:

GH R312 0100 R1

Order code for circuit symbol transparency:

GH R700 1901 R80

Identifying colour:

yellow

Mechanical structure:

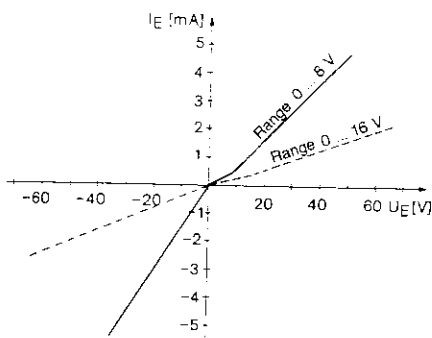
single width

Weight:

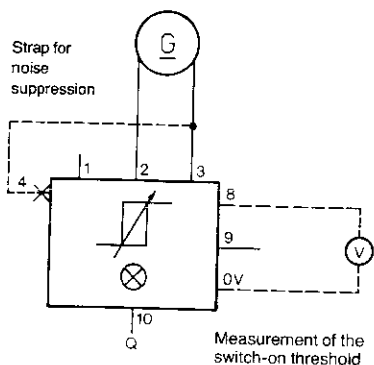
approx. 130 g

Technical data:

see page 2/5



Input current I_E as a function of the input voltage U_E
(The input current is independent of the set threshold value)



Measurement of the switch-on threshold
Connection of a transmitter, both switching thresholds lie within the range from 0...8 V

Technical data

Current consumption
0 signal at output Q
1 signal at output Q

Fan out at Q

Adjustment of switching thresholds
for input terminal 1
for input terminal 2

Maximally permissible input voltage
terminal 1
terminal 2

Input resistance

terminal 1, positive voltage
for negative voltage
terminal 2, positive voltage
for negative voltage

Current consumption of input A1 or A2

Signal delay between input and output

Voltage at the measurement outputs

terminal 8, when using input 1
terminal 9, when using input 1
terminal 8, when using input 2
terminal 9, when using input 2

Setting of switch-on threshold

Setting of switch-off threshold

Load capacity of measurement outputs 8 and 9 (voltmeter can be connected with $R_i \geq 10 \text{ k}\Omega/\text{V}$)

Repetition error over a longer period with otherwise constant conditions

Signalling

Agreement of the switching thresholds with their measurement outputs:

Range 0...8 V or 0...16 V

and measuring instrument $R_i \geq 1 \text{ M}\Omega/\text{mV}$:

Range 0...8 V or 0...16 V

and measuring instrument $R_i \geq 10 \text{ k}\Omega/\text{mV}$:

Additional deviation in the case of signal range 0...16 V and half the voltage value:

Change of switching thresholds in the range of the supply voltage of $24 \text{ V} \pm 30\%$:

Temperature error (reference temperature $+ 25 \text{ }^\circ\text{C}$)

within the range from 0...8 V

Switching threshold set to 0.1 V

0.2 V

0.5 V

1 V

2 V

4 V

8 V

within the range from 0...16 V

Switching threshold set to 8 V

12 V

16 V

25 mA
37 mA
100 loads

320 mV... 16 V
160 mV... 8 V

$\pm 65 \text{ V}$
 $+ 50 \dots - 35 \text{ V}$

$> 29.8 \text{ k}\Omega/\text{mV}$
 $> 24.6 \text{ k}\Omega/\text{mV}$
 $> 10.6 \text{ k}\Omega/\text{mV}$
 $> 6.4 \text{ k}\Omega/\text{mV}$

see characteristic
see guide value curve

$1/2$ the switch-on threshold
 $1/2$ the switch-off threshold
switch-on threshold
switch-off threshold
top potentiometer
bottom potentiometer

maximally 0.1 mA

$\leq \pm 20 \text{ mV}$
red LED, lights up in the case of 1 signal at output 10

$\leq \pm 10 \text{ mV}$

$\leq \pm 20 \text{ mV}$

$\leq \pm 1\%$

$\leq \pm 0.3\%$

$\leq \pm 0.24 \text{ mV/K}$

$\leq \pm 0.27 \text{ mV/K}$

$\leq \pm 0.33 \text{ mV/K}$

$\leq \pm 0.41 \text{ mV/K}$

$\leq \pm 0.53 \text{ mV/K}$

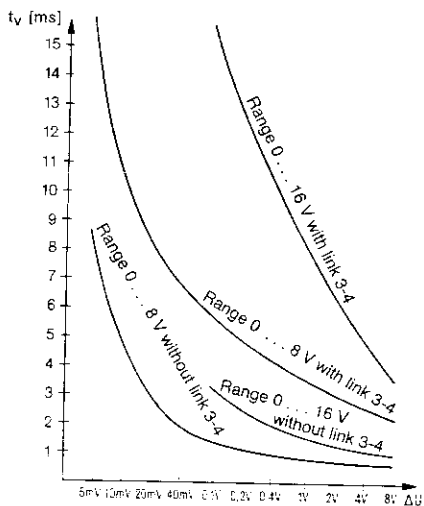
$\leq \pm 0.78 \text{ mV/K}$

$\leq \pm 1.28 \text{ mV/K}$

$\leq \pm 1.86 \text{ mV/K}$

$\leq \pm 2.40 \text{ mV/K}$

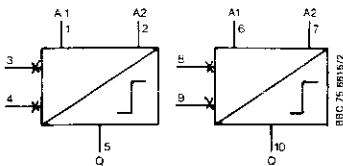
$\leq \pm 2.94 \text{ mV/K}$



Signal delay between input and output

The delay time between reaching the switching threshold and output of the signal is primarily dependent on by which voltage ΔU the input signal exceeds the set switch-on threshold or falls below the set switch-off threshold. The switch-on and switch-off delays are approximately equal if the two voltages ΔU are equal. For input 1 (range 0...16 V) and input 2 (range 0...8 V), the adjacent figure shows guide values for the delay times, t_d , until appearance of the signal at the output, both with and without link 3-4, as a function of the voltage ΔU .

Evaluater R 313



Description

The R 313 evaluator has two switching amplifiers for electrical path sensing as per DIN 19234 (draft Febr. 72) or NAMUR recommendations. It is suitable, for instance, for connecting initiators which have no built-in amplifier.

Each one of the two functional units has a current source and a switching amplifier. The current source feeds the connected initiator. The latter changes its resistance according to the damping state. The switching amplifier evaluates the resulting change of current. The outputs of the units will carry 0- or 1-signals; accordingly.

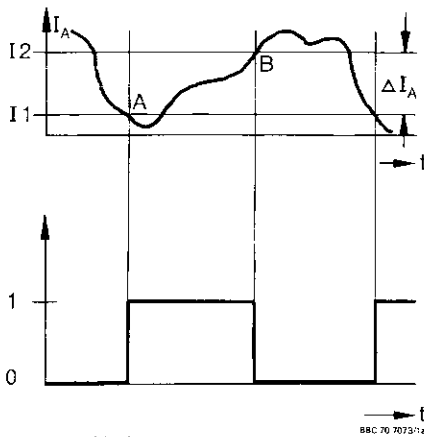
With open input or with a current below the response threshold (broken wire or damped initiator), a 1-signal will appear at the output. A current above the response threshold (free-swinging initiator or earth fault in the input line) will produce an 0-signal at the output.

Every functional unit has two inputs. The positive terminal of an initiator can be connected directly with the terminals 2 or 7 resp. The negative initiator terminals is directly connected to the zero bus bar.

If an initiator is to be used in locations with explosion hazards, this is possible with protection class "intrinsic safety" Ex . For this purpose the positive terminal of an initiator is connected with one of the terminals 1 or 6 of the evaluator via an Ex separator stage (e.g. the BBC types 05 ZS 51 or 05 ZS 52) with a inherent resistance of R_i , approx. 370 Ω . Apart from this the regulations regarding the Ex separator stages must be observed.

With open inputs 1 and 2 resp. 6 and 7 a 1-signal at output 5 or 10 occurs.

The max. transmissible frequency of the evaluator can be reduced by linking the terminals 3 and 4 or 8 and 9 for each functional unit from about 2 kHz to 100 Hz. Disturbances due to coupling can thus be suppressed.



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

GH R313 0000 V0
GH R700 1901 R14
D GEF 31011 D
yellow
single width
approx. 130 g

Technical data

Current consumption with 0-signal at the outputs
with 1-signal at the outputs

34 mA
48 mA

Input values as per DIN 19234 (draft Febr. 72)
and NAMUR recommendations:

No-load voltage at the input
Inherent resistance (input A2)
Position of switch-over points
Rated values
Boundary values
Switching hysteresis

8.2 V (7.7 ... 9 V)
1 k Ω \pm 5 %
 I_1 I_2
1.55 mA 1.75 mA
1.2 mA 2.1 mA
 $\Delta I_A = 0.2 \pm 0.1$ mA

Fan out

100 loads

Limit frequency, pins 3-4 or 8-9 open
pins 3-4 or 8-9 linked

approx. 2 kHz
approx. 100 Hz

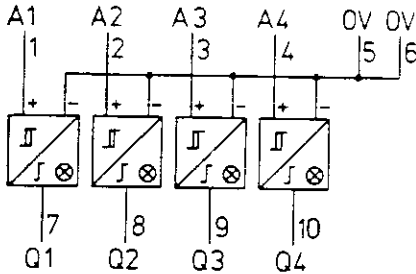
Delay, pins 3-4 or 8-9 open
0-1 change at output
1-0 change at output

$t_E < 0.35$ ms
 $t_A < 0.24$ ms

Delay, pins 3-4 or 8-9 linked
0-1 change at output
1-0 change at output

$t_E < 6$ ms
 $t_A < 4$ ms

Quadruple evaluator R 314.1



Description

The evaluator R 314.1 contains 4 identical switching amplifiers for evaluation of the switching state of 2-wire proximity switches (motion sensors) in accordance with DIN 19 234 or the NAMUR recommendations.

The positive terminals of the proximity switches are connected to terminals 1 to 4 (A1...A4) and the negative terminals to terminals 5 and 6 (0 V). These two terminals are connected within the unit to the terminal 0 of the supply voltage. The evaluated switching states are available at outputs Q1 to Q4 (terminal 7 to 10) in the form of SIGMA-tronic signals. The output signals are also indicated by LEDs.

Terminals A1 to A4 act as voltage sources with internal resistances (source resistance) for the connected proximity switches. The switching states are determined from the current consumption of the proximity switches.

Inductive proximity switches, for which the unit is primarily designed, have a higher current consumption in the free state than in the damped state. As the one signal is assigned to the damped state (body to be sensed is in the vicinity), the following relationships exist:

Proximity switch	Current consumption	Evaluated switching state	LED
free	high	0 signal	off
covered (damped)	low	1 signal	on

In the case of capacitive proximity switches, the relationships are reversed.

The module R 314.1 has a wire breakage monitoring circuit for all function units. If the wire between the proximity switch and the evaluation unit is broken, a zero signal appears at the output.

Without additional measures, the switching amplifiers are not suitable for connection of motion sensors in explosion risk areas. If motion sensors which are approved for use in Ex areas, and if suitably certified zener barriers are connected into the circuit and all safety measures applicable to this area (Ex rules, VDE 0165, VDE 0171) are complied with, motion sensors which are located in an explosion risk area (zone 1, protection type intrinsically safe) can also be evaluated. In order to guarantee correct function, the series resistance of the zener barriers should not be greater than 200 Ohm and the nominal voltage should be 12 V or more. These conditions are fulfilled by the BBC zener barrier 05 ZS 41.

The switching amplifiers contain signal delay circuits for suppression of induced interference.

The inputs are permanently short-circuit proof with respect to 0 V. If an input is short-circuited to 0 V, a current of approximately 10 mA flows. The switching amplifier evaluates this as 0 signal. If one input is inadvertently connected to the 24 V supply, than this does not cause destruction of the unit.

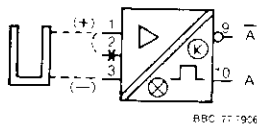
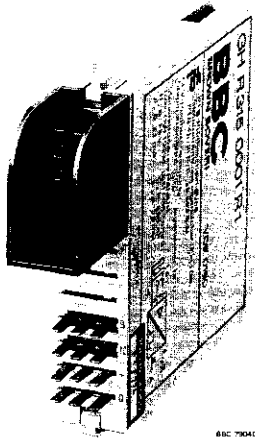
Order code for module:
Identifying color:
Mechanical structure:
Weight:

GHR 314 0100 R1
yellow
single width
130 g

Technical data

Current consumption, with 4 initiators connected and 0-signal at the outputs 1-signal at the outputs	30 mA 70 mA
Input values:	
Open circuit voltage	approx. 9 V
Internal resistance	approx. 1 kOhm
Position of switching thresholds	1.2 ... 2.1 mA
Switching hystereses	approx. 0.2 mA
Permissible wire resistance	max. 50 Ohm
Threshold of wire breakage monitoring circuit	0.1 ... 0.2 mA
Open circuit initiator wire causes	0-signal
Values for the zener barriers if the initiators are to be used in the explosion risk area, zone 1:	
series resistance	max. 200 Ohm
rated voltage	≧ 12 V
leakage current at 10 V	≧ 40 μA
Output values:	
Output loading signalling	100 loads 1 yellow LED per output
signal delays	
0-1 transition	approx. 2.2 ms
1-0 transition	approx. 2.2 ms

Exi-Separator R 315.1



Description

The Exi-separator stage allows for the adaption of control devices (initiators, limit switches) in the Ex area to the SIGMA-tronic control system in the non-Ex area.

The input circuit is monitored for wire breakage (with link between contacts 1 and 2). In the event of a fault, the output A always has a 0 signal (in the event of wire breakage or defective initiator).

Monitoring is inactive without a link between contacts 1 and 2. In the event of a fault, output A then has a 1 signal.

Output \bar{A} always has the inverted signal of A (e.g. A = 1 signal, \bar{A} = 0 signal).

A 1 signal on output A is shown via an LED.

Operation:

Damped indicator \triangle contact open

Undamped indicator \triangle contact closed

A = 1 signal

A = 0 signal

Order code for module:

Order code for circuit symbol transparency:

Identifying colour:

Mechanical structure:

Weight:

GH R315 0001 R1

GH R700 1901 R58

blue Exi

single width

approx. 130 g

Technical data

Control circuit

Voltage

Inherent resistance

Switching points

Switching hysteresis

Max. permissible input circuit inductance

Max. permissible input circuit capacitance

Fan out, on \bar{A}

on A

Outputs

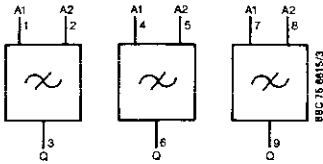
Max. limit frequency

Current consumption, 0 signal on output A or \bar{A}

1 signal on output A or \bar{A}

according to
DIN 19234 or
NAMUR intrinsic
safety Exi G5 zone 0
approx. 8 V
approx. 1 k Ω
 $\geq 1.2 \dots 2.1$ mA
 0.2 ± 0.1 mA
68 mH
707 nF
100 loads
100 loads
short circuit proof
1 kHz
5 mA
< 20 mA

Noise suppression element passive, R 321/V0 active, R 321/V101



Description

With the noise suppression units R 321 electrical fault signals, as may occur on long leads at the input of a SIGMA-tronic control, can be eliminated. In cases of very high noise energies the static and dynamic noise clearing capacity of the SIGMA-tronic units may not always be adequate. In order to prevent destruction of device inputs in such cases, in each of their three independent functional units the devices incorporate a low resistance bypass to the zero busbar and a capacitive bypass for pulse peaks. The active noise suppression element R 321/V101 has a simultaneous fan out of 100 loads at the output.

Input signals up to 65 V can be fed to the inputs 1, 4 or 7. Signals in the magnitude of the supply voltage of about 24 V are connected to the terminals 2, 5 or 8.

The device R 321/V0 will not carry out any other signal processing. It merely delays the input signals, possesses however no amplifier and will therefore not burden the supply voltage.

The outputs of multiple units R 321/V0 should not be operated in parallel.

Order code for module R 321/V0:

Order code for module R 321/V101:

Order code for circuit symbol transparency:

Order code for application:

Identifying colour:

Mechanical structure:

Weight:

GH R321 0000 V0

GH R321 0000 V101

GH R700 1901 R12

D NG 80765 D

yellow

single width

approx. 150 g

Technical data

(The values apply to + 24 V or + 52 V at the inputs)

R 321/V0:

Current consumption (passive unit)	0 mA
Input load, per input	10 loads + output of the functional unit
Fan out, per output	4 loads
Making delay t_E at + 24 V	approx. 0.5 ms
at + 52 V	approx. 1.0 ms
Breaking delay t_A at + 24 V	approx. 8 ms
at + 52 V	approx. 7 ms

R 321/V101:

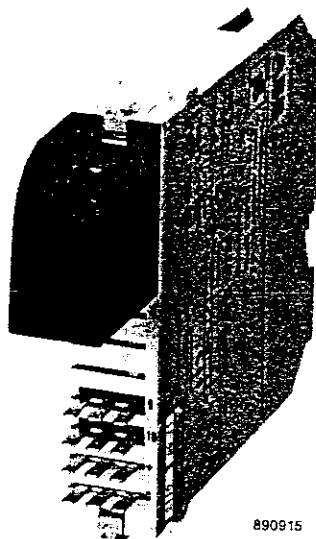
Current consumption, 0-signal at the outputs	5 mA
1-signal at the outputs	27 mA
Input load, per input	12 loads
Fan out	100 loads
Making delay t_E at + 24 V and + 52 V	approx. 0.7 ms
Breaking delay t_A at + 24 V and + 52 V	approx. 0.2 ms

2. Einlegeblatt zu D AT 1656 85 D

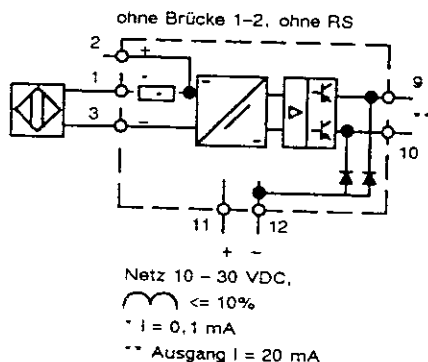


sigma[®]-tronic b

Exi-Trennstufe R 315.1 R2



890915



Beschreibung:

Die Exi-Trennstufe dient zur Anpassung von Befehlsgebern (Initiatoren, Endschaltern) im Ex-Bereich an die SIGMA-tronic-Steuerung im Nicht-Ex-Bereich.

Die Eingangsschaltung ist galvanisch von der Speisespannung U_s und dem Ausgangskreis getrennt.

Der Eingangskreis wird auf Leitungsbruch überwacht: Der Ausgang zeigt im Fehlerfall (bei Leitungsbruch oder defektem Initiator) 0-Signal. Die Überwachung ist durch Entfernen der Brücke zwischen den Kontakten 1-2 abschaltbar. Im Fehlerfall zeigt der Ausgang dann 1-Signal.

Für Anlagen mit eigensicheren Stromkreisen ist DIN VDE 0165 zu beachten. Die Trennstufe erfüllt nach DIN VDE 0165 die Spezifikationen für Zone 0, Temperaturklasse T5 (alt G5). Bei Anschluß von elektrischen Meßwertaufnehmern ist DIN 19234 einzuhalten.

Ein 1-Signal an Ausgang A wird durch eine Leuchtdiode (LED) angezeigt

Wirkungsrichtung:

Initiator bedämpft = Kontakt offen A = 1-Signal
 Initiator unbedämpft = Kontakt zu A = 0-Signal

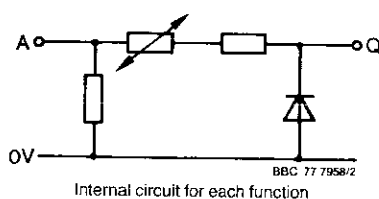
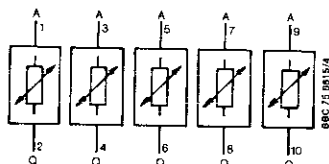
Bestell-Nummer für Baustein: GHR3150001R2
 Bestell-Nummer für Klebefolie: GHR7001901R58
 Kennfarbe: blau Exi
 Mechanischer Aufbau: Einfachbreite
 Gewicht: ca. 130 g
 PTB-Nummer: Ex-88.8.B.2098x
 EExialIC bzw. EExialIB

Technische Daten:

Versorgungsspannung
 (Anschluß 11 und 12): 10 V bis 30 V

Steuerstromkreis
 (Anschluß 1, 2 und 3): im Zündschutzart EExialIC, EExibIC
 bzw. EEx ia IIB
 Spannung: max. 12,7 V
 Strom: max. 20 mA
 Leistung: max. 63,5 mW
 Innenwiderstand: ca. 1 k Ω
 Schaltpunkte: $\geq 1,2 \dots 2,1 \text{ mA}$
 Schalthysterese: $0,2 \pm 0,1 \text{ mA}$

Protection element R 322 Input element R 323.1



Description

The protection element R 322 is used for noise suppression in long lines on outputs of units as, for instance, to be provided between parts of an extensive installation. The unit contains five functional units of the same type.

Each functional unit protects the SIGMA-tronic output on the line side from destruction, also in cases of very high interference potential in circuits of this type. This is ensured by a low resistance termination against the zero bus bar. Moreover, a current limiting facility guarantees short-circuit protection of the series connected SIGMA-tronic output. The unit has a passive structure, has no amplifying effect and does not carry out any further signal processing. One unit of the protection element may only be connected to an output with a fan out of 100 loads, e.g. 10 loads cannot be protected with the protection element R 322. There will be no burden on the supply voltage.

SIGMA-tronic controls with long connecting lines through rooms with high electric noise level are therefore best provided with a protection element R 322 on the sending end and a noise suppression element R 321 on the receiving end. This arrangement will avoid costly screened cables also in cases of extreme conditions.

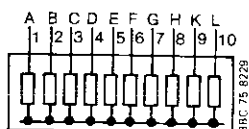
The outputs of multiple units should not be operated in parallel.

Order code for module:	GH R322 0000 V0
Order code for circuit symbol transparency:	GH R700 1901 R13
Order code for application:	D NG 80765 D
Identifying colour:	yellow
Mechanical structure:	single width
Weight:	approx. 120 g

Technical data

Input current at each input	13 mA
Input	10 loads \pm 13 mA
Fan out	30 loads \pm 39 mA

To find the total input current, the output current must be added to the input current (output load according to data sheet).



Description

The input element R 323.1 increases the contact reliability of mechanical switches and it provides the incoming signal with a low resistance by-pass to the neutral bus bar. It therefore protects inputs of SIGMA-tronic units from noise interference and destruction. Each of the inputs A to L is an input and an output at the same time.

Order code for module:	GH R323 0001 R1
Order code for application:	D NG 80765 D
Identifying colour:	yellow
Mechanical structure:	single width
Weight:	approx. 80 g

Technical data

Input current at each input (24 V-)	4 loads
Max. input voltage	32 V-
Fan out	depends on the max. output current of the feeder
Delay times	not delayed

