

# RCG RDG

## FORCIBLY GUIDED CONTACTS



RCG



RDG

## INSTANTANEOUS RELAYS, WELD-NO-TRANSFER 2-4 CONTACTS

### APPLICATIONS



### OVERVIEW

- Forcibly guided (mechanically linked) contacts, relays compliant with **EN 61810-3, type A, certified by TÜV Rheinland**
- Weld-no-transfer technology
- High performance, compact dimensions, light weight
- Compact plug-in monostable instantaneous relays
- Suitable for safety applications
- Solid and rugged construction for intensive duty, IP50 protection
- Self-cleaning knurled contacts, C/O type
- High electrical life expectancy
- Wide temperature range -40°C ... +85°C (as option)
- New "HIGH POWER" magnetic arc blow-out for improved breaking capacity (as option)
- Wide option range: signalling LED, FLYBACK DIODE, varistor, etc.
- Retaining clip for secure locking of relay on socket
- Transparent cover, pull-out handle

### DESCRIPTION

RCG & RDG relay, with 2 & 4 changeover contacts, are highly reliable products featuring high performance, suitable for applications in very harsh and disturbed environments, such as **ROLLING STOCK** applications.

Referring to the standard **EN61810-3**, these relays are classified as fully compliant and identified as **type A** relays, (all the contacts are mechanically linked). By way of further quality and safety certification for users, relays are **certified by TÜV Rheinland** laboratories.

The construction of the relays and careful choice of the materials ensure long life and considerable ruggedness even in harsh operating environments and in the presence of strong temperature fluctuations.

Wide range of coil's nominal voltage are available. The manufacturing versatility allows to adapt power supply to customer needs.

The IP50 protection allows the relays to be used even in dusty environments, protecting contact's surface against harmful deposits, with great benefit in conducting very low loads.

The operating temperature range is -40°C to +85°C (as option). RCG and RDG can operate in environment with high thermal shocks.

The contacts are designed to obtain remarkable performances both for high, inductive loads or very low loads. Each contact is able to switch from 5mA – 10V at new relay.

The knurled surface ensures an excellent self-cleaning effect, a lower ohmic resistance thanks to the various points of electrical contact, and will also improve the electrical life of the component.

The magnetic arc blow-out contributes to increase breaking capacity: the relay is suitable for controlling heavy duty loads with intensive switching frequency.

In this relay range, with forcibly guided contacts (mechanically linked) special design and constructional measures are used to ensure that make (NO) contacts cannot assume the same state as break (NC) contacts.

- If, when powering up a relay, a NC contact fails to open, the remaining NO contacts must not close, maintaining a contact gap  $\geq 0.5$  mm

- When the relay is de-energized, if a NO contact fails to open, the remaining NC contact must not close, maintaining a contact gap  $\geq 0.5$  mm

In the case of relays that include changeover contacts, either the make circuit or the break circuit of a changeover contact can be considered to meet the requirements of this standard.

### STANDARD COMPLIANCE

EN 61810-3	EN 61810-1
EN 60077	EN 61810-7
EN 50155	EN 60695-2-10
EN 61373	EN 61000
EN 45545-2	EN 60529
ASTM E162, E662	



MODELS	NUMBER OF CONTACTS	MAGNETIC ARC BLOW-OUT	HIGH POWER - MAGNETIC ARC BLOW-OUT
RCG.x2	2		
RCG.x6	2	•	
RCG.x8	2		•
RDG.x2	4		
RDG.x6	4	•	
RDG.x8	4		•



FOR PRODUCT CODE CONFIGURATION, SEE THE "ORDERING SCHEME" TABLE



COIL DATA	RCG	RDG
Nominal voltages Un	DC: 24-36-37.5-48-72-96-110-125 <sup>(1)</sup>	
Consumption at Un	2.2 W	2.7 W
Operating range	80 ÷ 115 % Un	
Operating range for rolling stock version <sup>(2)</sup>	70 ÷ 125 % Un - <b>Only for Un=37.5Vdc:</b> 23...41.5Vdc / 42.5Vdc for 10min	
Type of duty	Continuous	
Drop-out voltage <sup>(3)</sup>	DC: > 5% Un	

(1) Other values on request.

(2) See "Ordering scheme" table for order code. Suitable for application on ROLLING STOCK. Operating range in accordance with EN60077.

(3) Limit value for supply voltage, expressed as % of the nominal value, beneath which the relay is certainly de-energized.



CONTACT DATA		RCG		RDG	
Number and type		2 SPDT, form C		4 SPDT, form C	
Current	Nominal Maximum peak <sup>(1)</sup> Maximum pulse <sup>(1)</sup>	See the following chart 13A for 1min - 20A for 1s 100A for 10ms			
Example of electrical life <sup>(2)</sup> * 1,200 oper./h ** 600 oper./h		Standard: RCG.x2 / RDG.x2: 0,2A - 110Vdc - L/R 40ms - 5x10 <sup>5</sup> oper. * With Magnetic arc blowout: RCG.x6 / RDG.x6: 0.5A - 110Vdc - L/R 40ms - 1.5x10 <sup>5</sup> oper. * With <b>HIGH POWER</b> Magn. arc blowout: RCG.x8 / RDG.x8: 0.7A - 132Vdc - L/R 40ms - 7x10 <sup>4</sup> oper. **			
Minimum load <sup>(3)</sup>	Standard contacts Gold-plated contact <sup>(4)</sup>	200mW (10V, 10mA) 50mW (5V, 5mA)			
Making capacity		30 A - 110Vdc - L/R 0 ms : 2,000 operations			
Maximum breaking voltage		250 Vdc / 300 Vac			
Contact material		AgSnO <sub>2</sub> (mobile contacts) - AgNi (fixed contacts)			
Operating time at Un (ms) <sup>(5)</sup>		Standard	With diode	Standard	With diode
Pick-up (NC contact opening)		≤ 13	≤ 13	≤ 17	≤ 17
Pick-up (NO contact closing)		≤ 19	≤ 19	≤ 25	≤ 25
Drop-out (NO contact opening)		≤ 4	≤ 11	≤ 4	≤ 27
Drop-out (NC contact closing)		≤ 16	≤ 30	≤ 14	≤ 43

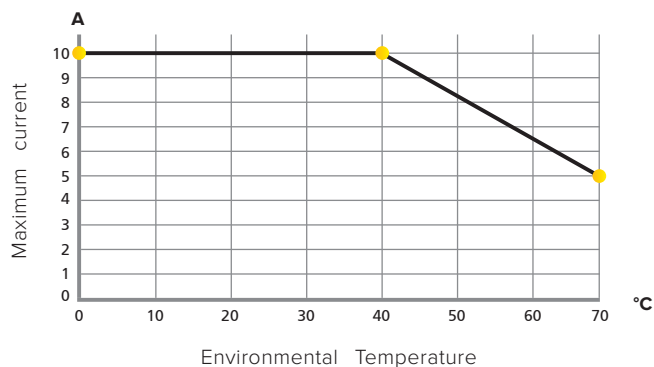
(1) The max. peak and pulse currents are those currents that can be handled, for a specified time, by the contact. They do not refer to steady or interrupted currents.

(2) For other examples, see electrical life expectancy table.

(3) Values referred to a new product, measured in laboratory. The ability to maintain this performance over the time depends on the environmental conditions and the contact' frequency use  
The use of gold plated contacts is recommended in the case of very low loads. For a correct contact use, refer to the chapter "Installation, operation and maintenance".

(4) A gold contact, if subjected to high loads, degrades superficially. In this case, the characteristics of the standard contact must be considered. This does not affect the operation of the relay.

(5) Unless specified otherwise, the operating times refer to the stabilization of the contact (including bounces).



## INSULATION



Insulation resistance (at 500Vdc) between electrically independent circuits and between these circuits and ground between open contact parts	> 1,000 MΩ > 1,000 MΩ
Dielectric withstanding voltage at industrial frequency between electrically independent circuits and ground between coil and contacts parts between adjacent contacts between open contact parts	4 kV (1 min) 3 kV (1 min) 3.5 kV (1 min) 2 kV (1 min)
Impulse withstand (1.2/50µs - 0.5J) between electrically independent circuits and ground between open contact parts	5 kV 3 kV

## MECHANICAL SPECIFICATIONS



Mechanical life expectancy	20x10 <sup>6</sup> operations	
Maximum switching rate	Mechanical	3,600 operations / h
Protection rating (with relay mounted)	IP50	
	RCG	RDG
Dimensions (mm)	40x20x50 <sup>(1)</sup>	40x40x50 <sup>(1)</sup>
Weight (g)	60	115

(1) Output terminals excluded.

## ENVIRONMENTAL CHARACTERISTICS



Operating temperature	Standard	-25 ÷ +55°C
Version for railways, rolling stock		-25 ÷ +70°C (+85°C for 10min) -40°C as option
Storage and shipping temperature		-40 ÷ +85°C
Relative humidity	Standard: 75% RH - Tropicalized: 95% RH	
Fire behaviour	V0	

See the "Operation" chapter of this document for more information and operating notes.

## STANDARDS AND REFERENCE VALUES



EN 61810-1	Electromechanical elementary relays Part 1: General and safety requirements
EN 61810-7	Electromechanical elementary relays Part 7: Test and measurement procedures
EN 61810-3, type A <sup>(1)</sup>	Electromechanical elementary relays Part 3: Relays with forcibly guided (mechanically linked) contacts <sup>(2)</sup>
EN 60695-2-10	Fire hazard testing Part 2-10: Glowing/hot-wire based test methods
EN 61000	Electromagnetic compatibility
EN 60529	Degrees of protection provided by enclosures (IP Code)

Unless otherwise specified, the products are designed and manufactured according to the requirements of the above-mentioned European and International standards.

In accordance with EN 61810-1, all technical data are referred to ambient temperature of 23°C, atmospheric pressure of 96kPa and 50% humidity.

Tolerance for coil resistance and nominal power is 5%.

(1) Gap verification as per method described at §5.3.1.1 b.

(2) Vibration resistance, frequency range, f = 10 ÷ 200 Hz

RCG: no contact opening up to 0.828G

RDG: no contact opening > 1ms up to 0.738G

Shocks resistance: 15 G – no damages

## RAILWAYS, ROLLING STOCK - STANDARDS APPLICABLE TO RCGR & RDGR VERSIONS



EN 60077-2	Railway applications - Electric equipment for rolling stock Part 2: Electrotechnical components - General rules
EN 50155	Railway applications - Rolling stock - Electronic equipment - T3 class Testing
EN 61373	Railway applications - Rolling stock equipment - Shock and vibration tests, Cat 1, Classe B Vibration resistance, frequency range f = 5 ÷ 150 Hz <sup>(1)</sup>
EN 45545-2	Railway applications - Fire protection on railway vehicles Part 2: Requirements for fire behavior of materials and components HL3: Cat E10 (R26 requirement)
ASTM E162, E662, E1354	Fire behavior - Standard test method
BSS7239	Fire behavior - Toxicity Test

(1) RDG: at de-energized relay: no contact opening > 0,1 ms



## CONFIGURATIONS - OPTIONS

<b>TROPICALIZATION</b>	Surface treatment of the coil with protective coating for use with RH 95%.
<b>GOLD PLATING</b>	Surface treatment of the contacts, with gold-cobalt alloy $\geq 2\mu$ . This treatment ensures long-term capacity of the contact to conduct lower currents.
<b>LED</b>	LED indicator showing presence of power supply. Flyback diode mounted as standard.
<b>FLYBACK DIODE</b>	Component connected in parallel to the coil (type BYW56) designed to dampen overvoltages generated by the coil when de-energized.
<b>TRANSIL</b>	Non-polarized component connected in parallel to the coil. Behaviour is similar to that of a varistor with faster operating times.
<b>LOW TEMPERATURE</b>	Minimum operating temperature -40°C, only for rolling stock version (option "L").



## ORDERING SCHEME

PRODUCT CODE	APPLICATION <sup>(1)</sup>	CONFIGURATION A	CONFIGURATION B	TYPE OF POWER SUPPLY	N	FINISH <sup>(3)</sup>	KEYING POSITION CODE <sup>(4)</sup>
<b>RCG</b> (2 contacts)	<b>E:</b> Energy <b>F:</b> Railway Fixed Equipment <b>R:</b> Railway Rolling stock	<b>1:</b> Standard <b>2:</b> Gold plating + Diode // + Led <b>3:</b> Diode // <b>4:</b> Gold plating <b>6:</b> Gold plating + Diode // <b>7:</b> Diode // + Led <b>8:</b> Transil	<b>2:</b> Standard <b>6:</b> With magnetic arc blow-out <b>8:</b> With <b>HIGH POWER</b> magnetic arc blow-out	<b>C:</b> Vdc	024 - 036 - 037 048 - 072 - 096 110 - 125	<b>T:</b> Tropicalized coil <b>L:</b> Low temperature	XX
<b>RDG</b> (4 contacts)							
Example	<b>RCG</b>	<b>E</b>	<b>4</b>	<b>2</b>	<b>C</b>	<b>048</b>	
	<b>RCGE42-C048 = ENERGY series relay with 2 SPDT gold-plated contacts, 48Vdc coil</b>						
	<b>RDG</b>	<b>R</b>	<b>1</b>	<b>6</b>	<b>C</b>	<b>110</b>	
	<b>RDGR16-C110 = RAILWAY series relay, rolling stock, with 4 SPDT contacts, magnetic arc blow-out, 110Vdc coil</b>						

1. **ENERGY:** all applications except for railway.

**RAILWAYS, FIXED EQUIPMENT:** application on fixed power systems and electrical railway traction. Construction according to RFI (FS Group, Italy) specification n° RFI DPRIM STF IFS TE 143 A, if applicable for list of RFI approved and conforming products, consult dedicated catalogue "RAILWAY SERIES - RFI APPROVED"

**RAILWAYS, ROLLING STOCK:** Application on board rolling stock. Electrical characteristics according to EN60077.

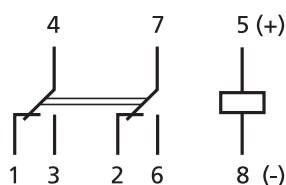
2. Other values on request.

3. Optional value. Use 037 for  $U_n=37.5Vdc$ .

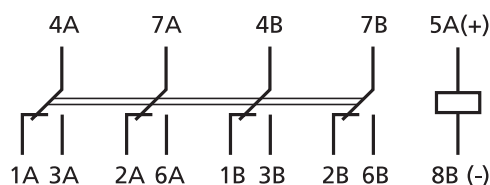
4. Optional value. The positive mechanical keying is applied according to the manufacturer's model.



## WIRING DIAGRAM



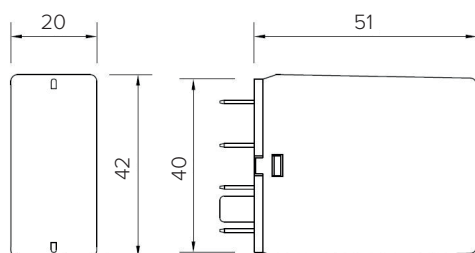
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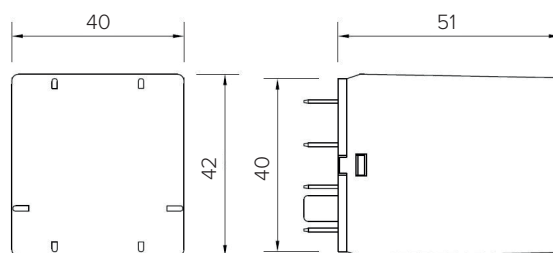
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## DIMENSIONS



RCG



RDG



## Some examples of electrical life expectancy

RCG.12, RDG.12			
U	I (A)	L/R (ms)	Oper.
110Vdc	0.2	40	500,000
220Vdc	0.2	10	80,000
U	I (A)	cosφ	Oper.
110Vac	1	1	1,200,000
110Vac	1	0.5	1,000,000
110Vac	5	1	500,000
110Vac	5	0.5	300,000
220Vac	0.5	1	1,200,000
220Vac	1	0.5	500,000
220Vac	5	1	400,000
220Vac	5	0.5	300,000

RCG.16, RDG.16			
U	I (A)	L/R (ms)	Oper.
110Vdc	0.2	40	1,000,000
110Vdc	0.5	40	150,000
110Vdc	0.6	10	300,000
110Vdc	1	10	100,000
220Vdc	0.2	10	100,000
U	I (A)	cosφ	Oper.
110Vac	1	1	2,000,000
110Vac	1	0.5	1,500,000
110Vac	5	1	950,000
110Vac	5	0.5	500,000
220Vac	0.5	1	2,000,000
220Vac	1	0.5	800,000
220Vac	5	1	600,000
220Vac	5	0.5	500,000

RCG.18, RDG.18			
U	I (A)	L/R (ms)	Oper.
24Vdc	1	0	5,100,000
24Vdc	2	0	3,900,000
24Vdc	3	0	2,900,000
24Vdc	4	0	2,600,000
24Vdc	5	0	2,200,000
24Vdc	1	20	2,700,000
24Vdc	2	20	2,100,000
24Vdc	3	20	1,500,000
24Vdc	3.5	20	1,000,000
24Vdc	1	40	2,000,000
24Vdc	2	40	1,500,000
24Vdc	3	40	1,100,000
24Vdc	3.5	40	800,000
110Vdc	0.3	0	1,000,000
110Vdc	0.5	0	700,000
110Vdc	1	0	190,000
110Vdc	0.3	20	450,000
110Vdc	0.5	20	260,000
110Vdc	0.8	20	600,000 <sup>(1)</sup>
110Vdc	1	20	100,000
110Vdc	0.3	40	300,000
110Vdc	0.5	40	180,000
110Vdc	0.6	40	150,000
110Vdc	0.7	40	100,000
132Vdc	0.7	40	70,000

<sup>(1)</sup> 2 series contacts

Switching frequency: 1,200 operations/hour

SOCKETS AND RETAINING CLIPS		RCG	RDG	RETAINING CLIP
Type of installation	Type of outputs	Model		
Wall or DIN H35 rail mounting	Spring clamp	PAIR080	PAIR160	VM1831
	Screw	50IP20-I DIN	48BIP20-I DIN	VM1831
Flush mounting	Spring clamp	PRIR080	PRIR160	VM1831
	Double faston (4.8 x 0.8 mm)	ADF1	ADF2-BIPOK	VM1831
PCB-mount	Solder	65 <sup>(1)</sup>	65	VM1841

<sup>(1)</sup> Suitable for mounting 2 relays side by side.

## INSTALLATION, OPERATION AND MAINTENANCE



## Installation

Before installing the relay on a wired socket, disconnect the power supply.

The preferential mounting position is on the wall, with the relay positioned horizontally in the “reading orienting” of marking so that the label is readable in the correct sense.

Spacing: the distance between adjacent relays depends on use' conditions.

If a relay is used in the "less favorable" conditions that occur with "simultaneously":

- Power supply: the maximum allowed, permanently
- Ambient temperature: the maximum allowed, permanently
- Current on the contacts: the maximum allowed, permanently
- Number of contacts used: 100%

it is strongly recommended to space relay at least 5 mm horizontally and 20 mm vertically, to allow for proper upward heat' dissipation and increase the longevity of the component.

Actually, relays could be used in less severe conditions. In this case, the distance between adjacent relays can be reduced or abolished. A correct interpretation of the use' conditions allows the optimization of the available spaces. Contact AMRA for more information.

To increase relay' longevity, we recommend mounting relays intended for “continuous use” (permanent power supply), alternating them with relays intended for less frequent use.

For a safe use, the retaining clip is recommended. For use on rolling stock, relays have been tested to EN 61373 standard equipped with retaining clip(s).

## Operation

**Before use:** if relay is not used, for example after long storage periods, contact resistance may increase due to a natural and slight oxidation or polluting deposits.

In order to restore the optimal conductivity and for standard contacts (**NOT gold plated**) it is recommended to switch several time a load of at least 110Vdc - 100mA or 24Vdc - 2A. The contacts will be "cleaned" thanks to the electric arc generated during the current interruption and the mechanical self-cleaning action.

The common contact rubs against the fixed poles (NO and NC contacts) both when opening and when closing, which ensures a self-cleaning action.

An increase in contacts' resistance, in most cases, does not represent a problem. Many factors contribute to the correct use of contact and consequently to the relay' long-term reliability:

- **Load:** the current switching generates an electric arc with cleaning effects. For proper electrical cleaning and performance keeping we recommend:
  - o Standard contacts: Minimum current = 20mA (20V)
  - o Gold plated contacts: Minimum current = 10mA (20V)
- **Operating frequency:** relays are components that can operate with a wide range of switching frequency. High frequency operation also allows a continuous cleaning effect by "sliding" (mechanical cleaning). In case of low frequency operation (for example few time a day), we advise:
  - o Use of contact with currents twice compared to those indicated.
  - o For currents lower than 10mA, use gold plated contacts and connect 2 contacts in parallel, in order to reduce the equivalent contact resistance
- **Pollution:** the presence of pollution can cause impurities on contact surface. Electric charges attract organic molecules and impurities that are deposited on the contact surface. Electrical and mechanical cleaning, respectively, burn and remove such impurities. In pollution presence, the minimum recommended currents must be respected. In extreme cases, provide double the cleaning current.

While a contact open high loads, impurities develop inside the relay due to the formation and interruption of the electric arc. These impurities are greater the higher the load and the more frequent the switching operation. These impurities could deposit on the adjacent contacts and alter the initial conductivity characteristics. If all contacts are used with similar loads, this is not a problem. Please, contact AMRA for further informations.

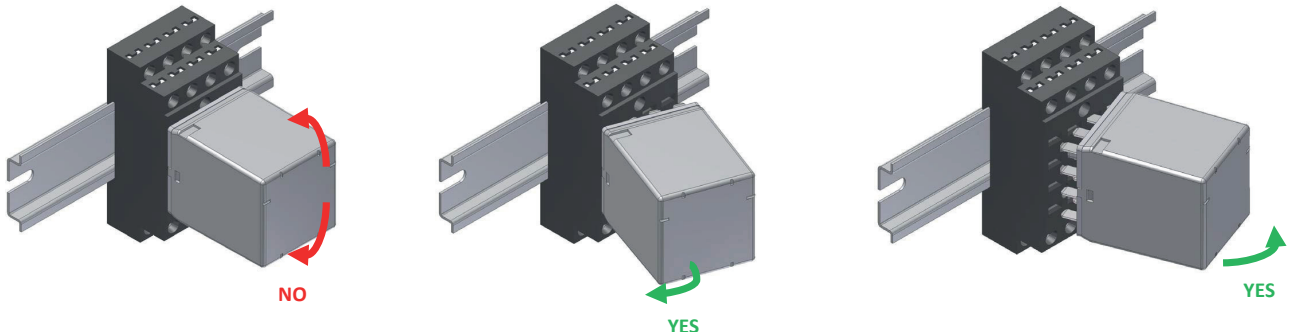
The possible formation of condensation inside the relay, when it is powered and the external ambient temperature is cold, is a normal phenomenon that has no effect on the electrical safety of the relay. In case of polluted or saline atmosphere, any condensation deposits on the contacts can degrade their performance in terms of conductivity.

## Maintenance

No maintenance is required.

In case of normal relay wear (reaching the end of electrical or mechanical life), the relay cannot be restored and must be replaced.

To check the component, relay removal must be carried out with slight lateral movements. An "up and down" movement can cause terminals damage.



Often the malfunctions are caused by power supply with inverted polarity, by external events or by use with loads exceeding the contact performance.

In case of suspected malfunction, energize relay and observe if mechanical operation of contacts / relay mechanism is performed. Pay attention to the power supply polarity, if relay is equipped with polarized components (example: diode, led).

- In case of expected operation, clean the contacts (see paragraph "OPERATION") and check if the circuit load ranges within the contact performance. If necessary, replace with relays with gold contacts. Note: the electrical continuity of contacts must be checked with adequate current.
- If it does not work, we recommend to use a relay of the same model and configuration.

If an investigation by AMRA is required, pull-out the relay from the socket, don't remove the cap, avoid any other manipulation and contact us. You will be asked for the following data: environmental conditions, power supply, switching frequency, contact load, number of operations performed.

The fault can be described through the "TECHNICAL SUPPORT" section of the website [www.amra-chauvin-arnoux.it](http://www.amra-chauvin-arnoux.it).

In any case, the relay cannot be repaired by the user.

## Storage

Storage conditions must guarantee the environmental conditions (temperature, humidity and pollution) required for the product conservation, in order to avoid deterioration.

The product must be stored in an environment sheltered from atmospheric agents and not polluted, with an ambient temperature between -40 and +85°C with max 75% RH. In any case, there must be no condensation. Before use, please read carefully "OPERATION" section.