

TOK-OKTF

SERIES

TIMER RELAYS 4 CONTACTS WITH
TIME DELAY ON DROP-OUT, CAPACITOR TYPE

APPLICATIONS



OVERVIEW

- **TOK:** Relay with time delay on pick-up or on drop-out
- **OKTF:** Relay with fixed time delay on drop-out, without auxiliary power supply
- Wide range of time settings available
- Solid and rugged construction for heavy or intensive duty
- Very high electrical life expectancy
- Independent and self-cleaning contacts with high breaking capacity
- Patent operating mechanism, designed to ensure high contact pressure
- Magnetic arc blow-out for higher breaking capacity
- Excellent shock and vibration resistance
- Wide range of sockets
- Retaining clip for secure locking of relay on socket
- Transparent cover, pull-out handle
- Positive mechanical keying for relay and socket



OKTF
(with external capacitor)



TOK

DESCRIPTION

Relays of the TOK and OKTF series are monostable types with time delay, using 4 SPDT contacts. Manufactured following the same basic electromechanical design of the OK model, they embody all the features and benefits of this product.

These models are suitable for use in the most demanding of sectors such as, for example, electricity generating stations, electrical transformer stations, industries using continuous production processes, and railways - fixed equipment and rolling stock alike. An ample clearance between open contact elements is instrumental in ensuring optimum performance when breaking high loads. The use of a magnetic arc blow-out helps to achieve a considerable increase in breaking capacity, even when handling highly inductive loads.

OKTF - OKSTf Series

The OKTF relay provides a time delay on drop-out, and uses 4 SPDT type contacts. The OKSTf model also offers magnetic arc blow-out, which provides an increase in breaking capacity.

There is no need for any auxiliary power supply to support the time delay function; this is provided by a capacitor connected in parallel with the coil.

With the advantages of a precision engineered ferromagnetic circuit, and operational friction components reduced to the lowest level possible, there will be minimal variation of the time delay characteristic, even after millions and millions of operations.

The relay is polarized. A resistor wired in series with the capacitor is designed to avoid current peaks.

For delays of duration less than 0.6 seconds, the capacitor is mounted internally of the relay. For delays of longer duration, the capacitor is mounted externally.

TOK Series

TOKe and TOKr relays provide time delays on pick-up and drop-out respectively, using 4 SPDT contacts. Intended originally for use in nuclear power plants, these relays are designed to guarantee particularly high reliability and superior strength. The time interval is adjusted by way of a potentiometer with flat head slotted screw drive, accessed from the top of the cover. A LED indicates energized status of the coil.

STANDARD COMPLIANCE

EN 61810-1	EN 60077
EN 61810-2	EN 50155
EN 61810-7	EN 60695-2-10
EN 61812-1	EN 61000
EN 61373	EN 60529
EN 45545-2	ASTM E162, E662



MODELS	FUNCTION		NUMBER OF CONTACTS	MAGNETIC ARC BLOW-OUT	ADJUSTABLE TIME DELAY	FIXED TIME DELAY, CAPACITOR CONTROLLED	ROLLING STOCK APPLICATIONS
	Pick-up	Drop-out					
TOKe	•		4	•	•		•
TOKr		•	4	•	•		•
OKTf		•	4			•	
OKSTf		•	4	•		•	



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



COIL DATA		TOKe - TOKr	OKTf - OKSTf
Nominal voltages at Un ⁽¹⁾		DC: 24 - 36 - 48 - 72 - 110 - 125 - 132 - 144 - 220 - AC: 24 - 48 - 110 - 125 - 220 - 230	
Max Consumption at Un		4 W / VA	
Operating range	Standard	80...115% Un	80...110% Un
	Rolling stock version ^{(1) (2)}	DC: 70...125% Un	-
Type of duty		Continuous	
Drop-out voltage ⁽³⁾		> 5% Un	

(1) Other values on request.

(2) See "Ordering scheme" table for order code.

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



CONTACT DATA	TOKe - TOKr - OKSTf		OKTf
Number and type	4 SPDT, form C		
Current	Nominal ⁽¹⁾	10A	
	Maximum peak (1 s) ⁽²⁾	20 A	
	Maximum pulse (10 ms) ⁽²⁾	150 A	
Example of electrical life expectancy ⁽³⁾ 1,800 operations / h	0.7 A – 132 Vdc – L/R = 40 ms : 10 ⁵ operations		0.5 A – 110 Vdc – L/R = 40 ms : 10 ⁵ operations
Minimum load ⁽⁴⁾	Standard contacts	500mW (20V, 20mA)	
	Gold-plated contacts P4GEO ⁽⁵⁾	100mW (10V, 5mA)	
Maximum breaking voltage	350 Vdc / 440 Vac		
Contact material	AgCu		
Operating time at Un (ms) ⁽⁶⁾			
Pick-up (NO contact closing)	≤ 38		≤ 40 + e(t) ⁽⁷⁾
Drop-out (NC contact closing)	DC: ≤ 8 AC: ≤ 80		-

(1) Nominal current: on all contacts simultaneously.

(2) 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.

(3) For other values, see electrical life expectancy curves.

(4) 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.

(5) Specifications of gold-plated contacts on new relay

a) Plating material: P4GEO: gold-nickel alloy (>6µ).

b) When the gold-plated contact is subject to heavy loads, it will be degraded on the surface. In such case, the characteristics of the standard contact should be taken into consideration.
This does not impair relay operation.

(6) Unless specified otherwise, the operating time signifies until stabilization of the contact (including bounces). It should be added to the preset delay time.

(7) e(t) = DC < 15% / AC < 20% of selected time delay.



INSULATION

Insulation resistance (at 500Vdc)		
between electrically independent circuits and between these circuits and ground		> 10,000 MΩ
between open contact parts		> 10,000 MΩ
Withstand voltage at industrial frequency		
between electrically independent circuits and between these circuits and ground		2 kV (1 min) - 2.2 kV (1 s)
between open contact parts		2 kV (1 min) - 2.2 kV (1 s)
between adjacent contacts		2 kV (1 min) - 2.2 kV (1 s)
Impulse withstand (1.2/50µs - 0.5J)		
between electrically independent circuits and ground		5 kV
between open contact parts		5 kV

MECHANICAL SPECIFICATIONS



Mechanical life expectancy	20x10 ⁶ operations
Maximum switching rate	3,600 operations/hour
Degree of protection (with relay mounted)	IP20
Dimensions (mm)	45x45x109 ⁽¹⁾
Weight (g)	~ 330

(1) Output terminals excluded. OKTf: dimension refers to version with internal capacitor. In the case of an external capacitor, the MAXIMUM dimensions are 90x45x134 mm.

ENVIRONMENTAL SPECIFICATIONS



Operating temperature	-25 ÷ +55°C
Rolling stock version	-25 ÷ +70°C
Storage and shipping temperature	-25 ÷ +85°C
Relative humidity	Standard: 75% RH - Tropicalized: 95% RH
Resistance to vibrations	5g - 10 to 60 Hz - 1 min.
Resistance to shock	30g - 11ms
Fire behaviour	V0

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

STANDARDS AND REFERENCE VALUES



EN 61810-1, EN 61810-2, EN 61810-7	Electromechanical elementary relays
EN 61812-1	Timer relays
EN 60695-2-10	Fire behaviour
EN 61000	Electromagnetic compatibility
EN 60529	Degree of protection provided by enclosures

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 ±7%.

RAILWAYS, ROLLING STOCK - STANDARDS



EN 60077	Electric equipment for rolling stock - General service conditions and general rules
EN 50155	Electronic equipment used on rolling stock
EN 61373	Shock and vibration tests, Cat 1, Class B
EN 45545-2	Fire behaviour, Cat E10, Requirement R26, V0
ASTM E162, E662	Fire behaviour

CONFIGURATIONS - OPTIONS



P2	Tropicalization of the coil with epoxy resin for use with 95% RH (@ T 50 °C). This treatment also protects the coil against corrosion which could occur by the combination of humidity with certain chemical agents, such as those found in acid atmospheres (typical of geothermal power stations) or saline atmospheres.
P4GEO	Gold plating of contacts with gold-nickel alloy, thickness ≥ 6μ. This treatment ensures long-term capacity of the contact to conduct lower currents in harsh ambient conditions such as acid atmospheres (typical of geothermal power stations) or saline atmospheres.
P5GEO	P4GEO type gold-plating, but applied to contacts, contact terminals and output terminals + P2 coil tropicalization.
P6GEO	Gold-plating of contacts, contact terminals and output terminals + P2 coil tropicalization.
P7	Silver cadmium oxide contacts.
P8	Gold plating of contacts with gold-cobalt alloy, thickness ≥ 5μ, knurled fixed contact. This finish allows further improvement of the gold-plated contact performance compared to the treatment P4GEO .
LED	LED indicator showing presence of power supply, wired in parallel with the coil.
FLYBACK DIODE	Polarized component connected in parallel with the coil designed to suppress overvoltages generated by the coil when de-energized.
TRANSIL	Non-polarized component connected in parallel with the coil. Behaviour is similar to that of a varistor, with faster operating times.



TOKx ORDERING SCHEME

PRODUCT CODE	APPLICATION ⁽¹⁾	CONFIGURATION A	CONFIGURATION B	TYPE OF POWER SUPPLY	NOMINAL VOLTAGE (V) ⁽²⁾	FULL SCALE TIME ⁽³⁾	KEYING POSITION CODE ⁽³⁾
TOKe TOKr	E: Energy	4: Led (fixed range)	0: Standard	C: Vdc ⁽⁴⁾	024 - 036 - 048	01S: 1 s 02S: 2 s 04S: 4 s 08S: 8 s 16S: 16 s 32S: 32 s	XX
	F: Railway Fixed equipment		2: P2 4: P4 GEO 5: P5 GEO 6: P6 GEO	A: Vac 50 Hz H: Vac 60 Hz	072 - 110 - 125 132 - 144 - 220 230	01M: 1 min 02M: 2 min 04M: 4 min 08M: 8 min 16M: 16 min 32M: 32 min 64M: 64 min	

Example

TOKe	E	4	0	C	110	04S	
TOKeE40-C110-04S - TOKe relay, ENERGY series, 110Vdc coil, full scale 4 seconds							
TOKr	R	4	4	C	024	08M	
TOKrR44-C024-08M - TOKr relay, ROLLING STOCK series, 24Vdc coil, full scale 8 minutes, with P4GEO finish (gold-plated contacts)							

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) specification no. RFI DPRIM STF IFS TE 143 A, if applicable.
For list of RFI compliant and type-approved products, consult dedicated catalogue "RAILWAY SERIES - RFI APPROVED".
RAILWAYS, ROLLING STOCK: application on board rolling stock (rail-tram-trolley vehicles). Electrical characteristics according to EN 60077.
2. Other values on request.
3. Optional value. The positive mechanical keying is applied according to the manufacturer's model.
4. Rolling Stock version, VDC only available.



OKTf ORDERING SCHEME

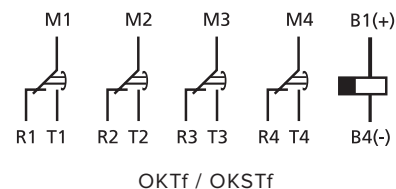
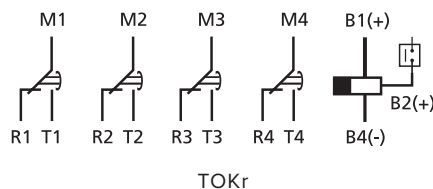
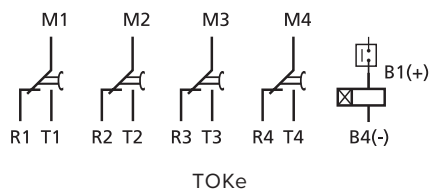
PRODUCT CODE	APPLICATION ⁽¹⁾	CONFIGURATION A	CONFIGURATION B	TYPE OF POWER SUPPLY	NOMINAL VOLTAGE (V) ⁽²⁾	OPERATING TIME	KEYING POSITION CODE ⁽³⁾
OKTf OKSTf	E: Energy	1: Standard	0: Standard	C: Vdc	024 - 048 - 110	See note (*)	XX
	F: Railway Fixed equipment		2: P2 4: P4 GEO 5: P5 GEO 6: P6 GEO	A: Vac 50 Hz H: Vac 60 Hz	115 - 125 - 220 230		
	M: MMI						

Example

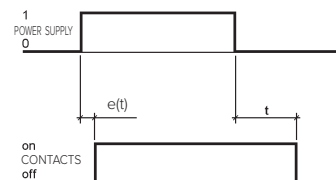
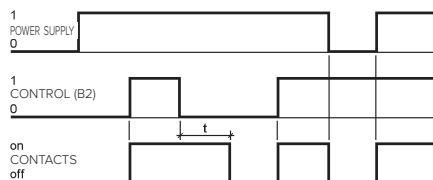
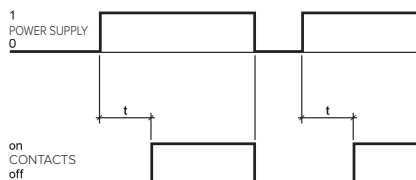
OKTf	E	1	0	C	110	30	
OKTfE10-C110-30 : OKTf Standard Relay, ENERGY series, 110VDC coil, Time Delay 3 seconds							
OKTf	M	1	6	H	115	10	
OKTfM16-H115-10: OKTf Standard Relay, ITALIAN NAVY series, 115VDC 60Hz coil, Time Delay 1 second, with P6 GEO finish							

- (*) Selection of full scale time.
Fill in this field with the time delay. For available time delay values, consult the table "Range of times for OKTf relay".
Indicate the time expressed in seconds and tenths of one second, without separators, as in the following examples:
0.1 seconds: 01
0.5 seconds: 05
2.5 seconds: 25
Note: from 0.1s to 1s, with intermediate steps of 0.1s
from 1s to 7s, with steps of 0.5s
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) specification no. RFI DPRIM STF IFS TE 143 A, if applicable.
For list of RFI compliant and type-approved products, consult dedicated catalogue "RAILWAY SERIES - RFI APPROVED".
MMI: Italian Navy specification. P6GEO treatment as standard (sse "Configuration B").
 2. Other values on request.
 3. Optional value. The positive mechanical keying is applied according to the manufacturer's model.

WIRING DIAGRAM



FUNCTIONAL DIAGRAM



e(t): DC<15% / AC < 20% of time t.

TIME DELAY – SWITCHING TIME SETTING

	TOKE - TOKr	OKTf - OKSTf
Time setting	By way of potentiometer, with slotted head screw	Fixed time
Full scale times available	1-2-4-8-16-32 seconds, 1-2-4-8-16-32-64 minutes	from 0.1 to 7 seconds
Time setting range	10...100 % of full scale	-
Accuracy, setting (0.8...1.1 Un, t=20°C)	±5% of time delay	±15% (Un) ⁽¹⁾
Accuracy, repeatability	DC: ±0.5% / AC: ±0.5% +20ms	-
Reset	< 100ms, in time-delay phase < 1s	< 1s

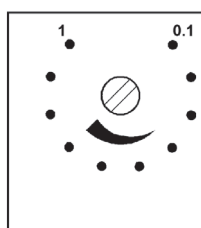
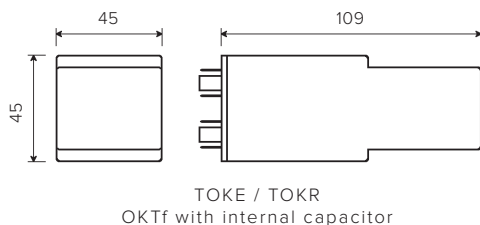
(1) The time varies by the same percentage as the input voltage fluctuation, within limits of ±10%.

RANGE OF TIMES FOR OKTf RELAY

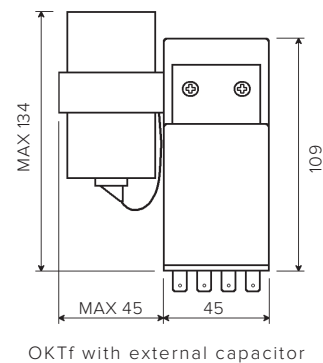
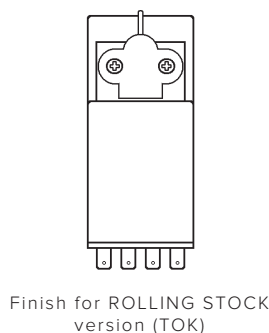
The time delay is fixed. The minimum time delay possible is 0.1s. The maximum time delay possible is dependent on the relay input voltage.

	Nominal coil voltage DC/AC				
	24V	48V	110V	125V	220V
Maximum time with internal capacitor (s)	0.2	0.4	0.5	0.6	0.6
Maximum time with external capacitor (s)	2	6	6.5	6.5	7
Possible time delays	from 0.1s to 1s, with intermediate steps of 0.1s from 1s to 7s, with intermediate steps of 0.5s				

DIMENSIONS

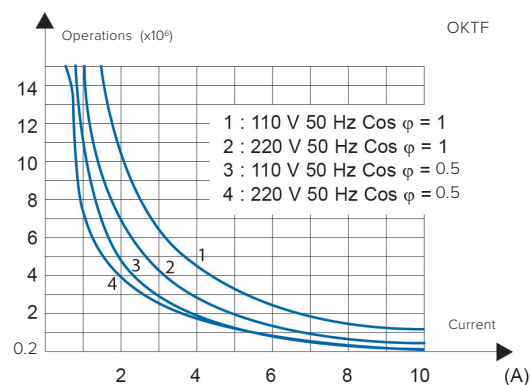
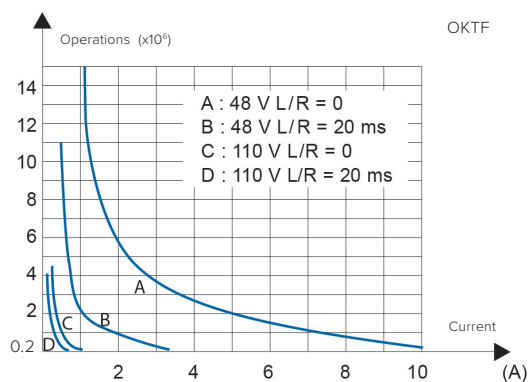


Time setting (TOK)
The scale shown on the relay
(0.1-1) is approximate

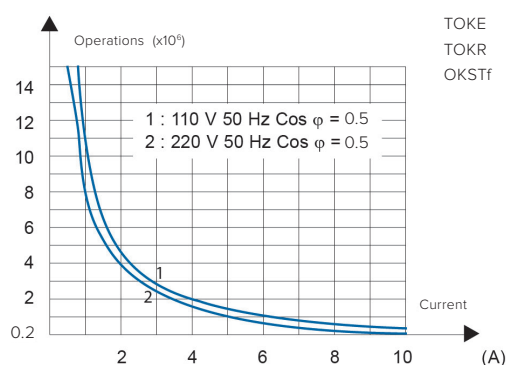
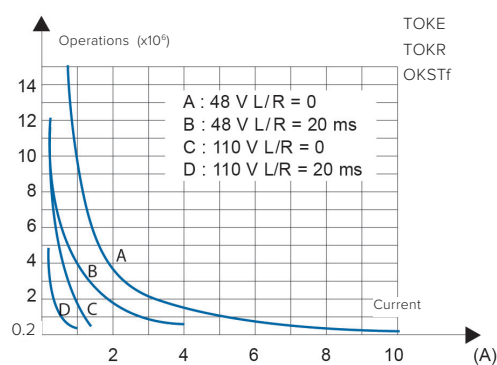




ELECTRICAL LIFE EXPECTANCY



Other examples of electrical life expectancy available on the technical data sheet of the OK series relay (OKFC model)



Other examples of electrical life expectancy available on the technical data sheet of the OK series relay (OKSFC model)



SOCKETS AND RETAINING CLIPS

Number of terminals (standard dimensions 5x0.8)	16	Retaining Clip
For wall or rail mounting		
Spring clamp, wall or DIN H35 rail mounting	PAIR160	RL48
Screw, wall or DIN H35 rail mounting	48BIP20-I DIN	RL48
Screw, wall mounting	48BL	RL48
Double faston, wall mounting	48L	RL48
For flush mounting		
Spring clamp	PRIR160	RL48
Double faston (4.8 x 0.8 mm)	ADF2	RL48
Screw	43IL ⁽¹⁾	RL43
For mounting in PCB	65	RL43

(1) Insert the clip before fastening the socket on the panel.
For more details, see specifications of mounting accessories.



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 - 500mA. 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
 - o Gold plated contacts: Minimum current = 10mA
- **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.

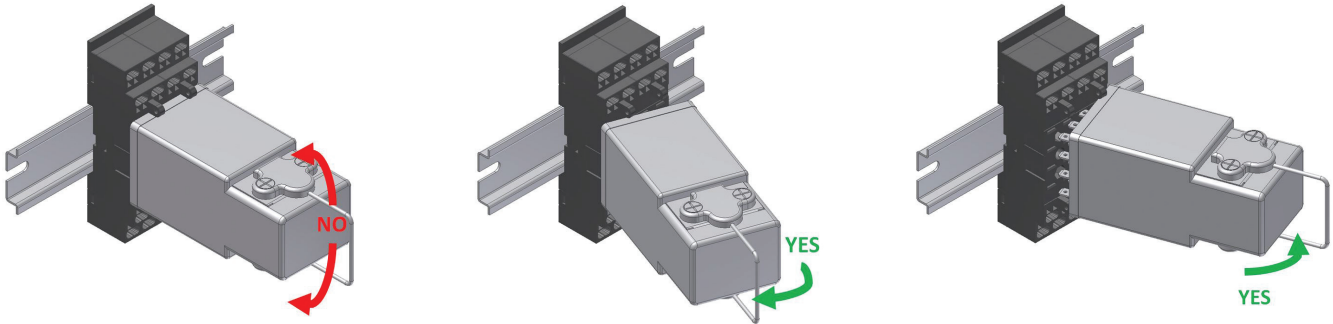
The possible formation of condensation inside the relay, when it is powered and the external ambient temperature is cold, is a normal phenomenon that has no effect on the electrical safety of the relay. In case of polluted or saline atmosphere, any condensation deposits on the contacts can degrade their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

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 -25 and +85°C with max 75% RH. In any case, there must be no condensation. Before use, please read carefully “OPERATION” section.