

Contacts

There are different contact types. The main distinction is between single contacts and twin contacts. While single contacts are more suitable for higher loads, twin contacts are significantly more reliable at small loads, i.e. < 24 V, < 100 mA.

Contact Material

There is no all-purpose contact! AgNi is used as standard material for a wide range of applications. AgNi contacts with hard gold plating (up to 10 µm) are offered for applications in aggressive atmosphere. Relays with gold contacts are approved for relatively high currents (e.g. 6 A, 250 V), but in practice values of 200 mA, 30 V should not be exceeded for operation with intact gold plating. Relays with a tungsten pre-contact are available for very high switch-on currents (up to 500 A, 2.5 ms). For some applications AgNi contacts with gold flashing (0.2 µm) are available. The purpose is corrosion protection during storage. There is no other purpose.

Minimum load

The minimum load value is a recommended value under normal conditions such as regular switching, no special ambient conditions, etc. Under these conditions reliable switching behaviour can be expected.

Contact resistance

In practice the contact resistance may vary depending on the load and other conditions. For higher currents the contact resistance is around 10 mΩ. For very small loads resistances of more than 1 Ω may occur.

Contact spacing

Normally all contacts have an air gap between 0,5 ... 1,5 mm when they are open. They are referred to as µ contacts. According to the Low-Voltage Directive and the associated standards these contacts are not suitable for safe disconnection. For switching of DC loads large contact clearances are beneficial for quenching the arc. See special relays: series connections.

Switching capacity

The contact switching capacity is the product of switching voltage and switching current. For AC the permitted switching capacity is generally high enough to handle the max. continuous AC1 current over the whole voltage range. For DC the load limit curve must never be exceeded, because this would lead to a remaining switch-off arc and immediate destruction of the relay. The order of magnitude of the DC switching capacity is a few 100 W (DC 1).

Drive (coil)

The drive of a relay refers to the coil plus connections. The coil has special characteristics, depending on the rated voltage and the type of current.

Coil design

The coil consists of a plastic former (resistant up to about 130 °C) and doubly insulated high-purity copper wire, temperature class F. The winding must withstand threshold voltages (EN 61000-4-5) of more than 2000 V. This is ensured through forced separation of the start and end of the winding

Coil resistance and other properties

Each coil has an ohmic coil resistance that can be verified with an ohmmeter. The specified coil resistance applies to a temperature of 20 °C. The tolerance is ± 10 %. For AC operation the coil current will not match the ohmic value, because self-inductance plays a dominant role. At 230 V this may reach more than 90 H. When a relay is switched off, self-inductance results in a self-induced voltage that may affect the switching source (destruction of transistors, EMC problems).

Drive voltages

A distinction is made between the standardised voltages according to EN 60947 as guaranteed values, and typical values that can be expected with a high degree of probability.

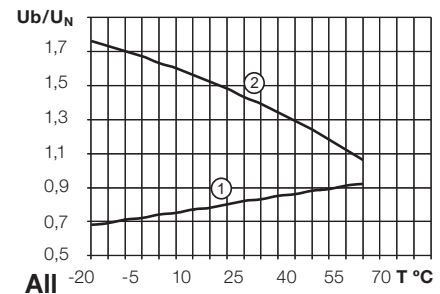
Pick-up voltage, Release voltage

The pick-up voltage is the voltage at which the relay engages safely. For DC the typical trip voltage is approx. 65% of U_{nom}, for AC approx. 75%. The release voltage, on the other hand, is approx. 25% or 60% respectively. For DC these voltages are strongly temperature-dependent, according to the temperature coefficient of Cu. This is not the case for AC, where the inductive resistance is the controlling factor, which is practically constant over a wide temperature range. With AC, in a certain undervoltage range the relay may hum, and the armature may flutter. This voltage range must be avoided.

Operating voltage range

Unless specified otherwise, the following characteristic curve applies for the operating voltage range. The upper limit of the coil voltage is determined by self-heating and the ambient temperature. Self-heating through contacts under high load must not be underestimated. It may be higher than the power dissipation in the drive.

During intermittent operation significantly higher overvoltages temporary may occur for short periods. If in doubt please consult our specialists.



General design

RELECO relays are made from high-quality, carefully selected materials. They comply with the latest environmental regulations such as RohS. Their meticulous design makes them particularly suitable for industrial applications and installation engineering. They are particularly service-friendly through robust terminals, mechanical position indicating device a standard, manual operation, dynamic, permanent characteristics. Colour coding for manual operation as a function of the coil voltage is another useful feature. Further options such as different coil connections, freewheeling diode, LED display, bridge rectifier for AC/DC drives etc., and short-term availability of special versions for practically any drive voltage up to DC 220 V/ AC 400 V leave nothing to be desired. Apart from a few special versions, the standard RELECO industrial relays feature manual operation (push/pull) and a mechanical position indicating device. For safety reasons, manual operation may be replaced with a blanking button, if required.

Coil connections

Different coil connections can be integrated in the relay as an option. For DC a cost-effective freewheeling diode is available. Please note that the stated release times are generally specified without the coil connection. While an additional LED status indicator has practically no effect, a freewheeling diode (D) will lead to an increase in release time by a factor 2 to 5, or 0 ms to 30 ms. For AC VDRs or RC elements may be used. In this case resonance effects may have to be considered. VDRs and common RC elements may increase release times by < 5 ms.

Industrial relays MRC, QRC, IRC

General information

Standards, conformities

While CE marking of relays/bases is controversial, since relays are sometimes regarded as components to which the marking requirement does not apply, all RELECO relays feature the CE mark to indicate that CE standards may also be applied to the relays, e.g. 2 kV surge resistance according to EN 61000-4-5.

A significant and not generally available characteristic is that the coils and in particular the connections are able to withstand the voltage spikes that may occur in practice.

In addition, the relays feature various technical approvals depending on the respective relay code, and they comply with further standards and guidelines. The main technical approvals include cURus, CSA, and CCC.

The associated information is provided in the respective data sheets.

Switching classes

EN 60947 defines different switching classes that specify the suitability of contacts for different load types.

Examples:

AC1 = Ohmic AC load

AC5b = AC incandescent lamp loads

AC15 = Power contactors, solenoid valves, solenoids











DC1 = Ohmic DC load

DC6 = DC incandescent lamps

DC13 = DC contactors, solenoids

UL508 contains different technical approval criteria such as general purpose, control application etc. Switching classes are defined based on the electrical switching capacity, e.g. B600 etc.

Main technical approvals and standards

Country	Technical approval
China	 Authority: CQC Specification GB14048.5-2001 A003850
Denmark	 Authority: DEMKO Specification EN 60 947
Finland	 Authority: SETI Specification EN 60 947
Canada	 Authority: CSA Specification C 22,2; UL 508
Norway	 Authority: SETI Specification EN 60 947
Russia	 Authority: KORPORATSIA STANDART Specification GOST R 50030.5.1
Sweden	 Authority: SEMKO Specification EN 60 947
Switzerland	 Authority: SEV Specification EN 60 947
USA	 Authority: UL Specification C 22,2; UL 508
Shipping	 Authority: GB Lloyd's Register of Shipping

Relay IP40/IP50: not watertight, but protected against ingress of coarse contaminants.

Further information and tips

The main operational criteria for relays such as number of cycles, switching frequency, ambient conditions, reliability requirements, load type, switch-on current, load switch-off energy must be clarified in order to ensure reliable operation and long service life.

Example

If the number of cycles is expected to exceed several 100,000 operations per year (e.g. clock generators, fast running machines), an electronic solution is no doubt more appropriate, although we also offer solutions for this type of application. In AC applications crosstalk caused by long control leads is often problem and can result in constant humming of the relay or even inadvertent triggering due to interference. Here, too, we offer solutions.

Various, apparently harmless loads may lead to very high switch-on currents or switch-off energy values, resulting in an unacceptable reduction in service life. Particularly tricky are DC loads, particularly if they are inductive.

Circuits with relays and their connections often require a level of developer skill that is frequently no longer offered during standard education and training.

Your supplier will be very happy to provide expert advice

Characteristics of various loads:

Heating circuits

No higher switch-on currents, no higher switch-off loads.

Incandescent lamps, halogen lamps

Switch-on currents during a few ms in the range 10 ... 18 x rated. Switch-off at rated load.

Low-energy lamps

Very high, but very short switch-on currents due to built-in decoupling capacitors.

Contacts have a tendency to fuse.

Transformers, AC contactors

Switching on during zero-transition may lead to switch-on currents of 8 ... 15 x rated. High inductive switch-off energy is possible. The load must be connected, not least due to EMC problems.

Utilisation categories according to

EN 60947-4-1/-5-1

Pollution category

Cat. 1

Dry, non-conductive contamination without further effect

Cat. 2

Occasional conductive contamination, short duration due to moisture condensation

Cat. 3

Dry, non-conductive and conductive contamination with moisture condensation

Cat. 4

Contamination with persistent conductivity through conductive dust, rain

Protection class IP according to DIN

40050 and other standards. Industrial relays and their bases can be classified as follows:

Base IP20: Contact safety