

## Coil accessories General Information

### Industrial Relays C2-C9

#### Protection against transients

When the coil is disconnected from an electromagnet, peaks of inverse voltage appear at the terminals which can reach very high values. These pulses can be transmitted down the line associated with the coil and could possibly affect other components. In the case of a relay being operated by such devices as transistors, Triacs, etc; it may be necessary to protect against transients.

#### Transients carried in the line

High voltage surges can be carried in the supply line to the relay coil. These may appear in the form of peaks or bursts and are generated by the connection and disconnection of electric motors, transformers, capacitors etc. Normally a relay is unaffected by these pulses, but if a diode is connected in association with the coil, it must be capable of withstanding an inverse voltage higher than those of the incoming peaks.

#### Protection circuits

A protection circuit must efficiently cope with pulses generated by the coil as well as incoming line surges (surges  $U_{1.2/50\mu s}$ ). ComatReleco Relays are available with integrated protection circuits or with modules plugged into sockets S3-M, S3-M0 or S3-M1.

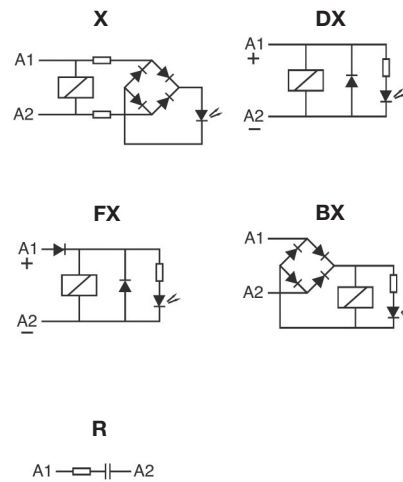
**X** LED indication with rectifier.  
For DC and AC relays up to 250 V  
Note: LED connected, in series with the coil @ 220 V DC in QRC types.

**DX** Free-wheeling diode + LED  
Dampens transients caused by the relay coil on de-energisation.

**FX** Polarity + free wheeling diode + LED  
A diode in series with the coil protects the relay from reverse connection.

**BX** Bridge rectifier + LED indication  
Allows the relay to operate in both AC or DC without any polarity inconvenience. Available only in voltages up to 60 V.

**R** Resistor and capacitor.



### Industrial Relays C10-C18

#### LED and protection circuit connected to coil.

- X** LED with no polarity, (standard)  
Coils  $\leq 12$  V A DC coils  
LED rectifier bridge in parallel
- X** LED with no polarity, (standard)  
Coils  $\geq 24$  V A DC coils  
LED rectifier bridge in series
- FX** LED with polarity **A1+** (option)  
Every DC coil voltage  
Polarity and Free-wheeling diodes
- BX** LED with no polarity, (option)  
Only 24 V and 48 V A DC coils  
Rectifier bridge for AC/DC relays
- R** LED not available (option)  
RC protection against pulses on AC

#### Protection against pulses

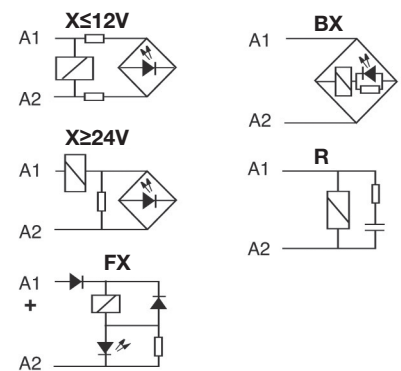
When a relay coil is disconnected, reverse voltage peaks may arise and reach very high values. Said peaks can transmit to the coil associated line and other relays or semiconductors can be affected.

If Triac, transistor, etc. controls a relay, appropriate steps must be taken to avoid or decrease peaks down to a non risky level.

Both Polarity and Free-wheeling diodes (**FX**), must protect coils, to avoid malfunctions provided DC relays in battery are installed.

Making or breaking engines, transformers or contactors in an industrial environmental, may generate high voltage pulses, either isolated or burst, through the main line.

The voltage level of those pulse may be high enough to affect the isolation of the coil.



### 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. < 24V, < 100mA.

### 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 5µm) are offered for applications in aggressive atmosphere. Relays with gold contacts are approved for relatively high currents (e.g. 6A, 250V), but in practice values of 200mA, 30V 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 500A, 2.5ms). For some applications AgNi contacts with gold flashing (0.2µm) are available. The purpose is corrosion protection during storage. Tin oxide is specially appropriated for load with high-inrush current.

### 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

Initial values of resistance of contact can vary with the use, load and others conditions. Typical values when the relay is new is about 50mΩ.

### Contact spacing

Normally all contacts have an air gap between 0.5 ... 1.5mm 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 relays with "Cx-Gyz" naming. "G" stands for extended contact gap of 3mm.

### 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 AC-1 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 100W (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 2000V. This is ensured through forced separation of the start and end of the winding.

### Coil resistance and other properties

Each coil has an ohmic 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 230V this may reach more than 90H. 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.

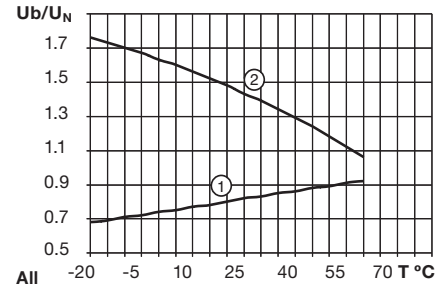
### Pick-up voltage, Release voltage

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

ComatReleco 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, free-wheeling 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 220V / AC 400V leave nothing to be desired. Apart from a few special versions, in general, ComatReleco industrial relays feature manual operation (push/pull) and a mechanical position indicating device. For safety reasons, manual operation may be replaced with a black button, if required.

### Coil connections

Different coil connections can be integrated in the relay as an option.

For DC a cost-effective free-wheeling 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 free-wheeling diode (D) will lead to an increase in release time by a factor 2 to 5, or 10ms to 30ms. 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 less than 5 ms.