Reliable switching of power and signals

Relay modules for various applications

Selection guide for electromechanical relay modules

Weidmüller

Rely on the right one
Electromechanical relay modules from Weidmüller

Introduction
When selecting a relay module, there is a risk of incorrect dimensioning of the loads or signals to be switched. This can lead to malfunction or premature loss of the relay module. This brochure is intended to help you select the appropriate relay for each load or signal you wish to switch.

Selection guide for electromechanical relay modules

Switch to simple – with Klippon® Relay	04
Basics for the correct selection of relay modules	08
Switching of small resistive and inductive loads – Selection table for signal relays	10
Switching of large resistive and inductive loads – Selection table for power relays	12
Additional information on the selection tables – Simple formulas for calculating individual values	14
Select contact materials suitable for your application – Information of various contact material	15
Protect relay contacts effectively – Selection criteria for protective circuits of inductive loads	16
Switching of capacitive loads – Relays for LED lamps and devices with high inrush currents	18
Switching of very low power circuits – Relay for forwarding control signals	20
Online support and downloads	22

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For more than 40 years, we have specialised in the optimisation of cabinet infrastructures. Our wide range of relay modules, solid-state relays and additional value-added services combine the highest standards with ultimate quality. Less wiring effort, housing optimisation through space saving, optimal marking and cost reductions – our customers challenges are our motivation.

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In our universal range, you will find an extensive portfolio of relay modules and solid-state relays in various designs.

In our application range, you will find a tailor-made portfolio of products to increase your productivity and safety for various fields of application.

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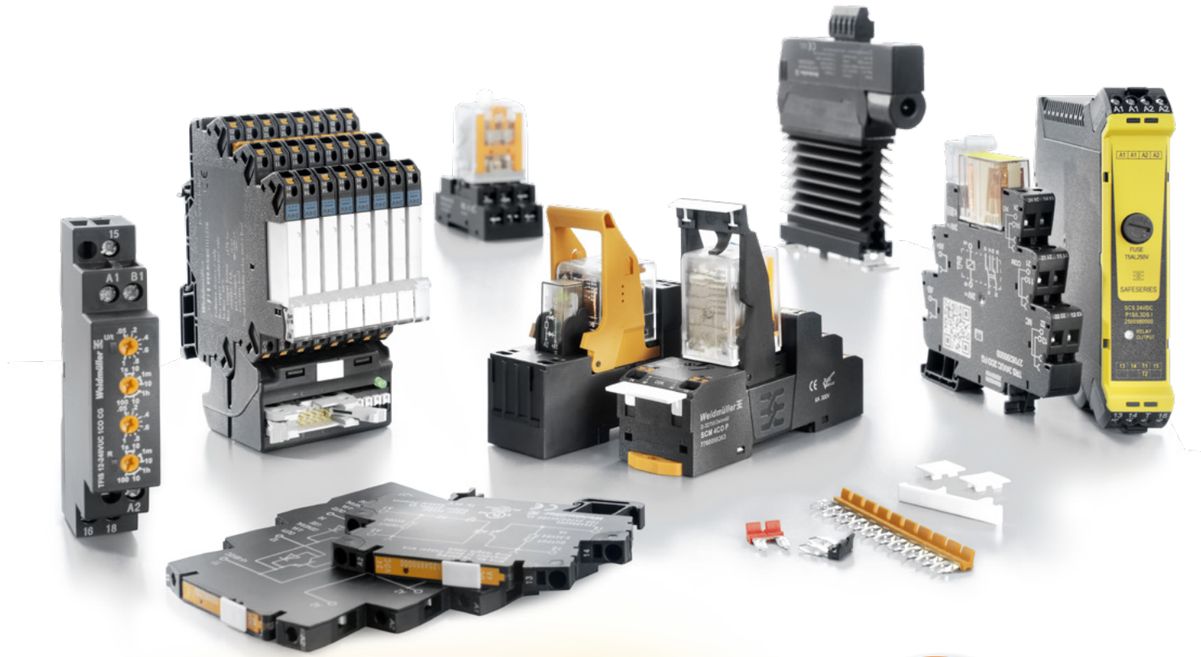
That's our promise!



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Switch to simple – with Klippon® Relay

High-quality relays with unique all-round service

Switch to secure selection – with Klippon® Relay

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However complex your application environment, the wide Klippon® relay portfolio offers robust and efficient relays for every imaginable application. To ensure you find exactly what you need from our large selection, we offer comprehensive support in choosing the right product. We support you in selecting accessories and provide tips for installation and maintenance. This saves a lot of time and ensures you that you always get the optimum product for your specific application. Quick, easy – and without selection errors!

Switch to reliable – with Klippon® Relay

Optimal relay selection for maximum plant availability

Is system availability your top priority? Then with our high quality Klippon® Relay portfolio you are on the safe side. We offer you comprehensive support to ensure you get the optimally dimensioned product for your application. With decades of experience in the relay segment, we choose the optimal products for you and ensure they are available within the shortest possible time. In this way you can reliably avoid unnecessary machine and system damage, minimise downtimes, and ensure system availability.

Switch to efficient – with Klippon® Relay

Innovative relay solutions for fast and easy wiring

Time is money. Especially in switch cabinet production and plant engineering. Relay modules and solid-state relays from the Klippon® relay portfolio can be installed particularly easily, quickly, and conveniently. The innovative PUSH IN technology shortens your wiring times and avoids incorrect wiring due to coloured pushers. Our KITs, consisting of relays with status LED and sockets with-retaining clips, offer you even more convenience. They are supplied fully assembled and functionally tested for time-saving installation and fast commissioning with shorter processing times.

Switch to maintainable – with Klippon® Relay

User-friendly relays for fast and error-free operation

Regardless of the application and environment, maintenance and repairs are unavoidable and must be carried out at regular intervals. With Klippon® Relay you can considerably reduce the required effort. We have focused on many details that make everyday maintenance work faster and easier. These include optimum marking options, clear status LED, consistent product labelling, connection markings, and much more. This makes work easier, faster, more cost-effective, and safer.

Switch to safe – with Klippon® Relay

Fully reliable special relays with comprehensive certification

Many machines and plants are applied worldwide and under the most diverse conditions. Therefore, they have to operate reliably under very different environmental conditions. In addition, they must comply with specific standards and directives. With Klippon® Relay, you have a range of products available to meet these requirements optimally. Whether high temperature ranges, strong vibrations, fast switching cycles, or specific safety requirements: With Klippon® Relay you will always find a suitable solution.

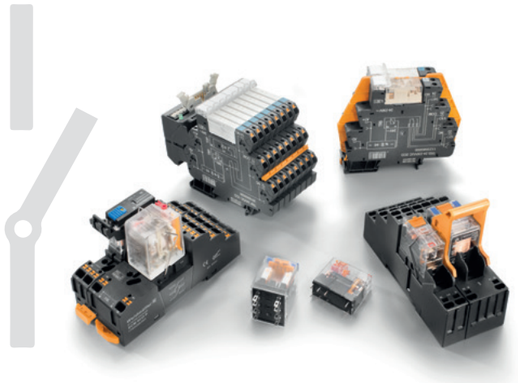
Switch to profitable – with Klippon® Relay

Multifunctional relay solutions for efficient warehousing

Warehousing and logistics play an important role in the assessment of total costs. With Klippon® Relay you can significantly reduce your logistic expenses. For example, we provide many of our products with Multi-voltage inputs, which reduces the width of your stock. In addition, we can supply you with a wide range of convenient relay KITs that are pre-assembled, function and insulation tested. With these KITs you can reduce material numbers and speed up the storage and retrieval process considerably. An important contribution to process optimisation in everyday life.

Find suitable relay modules for your application

Basics for relay module selection



Electromechanical relays are a varied and cost-effective solution for a wide range of switching processes. They can be used for level and power adaptation and form interfaces between control, signalling and regulating equipment and peripherals. In spite of rising raw material prices, they are still very inexpensive and can be easily integrated into a wide variety of circuit types.

Relay modules from Weidmüller are extremely reliable, durable, and available in many different designs. The diversity of their applications in the various industrial sectors makes it necessary to select a suitable relay for each specific application. The following applies: Due to their design, relay modules are subject to mechanical and electrical wear, which must be taken into account when relay circuits are set up.

EN 60947-4-1 and EN 60947-5-1 describe various industrial reference loads such as resistive, capacitive, and inductive loads that stress the switching contact of a relay modules more or less. Electrical loads are formed out of a mixed load with ohmic, capacitive, and inductive load shares, though in practice, loads with a large inductive load share are used mostly. These include contactors, solenoid valves, motors, etc. We will take a closer look at these areas of application in the following.

Switching of large AC loads

If large AC loads are switched, the relay can in principal be operated until the specified maximum value of switching voltage, current, or power is reached. However, when switching AC loads, the switching voltage has a much smaller influence on the service life of the relay contact than the switching current. The reason for this is that the arc that occurs when the relay is switched off usually extinguish automatically at the next zero crossing of the load current. In applications with inductive loads, an effective protective circuit should be provided, as otherwise a significantly reduced service life can be expected.

Switching of large DC loads

Relays can only switch off relatively small direct currents because the zero crossing for extinguishing the arc is missing here. The maximum direct current value is also dependent on the switching voltage as well as on design conditions such as contact gap and contact opening speed. Corresponding current and voltage values are documented in load limit curves.

With undamped inductive DC loads, these values are lower because the energy stored in the inductance can ignite an arc that carries the current through the open contacts. The resulting arc significantly reduces the service life compared to an resistive load.
An effective contact protection circuit can increase the service life of the contacts by 5 to 10 times compared to inductive loads that are not or unfavorably protected.
Type 1N4007 freewheeling diodes are preferably suitable for this purpose.

Switching of utilization categories according to EN 60947

When selecting the relay, the maximum breaking capacity for AC loads and the DC breaking values taken from the load limit curves provide only rough reference values. In practice, however, this is not sufficient because real loads in industrial applications predominantly have inductive or capacitive load shares. Those variables can result in very different values for the service life.

To avoid these disadvantages, the contactor standard EN 60947 divides the loads into different use categories, such as DC-13 or AC-15. The standard is also partly applied to relays. However, users must be aware that these values are only partially suitable for practical use since all DC-13 and AC-15 test loads are highly inductive and operated without a protective circuit.

More precise statements on switching capacity and service life can be given based on specific application data. The more extensive the data collection, the more accurately the service life can be estimated for the respective applications and, if necessary, optimisation suggestions made. For critical applications, the users should determine the service life values themselves.

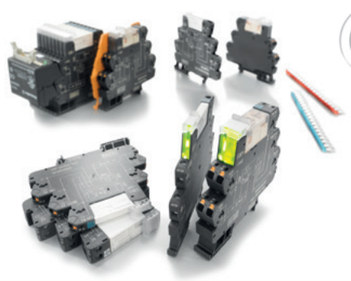
Switching of small resistive and inductive loads

Selection table for signal relays

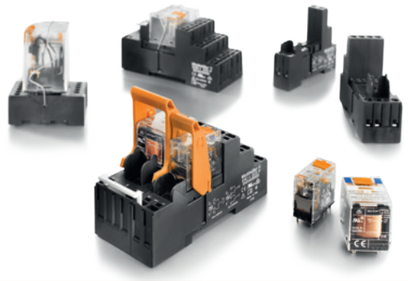
The table below helps you to select suitable relay modules for the specified loads. A service life of around 100,000 switching operations is assumed.

Suitable KITs are available for all series on this page.

TERMSERIES



RIDERSERIES



D-SERIES







		RSS 1 CO	RCL 1 CO	RCL 2 CO	RCI 1 CO	RCI 2 CO	RCM 2 CO	RCM 3 CO	RCM 4 CO	DRI 1 CO	DRI 2 CO	DRM 2 CO	DRM 4 CO
Example Part No. Single relay 24 V DC input		4060120000	1984040000	4058570000	8870250000	8870320000	8689860000	8690040000	8690200000	7760056315	7760056340	7760056069	7760056097
Example Part No. KIT 24 V DC input		2618000000	2618100000	2618400000	8897190000	8897230000	8921080000	8920980000	8921120000	2576210000	2576190000	2576120000	2576140000
Insulation between input and output		reinforced insulation	reinforced insulation	reinforced insulation	reinforced insulation	reinforced insulation	basic insulation	basic insulation	basic insulation	basic insulation	basic insulation	basic insulation	basic insulation
Contact material		AgNi	AgNi	AgNi	AgNi	AgNi	AgNi	AgNi	AgNi	AgSnO	AgSnO	AgNi	AgNi
Resistive AC load	AC1 loads: Heaters 250 V AC	< 5 A	< 12 A	< 6 A	< 12 A	< 6 A	< 12 A	< 10 A	< 6 A	< 10 A	< 5 A	< 10 A	< 5 A
Inductive AC load	AC15 loads: Valves, contactors 250 V AC	< 1,5 A	< 3 A	< 1,5 A	< 3 A	< 1,5 A	< 2,5 A	< 2,5 A	< 1,5 A	< 3 A	< 1,5 A	< 2,5 A	< 1,5 A
	AC3 loads: 1-phase motors 250 V AC	< 0,5 A	< 1 A	< 0,7 A	< 1 A	< 0,7 A	< 1 A	< 0,75 A	< 0,5 A	< 1 A	< 0,5 A	< 1 A	< 0,5 A
Resistive DC load	DC1 loads: Heaters 24 V DC	< 3 A	< 8 A	< 4 A	< 8 A	< 4 A	< 7 A	< 5 A	< 3,5 A	< 8 A	< 4 A	< 7 A	< 3,5 A
Inductive DC load	DC13 loads: Valves, contactors 24 V DC	< 1 A	< 2 A	< 1 A	< 2 A	< 1 A	< 2 A	< 2 A	< 1 A	< 2 A	< 1 A	< 2 A	< 1 A
Recommended field of application		Miniature switching relay for decoupling control systems and for switching industrial small loads < 1.5 A in the smallest space.	Miniature industrial relay for decoupling controls and switching industrial minimum loads < 3 A.	Miniature industrial relay for decoupling controls, amplifying signals, and switching industrial minimum loads < 2 A.	Miniature industrial relay with optional mechanical test button for decoupling controls and switching industrial minimum loads < 3 A.	Miniature industrial relay with optional mechanical test button for decoupling controls, amplifying signals, and switching industrial loads. Minimum loads < 2 A.	Miniature industrial relay with mechanical test button for decoupling controls, amplifying signals, and switching industrial micro loads < 2.5 A.	Miniature industrial relay with mechanical test button for decoupling controls, amplifying signals, and switching industrial micro loads < 2.5 A.	Miniature industrial relay with mechanical test button for decoupling controls, duplicating signals, and switching industrial micro loads < 1.5 A.	Miniature industrial relay with optional mechanical test button for decoupling controls and switching industrial minimum loads < 3.5 A.	Miniature industrial relay with optional mechanical test button for decoupling controls, amplifying signals, and switching industrial minimum loads < 2.5 A.	Miniature industrial relay with optional mechanical test button for decoupling controls, amplifying signals, and switching industrial loads. Minimum loads < 3 A.	Miniature industrial relay with optional mechanical test button for decoupling controls, duplicating signals, and switching industrial loads. Minimum loads < 2 A.

The indicated currents only apply to the normally open contact. The data of the normally closed contact are to be set at approx. one third of the specified values. The real service life can be both above and below the specified value because each load stresses the switching contact differently and other environmental factors influence the service life of the switching contact, e.g. ambient temperature, mounting position, switching frequency, and many more. Therefore, these values are without guarantee and serve as orientation for better dimensioning. The assessment of the maximum load capacity was carried out on the basis of many years of practical experience as well as life cycle tests under laboratory conditions.

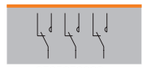
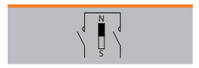
Switching of large resistive and inductive loads

Selection table for power relays

The table below helps you to select suitable relay modules for the specified loads. A service life of around 100,000 switching operations is assumed.

D-SERIES

POWER

		DRR 2 CO	DRR 3 CO	DRL 1 CO	DRL 2 CO	DRL 3 CO	DRL 4 CO	DRW 2 CO	DRW 3 CO	DRH 1 NO	DRH 2 NO	PWR 1 NO	PWR 2 NO
													
Example Part no. Single relay		2765020000	2765070000	2765110000	2765160000	2765220000	2765270000	2765600000	2765650000	1219850000	1220150000	1219480000	1219550000
Example Art. no. KIT 24 V DC input		-	-	-	-	-	-	-	-	-	-	-	-
Insulation between input and output		Basic insulation	Functional insulation	Basic insulation	Basic insulation	Basic insulation	Basic insulation	Basic insulation	Basic insulation	Basic insulation	Basic insulation	Basic insulation	Basic insulation
Contact material		AgSnO	AgSnO	AgSnO	AgSnO	AgSnO	AgSnO	AgSnO	AgSnO	AgSnO	AgSnO	AgSnO	AgSnO
Resistive AC load	AC1 loads: Heaters 250 V AC	< 10 A	< 10 A	< 16 A	< 10 A	< 10 A	< 10 A	< 16 A @ 250 V < 10 A @ 400 V	< 16 A @ 250 V < 10 A @ 400 V	< 16 A @ 400 V	< 16 A @ 250 V	< 30 A	< 25 A
Inductive AC load	AC15 loads: Valves, contactors 250 V	< 3,5 A	< 3,5 A	< 5,5 A	< 4,5 A	< 4,5 A	< 4,5 A	< 5,5 A	< 5 A	< 7 A	< 6 A	< 12 A	< 8,5 A
	AC3 loads: 1-phase motors 250 V AC	< 1,5 A	< 1,5 A	< 3,5 A	< 2 A	< 2 A	< 2 A	< 3,5 A	< 3 A 1-phasig < 3 A 3-phasig	< 4 A	< 3,5 A	< 8 A	< 6 A
Resistive DC load	DC1 loads: Heaters	< 10 A	< 10 A	< 10 A	< 7 A	< 7 A	< 7 A	< 16 A	< 16 A	< 16 A @ 24 V DC < 12 A @ 125 V DC < 10 A @ 220 V DC	< 16 A @ 24 V DC < 7 A @ 125 V DC < 3 A @ 220 V DC	< 25 A	< 20 A
Inductive DC load	DC13 loads: Valves, contactors 24 V DC	< 2,5 A	< 2,5 A	< 4 A	< 3,5 A	< 3,5 A	< 3,5 A	< 4 A	< 3,5 A	< 12 A @ 24 V DC < 5 A @ 125 V DC < 3 A @ 220 V DC	< 9 A @ 24 V DC < 2 A @ 125 V DC < 1 A @ 220 V DC	< 7 A	< 6 A
Recommended field of application		Power relay (with octal relay) for switching several industrial loads < 3.5 A.	Power relay (with octal relay) for switching several industrial loads < 3.5 A.	Miniature power relay for switching industrial loads < 5.5 A.	Miniature power relay for switching several industrial loads < 4.5 A.	Miniature power relay for switching several industrial loads < 4.5 A.	Miniature power relay for switching several industrial loads < 4.5 A.	Power relay with mechanical test button for switching multiple industrial loads < 5.5 A.	Power relay with mechanical test button for switching industrial loads < 5 A or a 3-phase electric motor < 3 A.	Power relay with blow out magnet and mechanical test button specially designed for switching industrial loads with high DC voltage up to 220 V DC 3 A.	Power relay with blow out magnet and mechanical test button especially for switching industrial loads with high DC voltage up to 220 V DC 1 A.	Power relay (miniature contactor) with double contact opening for switching industrial loads < 12 A.	Power relay (miniature contactor) with double contact opening for switching industrial loads < 8.5 A.

The indicated currents only apply to the normally open contact. The data of the normally closed contact are to be set at approx. one third of the specified values. The real service life can be both above and below the specified value because each load stresses the switching contact differently and other environmental factors influence the service life of the switching contact, e.g. ambient temperature, mounting position, switching frequency, and many more. Therefore, these values are without guarantee and serve as orientation for better dimensioning. The assessment of the maximum load capacity was carried out on the basis of many years of practical experience as well as life cycle tests under laboratory conditions.

Additional information on the selection tables

Simple formulas for calculating individual values

Calculating the service life of the relay contacts for different switching currents

In the previous tables we gave you the maximum recommended currents at various loads for a service life of approx. 100,000 switching cycles. If you switch lower currents, the service life of the relay contacts will be extended. With the following formulas you can approximately calculate how the service life of the relay contacts will change.

Example: A 24 V DC solenoid valve with 200 mA current consumption should be switched with a 6.4 mm wide TERMSERIES RSS 1 CO relay. A solenoid valve corresponds to a DC13 load. According to the table, a switching current of max. 1 A is specified for the relay at this load. To calculate the expected service life, proceed as follows:

$$x = \frac{I_{Table}}{I_{App}} = \frac{1\,A}{200\,mA} = 5$$

$$n_{new} = 100{,}000 \bullet x = 100{,}000 \bullet 5 = 500{,}000 \text{ switching cycles}$$

The expected service life when switching a 200 mA solenoid valve should be approx. 500,000 switching cycles.

I_{App}	= Switching current in the application
I_{DC}	= DC Switching current at the DC switching voltage in the application
$I_{Load\ curve}$	= DC Switching current from the load limit curve of the data sheet
I_{Nom}	= Continuous current from relay data sheet
I_{Table}	= Switching current from the selection table for the respective load
n_{new}	= Service life at switching current in the application
x	= Reduction factor of the switching current

Calculating the switching currents for voltages that deviate from the values in the table

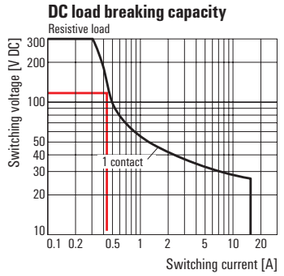
AC switching voltage:
With AC loads, the switching current has the greatest influence on the service life. Therefore, the switching currents from the table can also be used for switching voltages up to 100 V AC. For values below 100 V AC, the service life increases at the same switching current:

- at 24 V AC four times the service life
- at 60 V AC twice the service life

Example: If the table shows a switching current of 2 A for a 250 V AC AC15 load, then these 2 A are also applicable for 120 V AC. At 24 V AC switching voltage, the expected service life increases four times to 400,000 switching cycles.

DC switching voltage:
When switching DC loads, the switched voltage has a large influence on the maximum switching current of the relay contact. This can also be seen from the DC load breaking curve given in the data sheet. The following formulas can be used to roughly determine the maximal switching current for other DC switching voltages:

Example: A TERMSERIES RCL 1 CO relay with a DC13 load and a switching voltage of 110 V DC. According to the table a maximum of 2 A at 24 V DC applies to a DC-13 load for a service life of 100,000 switching cycles.



The curve shows a maximum switching current of approx. 0.45 A with resistive load. This must now be set in relation to the rated current of the relay (16 A) from the data sheet and the value for a DC13 load from the table.

$$x = \frac{I_{Table}}{I_{Nom}} = \frac{2\,A}{16\,A} = 0{,}125$$

$$I_{DC} = I_{Load\ curve} \bullet x = 0{,}45\,A \bullet 0{,}125 = 0{,}056\,A = 56\,mA$$

To achieve 100,000 switching cycles, a DC13 load of 56 mA can be switched with a switching voltage of 110 V DC.

Select contact materials suitable for the application

Information of various contact materials

Relay modules are used in a wide variety of industrial areas and environments. The relays must therefore be adapted to the various tasks by selecting suitable contact materials. The following applies: the load capacity of the contacts for voltage, current, and power depends essentially on the material used. To make the selection easier for you, we have compared the most important characteristics of the contact materials.

Criteria for the selection of the contact material:

- Welding tendency
- Burn-off resistance
- Contact resistance
- Material migration
- Resistance to harmful gas atmospheres

Please obtain information when selecting a relay in this table:

Material	Characteristics	Recommended applications
AgNi Silver-nickel	• Higher welding tendency than AgSnO and AgCdO • High burn-off resistance • Lower contact resistance than AgSnO and AgCdO • Mean material migration • Low resistance to harmful gas atmospheres	• Suitable for low to high resistive and low inductive loads (solenoid valves, fans, heaters) • Standard contact material for a variety of relays • Limited suitable for high inrush currents • Suitable for loads > 12 V/10 mA or 5 V/100 mA
AgNi 0,15 Au Silver-nickel flash gold plated	• Higher welding tendency than AgSnO and AgCdO • High burn-off resistance (gold just storage protection) • Lower contact resistance than AgSnO and AgCdO • Mean material migration • Low resistance to harmful gas atmospheres	• Suitable for low to high resistive and low inductive loads (solenoid valves, fans, heaters) • The flash gold plating is a storage protection, but offers no functional improvement to AgNi • Limited suitable for high inrush currents • Suitable for loads > 12 V/10 mA or 5 V/100 mA
AgNi Au Silver-nickel hard gold plated	• Very low resistance to burn-off • Lowest contact resistance • High resistance to harmful gas atmospheres	• Suitable for decoupling control inputs and other small resistive loads • Suitable for loads > 1 V/1 mA and < 30 V/10 mA • After switching loads > 30 V/100 mA, small powers can no longer be switched reliably because the hard gold plating has been burned-off. Only the characteristics of the base contact material AgNi still apply.
AgSnO Silver-Tin-Oxide	• Lower welding tendency than AgNi und AgCdO • High resistance to burn-off • Average contact resistance • Lower material migration than AgNi and AgCdO • Very low resistance to harmful gas atmospheresn	• Suitable for medium to high resistive DC-loads and low up to medium inductive DC loads due to low material migration. Thanks to the low tendency to weld, it is also well suited for loads with higher inrush currents such as lamp loads, light capacitive loads, fluorescent tubes, etc. • Suitable for loads > 12 V/100 mA
AgCdO Silver-Cadmium-Oxide	• Lower welding tendency than AgNi • High resistance to burn-off • Average contact resistance • Lower material migration than AgNi • Very low resistance to harmful gas atmospheres	• Suitable for medium to high resistive and inductive AC loads, due to high burn-off resistance • Suitable for loads > 12 V/100 mA
W Tungsten	• Lowest welding tendency • Very high resistance to burn-off • Highest contact resistance • Low material migration	• Suitable for loads with very high inrush currents of up to 165 A/20 ms or 800 A/200 µs (e.g. lamp loads, capacitive loads, fluorescent tubes, switched-mode power supplies etc.) • Often used as a pre-making contact in parallel to AgSnO contacts

Cadmium
Gold
Nickel
Silver
Tungsten
Tin

Protect relay contacts effectively

Selection criteria for protective circuits of inductive loads

In our selection tables we specified the maximum recommended switching currents for inductive loads without protective circuits. If you want to increase the service life of the contacts, you must equip the relay contacts with an effective protective circuit.

The protective circuit on the coil side of a relay module can, for example, be implemented with an integrated or additionally pluggable freewheeling diode. However, this only protects the controlling periphery from the voltage peaks that occur in the coil of the relay module. The relay contact is usually not sufficiently protected against the voltage peaks of the inductive load to be switched, although with optimum dimensioning almost the same values for switching capacity or switching cycles can be achieved as with resistive load.

The largest reduction factor for the service life of a relay contact is the arc generated during switching off inductive loads. It is caused during the switching process by the energy stored in the coil and can destroy the contact through material evaporation and material migration.

With DC voltage and standing arc, the relay can even fail during the first switching cycle. Voltage peaks caused by electric arcs can reach values up to several 1,000 volts.

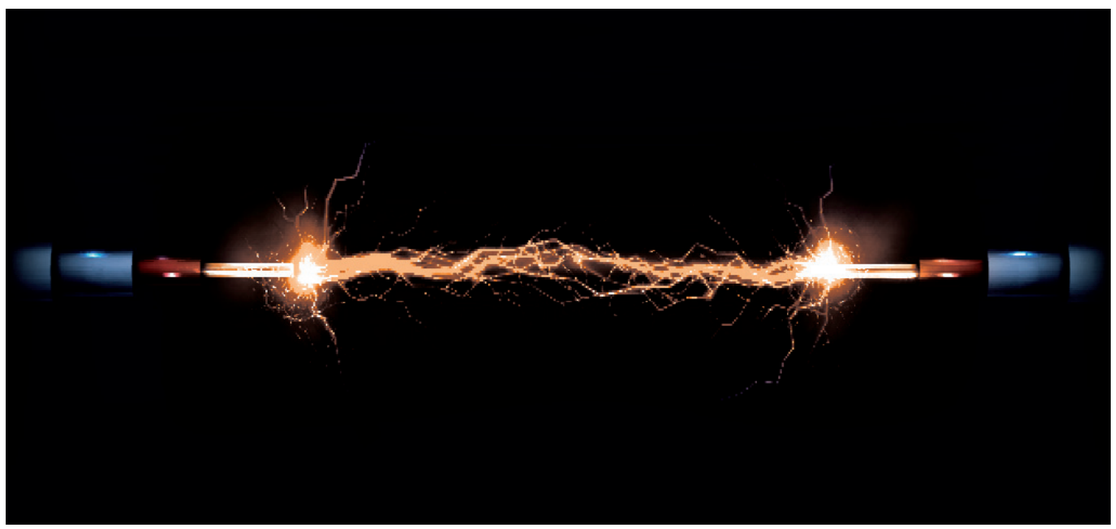
A protective circuits must be used to suppress the formation of electric arcs.

In the following, we will explain the correct installation of the protective circuit and the effectiveness of the most common types of protective circuit. There are various ways to install an effective protective circuits. For example, the protective circuit can be mounted either parallel to the relay contact or parallel to the load.

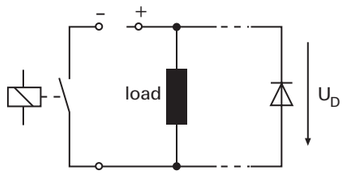
However, the protective measure should always apply directly to the source of the fault. Therefore, the protective circuit of the load is preferable to the circuit of the contact.

Advantages of a protective circuit at the load:

- When the contact is open, the load is still galvanically isolated from the operating voltage
- The switch-off peaks of the load cannot be coupled into the control lines running in parallel



Free-wheeling diodes

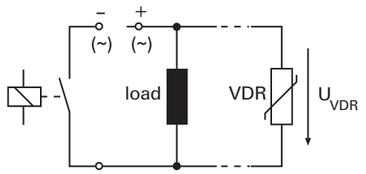


Free-wheeling diodes are used to protect against overvoltages caused by self-induction when an inductive DC voltage load is switched off (e.g. solenoid valves or electric motors). They ensure that the voltage peaks that occur are reduced to the value of the diode forward voltage (U_D). However, this leads to a delay in the voltage drop and thus in the switch-off process of the load.

Advantage:
- Uncritical dimensioning
- Very positive effect on the service life of the contacts

Disadvantage:
- Significantly extended switch off process
- Only suitable for DC voltage

Varistors

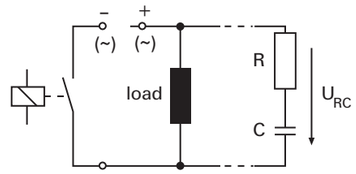


The functional principle of varistors is also based on breakdown voltages (U_{VDR}). High energies can be dissipated, but this causes the component to aging. Therefore, the breakdown voltage is reduced over time and the leakage current is increased.

Advantage:
- Uncritical dimensioning
- Suitable for DC and AC voltage
- Slightly extended switch off process

Disadvantage:
- Complex and expensive with increasing power
- Low effect on the service life of the contact

RC modules



With RC modules, voltage peaks are compensated via a capacitor. Thanks to its special characteristics during charging and discharging the interference pulses are already filtered out during the voltage rise and not only when the breakdown voltage (U_{RC}) is reached.

Advantage:
- Suitable for DC and AC voltage
- Slightly extended switch off process

Disadvantage:
- Exact dimensioning required
- High inrush current
- Low effect on the service life of the contact

In order to implement a protective circuit tailored to the load, suitably dimensioned protective circuits are available as accessories from many manufacturers of inductive loads such as contactors or solenoid valves. This enables simple integration of the protective circuit on the load.

Switching of capacitive loads

Relays for LED lamps and devices with high inrush currents

Loads with capacitive load shares, especially LED lamps, place extreme demands on the switching contacts, regardless of the voltage type. They produce extremely high-energy current peaks at the moment of switching on. These can reach over 100 A and weld the contact.

Today, many loads with capacitive load shares are hidden in pre-circuits, which previously were typical inductive loads in the past, e.g. solenoid valves and contactors. Due to these pre-circuits, the operation is often possible over a wide range of input voltage.

One example are solenoid valves that can be operated with a voltage of 110 V to 230 V AC/DC. The pre-circuits can also conceal capacitors that are switched on not damped and thus generate very high inrush current peaks of up to 150 A. These current peaks also lead to welding of the contacts.

For loads with wide-range input, the inductive load share is usually unproblematic, as it is eliminated by a suitable protective circuit in the wide-range input.

The electromechanical relays listed below are ideally suited for very high inrush currents of up to 800 A for 200 µs. In addition to the robust AgSnO contact, some of them have a particularly welding resistant tungsten contact.

It closes ahead of the AgSnO contact and takes over the inrush current. The AgSnO contact then closes to bridge the tungsten contact. This is necessary to reduce the power dissipation, because tungsten has a much worse conductance than AgSnO.

TERMSERIES

Special relay modules with tungsten contact for very high inrush currents of up to 800 A for 200 µs

Single relay, 12.8 mm wide	Order No.
RCLS3T024W	8866920000
Complete module/KIT, 12.8 mm wide	
TRP 24VDC 1NO HCP	2617930000
TRS 24VDC 1NO HCP	1479810000

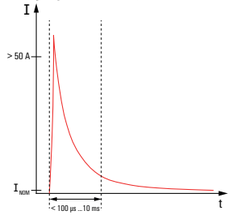
Special relay modules without tungsten contact for high inrush currents of up to 80 A for 20 ms

Single relay, 12.8 mm wide	Order No.
RCLS3L024W	1984080000
Complete module/KIT, 12.8 mm wide	
TRS 24-230VUC 1NO HC	1479790000
TRS 24VDC 1NO HC	1479780000
TRZ 24-230VUC 1NO HC	1479950000
TRZ 24VDC 1NO HC	1479940000

The semiconductor relays listed below are particularly suitable for short and high inrush current peaks of less than 10 ms. As they do not contain mechanical components due to their design, their outputs cannot be welded.

At the same time, they are insensitive to short-term high inrush currents, which makes them ideal for switching loads with short-term high inrush current peaks, e.g. LED lamps or devices with wide-range input.

Exemplary inrush current curve



TERMSERIES

Solid state relays for short and high inrush currents (<10 ms) e.g. of LED lamps or devices with wide range inputs

Pluggable solid-state module DC output, 12 mm wide	Order No.
SSR 10-32VDC/0-35VDC 5A	1421450000
SSR 24VDC/0-24VDC 3,5A	1132310000
Pluggable solid-state module DC output, 5 mm wide	
SSS Relais 24V/24V 2Adc	4061190000
Complete module/KIT, 12.8 mm wide	
TOP 24VDC 24VDC5A	2618840000
TOS 24VDC 24VDC5A	1990960000
TOP 24VDC 24VDC3.5A	2618700000
TOS 24VDC 24VDC3,5A	1127630000
Complete module/KIT, 6.4 mm wide	
TOP 24VDC 24VDC2A	2618720000
TOS 24VDC 24VDC2A	1127170000
Pluggable solid-state module, AC output, 5 mm wide	
SSS Relais 24V/230V 1Aac	4061210000
Complete module/KIT, 6.4 mm wide	
TOP 24VDC 230VAC1A	2618420000
TOS 24VDC 230VAC1A	1127410000

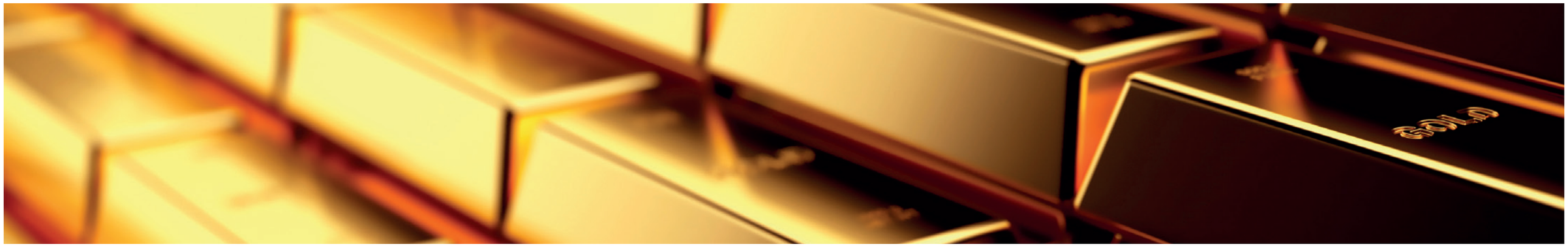
MICROOPTO

Solid state relays for short and high inrush currents (<10 ms) e.g. of LED lamps or devices with wide range inputs

Complete module, 6.1 mm wide	Order No.
MOS 24VDC/8-30VDC 2A	8937970000
MOS 24VDC/8-30VDC 2A E	1283230000

Switching of very low power circuits

Relay for forwarding control signals



Low power circuits with values below 30 V/10 mA are mainly used in applications where signals has to be transmitted to control inputs, e.g. to a PLC. Such low loads do not produce a sufficient arc at the contacts.

However, this arc has two important functions:
On the one hand, it ensures continuous cleaning of the contacts; on the other hand, it can penetrate non-conductive foreign layers at the contacts. Such foreign layers are usually created by oxidation or sulfidation of common contact materials such as silver (Ag), silver-nickel (AgNi), or silver-tin oxide (AgSnO). The foreign layers can increase the contact resistance after a short time to such an extent that reliable switching of low loads is no longer possible.

For these reasons, gold (Au) is used as the contact material for relays switching small loads. It has proven itself due to its low and constant contact resistance and its resistance to ambient air containing sulphur.

TERMSERIES

The all-rounder. Modular relay modules from 6 mm width with extensive accessories, large selection of variants, and unlimited cross-connection possibilities.

Single relay, 5 mm wide	Order No.
RSS112024	4061590000
Complete module/KIT, 6.4 mm wide	
TRP 24VDC 1CO AU	2618110000
TRS 24VDC 1CO AU	1123000000

Single relay, 12.8 mm wide	Order No.
RCL425024	4058580000
Complete module/KIT, 12.8 mm wide	
TRP 24VDC 2CO AU	2618530000
TRS 24VDC 2CO AU	1123730000

RIDERSERIES

High-quality universal relays with sophisticated details and international approvals in various designs for a wide range of industrial applications.

Single relay, 22.5 mm wide	Order No.
RCM580024	8694460000

D-SERIES

Industrial relay modules with innovative features and a large selection of variants for various applications.

Single relay, 21 mm wide	Order No.
DRM270024LT Au	7760056185
DRM570024LT Au	7760056189

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