

DELCON



Interface relays

10 years
warranty

Introduction

Delcon was founded in 1975 as a specialist manufacturer of solid state interface relays. Our relay design utilizes pulse transformer technology which gives unique advantages over traditional opto coupler based solid state relays and electro mechanical relays. This helps ensure a long lifetime and trouble free performance in harsh industrial applications where difficult loads, noise and interference can cause big problems.

Delcon has distributors in more than 20 countries. The largest customer segments are the energy industry, cargo handling at ports, as well as the pulp and paper industry. Delcon's customers include a number of companies that are the market leaders in their own fields.

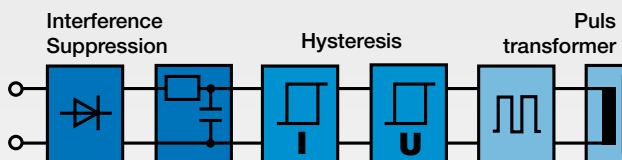


Problems with interference

- Power cables installed adjacent to signal cables, especially over long cable runs, create a capacitive effect that can cause opto coupler/electro mechanical relays to switch on or remain on after the control signal switches off
- Transients in the power supply causes damage to relay coils/ opto coupler relays
- Interference from frequency inverters can provide false on/off switching

Solution

Delcon relays have built in capacitive suppression to allow safe, reliable operation even with very long cable runs. An RC circuit protects the relays from transients and high frequency interference.

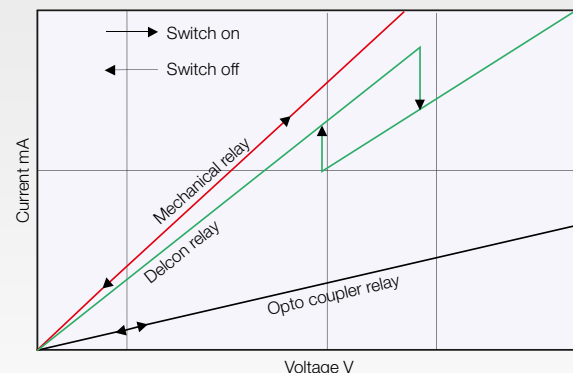


Problems with signaling

- Electrical disturbances can cause the LED indicator of the opto coupler / electromechanical relays to glow when the relay is switched off and no input signal present. This makes it difficult to quickly diagnose faults and rectify problems

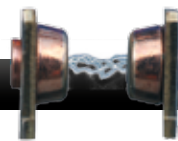
Solution

The Delcon LED is synchronized with the output so it is impossible for it to glow without being on. The relays have good hysteresis with clearly defined on / off points for reliable operation in high noise environments.





Problems with inductive loads



- Contactors and solenoid valves are commonly used throughout the industry, they are also problematic inductive loads for electromechanical relays to handle
- Contacts weld
- Short lifetime

Solution

Delcon AC output relays are rated at 3A and can switch inductive loads without any derating. Delcon DC output relays have no derating up to 24Vdc and thereafter still offer significantly less derating compared to electromechanical relays.

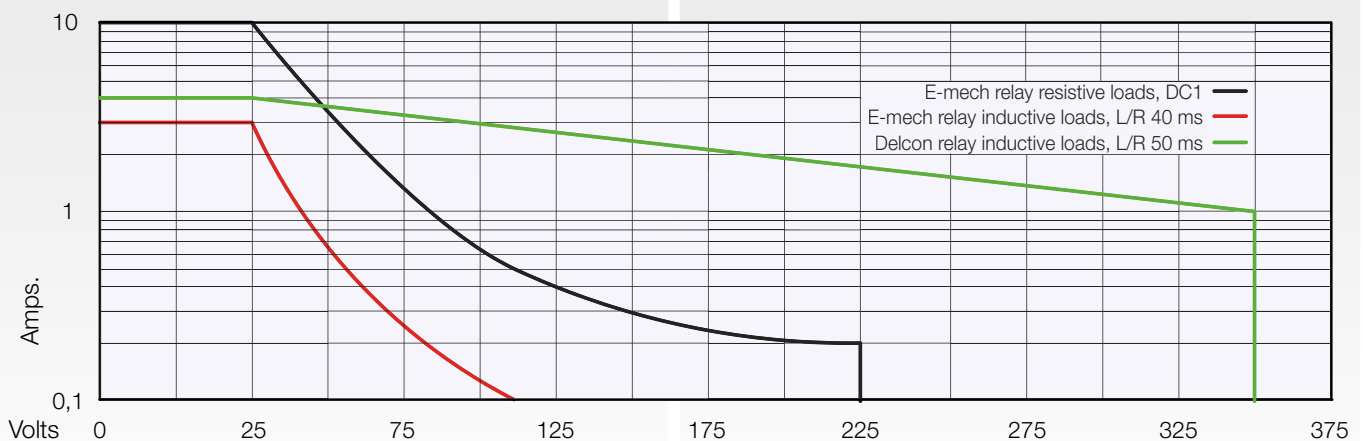
Problems with high dc voltage



- Reduced switching capacity
- Electromechanical relays are significantly derated at higher dc voltages
- Usually require special version electromechanical relays that are physically bigger and take up more space

Solution

Delcon dc output relay types CRA & CRA4 can switch up to 300Vdc with no derating compared to electromechanical relay and in a smaller package. Example SLO24CRA4 switching 40ms inductive load at 3A / 110Vdc will give service life of 15 years or more.



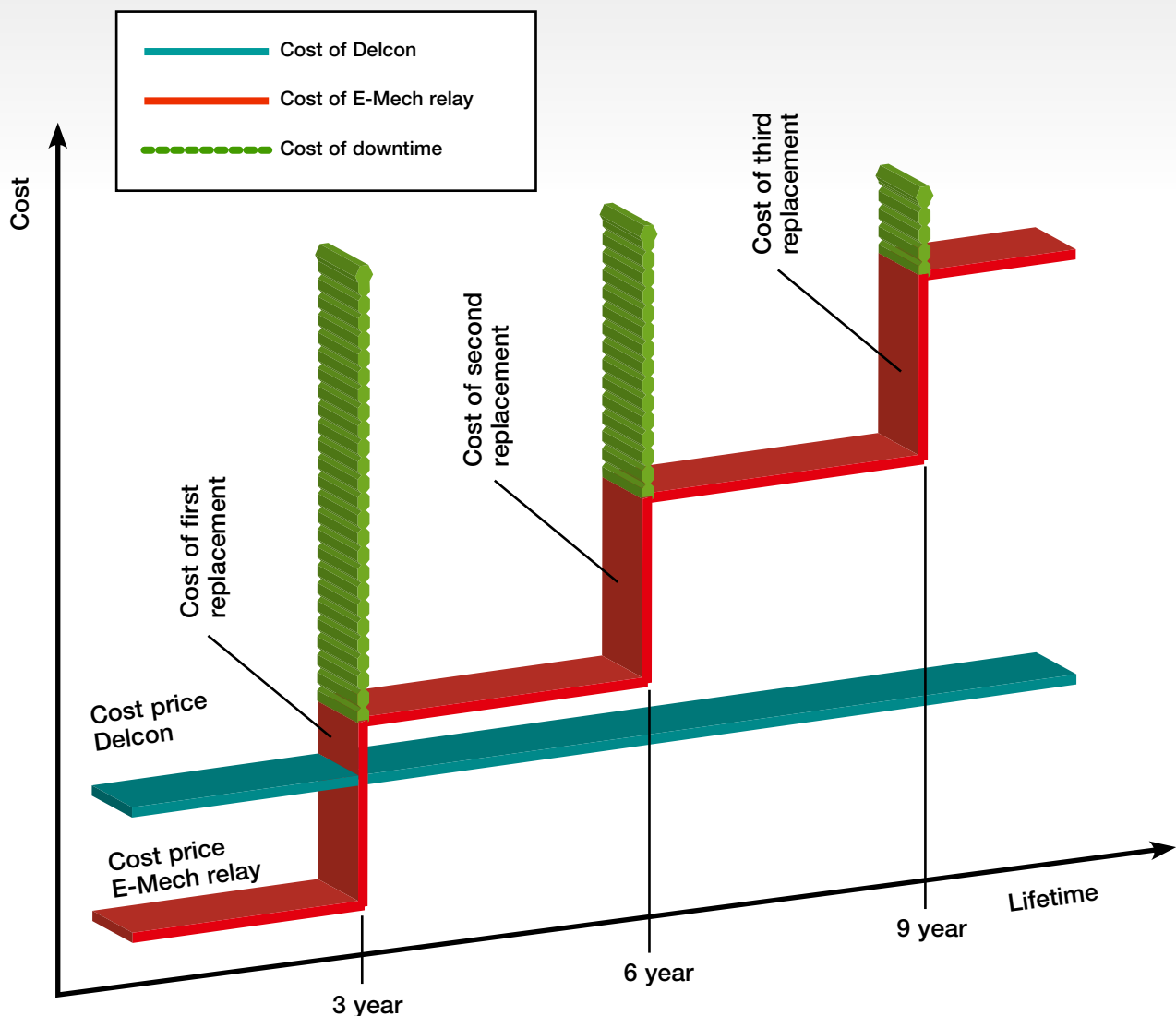
Changing relays is a costly business

Compared to the total system cost, a relay is a relatively inexpensive component. However, a relay that fails in a system runs the risk of becoming the most expensive component. Choosing a relay with a shorter life span than the entire system will probably result in costly unwanted system downtime!

The life span of an industrial system is typically considered to be 15 years.

If your application has any of the following requirements then select Delcon relays for a hassle free and safe operation that spans the entire system life.

- Frequent switching - relays operate at least once per minute
- Inductive loads – fitting clamp diodes can help but increases switch off time
- Inductive loads combined with high switching frequency
- High dc voltages



Choosing Delcon relays for your system will improve your long term profitability. The cost of system downtime differs depending on the type of industry but is usually very expensive. If we consider only the cost of trouble shooting and replacing a faulty relay for the first time then the initial cost of choosing Delcon is already exceeded.

Delcon is the default choice in many Scandinavian paper mills which is a well known, tough industrial environment. These customers choose Delcon for reliable, safe operation and long term cost savings through minimal maintenance and avoiding costly downtime.

Quick guide

SLI-relays for mA size loads: AC-control, DC-load	CR  <ul style="list-style-type: none"> Long signal cables (> 100 m) Parallel signal & load cables Radio frequency noise Transient noise 	CRP  <ul style="list-style-type: none"> 2 wire sensor version for leakage current immunity up to 3.5mA
SLI-relays for mA size loads: DC-control, DC-load	CR  <ul style="list-style-type: none"> Parallel signal & load cables Radio frequency noise Transient noise 	CRP  <ul style="list-style-type: none"> High switching frequency
SLO-relays for A size loads: DC-control, AC-load	TR  <ul style="list-style-type: none"> high switching frequency resistive loads inductive loads 	TRA  <ul style="list-style-type: none"> Motor control
SLO-relays for A size loads: DC-control, DC-load	CR  <ul style="list-style-type: none"> high switching frequency resistive loads 	CRA & CRA4  <ul style="list-style-type: none"> inductive loads high DC-loads
SLO-relays for A size loads: AC-control, AC-load	IRA  <ul style="list-style-type: none"> all AC- and DC-loads high switching 0,5 ms off-delay 	
Accessories		 <ul style="list-style-type: none"> Sockets 16 channel base PLC adapter Cables

For more information please call or visit our website www.delcon.fi



SLI-relays for mA size loads: AC-control, DC-load

- Galvanic isolation 4 kV, 8 mm creep distance
- Effective interference elimination
- Compatible with NPN/PNP logic
- LED indication



General description

The relays are used as an interface between AC sensors and control systems. The integrated interference protection provides reliable operation even in very demanding electrical environments. Thanks to interference protection, signal cables can be run alongside power cables on, for example, cable racks for more than

1.5 km without capacitive cross-talk affecting relays. The relays have no mechanical parts, which provides very reliable application. The CRP models are especially designed for connecting to 2-wire sensors that generate leakage current. The CRP relays are blind to leakage currents up to 3.5 mA.

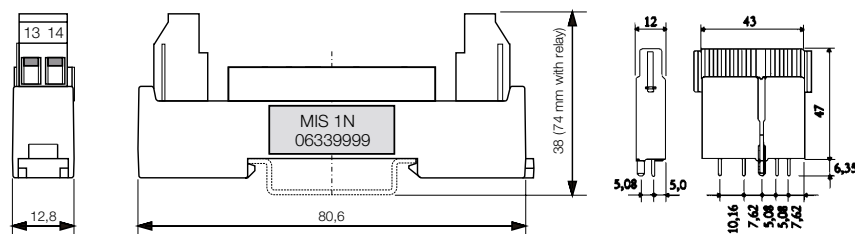
Technical data

(Values at +25 °C)

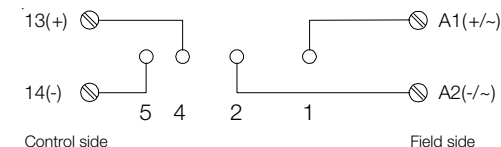
PRIMARY CIRCUIT		SLI25CR	SLI120CR	SLI120CRP	SLI230CR	SLI230CRP	SLI380CRS*
Input voltage	nom.	24 V AC	120 V AC	120 V AC	230 V AC	230 V AC	400 V AC
Input voltage	max.	32 V AC	140 V AC	140 V AC	265 V AC	265 V AC	440 V AC
Power consumption	max.	15 mA	7 mA	8 mA	6 mA	7.5 mA	5 mA
Input impedance	typical	2 kΩ	20 kΩ	17 kΩ	45 kΩ	35 kΩ	80 kΩ
Activation voltage	typical	16 V AC	80 V AC	80 V AC	170 V AC	170 V AC	320 V AC
Drop-out voltage	typical	14 V AC	60 V AC	60 V AC	110 V AC	140 V AC	220 V AC
Drop-out current	typical			3.5 mA		3.5 mA	
SECONDARY CIRCUIT							
Load voltage	max.	0-60 V DC	0-60 V DC	0-60 V DC	0-60 V DC	0-60 V DC	0-60 V DC
Voltage drop at max. load	typical	0.2 V DC	0.2 V DC	0.2 V DC	0.2 V DC	0.2 V DC	0.2 V DC
Load current	max.	50 mA	50 mA	50 mA	50 mA	50 mA	50 mA
Activation time	typical	20 ms	50 ms	20 ms	50 ms	40 ms	50 ms
Drop-out time	typical	60 ms	50 ms	40 ms	50 ms	40 ms	50 ms
Operating temperature		See table below					

*The socket is securely fitted to the relay.

Dimensions



Connections



AC input module

Ambient temperature is defined as the temperature in direct proximity to the relays. The surface temperature of the relay (measured at the

middle of the relay's top surface) must be kept under 70-75 °C for a long lifetime. Each 10 °C increase halves the lifetime of the relay.

Ambient temperature	Applies to	Limitations
-25 °C to +40 °C	All input relays	None
+40 °C to +55 °C	120 V AC and 230 V AC relays	Only every other module should be constantly activated when the relays are mounted beside one another.
+55 °C to +70 °C	Relays with voltages from 48-230 V AC	If the modules are in the activated state the majority of the time, the modules must be 12.5 mm apart. On a mounting base, every other position must be empty.

Ordering guide

Part number	Description	Input	Output	Mounting
SLI25CR	Input relay	24 V AC	0-60 V DC/50 mA	Plug-in
SLI120CR	Input relay	120 V AC	0-60 V DC/50 mA	Plug-in
SLI230CR	Input relay	230 V AC	0-60 V DC/50 mA	Plug-in
SLI120CRP	Input relay	120 V AC	0-60 V DC/50 mA	Plug-in
SLI230CRP	Input relay	230 V AC	0-60 V DC/50 mA	Plug-in
SLI380CRS	Input relay	400 V AC	0-60 V DC/50 mA	Plug-in
MIS1GN	Socket for input relays. Standard			DIN rail
JUMPER 16-13	Jumper bar for Delcon's sockets, max. 16/bar.			

SLI-relays for mA size loads: DC-control, DC-load

- Galvanic isolation 4 kV, 8 mm creep distance
- Effective interference elimination
- Compatible with NPN/PNP logic
- LED indication



General description

The relays are used as an interface between DC sensors and control systems. The integrated interference protection provides reliable operation even in very demanding electrical environments. Thanks to interference protection, signal cables can be run alongside power cables on, for example, cable racks for more

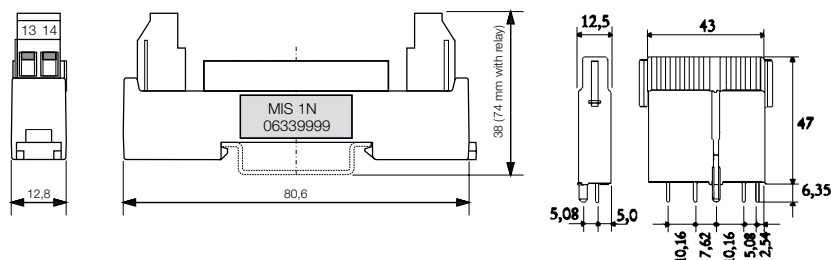
than 1.5 km without capacitive cross-talk affecting relays. The relays have no mechanical parts, which provides very reliable application. If high frequencies occur from sensors for counting inputs, for example, we recommend SLI24CRF.

Technical data

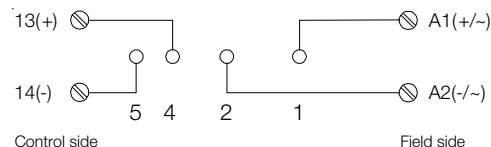
(Values at +25 °C)

PRIMARY CIRCUIT		SLI12CR	SLI24CR	SLI24CRF	SLI48CR	SLI125CR	SLI250CR
Input voltage	nom.	12 V DC	24 V DC	24 V DC	48 V DC	125 V DC	250 V DC
Input voltage	max.	18 V DC	32 V DC	32 V DC	70 V DC	140 V DC	265 V DC
Power consumption	max.	7.5 mA	7 mA	8 mA	7 mA	4.2 mA	4 mA
Input impedance	typical	1.8 kΩ	4 kΩ	4 kΩ	8 kΩ	31 kΩ	68 kΩ
Activation voltage	typical	7.5 V DC	16 V DC	16 V DC	36 V DC	80 V DC	170 V DC
Drop-out voltage	typical	6 V DC	14 V DC	14 V DC	26 V DC	60 V DC	110 V DC
SECONDARY CIRCUIT							
Load voltage	max.	0-60 V DC	0-60 V DC	0-60 V DC	0-60 V DC	0-60 V DC	0-60 V DC
Voltage drop at max. load	typical	0.2 V DC	0.2 V DC	0.2 V DC	0.2 V DC	0.2 V DC	0.2 V DC
Load current	max.	50 mA	50 mA	50 mA	50 mA	50 mA	50 mA
Activation time	typical	0.3 ms	0.3 ms	5 μs	0.3 ms	0.5 ms	0.5 ms
Drop-out time	typical	0.3 ms	0.5 ms	20 μs	0.5 ms	0.5 ms	0.5 ms
Operating temperature		-25 °C to +70 °C					

Dimensions



Connections



Ordering guide

Part number	Description	Input	Output	Mounting
SLI12CR	Input relay	12 V DC	0-60 V DC/50 mA	Plug-in
SLI24CR	Input relay	24 V DC	0-60 V DC/50 mA	Plug-in
SLI24CRF	Input relay, high frequency 10 kHz.	24 V DC	0-60 V DC/50 mA	Plug-in
SLI48CR	Input relay	48 V DC	0-60 V DC/50 mA	Plug-in
SLI125CR	Input relay	125 V DC	0-60 V DC/50 mA	Plug-in
SLI250CR	Input relay	250 V DC	0-60 V DC/50 mA	Plug-in
MIS1GN	Socket for input relays. Standard			DIN rail
JUMPER 16-13	Jumper bar for Delcon's sockets, max. 16/bar.			

N/C relays also available upon request.



SLO-relays for A size loads: DC or AC -control, AC-load

- Galvanic isolation 4 kV, 8 mm creep distance
- 3 A inductive or resistive load
- Effective interference elimination
- LED indication



General description

The relays are used as an interface between control systems and AC loads. The relays can handle inductive loads without load current reduction, which makes them very suitable for connection to, for example, solenoid valves and contactors. The relays have no mechanical parts, which means very reliable application. The integrated interference protection provides reliable operation even in very demanding electrical environments. Thanks to interference protection, signal cables can be run alongside power cables on,

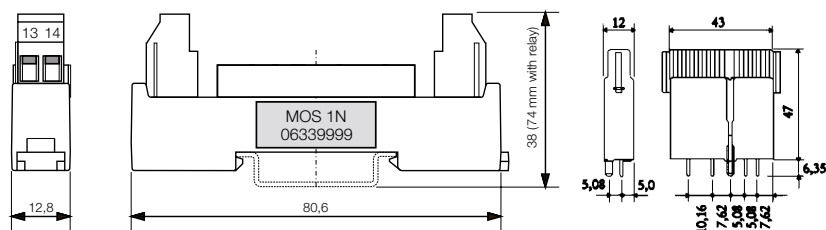
for example, cable racks for more than 1.5 km without capacitive cross-talk affecting relays. The SLOP models are especially designed for connection to 2-wire sensors that produce leakage current. The relays are blind to leakage currents up to 3.0 mA. For forward/reverse control of AC motors, the SLO24TRA is used. The relay has a higher operating voltage and withstands regenerated voltages from motors.

Technical data

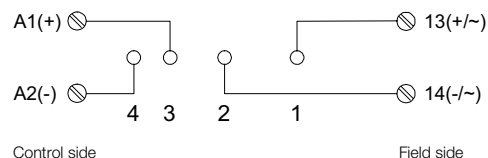
(Values at +25 °C)

PRIMARY CIRCUIT		SLO5TR	SLO24TR	SLO24IRA	SLOP120TR	SLOP230TR	SLO24TRA
Input voltage	nom.	5 V DC	24 V DC	24 V DC	120 V AC	230 V AC	24 V DC
Input voltage	max.	7 V DC	32 V DC	32 V DC	140 V AC	265 V AC	32 V DC
Power consumption	max.	17 mA	17 mA	15 mA	6 mA	6 mA	17 mA
Input impedance	typical	0.3 kΩ	1.6 kΩ	2 kΩ	24 kΩ	46 kΩ	1.4 kΩ
Activation voltage	typical	2.7 V DC	16 V DC	16 V DC	80 V AC	170 V AC	16 V DC
Drop-out voltage	typical	2.5 V DC	14 V DC	14 V DC	65 V AC	110 V AC	14 V DC
Drop-out current					3 mA	3 mA	
SECONDARY CIRCUIT							
Load voltage	max.	0-265 V AC	0-265 V AC	0-265 V AC 0-300 V DC	0-265 V AC	0-265 V AC	0-265 V AC motor loads 0-460 V AC static loads
Voltage drop at max. load	typical	1 V	1 V	1.5 V	1 V	1 V	1 V
Load current	max.	3 A	3 A	1.2 A	3 A	1.5 A	2.5 A
Peak current, max. 20 ms		90 A	90 A	8 A	90 A	90 A	65 A
Leakage current	typical	2 mA	50 μA	50 μA	2 mA	2 mA	50 μA
Activation time	typical	0.5 ms	0.5 ms	0.3 ms	10 ms	10 ms	0.5 ms
Drop-out time	typical	11 ms	11 ms	0.3 ms	20 ms	20 ms	11 ms
Operating temperature		See the technical information.					

Dimensions



Connections



Ordering guide

Part number	Description	Input	Output	Mounting
SLO5TR	Output relay	5 V DC	0-265 V AC/3 A	Plug-in
SLO24TR	Output relay	24 V DC	0-265 V AC/3 A	Plug-in
SLO24IRA	Output relay	24 V DC	0-300 DC or 0-265 V AC/1.2 A	Plug-in
SLOP120TR	Output relay	120 V AC	0-265 V AC/3 A	Plug-in
SLOP230TR	Output relay	230 V AC	0-265 V AC/1.5 A	Plug-in
SLO24TRA	Output relay	24 V DC	0-265 V AC Motor load 0-460 V AC Static load	Plug-in
MOS1GN	Socket for output relays. Standard			Din rail
JUMPER 16-13	Jumper bar for Delcon's sockets, 16 way strip.			

SLO-relays for A size loads: DC-control, DC-load

- Galvanic isolation 4 kV, 8 mm creep distance
- Effective interference elimination
- Compatible with NPN/PNP logic
- LED indication



General description

The relays are used as interfaces between control systems and DC loads. The relays handle inductive loads and high DC voltages with low load reduction compared to mechanical relays, which provide a long lifetime. If a diode is mounted across a load, such as 1N4007, the nominal current applies, even with high inductive loads. (Keep in mind that the drop-out time increases when mounting a diode.) The relays have no mechanical parts,

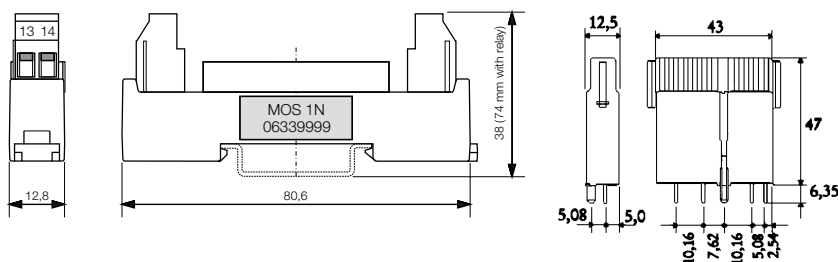
which means very reliable application. The integrated interference protection provides reliable operation even in very demanding electrical environments. Thanks to interference protection, signal cables can be run alongside power cables on, for example, cable racks for more than 1.5 km without capacitive cross-talk affecting relays.

Technical data

(Values at +25 °C)

PRIMARY CIRCUIT		SLO5CR	SLO24CR	SLO24CRA	SLO24CRA4	SLO24CRX	SLO120CRA	SLO120CRA4	SLO220CRA	SLO220CRA4
Input voltage	nom.	5 V DC	24 V DC	24 V DC	24 V DC	24 V DC	120 V DC	120 V DC	220 V DC	220 V DC
Input voltage	max.	15 V DC	32 V DC	32 V DC	32 V DC	32 V DC	140 V DC	140 V DC	250 V DC	250 V DC
Power consumption	max.	15 mA	15 mA	15 mA	15 mA	15 mA	4 mA	4 mA	4 mA	4 mA
Input impedance	typical	420 kΩ	2 kΩ	2 kΩ	2 kΩ	2 kΩ	34 kΩ	34 kΩ	63 kΩ	63 kΩ
Activation voltage	typical	2.7 V DC	16 V DC	16 V DC	16 V DC	16 V DC	80 V DC	80 V DC	170 V DC	170 V DC
Drop-out voltage	typical	2.5 V DC	14 V DC	14 V DC	14 V DC	14 V DC	60 V DC	60 V DC	120 V DC	120 V DC
SECONDARY CIRCUIT										
Load voltage	max.	0-60 V DC	0-60 V DC	0-300 V DC	0-300 V DC	0-32 V DC	0-300 V DC	0-300 V DC	0-300 V DC	0-300 V DC
Voltage drop at max. load	typical	0.5 V DC	0.5 V DC	1.5 V DC	0.8 V DC	0.4 V DC	1.5 V DC	0.8 V DC	1.5 V DC	0.8 V DC
Load current	max.	3 A	3 A	1.8 A	4 A	10 A	1.8 A	4 A	1.8 A	4 A
Peak current max. 10 ms		15 A	15 A	12 A	20 A	80 A	12 A	20 A	12 A	20 A
Activation time	typical	0.3 ms	0.3 ms	0.3 ms	0.3 ms	0.3 ms	0.5 ms	0.5 ms	0.5 ms	0.5 ms
Drop-out time	typical	0.3 ms	0.3 ms	0.3 ms	0.3 ms	0.3 ms	0.5 ms	0.5 ms	0.5 ms	0.5 ms
Operating temperature		See the general technical information.								

Dimensions

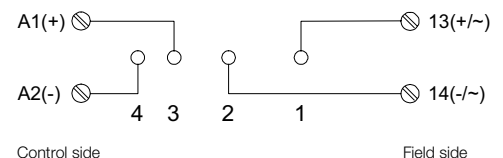


Ordering guide

Order number	Description	Input	Output	Mounting
SLO5CR	Output relay	5 V DC	0-60 V DC/3 A	Plug-in
SLO24CR	Output relay	24 V DC	0-60 V DC/3 A	Plug-in
SLO24CRA4	Output relay	24 V DC	0-300 V DC/4 A	Plug-in
SLO24CRA	Output relay	24 V DC	0-300 V DC/1.8 A	Plug-in
SLO24CRX*	Output relay	24 V DC	0-32 V DC/10 A	Plug-in
SLO120CRA	Output relay	120 V DC	0-300 V DC/1.8 A	Plug-in
SLO120CRA4	Output relay	120 V DC	0-300 V DC/4 A	Plug-in
SLO220CRA	Output relay	120 V DC	0-300 V DC/1.8 A	Plug-in
SLO220CRA4	Output relay	220 V DC	0-300 V DC/4 A	Plug-in
MOS1GN	Socket for output relays. Standard			
JUMPER 16-13	Jumper bar for Delcon's sockets, max. 16/bar.			

* For mounting in socket MOS1GN or MBS16, 6.3 A applies. For solder connection in socket 10A order no. SLO24CRXS.

Connections



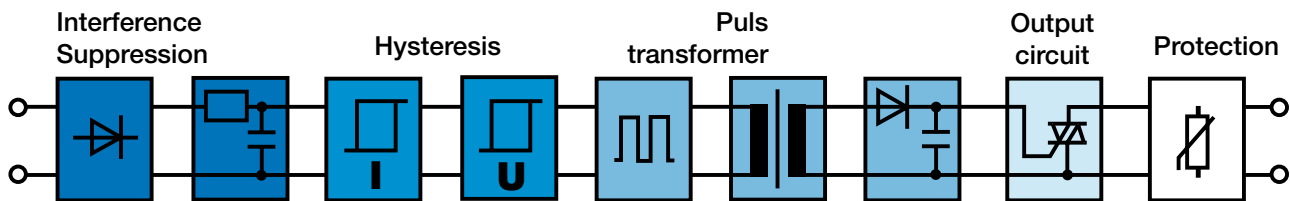
Delcon's unique interface relays

Field of application

Delcon's interface relays are designed to withstand tough industrial environments. Reliable activation and drop out, very high interference immunity, 4 kV isolation and high load currents provide a maintenance-free process with low service costs and reliable operation. Lifetime is estimated at up to 20 years, depending on the type.

Interference protection

Delcon's interface relays have interference protection in several layers that effectively prevent false signals from affecting the relays. Only actual control signals pass through the filter.



Capacitive Suppression

When power cables with AC voltage are installed alongside a signal cable, a capacitance occurs between the cables. This capacitance creates an undesired current in the signal cable that can affect optocouplers/mechanical relays so that they are activated or do not disconnect when the control signal ceases. Delcon's relays have integrated protection that prevents capacitive cross-talk from incorrectly activating relays. Installation of power cables beside unshielded signal cables for long distances (>1.5 km) is therefore feasible.



Transient & High Frequency Suppression

The relays have integrated protection against transients and EMI that can occur on the primary side.



Switching Points & Hysteresis

The relays have defined activation and drop-out points. Activation occurs at 2/3 of the nominal voltage and drop out occurs at 1/2 of the nominal voltage. Current hysteresis entails that the relay's impedance is changed at the activation point; less current is required to hold the relay in the activated position. The two functions above ensure a hysteresis between the activation and drop-out point. Activation and drop out are always reliably conducted, even in environments with high interference.



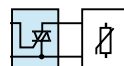
Pulse transformer

Delcon uses a pulse transformer for transmission of the signal from the primary to secondary side, resulting in high energy transfer. This permits the

use of heavy duty output components of high quality.

In comparison with an optocoupler, which utilises the load side for supply to the internal electronics, the pulse transformer and Delcon's circuit solution offer many benefits:

- Creep distance of 8 mm
- 4 kV isolation
- Very low leakage current
- No demand for min. load
- High immunity to load transients
- High load currents
- High dV/dt values



Solid State Switch & Protection Components

AC output

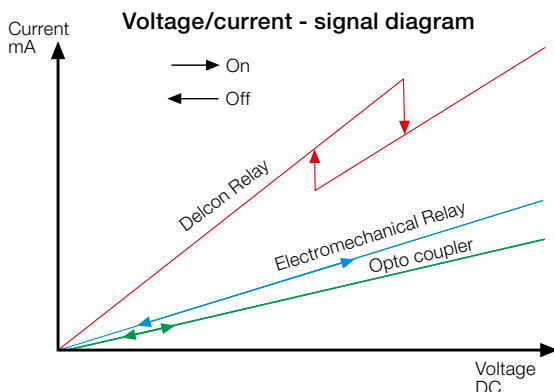
TRIAC output semi-conductor. Thanks to the pulse transformer's strong signal transmission, TRIACs can be used that are less sensitive to rapid load voltage (dV/dt) rise/fall times. Sensitive TRIACs can be activated by rapid voltage changes. This problem is eliminated with Delcon's interface relays. The SLO24TR standard relay has very low leakage current (0.05 mA) and has varistor protection against load transients. Other AC relays have varistors and RC protection on the secondary side. No minimum load is required and all modules have a wide voltage range. The relays can handle resistive and inductive loads without load currents needing to be reduced.



DC output

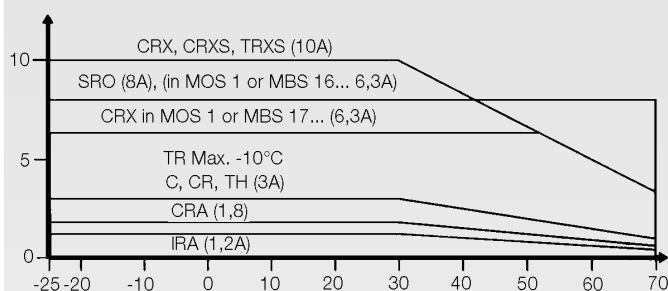
Power MOSFET output semi-conductor. Available for load currents up to 10A in the same compact casing. Transient protection is provided by a zener diode or varistor, which entails that there is no leakage current. Low reduction of load current for inductive loads compared with mechanical relays.

The diagram shows the change-over levels/hysteresis for Delcon's interface relays compared with mechanical relays and optocouplers.



Operating temperature output modules

The permitted load is linearly reduced to 1/3 from +30 °C to +70 °C ambient temperature (the ambient temperature must be measured immediately adjoining the relays). When the output modules are mounted close together, the maximum load should not be more than 50 percent for an extended period. In other words, all modules constant to and including 50 % load, or half of the modules with 100 % load or all with 100 % load half the time. This provides maximum lifetime. If there is a 12.5 mm gap between the modules, these restrictions do not apply. AC output relays with AC control circuits (SLOA120TR, SLOP120TR, SLOA230TR, SLOP230TR) are to be installed with the same method as for the AC input relays, in addition to what is described above. This is done to achieve optimal heat dissipation. Also note the reduction diagram below.



Approval

CE, cULus listed (file no.: E162 828)

Application tips NPN/PNP

All input relays can be connected both for NPN and PNP logic.

Input relays connected with long unscreened signal cables

When power cables are installed beside signal cables for long distances, the CR type must be used.

Connection of 2-wire sensors with leakage current

If 2-wire sensors or other equipment that generates leakage current is to be connected to the interface relays, we recommend use of the following relays:

Input relay

SLI120CRP or SLI230CRP.

Output relay

SLOP120TR or SLOP230TR.

Forward/reverse operation with motors

Delcon's standard relays (e.g., SLO24TR) should not be used for forward/reverse operation of single-phase or three-phase motors. Doing so entails risk for the returned voltage damaging the relays. For forward/reverse or static control of AC motors, SLO24TRA is to be used. This relay is especially designed for controlling motor operation and has a higher maximum voltage compared to the standard relays. For forward/reverse control of DC motors, we recommend LPS24.

24 V DC applications with high inductive loads

If the load is strongly inductive, we recommend the use of transient protection along with SLO24CR.

If transient protection cannot be fitted, we recommend SLO24CRA/SLO24CRA4, which have an operating voltage of up to 300 V DC. The relay has higher immunity to high-energy load transients. For inductive DC loads, the maximum nominal current is reduced.

For more information about maximum current for inductive DC loads, contact OEM Automatic's Panel Components business area or go to Delcon's website: www.delcon.fi

Colour coding

Input

- Input relays for AC voltage
- Input relays for DC voltage
- Input relays for AC voltage, 2-wire sensors (leakage currents)

Output

- Output relays for AC voltage
- Output relays for DC voltage

Marking of Delcon interface modules

There are two types of relay markings. Alt. 1. The marking holder is mounted on the relay's clip bracket. Up to four marking digits can be applied to the holder. Alt. 2. Label for mounting on the marking holder or directly on the relay's clip bracket. The label can be printed or marked with, for example, DYMO embossing tape.

Alt. 2





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