DI-U900 relay - Current monitoring

Datasheet

Features

- Current detection relay
- Compact plug-in design
- AC or DC coil
- 2 C/O contacts
- Magnetic arc blow-out
- Flat, square silver plated relay pins for excellent socket connection
- Wide range sockets
- Integrated snap lock
- Transparent cover
- High DC breaking capacity
- Optional positive mechanical keying relay to socket
- Flexibility by many options

Benefits

- Proven reliable
- Long term availability
- Easy to maintain
- Low life cycle cost
- No maintenance

Railway compliancy

- EN 50155 Electronic equipment used on rolling stock for railway applications
- IEC 60571 Electronic equipment used on railway vehicles
- IEC 60077 Electrical equipment for rolling stock in railway applications
- IEC 60947 Low voltage switch gear and control gear
- IEC 61373 Rolling stock equipment - Shock and vibration test
- EN 50121 Electromagnetic compatibility for railway applications
- NF F 16-101/102, EN 45545-2 Fire behaviour - Railway rolling stock
- IEC 60529 European standard describes the protection class (IP-code)
- NF F 62-002 On-off contact relays and fixed connections

Description

Plug-in current monitoring railway relay with two change-over contacts. Suitable for AC or DC currents.

Proven reliable operation in switching high DC voltage / inductive loads and low currents. Standard equipped with magnetic arc blow-out for high breaking capacity and long contact life. No external retaining clip needed as integrated 'snap-lock' will hold relay into socket under all circumstances and mounting directions.

The construction of the relay and choice of materials makes the DI-U900 relay suitable to withstand low and high temperatures, shock & vibrating and dry to very humid environments.

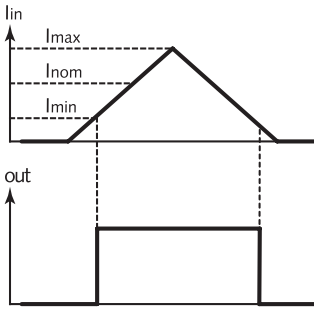
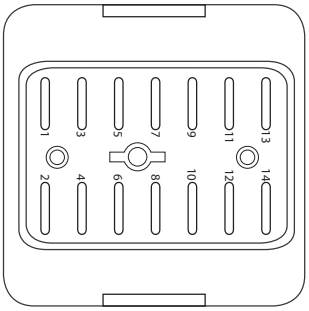
Compact design, choice of many options and a wide range of sockets makes the DI-U900 relay an easy and flexible solution to use.

Application

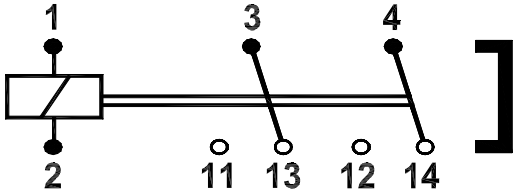
These relay series are designed for demanding rolling stock applications. The DI-U900 is used in applications for current monitoring or where switching is activated by a fixed current level.

DI-U900 relay
Technical specifications

Functional and connection diagrams

Timing diagram	Relay pin correspondence
	

Connection diagram



DI-U900 relay
Technical specifications

Coil characteristics

Operating times at nominal voltage (typical):	
Pull-in time	≤ 20 ms
Release time	≤ 5 ms
Bounce time N/O contacts	≤ 4 ms
Bounce time N/C contacts	≤ 8 ms
Voltage drop across coil	DC 0.5 x $I/(I_{nom})^2$
	AC 2.0 x $I/(I_{nom})^2$
Hold-up current	DC 0.1 - 0.4 I_{nom}
	AC 0.3 - 0.7 I_{nom}

Currents DC

Type	I_{nom} (ADC)	$I_{pull-in}$ (ADC)	I_{max} (ADC)	R_{coil} * (Ω)	P_{nom} (W)
DI-U901	2.7	2.16	5.4	0.04	0.3
DI-U902	1.2	0.96	2.4	0.2	0.3
DI-U903	0.39	0.312	0.78	2.1	0.3
DI-U904	0.12	0.096	0.24	22	0.3
DI-U905	0.082	0.066	0.164	45	0.3
DI-U906	0.018	0.014	0.036	940	0.3
DI-U907	0.063	0.05	0.126	72	0.3

Currents AC, 50 Hz

Type	I_{nom} (AAC)	$I_{pull-in}$ (AAC)	I_{max} (AAC)	R_{coil} * (Ω)	P_{nom} (VA)
DI-U950	3.3	2.64	4.62	0.035	0.3
DI-U951	2.2	1.76	3.08	0.088	0.3
DI-U952	1.0	0.8	1.4	0.31	0.3
DI-U953	0.56	0.448	0.784	0.91	0.3
DI-U954	0.27	0.216	0.378	3.1	0.3
DI-U955	0.12	0.096	0.168	22	0.3
DI-U956	0.082	0.066	0.115	45	0.3

* The R_{coil} is measured at room temperature and has a tolerance of ± 10%.

Other types on request.

DI-U900 relay
Technical specifications

Contact characteristics

Amount and type of contacts	2 C/O
Maximum make current	16 A
Peak inrush current	200 A (withstand > 10 x 200 A @ 10 ms, 1 min)
Maximum continuous current	10 A (AC1 ; IEC 60947)
Maximum switching voltage	250 VDC, 440 VAC
Minimum switching voltage	12 V
Minimum switching current	10 mA
Maximum breaking capacity	110 VDC, 8 A (L/R ≤ 15 ms) 230 VAC, 10 A (cosφ ≥ 0.7)
Contact resistance	15 mΩ (initial)
Material	Ag standard (optional $AgSnO_2$, Au on Ag)
Contact gap	0.7 mm
Contact force	> 200 mN

Electrical characteristics

Dielectric strength		EN 50155
	Pole-pole	IEC 60255-5 4 kV, 50 Hz, 1 min
	Cont-coil	IEC 60077 2.5 kV, 50 Hz, 1 min
Insulation between open contacts		2.5 kV; 50 Hz; 1 min
Pulse withstanding		IEC 60255-5 5 kV (1.2/50 µs)

Mechanical characteristics

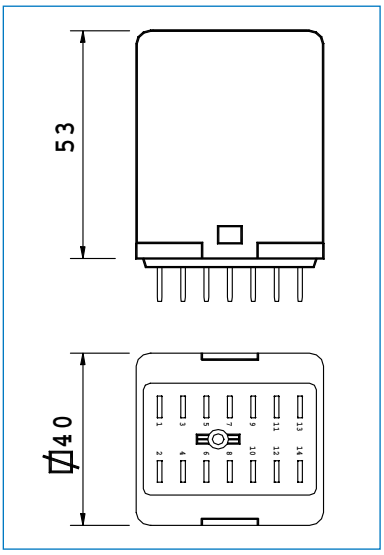
Mechanical life	10 x 10^6 operations
Maximum switching frequencies	Mechanical: 3600 ops/h Electrical: 1200 ops/h
Weight	130 g (without options)

Environmental characteristics

Environmental	EN 50125-1 and IEC 60077-1
Vibration	IEC 61373, Category I, Class B, Body mounted
Shock	IEC 61373, Category I, Class B, Body mounted
Operating temperature	-25 °C...+85 °C (optional -40 °C)
Humidity	95% (condensation is permitted temporarily)
Salt mist	IEC 60068-2-11, class ST4
Damp heat	IEC 60068-2-30, Test method Db variant 1
Protection	IEC 60529, IP40 (relay on socket) (with option K: IP50)
Fire & smoke	NF F 16-101, NF F16-102, EN 45545-2
Insulation materials	Cover: polycarbonate Base: polyester

DI-U900 relay
Technical specifications

Dimensions (mm)



Options

Code	Description	Remark	Cannot be combined with:
C	Low temperature (-40 °C)	$I_{contact}$ < 8 A	
E*	Au; Gold plated contacts (10 µm)		M
K	Dust protection	IP50**	
M	$AgSnO_2$; "non-weldable" contacts	$I_{contact}$ > 100 mA	E
Y	Double make / double break contacts	1 C/O DM/DB, -40 °C	
Keying	Coil coding relay and socket		
Colour coding	Coloured cover for coil voltage coding		

* Gold plated contacts characteristics	
Material	Ag, 10 µm gold plated
Maximum switching voltage	60 V (higher voltages may be possible, contact Mors Smitt for more information)
Maximum switching current	400 mA (at higher rate gold will evaporate, then the standard silver contact rating of minimum 10 mA and 12 V is valid)
Minimum switching voltage	5 V
Minimum switching current	1 mA
** IP50 Cat2 for relays mounted in a Mors Smitt socket, application PD1/PD2 and contact load >0.5A.	

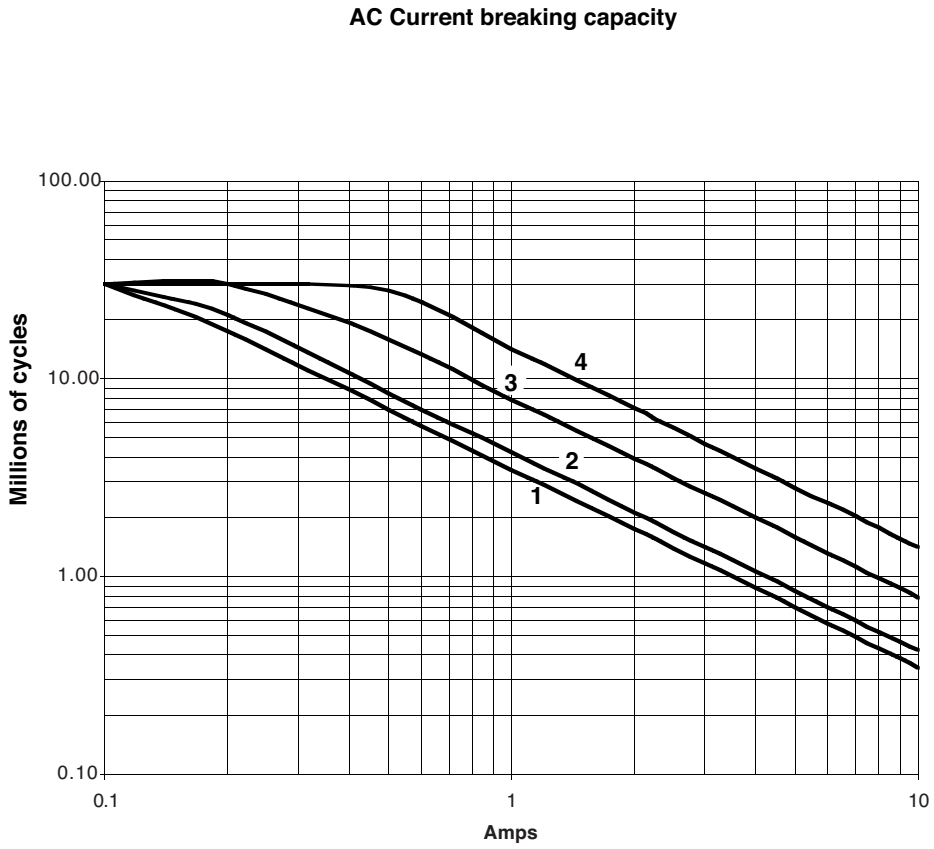
DI-U900 relay
Technical specifications

Electrical life expectancy

AC Current breaking capacity at cosφ = 1

AC Current breaking capacity versus life expectancy in millions of cycles.
Rate of contacts opening and closing = 1200 operations per hour.
Curves shown for resistive load (Power Factor = 1).

Curve	1	2	3	4
VAC	220	125	48	24



DI-U900 relay
Technical specifications

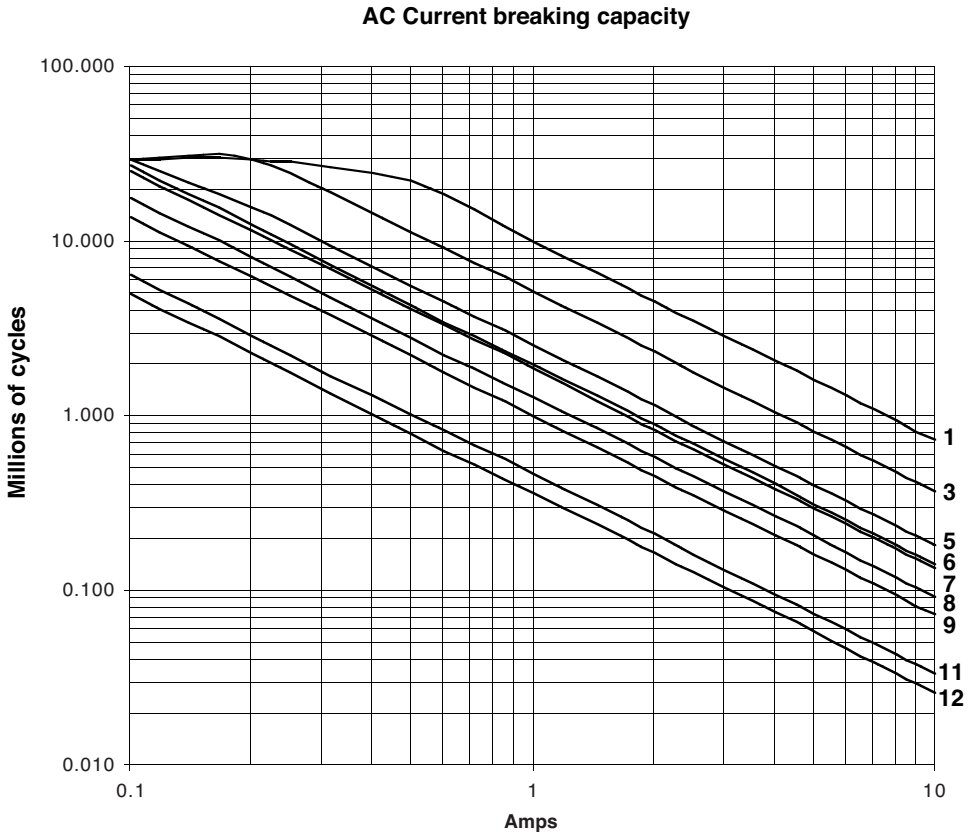
Electrical life expectancy

AC Current breaking capacity at cosφ = 0.7 ; 0.5 ; 0.3

AC Current breaking capacity versus life expectancy in millions of cycles.
Rate of contacts opening and closing = 1200 operations per hour.
Values shown for inductive loads -

——— Cos Ø = 0.7
– – – – Cos Ø = 0.5
—·— Cos Ø = 0.3

Curves	1	3	5	6	7	8	9	11	12
VAC	24	24	125	220	24	125	220	125	220
Cos Ø	0.7	0.5	0.7	0.7	0.3	0.5	0.5	0.3	0.3



DI-U900 relay
Technical specifications

Electrical life expectancy

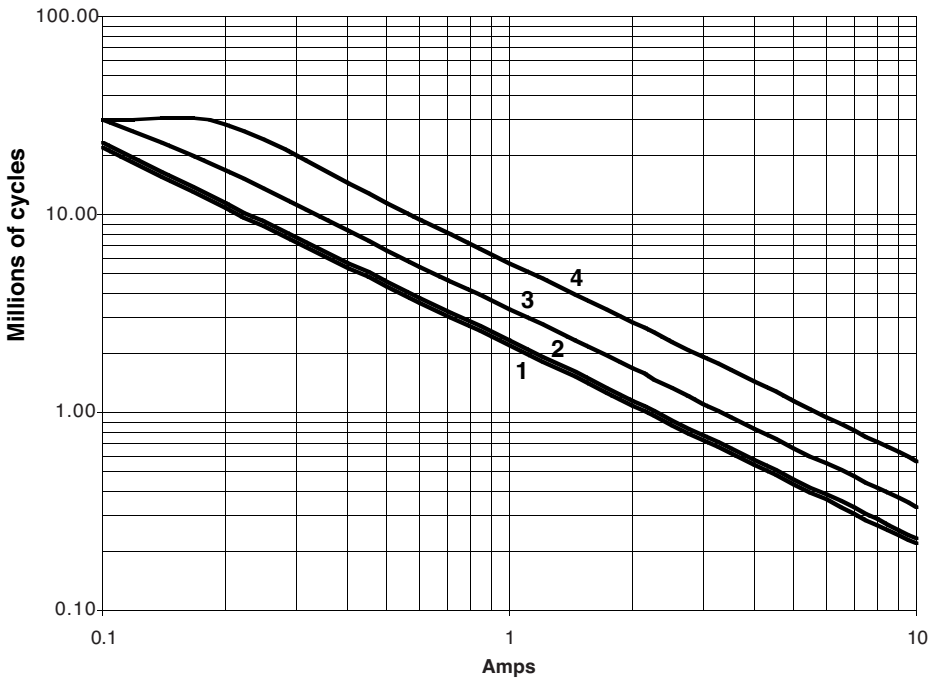
DC Current breaking capacity at L/R = 0

DC Current breaking capacity versus life expectancy in millions of cycles.
Rate of contacts opening and closing = 1200 operations per hour.
Curves shown for resistive load (L/R = 0). Continuous current.

* By connecting 2 contacts in series, we increase the DC current breaking capacity by 50%

Curve	1	2	3	4
VDC	220	125	48	24

DC Current breaking capacity



DI-U900 relay
Technical specifications

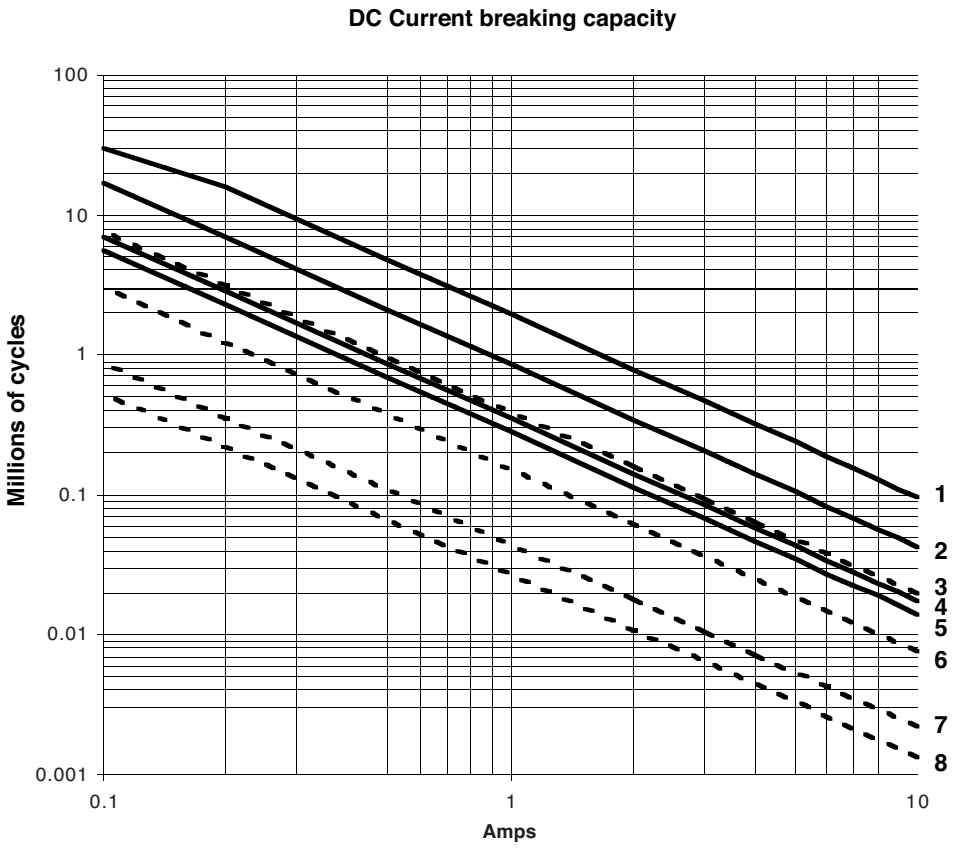
Electrical life expectancy

DC Current breaking capacity L/R = 20 ms ; 40 ms

DC Current breaking capacity versus life expectancy in millions of cycles.
Rate of contacts opening and closing = 1200 operations per hour.
Curves shown for inductive load -
———— L/R = 20 ms continuous current
— — — — L/R = 40 ms continuous current

* By connecting 2 contacts in series, we increase the DC current breaking capacity by 50%

Curves	1	2	3	4	5	6	7	8
VDC	24	48	24	125	220	48	125	220
L/R (ms)	20	20	40	20	20	40	40	40



DI-U900 relay
Sockets

Mounting possibilities/sockets


V3


V22 BR


V23


V23BR


V26


V29


V31


V32


V33

Surface/wall mounting

338000302	V22BR	Screw socket, wall mount, front connection (9 mm terminals)
338000580	V23	Screw socket, wall mount, front connection (7.5 mm terminals)
338000610	V29	Spring clamp socket, wall mount, front dual connection (2.5 mm²)

Rail mounting

338000580	V23	Screw socket, rail mount, front connection (7.5 mm terminals)
338000402	V23BR	Screw socket, rail mount, front connection (9 mm terminals)
338000610	V29	Spring clamp socket, rail mount, front dual connection (2.5 mm²)

Panel/flush mounting

338100100	V3	Solder tag socket, panel mount, rear connection
328400100	V26	Crimp contact socket, panel mount, rear connection, A260 crimp contact
338000560	V31	Faston connection socket, rear dual connection (6.3 mm)
338000570	V33	Spring clamp socket, flush mount, rear dual connection (2.5 mm²)

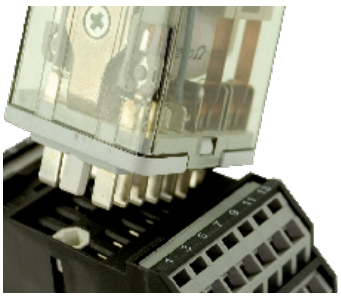
PCB mounting

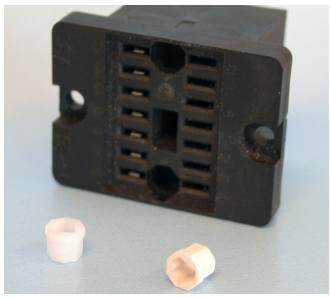
338000561	V32	PCB soldering socket

For more details see datasheets of the sockets

DI-U900 relay
Keying

Mechanical keying relay and socket (optional)





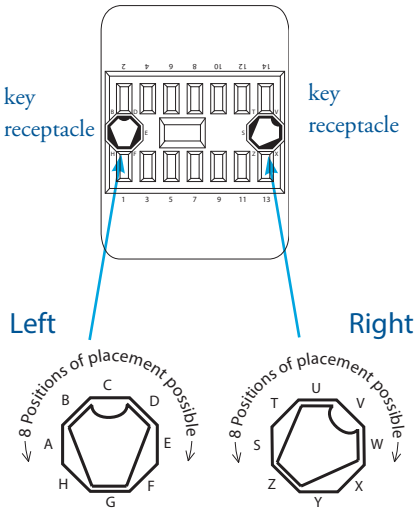
Function:
- To prevent wrong installation
- To prevent damage to equipment
- To prevent unsafe situations

Using keyed relays and sockets prevents a relay is inserted in a wrong socket. For example it prevents that a 24 VDC relay is put in a 110 VDC circuit. Positive discrimination is possible per different function, coil voltage, timing, monitoring, safety and non-safety.

The D-relay socket keying option gives 8 x 8 = 64 possibilities. Upon ordering the customer simply indicates the need for the optional keying. Mors Smitt will assign a code to the relay and fix the pins into the relay. The sockets are supplied with loose key receptacles. Inserting the keys into the socket is very simple and self explaining.

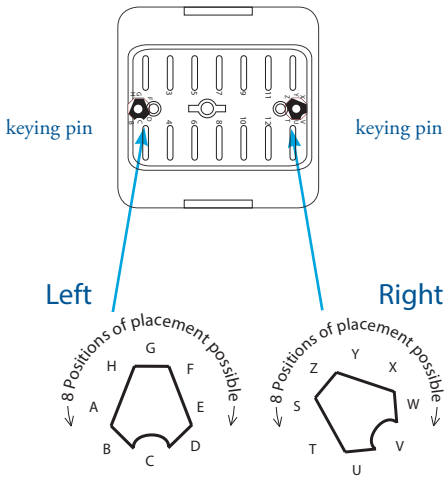
Remark: sockets and relay shown are only examples.

Top view socket



Example keying position G-Z on socket

Bottom view relay



Example keying position G-Z on relay

DI-U900 relay
Instructions

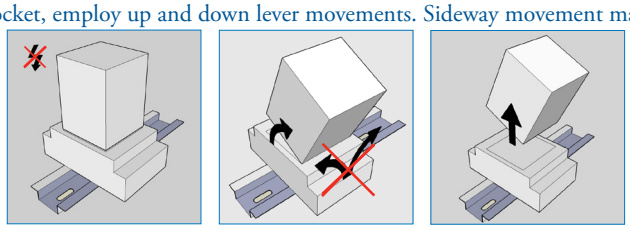
Installation, operation & inspection

Installation

Before installation or working on the relay: disconnect the power supply first! Install socket and connect wiring according to the terminal identification. Plug relay into the socket ensuring there is no gap between the bottom of relay and the socket. Reverse installation into the socket is not possible due to the mechanical blocking snap-lock feature. Check to ensure that the coil connection polarity is not reversed. Relays can be mounted tightly together to save space.
When rail mounting is used, always mount the socket in the direction of the UP arrow, to have proper fixation of the socket on the rail.

Warning!

- Never use silicon in the proximity of the relays.
- Do not use the relay in the presense of flammable gas as the arc generated from switching could cause ignition.
- To remove relays from the socket, employ up and down lever movements. Sideway movement may cause damage to the coil wires.



Operation

After installation always apply the rated voltage to the coil to check correct operation.
Long term storage may corrode the silver on the relay pins. When plugging the relay into the socket, the female bifurcated or trifurcated receivers will automatically cut through the corrosion on the pins and guarantee a reliable connection.

Before actual use of relays, it is advised to switch the load several times with the contacts. The contacts will both be electrically and mechanically cleaned due to the positive wiping action. Sometimes a contact can build up increased contact resistance (≤ 15 mΩ when new). When using silver contacts one can clean the contact by switching a contact load a few times using >24 VDC & ~2 A. Increased contact resistance is not always problematic, as it depends on circuit conditions. In general a contact resistance of 1 Ω is no problem, consult Mors Smitt for more information.

Condensation in the relay is possible when the coil is energised (warm) and the outside, environmental temperature is cold. This is a normal phenomenon and will not affect the function of the relay. Materials in the relay have no hygroscopic properties.

Inspection

Correct operation of the relay can easily be checked as the transparent cover provides good visibility of the moving contacts. If the relay does not seem to operate correctly, check for presence of the appropriate coil voltage and polarity using a suitable multimeter. If a LED is fitted, it indicates voltage presence to the coil.
If coil voltage is present, but the relay does not operate, a short circuit of the suppression diode is possible (This may be due to the coil connection having been reversed).

If the relay doesn't work after inspection, replace the relay unit with a similar model. Do not attempt to open the relay cover or try to repair. Contacts are calibrated and in balance, touching can affect proper operation.
Also re soldering may affect correct operation. Since 2009 relays have tamper proof seals fitted and once broken, warranty is void.

Most relay defects are caused by installation faults such as over voltage, spikes/transients, high/short current far exceeding the relay specifications. When returning the relays for investigation, please provide all information on the RMA form. Send defective relays back to the manufacturer for repair or replacement. Normal wear and tear or external causes are excluded from warranty.

DI-U900 relay
Ordering scheme

Configuration:

DI-U9	55	-	C

1. Relay model 2. Coil current 3. Options

This example represents a **DI-U955-C**
Description: DI-U900 series relay, I_{nom}: 0.12 AAC 50 Hz, Low temperature (-40 °C)

1. Relay model

DI-U9

2. Coil current

DC currents		AC currents	
01	2.7 ADC	**50**	3.3 AAC, 50 Hz
02	1.2 ADC	**51**	2.2 AAC, 50 Hz
03	0.39 ADC	**52**	1.0 AAC, 50 Hz
04	0.12 ADC	**53**	0.56 AAC, 50 Hz
05	0.082 ADC	**54**	0.27 AAC, 50 Hz
06	0.018 ADC	**55**	0.12 AAC, 50 Hz
07	0.063 ADC	**56**	0.082 AAC, 50 Hz

3. Options

C	Low temp. (-40 °C) - Max. contact current 8 A
E	Gold plated contacts
K	Dust protection, IP50
M	$AgSnO_2$ contacts, highly resistant to welding
Y	Double make / double break (Y=-40 °C)

Upon ordering indicate keying if necessary.

Mors Smitt
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SERVING SAFETY

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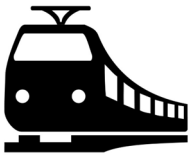

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