/// Plug-in railway relay with 8 C/O contacts

Rugged plug-in relays for extreme reliability, within long endurance applications and harsh environments

KDN-U200

Latching relay

Part of D-platform

Features

- Latching (bistable) relay
- Compact plug-in design
- 8 C/O contacts
- 2 galvanic isolated coils
- Clear position indicator
- Magnetic arc blow-out
- Flat, square and silver plated relay pins for excellent socket connection
- Wide range sockets
- 2 integrated snap locks
- Transparent cover
- High DC breaking capacity
- Optional positive mechanical keying relay to socket
- Flexibility by many options

Description

Plug-in bistable railway relay with eight change-over contacts. The contacts remain in the last powered position, the position is clearly shown via a position indicator.

Bistable by means of two coils and a mechanical rocker mechanism. The two separate coils are galvanically isolated.

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.

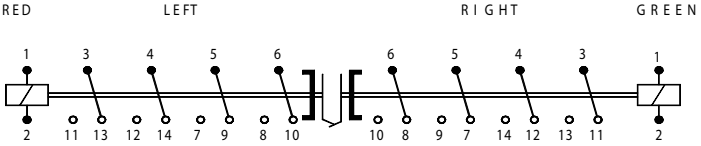
The construction of the relay and choice of materials makes the KDN-U200 relay suitable to withstand low and high temperatures, shock & vibrating and dry to very humid environments.

Application

These relay series are designed for demanding rolling stock applications.

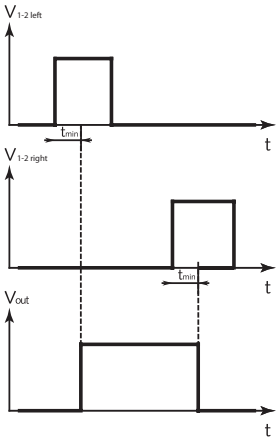
The KDN-U200 is used in applications where eight contacts are used in one relay and the contacts are set and reset with permanent power or impulses.

Connection diagram



Please note the relay will leave production in open state (with open armature at the left side, flag is green) with all contacts in the position shown in the connection diagram. Due to severe shocks far exceeding maximum levels mentioned in IEC 61373 (Category I, Class B, Body mounted), it can happen the left armature closes and stay closed. Therefore after installation all relays must be checked on correct state of the contacts and activate both coils 10 times alternately for correct operation.

Timing diagram



Railway compliancy

EN 50155	EN 50121
IEC 60571	EN 45545-2
IEC 60077	NF F16-101/102
IEC 60947	NF F 62-002
IEC 61373	IEC 60529

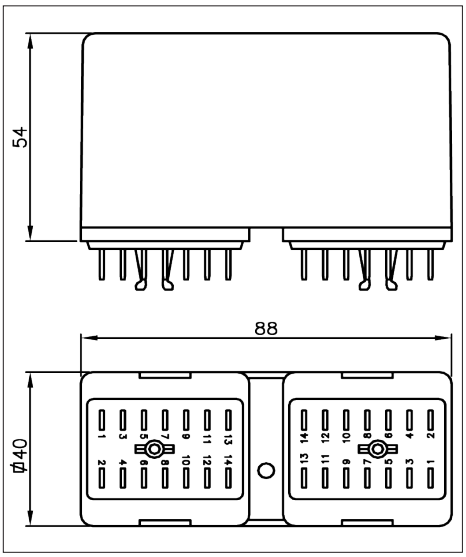
Latching relay
KDN-U200

Options

- Low temperature (-40 °C), max. contact current 8 A
- Back EMF protection diode
- Gold plated contacts
- Extra dust protection
- $AgSnO_2$ contacts, high resistant to welding
- No magnetic arc blow-out
- Double zener diode
- Double make / double break contacts (-40 °C)

Remark: Not all combinations possible

Dimensions (mm)



Sockets

		Mounting			
		Surface / Wall	35 mm rail	Panel / Flush	PCB
Terminal connection	Screw	V93	V93	-	-
	Screw - wide terminals	V92BR	V93BR	-	-
	Spring clamp	V99	V99	V88	-
	Faston	-	-	V89	-
	Crimp	-	-	V97	-
	Solder tag	-	--	V96	-
	PCB	-		-	2x V32

For more information see the respective datasheets

For more detailed technical specifications, drawings and ordering information, go to the product page on www.morssmitt.com

Over 10 million Mors Smitt relays in use in rail transport applications worldwide!

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Technical specifications

Latching relay
KDN-U200

Coil characteristics

Operating times at nominal voltage (typical):	
Minimum impulse time	50 ms
Bounce time N/O contacts	≤ 4 ms
Bounce time N/C contacts	≤ 8 ms
Inductance L/R at Unom (typical):	
Energized	11 ms
Released	8 ms
Operating voltage range	70 % - 125 % Unom

Type	U_{nom} (VDC)	U_{min} (VDC)	U_{max} (VDC)	$U_{drop-out}$ (VDC)	R_{coil} * (Ω)	P_{nom} (W)
KDN-U201	24	16.8	30	9.6	178	3.2
KDN-U202	48	33.6	60	19.2	666	3.3
KDN-U203	72	50.4	90	28.8	1580	3.3
KDN-U204	110	77	137.5	44.0	3850	3.0
KDN-U205	96	67.2	120	38.4	2822	3.3
KDN-U206	12	8.4	15	4.8	94	3.3
KDN-U207	36	25.2	45	14.4	370	3.2

Other types on request
* The Rcoil is measured at room temperature and has a tolerance of ± 10%

Remarks:
- Umin is the must-operate voltage at which the relay has picked up in all circumstances (worst-case situation), in practice the relay picks up at a lower voltage
- Udrop-out is the must-release voltage at which the relay has dropped-out in all circumstances (worst-case situation), in practice the relay drops out at a higher voltage
- Always select the nominal voltage as close as possible to the actual voltage in the application

Contact characteristics

Amount and type of contacts		8 C/O
Maximum make current		16 A
Peak inrush current	NF F 62-002	200 A (withstand > 10 x 200 A @ 10 ms, 1 min)
Maximum continuous current		10 A
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 (cos φ ≥ 0.7)
Maximum contact resistance		15 mΩ
Material		Ag standard (optional $AgSnO_2$, Au on Ag)
Contact gap		0.7 mm
Contact force		> 200 mN

Electrical characteristics

Dielectric strength EN50155	Pole-pole	IEC 60255-5	4 kV, 50 Hz, 1 min
	Cont-coil	IEC60077	2.5 kV, 50 Hz, 1 min
	Open contacts		2.5 kV; 50 Hz; 1 min
Pulse withstanding		IEC 60255-5	5 kV (1.2/50 µs)

Latching relay
KDN-U200

Mechanical characteristics

Mechanical life	2 x 10^6 operations
Maximum switching frequency	Mechanical: 3600 ops/h Electrical: 1200 ops/h
Weight	305 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)
Maximum altitude	2000 meter. Higher altitudes are possible but have consequences mentioned in IEC 60664 (for example 5000 meter with bigger clearance distance)
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 F 16-102, EN 45545-2: HL3 for requirements R22, R23, R26
Insulation materials	Cover: polycarbonate Base: polyester

Railway compliancy

EN 50155	Railway applications - Rolling stock - Electronic equipment
IEC 60571	Railway applications - Electronic equipment used on rolling stock
IEC 60077	Railway applications - Electric equipment for rolling stock
IEC 60947	Low-voltage switchgear and controlgear
IEC 61373	Railway applications - Rolling stock equipment - Shock and vibration tests
EN 50121	Railway applications - Electromagnetic compatibility
NF F16-101/102	Railway rolling stock - Fire behavior
EN 45545-2	Railway applications - Fire protection on railway vehicles Part 2: Requirements for fire behavior of materials and components
NF F 62-002	Railway rolling stock - On-off contact relays and fixed connections
IEC 60529	European standard describes the protection class (IP-code)

Latching relay
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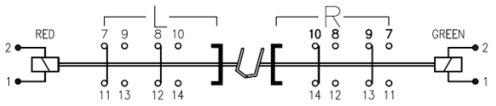
Options

Code	Description	Remark	Cannot be combined with:
Standard options:			
C	Low temperature (-40 ºC)	Icontact < 8 A	
D	Back EMF protection diode		
E*	Au; Gold plated contacts (10 µm)		M
K	Extra dust protection	IP50 Cat 2 for the relays mounted in a Mors Smitt socket. Application PD1/PD2 and contact load > 0.5 A.	
N	No magnetic arc blow-out		
Q	Double zener diode over coil	Maximum allowed peak voltage 180 V, higher voltage will damage the diode	
Y	Double make/double break contacts	4 C/O DM/DB, -40 °C 	
Keying	Coil coding relay and socket		
Special options:			
M	$AgSnO_2$; “non-weldable” contacts	Icontact > 100 mA	E

* 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

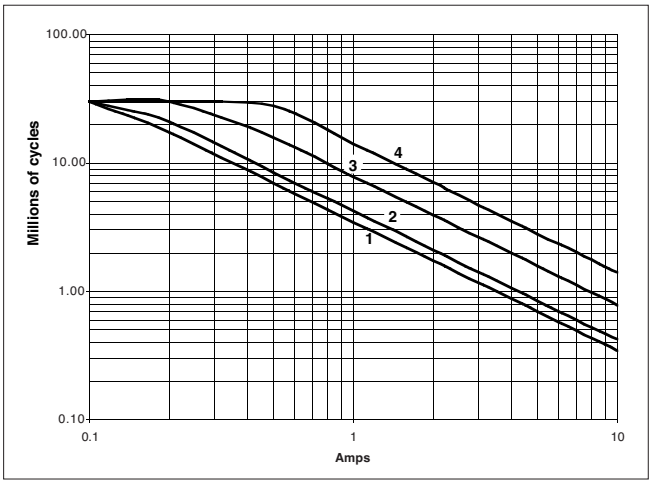
Remark: For application support or technical product support, contact your local Mors Smitt sales office (see contact details on last page).

Latching relay
KDN-U200

Electrical life expectancy

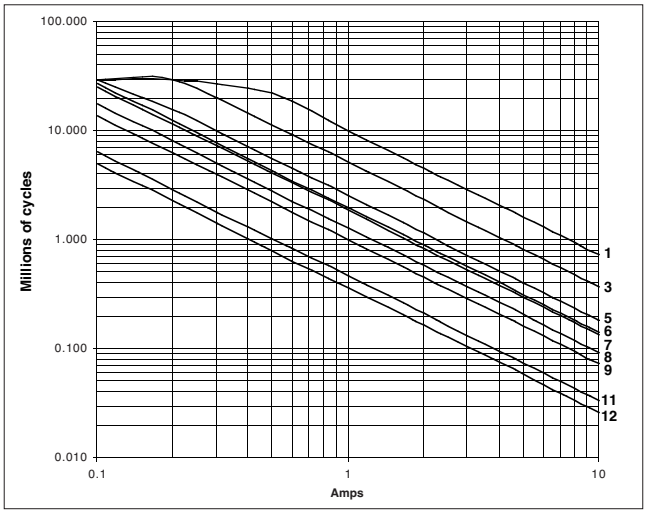
AC Current breaking capacity at cosφ = 1

Curve	1	2	3	4
VAC	220	125	48	24



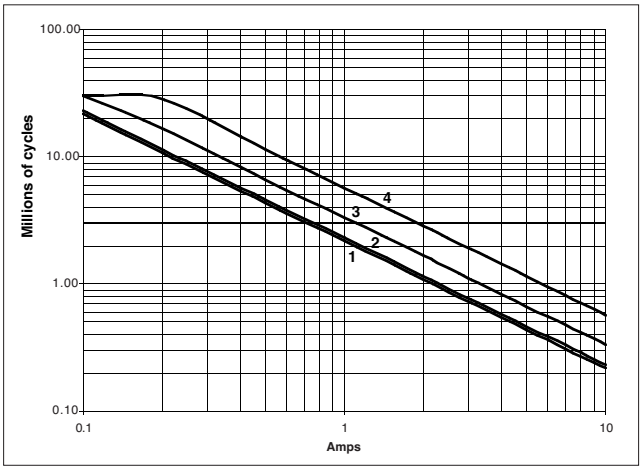
AC Current breaking capacity at cosφ = 0.7 ; 0.5 ; 0.3

Curve	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



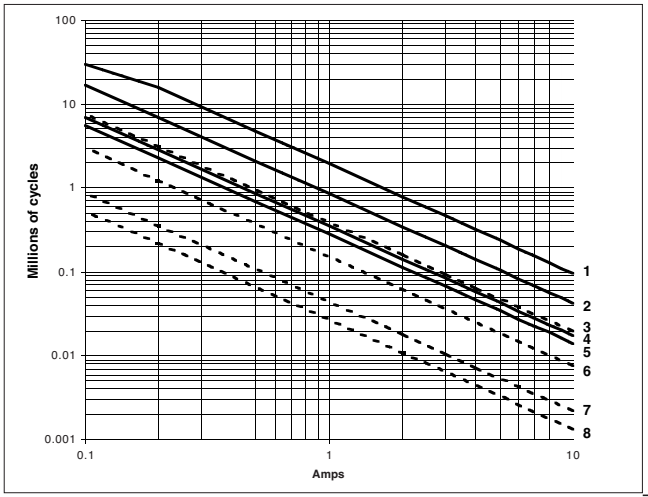
DC Current breaking capacity at L/R = 0

Curve	1	2	3	4
VDC	220	125	48	24



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

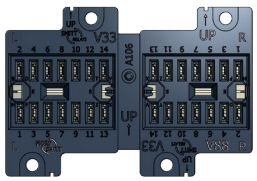
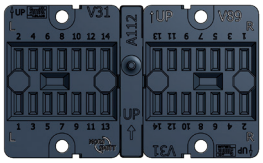
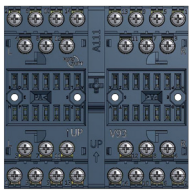
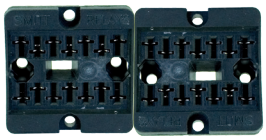
Curve	1	2	3	4	5	6	7	8
VDC	24	48	24	125	220	48	125	220
L/R (ms)	20	20	40	20	20	40	40	40



By connecting 2 contacts in series, the DC current breaking capacity is increased by 50%.

Latching relay
KDN-U200

Mounting possibilities/sockets

 V88	 V89	 V93	 V93BR	 V96
 V97	 V99	 2x V32		

Surface/wall mounting

338002920	V92BR	Screw socket, wall mount, front connection (9 mm terminals)
338003900	V93	Screw socket, wall mount, front connection (7.5 mm terminals)
338003950	V99	Spring clamp socket, wall mount, front dual connection (2.5 mm^2)

Rail mounting

338003900	V93	Screw socket, rail mount, front connection (7.5 mm terminals)
338003925	V93BR	Screw socket, rail mount, front connection (9 mm terminals)
338003950	V99	Spring clamp socket, rail mount, front dual connection (2.5 mm^2)

Panel/flush mounting

328100200	V96	Solder tag socket, panel mount, rear connection
338400100	V97	Crimp contact socket, panel mount, rear connection, A260 crimp contact
338001850	V89	Faston connection socket, rear dual connection (4.8 x 0.8 mm)
338001700	V88	Spring clamp socket, flush mount, rear dual connection (2.5 mm^2)

PCB mounting

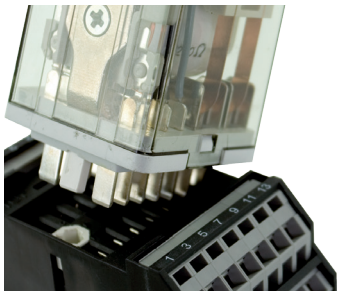
338000561	V32	PCB soldering socket

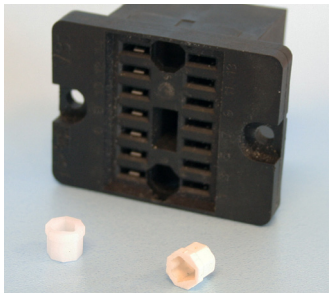
No external retaining clip needed as the ‘snap-lock’ will hold the relay into the socket under all circumstances and mounting directions (according shock & vibration requirements IEC 61373, Category I, Class B, Body mounted). If regulations require external retaining clips, these are available as well.

For more details see datasheets of the sockets on www.morssmitt.com

Latching relay
KDN-U200

Mechanical keying relay and socket (optional)





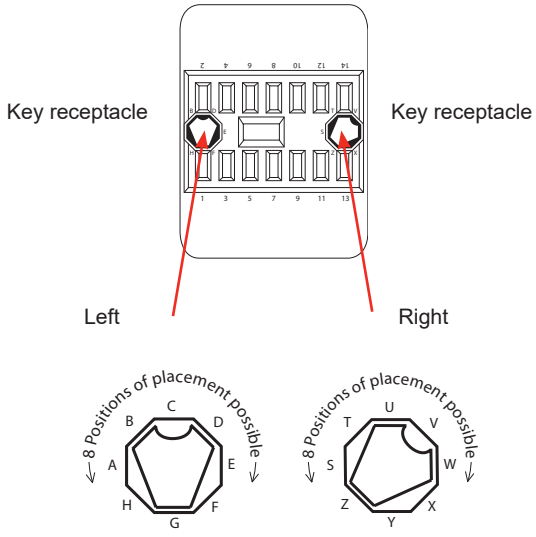
Function:
- To prevent wrong installation
- To prevent damage to equipment
- To prevent unsafe situations

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.

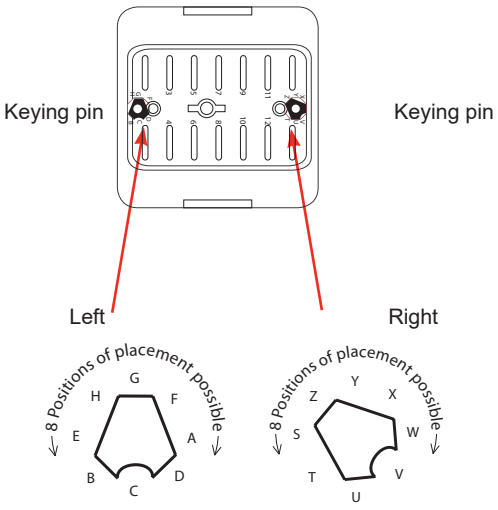
Remark: Sockets and relay shown are examples.

Top view socket



Example keying position G-Z on socket

Bottom view relay



Example keying position G-Z on relay

Latching relay
KDN-U200

Important for relay selection and operation

Make sure the relay is suitable for the application. For critical applications (for example: green loop applications) relays should be checked on correct working during periodic inspection.

Recommendations for long time contact reliability

For relays to enable failure free performance over a very long operational time, it is important to create the right circumstances. In any relay, contact usage and atmospheric conditions influence the contact surface. To counter this effect it is common practice to use a safety factor of > 2 to ensure long time contact reliability.

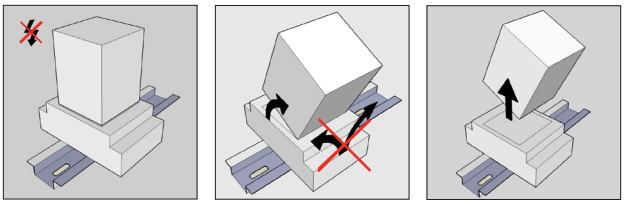
Therefore for long time contact reliability we recommend:
- Silver contacts: a minimum contact current of 20 mA per contact
- Gold contacts: a minimum contact current of 10 mA per contact
- Double Make Double Break contacts: a minimum contact current of 40 mA per contact
- When low currents are switched and not frequently, e.g. 10 mA once a day, it is advised next to gold plated contacts to put similar contacts within the same relay in parallel
- With higher load switching, e.g. 110 VDC and > 1 A, put relay contacts in series
- Rule of thumb: any relay works best with switching currents > 20 mA in DC environment when frequently switched. When not switched frequently a higher switching current like 50 mA is better for a long reliable operational time
- Check relays regularly, for example with the Mors Smitt Portable Relay Tester and visually through the transparent cover

Instructions for use

Installation

Before installation or working on the relay: disconnect the power supply first (no hot swapping)! 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



- Relays should never be swapped to other circuit positions when taken out of its socket for inspection or fault finding, always place it back into the original position to prevent contact resistance problems. Contact resistance problems can be created when swapping relays between different circuit loads due the contact wear/condition having changed during its operational life.

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 & ~ 2A. 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 / maintenance

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 have been reversed due to the coil connection).

Relays can easily be tested with the Mors Smitt Relay Tester. More information on: www.morssmitt.com.

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 resoldering 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 overvoltage, 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.

RMA procedure see www.morssmitt.com

Latching relay
KDN-U200

Ordering scheme

KDN-U2		-			
Coil voltages	01			24 VDC	
	02			48 VDC	
	03			72 VDC	
	04			110 VDC	
	05			96 VDC	
	06			12 VDC	Cannot be combined with:
	07			36 VDC	
Options			C	Low temperature (-40 °C) - Max contact current 8 A	
(add as many options as needed)			D	Back EMF protection diode	
			E	Gold plated contacts	M
			K	Extra dust protection, IP50	
			N	No magnetic arc blow-out	
			Q	Double zener diode	
			Y	Double make/ double break (-50 °C)	
Special options					
(minimum order quantity: 20)			M	$AgSnO_2$ contacts, highly resistant to welding	E

Example: KDN-U204-C
Description: KDN-U200 relay, Unom: 110 VDC, low temperature (-40 °C)

Latching relay
KDN-U200

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