

## /// Plug-in fast trip industrial latching relay with 8 C/O contacts

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

### KDN-R8

Industrial latching fast trip relay, 8 pole

Part of D-platform



### Description

The KDN-R8 relay is a plug-in fast trip bistable tripping relay that features 8 changeover (C/O) contacts. The contacts of this relay remain in the last powered position, and the position is clearly shown to the user via a position- indicator.

The KDN-R8 relay has a trip time less than 10 ms. Standard equipped with magnetic arc blow-out for high breaking capacity and long contact life. Including mechanical reset button.

Input voltage must be a rising edge with

- minimum slew rate: 1 V/ms

- minimum time: 10 ms

### Application

Rugged plug-in relays for extreme reliable, long endurance applications in harsh environment. These relays are designed for demanding industrial applications such as power utilities and petrochemical industries.

The KDN-R8 relay is used in applications where the contacts are set and reset with permanent power or impulses.

Remark:

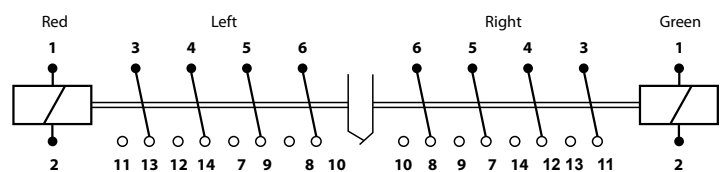
\*Never energize the trip or reset coil when the reset push button is depressed.

Adherence to these remarks is essential for the proper and safe operation of the Relay.

### Features

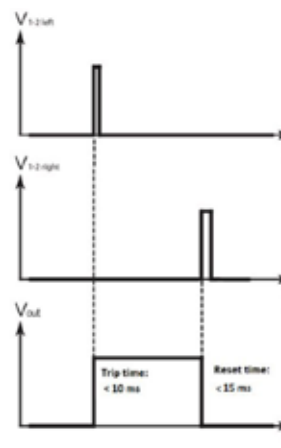
- Latching (bistable) relay
- Magnetic arc blow-out for high breaking capacity
- Back EMF suppression diode on trip and reset inputs
- 8 C/O contacts
- Fast Tripping <10ms
- Contact position indicator
- Flat, square and silver plated relay pins for excellent socket connection
- Wide range sockets
- High DC breaking capacity
- Less than 0.2W power consumption after trip
- Optional positive mechanical keying relay to socket
- Mechanical & Electrical reset
- Reset Inhibitor
- High DC breaking capacity
- High burden operation to comply with capacitor discharge test requirement
- Back EMF suppression diode & protection against transient voltage as standard option

### 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



### Compliance

EN 60255

EN 60947-5-1

IEC 61810



## Options

- Au; Gold plated contacts (10 µm)
- Extra dust protection
- High resistance to welding (AgSnO<sub>2</sub> contacts)
- Ambient temperature: -25 °C...+70 °C
- Double make/double break contacts

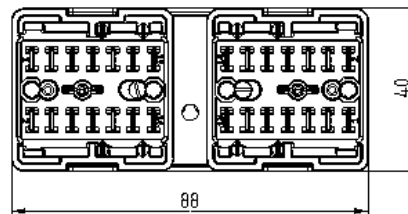
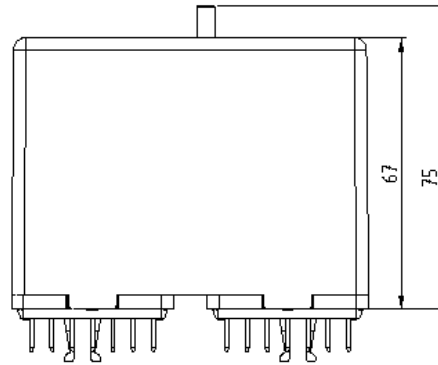
Remark: Not all combinations possible

## Solve-All relay application concept

The unique KDN-R8 relay with all its options has been designed in close cooperation with customers from the power utility industry.

The Solve-All relay application concept offers ultimate flexibility to design and supply tailor made KDN-R8 relays.

## Dimensions (mm)



## Sockets

		Mounting			
		Surface / Wall	35 mm rail	Panel / Flush	PCB
Terminal connection	Screw	V93	V93	V87	-
	Screw - wide terminals	V92BR	V93BR	-	-
	Spring clamp	V99	V99	V88	-
	Faston	-	-	V89	-
	Solder tag	-	-	V96	-
	Crimp	-	-	V97	-
	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](http://www.morssmitt.com)

## Technical specifications

### Operating Time

Make contacts	< 10 ms (Rated Voltage)
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\*All Speeds are first touch excluding bounce time. Above data is only for electrical set and reset.

### High Burden Operation

The KDN-R8 tripping relay is designed for high burden operation, making it suitable for application in high-security circuit breaker tripping circuits, particularly where the initiating contact may be located remotely from the relay. The high burden configuration of the KDN-R8 relay also facilitates the satisfactory operation of external series elements.

This high burden design provides the KDN-R8 relay with maximum immunity to electrical disturbances and noise. The high burden relay is specifically engineered to be immune to capacitive discharges, as per the requirements of ENA TS 48-4, Issue 6, 2021.

### Operating Burden

ENA TS 48-4, Issue 6, 2021

Low burden relay	< 100 Watts
High burden relay	> 100 Watts
	< 150 Watts

### Operated Burden

Less than 0.2 Watts after switching. No hold current needed as relays are latching.

KDN-R8 relay remains in the last energized condition even when power is removed completely.

### Minimum Operating Current

Minimum operating current	> 50 mA
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### Time Delayed Cut Off

Economizing delay -Operate	< 60 ms
-Reset	< 60 ms

### Pickup Operating Voltage

The KDN-R8 relay has guaranteed operation between 80% and 110% of nominal rated DC operating voltage.

### Non Operate Voltage

Relay will not operate below 75% Rated Voltage. This provides immunity against unwanted tripping as a result of a high power trip coil.

### Reset Voltage

The KDN-R8 relay will reset 80% to 110% of Rated Voltage.

### Operation of Series Elements

External relay elements are sometimes employed for additional flagging and alarm functions. These elements are typically much slower than the primary high speed tripping relay so care must be taken to ensure reliable operation of all series element before the series trip signal is cut off or economized. The incorporation of a 50 ms time delay cut off in the KDN-R8 relay provides for such circumstances.

### Coil Thermal Rating

All operate, reset and time delayed circuits are designed to withstand continuous application of 110% of the nominal rated voltage.

The high-speed operate coil element, with a maximum power rating of 150 Watts, has a thermal rating of 30 seconds. However, the KDN-R8 relay is equipped with an automatic economization feature that activates within 60 ms of operation. This inherent thermal protection mechanism ensures the relay's safe and reliable performance, even under sustained high-power conditions.

## Contact characteristics

Contact material	Ag, AgSnO <sub>2</sub> (Optional)	
Isolation across open contacts	2.0 kV, 50 Hz, 1 min	
Make and carry	7 A all contacts 10 A any two contacts	
Peak inrush current (make and carry)	200 A (withstand > 10 x 200 A @ 10 ms, 1 min)	
DC break capacity (rated load)	Resistive (DC1)	7 A / 110 V 3 A / 220 V
	Inductive (L/R = 40 ms)	0,5 A / 110 V 0,15 A / 220 V
Maximum switching voltage	250 VDC / 440 VAC	
Minimum switching voltage	12 V	
Minimum switching current	10 mA	

## Electrical characteristics

Dielectric strength	Pole-pole	4 kV, 50 Hz, 1 min
	Cont-coil	2.5 kV, 50 Hz, 1 min
	Open contacts	2.0 kV, 50 Hz, 1 min
Pulse withstanding	IEC 60255-5	5 kV (1.2/50 µs)

## Mechanical characteristics

Mechanical life	1 x 10 <sup>6</sup> operations	
Maximum switching frequency	Mechanical: 1800 ops/h Electrical: 600 ops/h	
Weight	320 g (without options)	

## Environmental characteristics

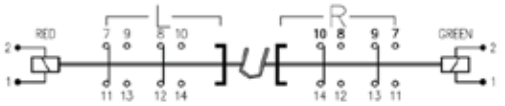
Environmental	IEC 61810	
Vibration	IEC 60255-21-1, Class 1	
Shock	IEC 60255-21-3, Class 1	
Operating temperature	-10 °C...+55 °C	
Humidity	95% (condensation is permitted temporarily)	
Salt mist	IEC 60068-2-11, NaCl, 35 °C for 4 days	
Damp heat	IEC 60068-2-30, Test method Db variant 1	
Protection	IEC 60529, IP40 (relay on socket) (with option K: IP50)	
Insulation materials	Cover: polycarbonate Base: polyester	

## Compliance

EN 60255	Relay design and environmental conditions
EN 60947	Low voltage switch gear and control gear
EN 60947-5-1	Electromechanical control circuit devices and switching elements
IEC 61810	Electromechanical elementary relays

## Options

Available options for KDN-R8 relay according ths *Solve-All* relay application concept.

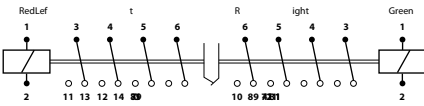

Code	Description	Remark	Can not be combined with
<b>Standard options</b>			
B	Magnetic arc blow-out. Ensures a high DC breaking capacity and longer contact life.		
C	Lower temperature (-40 °C).		
E	Gold plated contacts. Low contact resistance and good resistance against corrosive atmospheres. Suitable for switching low level loads.  Gold plated contacts characteristics: Material Ag, 10 µm gold plated Max. switching voltage 60 V (higher voltages may be possible, contact Mors Smitt for more info) Max. 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)  Min. switching voltage 5 V Min. switching current 1 mA		M
K	Extra dust protection. Cover sealed with sealant.	IP50 Cat 2 for the relays mounted in a Mors Smitt socket. Application PD1/PD2 and contact load > 0.5 A.	
V	Wider operating range and ambient temperature. Operating range: 0.7 ... 1.25 Unom Ambient temperature: -25 °C ...+70 °C Up to 110 V 0C	Not Available as of now	
Y	Double break / double make contacts. Breaking capacity increased by 50% and longer contact life. To increase the breaking capacity and contact life more this option can be combined with option B.	4 C/O DM/DB contacts 	
<b>Special options:</b>			
M	AgSnO <sub>2</sub> contacts. Highly resistant to welding.	Min. contact current 100 mA.	E

Coloured cover and keying of relay on socket on request

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

In this section the most common breaking capacity for DC-voltage / inductive load possibilities are presented with the different options and contact configurations within the D-relays series.

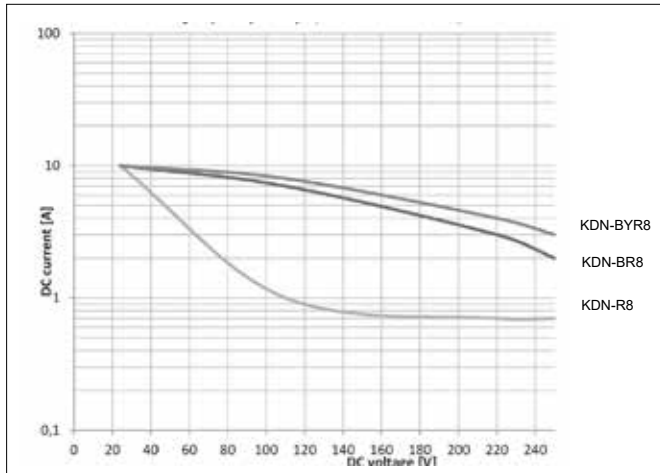
## Power relays, DC

KDN-R8			KDN-BR8		
					
<ul style="list-style-type: none"> <li>• 8 C/O contact</li> <li>• Contact gap: 0.7 mm</li> </ul>			<ul style="list-style-type: none"> <li>• 8 C/O contacts</li> <li>• Magnetic arc blow out</li> <li>• Contact gap: 0.7 mm</li> </ul>		
<b>Breaking capacity</b>			<b>Breaking capacity</b>		
DC1	110 VDC	1 A	DC1	110 VDC	7 A
	220 VDC	0.7 A		220 VDC	3 A
L/R=40 ms	110 VDC	0.3 A	L/R=40 ms	110 VDC	0.5 A
	220 VDC	0.1 A		220 VDC	0.3 A
DC13	110 VDC	-	DC13	110 VDC	-
	220 VDC	-		220 VDC	-

## Electrical life expectancy and breaking capacity

The life expectancy values shown below are based on factory tests. These values could be different in real life applications as environmental conditions, switching frequencies and duty cycles will influence these values. Putting more contacts in series (Y) will increase breaking capacity and life expectancy significantly.

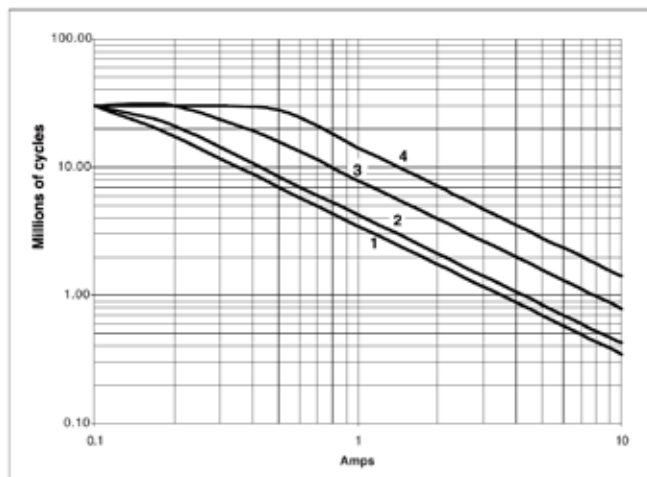
Breaking capacity relays (Resistive load DC1)



**AC and DC current breaking capacity versus life expectancy in millions of cycles for KDN-BR8.**  
**Rate of contacts opening and closing = 600 operations per hour.**

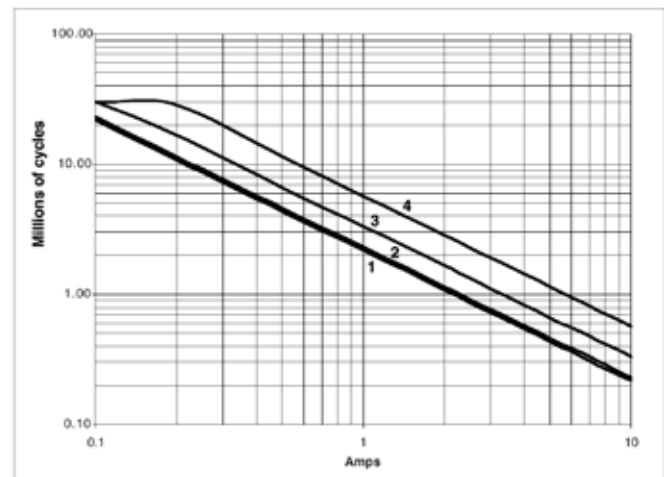
AC Current breaking capacity at  $\cos\phi = 1$

Curve	1	2	3	4
VAC	220	125	48	24



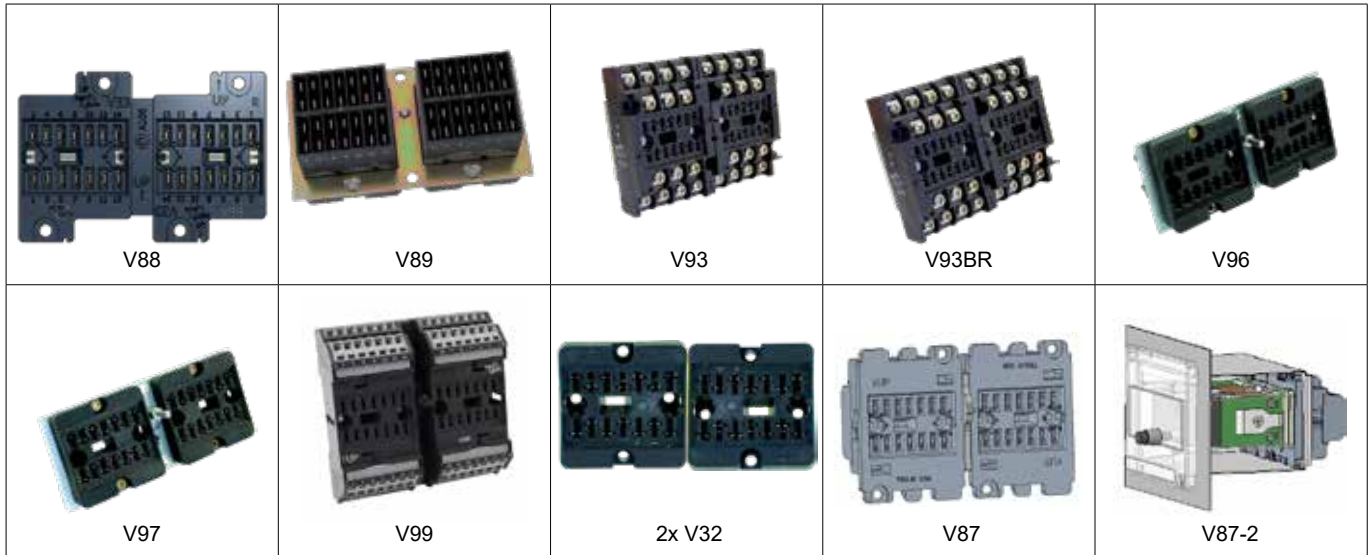
DC Current breaking capacity at  $L/R = 0$

Curve	1	2	3	4
VDC	220	125	48	24



By connecting 2 contacts in series, the DC current breaking capacity is increased by 50%. In all the cases, these relays guarantee a right performance during 50,000 operations.

## Mounting possibilities/sockets



### 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 <sup>2</sup> )

### 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 <sup>2</sup> )

### Panel/flush mounting

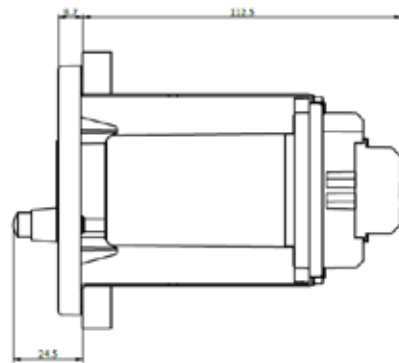
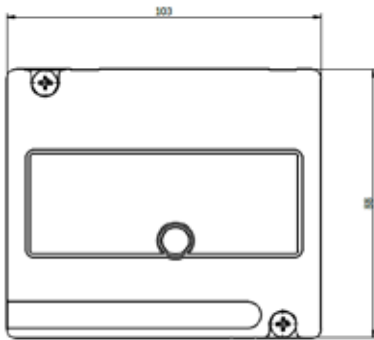
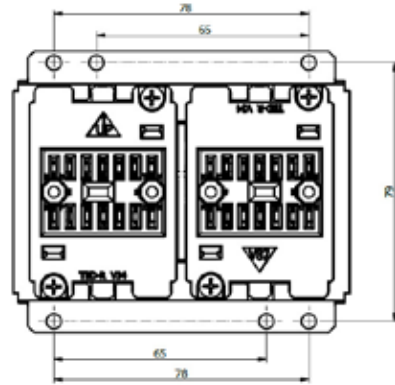
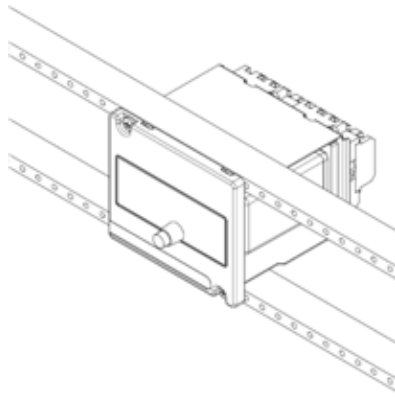
338001700	V88	Spring clamp socket, flush mount, rear dual connection (2.5 mm <sup>2</sup> )
328001850	V89	Faston connection socket, rear dual connection (4.8 x 0.8 mm)
338100200	V96	Solder tag socket, panel mount, rear connection
338400100	V97	Crimp contact socket, panel mount, rear connection, A260 crimp contact
325000521	V87	Flush mounted socket with rear screw connections
325000522	V87-2	Flush mounted socket with rear screw connections & panel / rack mounting kit

For PCB mount: use 2x V32 according to pin layout.

For more details see datasheets of the sockets on [www.morssmitt.com](http://www.morssmitt.com)

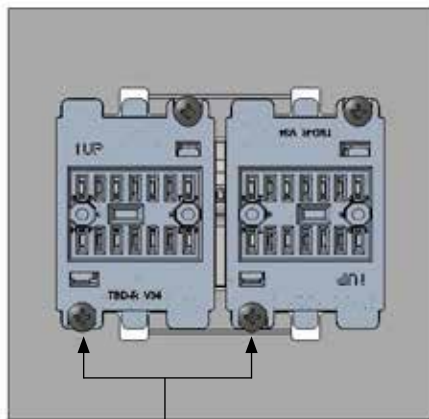


### Rack Mount Rear Connect V87-2 with Flush Mounting Socket and Kit

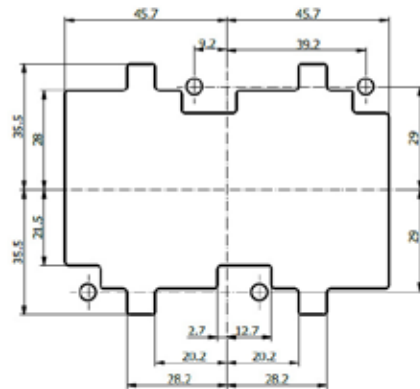


### Surface Mount Rear Connect V87 with Flush Mounting Socket

Panel cut-out to mount surface rear connect base.

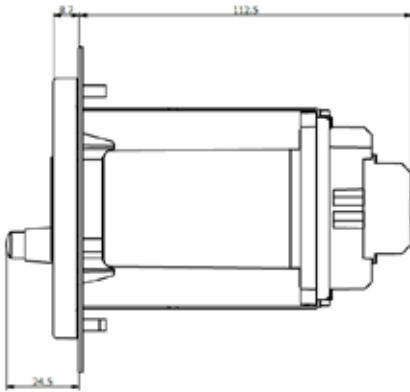
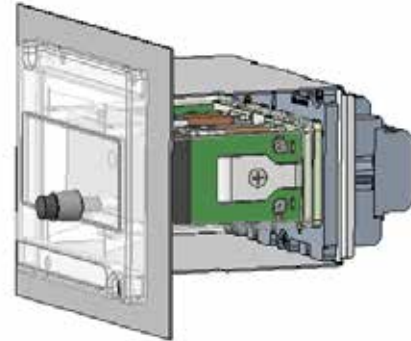
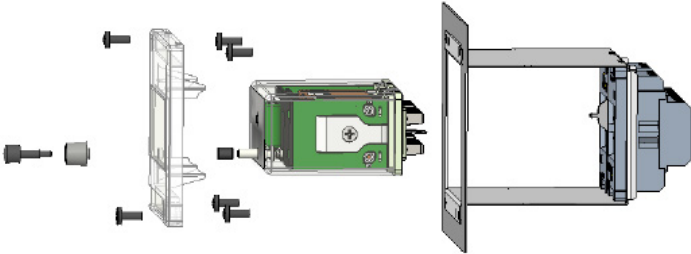


4x M4 terminal block retaining screw

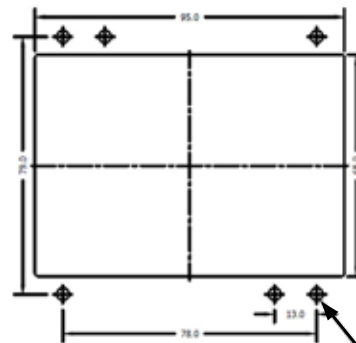


PANEL THICKNESS (T)	HOLE DIA (Ø)
1mm < T < 2mm	3.6mm
T > 2mm	3.7mm

## Flush Panel Mount Rear Connect (V87-2 with Flush Mounting Socket and Kit)



Panel cut-out to flush mount relay with rear connect.



PANEL THICKNESS (T)	HOLE DIA (Ø)
1mm < T < 2mm	3.6mm
T > 2mm	3.7mm

## Mechanical keying relay and socket (optional)



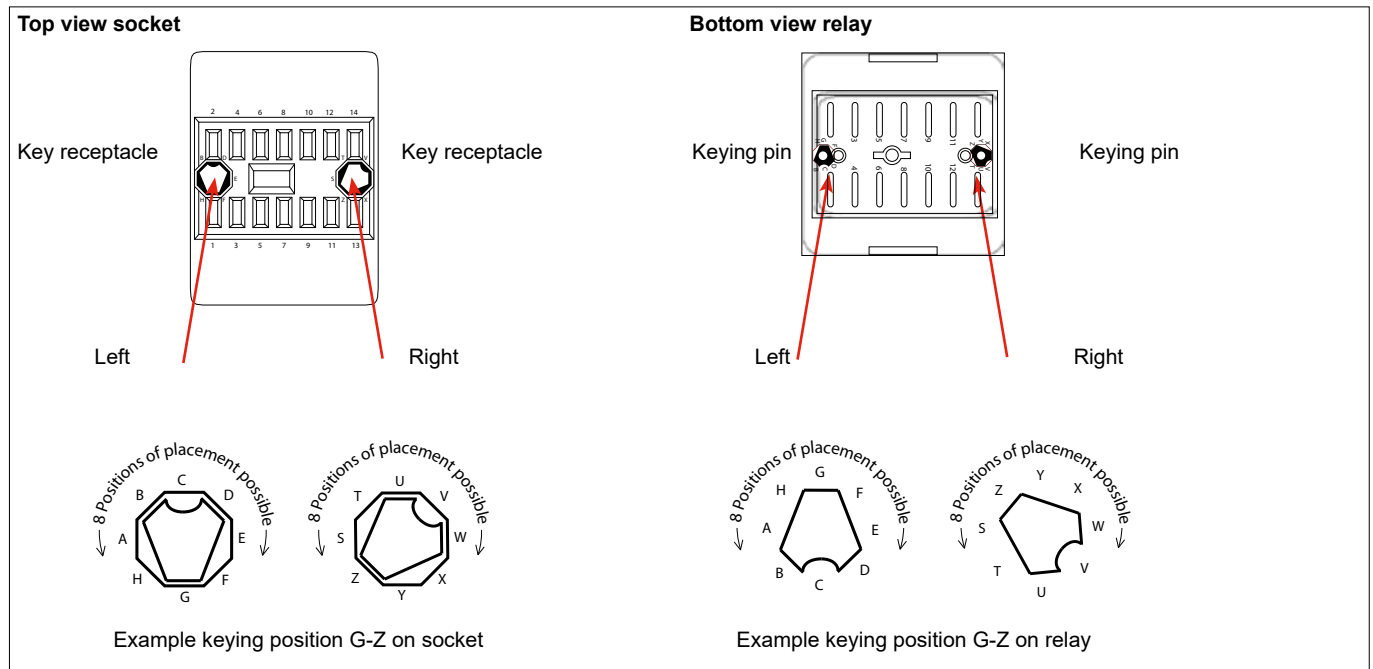
**Function:**

- 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  $8 \times 8 = 64$  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.



## 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

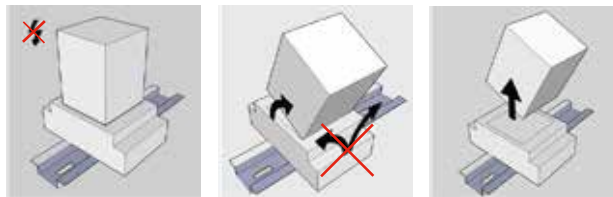
## Instructions for use

### 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. To ensure correct working of the KDN relay, the relay should be mounted in horizontal position as the position indicator will not work correct in vertical position due to gravity. 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 ( $< 15$  m $\Omega$  when new). When using silver contacts one can clean the contact by switching a contact load a few times using  $>24$  VDC &  $\sim 2$  A. Increased contact resistance is not always problematic, as it depends on circuit conditions. In general a contact resistance of  $1 \Omega$  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](http://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](http://www.morssmitt.com)

## Ordering scheme

KDN-		N	-	R8		
Coil voltages	24				24 VDC	
	32				32 VDC	
	48				48 VDC	
	60				60 VDC	
	110				110 VDC	
	125				125 VDC	Cannot be combined with:
	220				220 VDC	
Options (add as many options as needed)		<b>B</b>			Magnetic arc blow-out	
		<b>E</b>			Gold plated contacts	M
		<b>K</b>			Extra dust protection, IP50	
		<b>H</b>			High Burden	
		<b>Y</b>			Double make/ double break	
Special options (minimum order quantity: 20)		<b>M</b>			AgSnO <sub>2</sub> contacts, highly resistant to welding	E

Example: KDN-110N-BHR8

Description: KDN-R8 relay, Unom: 110 VDC, Magnetic arc blow-out, High Burden

 **Over 11 million Mors Smitt relays in use in applications worldwide!**

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