/// Plug-in industrial relay with 4 contacts

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

BD relay

Latching relay

Description

Plug-in industrial bistable power relay with three change-over contacts and one normally closed contact. The contacts remain in the last powered position. Bistable by means of a permanent magnet. Optionally equipped with magnetic arc blow-out and double make/double break contacts for high breaking capacity and long contact life.

Proven reliable operation in switching high DC voltage / inductive loads and low currents. 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 BD relay suitable to withstand corrosive atmospheres, 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 BD-relay an easy and flexible solution to use.

Application

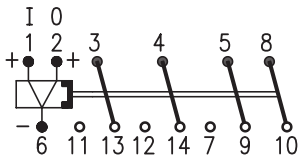
Rugged plug-in relays for extreme reliable, long endurance applications in harsh environment. These relay series are designed for demanding industrial applications such as power utilities and petrochemical industries. The BD relay is used in applications where the contacts are set and reset with permanent power or impulses.

Features

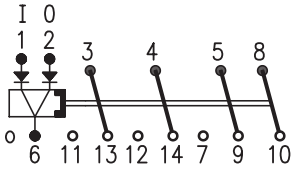
- Latching (bistable) relay
- Compact plug-in design
- 2 combined coils
- 3 C/O contacts and 1 N/C contact
  (or 3 C/O + 1 N/O, contacts remain in last powered position)
- Flat, square silver plated relay pins for excellent socket connection
- Wide range of sockets for panel, rack or 35 mm rail
- Integrated snap lock
- High DC breaking capacity
- Optional positive mechanical keying relay to socket
- Optional mechanical on/off position indicator
- Optional back EMF suppression diode (DC version)
- Flexibility by many options

Connection diagram

DC version



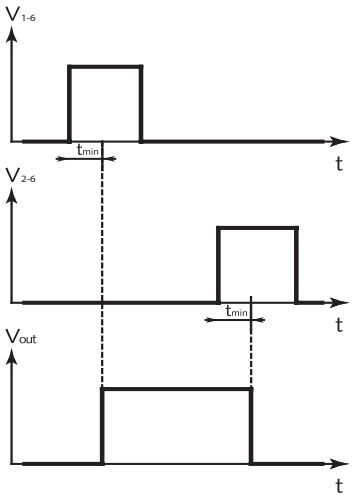
AC-version



Please note the relay will leave production in open state (with open armature) 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 armature closes and stay closed.

Therefore after installation all relays must be checked on correct state of the contacts and apply rated voltage to the coil to check correct operation.

Timing diagram



Compliancy

IEC 61810
IEC 60947
IEC 60947-5
IEC 60255

CE

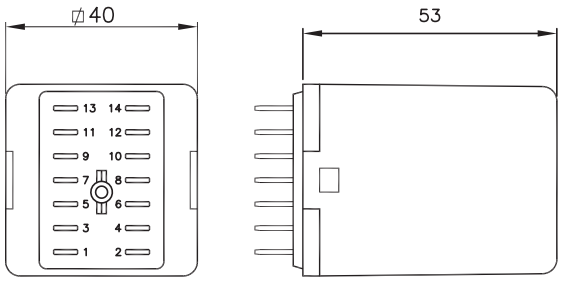
Latching relay
BD

Options

- Magnetic arc blow-out
- 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
- Mechanical on/off position indicator
- Reversed polarity
- Double make / double break contacts (-40 °C)
- Keying

Remark: Not all combinations possible

Dimensions (mm)



Solve-All relay application concept

The unique D 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 D relays

Sockets		Mounting			
		Surface / Wall	35 mm rail	Panel / Flush	PCB
Terminal connection	Screw	V23	V23	-	-
	Screw - wide terminals	V22 BR	V23 BR	-	-
	Spring clamp	V29	V29	V33	-
	Faston	-	-	V31	-
	Crimp	-	-	V26	-
	Solder tag	-	-	V3	-
	PCB	-	-	-	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 applications worldwide!

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Coil characteristics DC-versions

Operating times at nominal voltage (typical value):	
Minimum impulse time t_{min}	25 ms
Bounce time N/O contacts	4 ms
Bounce time N/C contacts	8 ms
Nominal power consumption	1.2 W at Unom
Operating voltage range	0.8 - 1.1 Unom

Type	U_{nom} (VDC)	U_{min} (VDC)	U_{max} (VDC)
12 VDC	12	9.6	13.2
24 VDC	24	19.2	26.4
48 VDC	48	38.4	52.8
60 VDC	60	48.0	66.0
110 VDC	110	88.0	121.0
125 VDC	125	100.0	137.5
220 VDC*	220	176.0	242.0

Other types on request
* 220 VDC types contain an additional PCB to ensure correct functioning at this voltage

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
- Always select the nominal voltage as close as possible to the actual voltage in the application

Coil characteristics AC-versions

Operating times at nominal voltage (typical value):	
Minimum impulse time t_{min}	50 ms
Bounce time N/O contacts	4 ms
Bounce time N/C contacts	8 ms
Nominal power consumption	4 VA at Unom
Operating voltage range	0.8 - 1.1 Unom

Type	U_{nom} (VAC)	U_{min} (VAC)	U_{max} (VAC)
24 V 50 Hz	24	19.2	26.4
42 V 50 Hz	42	33.6	46.2
110-115 V 50 Hz	115	92.0	121.0
220-230 V 50 Hz	230	184.0	242.0

Other types on request

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
- Always select the nominal voltage as close as possible to the actual voltage in the application

Latching relay
BD

Contact characteristics

Amount and type of contacts		3 C/O + 1 N/C
Peak inrush current	NF F 62-002	200 A for 10 ms (withstand > 10 x 200 A @ 10 ms, 1 min) 40 A for 0.5 s 30 A for 1 s
Maximum continuous current		10 A (AC1: IEC 60947)
Maximum switching voltage		250 VDC, 440 VAC
Minimum switching voltage		12 V (5 V for option E)
Minimum switching current		10 mA (1 mA for option E)
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	IEC 61810-1 IEC 61810-1	Pole-pole Cont-coil Open contacts	4 kV, 50 Hz, 1 min 2.5 kV, 50 Hz, 1 min 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 frequency	Mechanical: 3600 ops/h Electrical: 1200 ops/h
Weight	135 g (without options)

Environmental characteristics

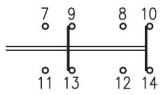
Environmental	IEC 61810
Vibration	IEC 61373, Category I, Class B, Body mounted
Shock	IEC 61373, Category I, Class B, Body mounted
Operating temperature	-25 °C...+55 °C (with option C and option Y: -40 °C) -25 °C...+70 °C (with option V)
Humidity	95% (condensation is permitted temporarily)
Salt mist	IEC 60068-2-11, NaCi, 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

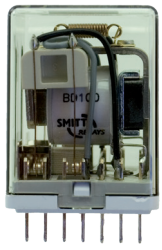
Industry compliancy

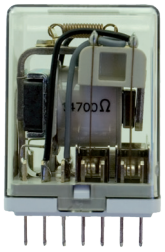
IEC 61810	Electromechanical elementary relays
IEC 60947	Low voltage switch gear and control gear
IEC 60947-5-1	Electromechanical control circuit devices and switching elements
IEC 60255	Relay design and environmental conditions
CE	

Options

Available options for BD-relay according the *Solve-All* relay application concept

Code	Description	Remark	Can not be combined with
Standard options			
B	Magnetic arc blow-out. Ensures a high DC breaking capacity and longer contact life.		
C	Lower temperature (-40 °C).	Max contact current 8A	
D	Protection against back EMF. When a coil is switched off, a large Back EMF appears across the coil. This back EMF may be several hunderd volts in value, enough to destroy the transistor,	DC: up to 125 VDC	
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	Power consumption 2.22 W @ U_{nom} Operating range AC can differ	
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.	2 C/O DM/DB contacts, -40 °C 	
Special options:			
M	$AgSnO_2$ contacts. Highly resistant to welding, for safety and vital applications.	Min. contact current 100 mA.	E
S	Mechanical on/off position indicator. (following the contacts). Indicates visual the position of the contacts.		
X3	Reversed polarity of coil contacts	+ on pin 6	

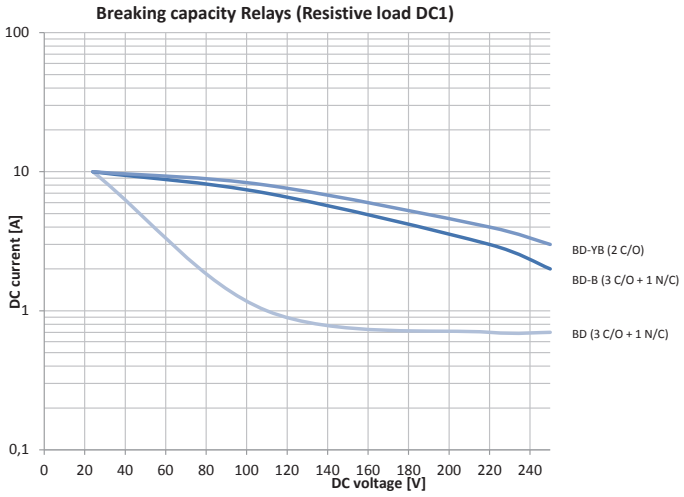




Electrical life expectancy and breaking capacity

The life expectancy values shown below are based on factory tests (test frequency at 1/3 Hz). 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.

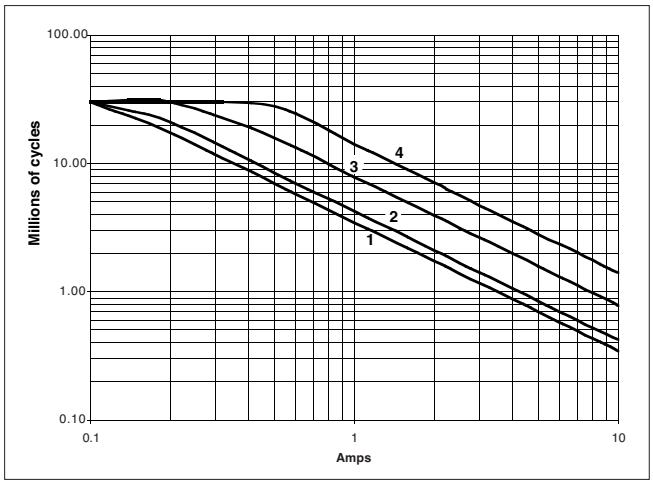
Breaking capacity relays (Resistive load DC1)



AC and DC current breaking capacity versus life expectancy in millions of cycles for D-B.
Rate of contacts opening and closing = 1200 operations per hour.

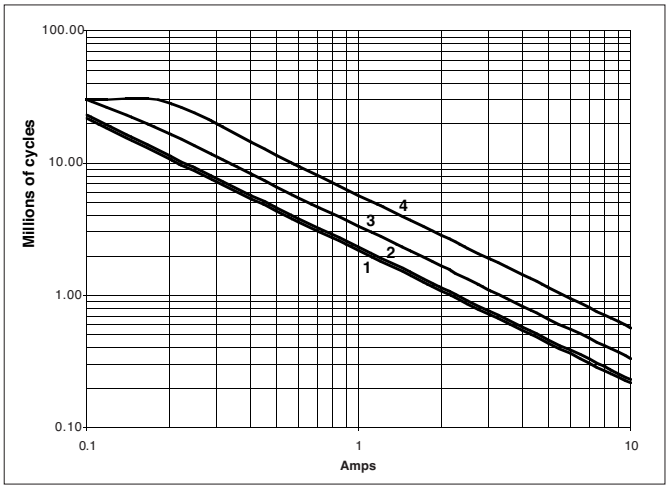
AC Current breaking capacity at cosφ = 1

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

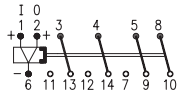


By connecting 2 contacts in series, the DC current breaking capacity is increased by 50%.

Latching relay
BD

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 BD-relays series.

BD

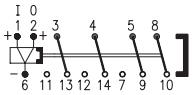


- 3 C/O + 1 N/C contacts
- Contact gap: 0.7 mm

Breaking capacity

DC1	110 VDC	1 A
	220 VDC	0.7 A
L/R=40 ms	110 VDC	0.3 A
	220 VDC	0.1 A
DC13	110 VDC	-
	220 VDC	-

BD-B

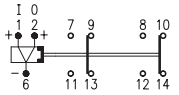


- 3 C/O + 1 N/C contacts
- Magnetic arc blow out
- Contact gap: 0.7 mm

Breaking capacity

DC1	110 VDC	7 A
	220 VDC	3 A
L/R=40 ms	110 VDC	3 A
	220 VDC	1 A
DC13	110 VDC	-
	220 VDC	-

BD-Y

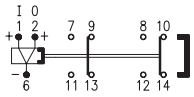


- 2 C/O contacts
- Double make double break
- Contact gap: 1.4 mm

Breaking capacity

DC1	110 VDC	1.5 A
	220 VDC	1 A
L/R=40 ms	110 VDC	0.5 A
	220 VDC	0.2 A
DC13	110 VDC	-
	220 VDC	-

BD-YB



- 2 C/O contacts
- Double make double break
- Magnetic arc blow out
- Contact gap: 1.4 mm

Breaking capacity

DC1	110 VDC	8 A
	220 VDC	4 A
L/R=40 ms	110 VDC	5 A
	220 VDC	2 A
DC13	110 VDC	1.5 A
	220 VDC	0.5 A

Latching relay
BD

Mounting possibilities/sockets

 V3	 V22BR	 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 mm^2)

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 mm^2)

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 (4.8 x 0.8 mm)
338000670	V33	Push-in terminal socket, panel mount, rear dual connection (3.3 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
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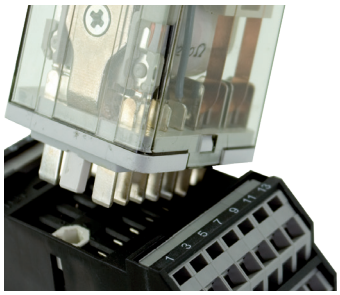
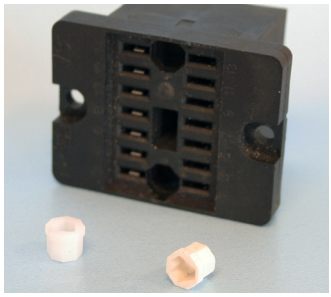
Mechanical keying relay and socket (optional)





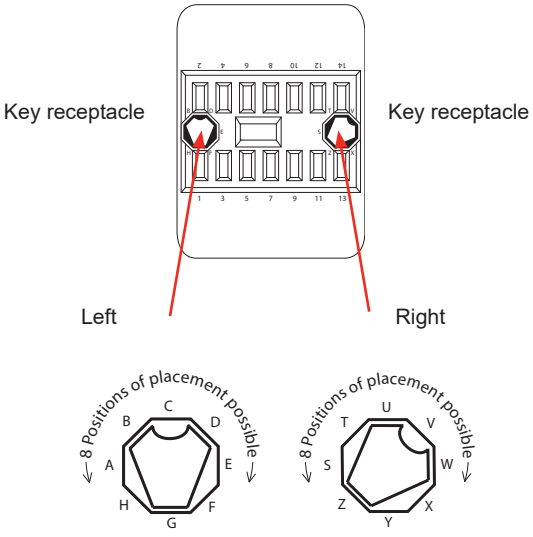
Function:
- To prevent wrong installation
- To prevent damage to equipment
- To prevent unsafe situations

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.

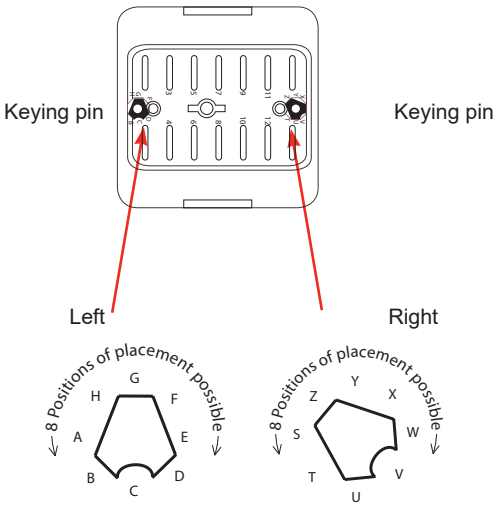
Remark: Sockets and relay shown are examples.

Top view socket



Example keying position G-Z on socket

Bottom view relay



Example keying position G-Z on relay

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.

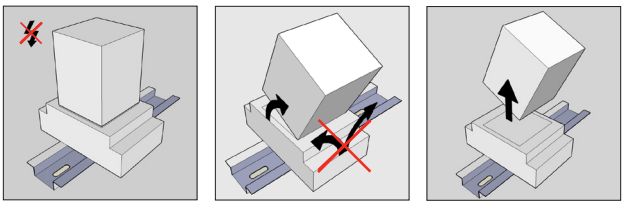
Therefore for long time contact reliability we recommend:
- Silver contacts: a minimum contact current of 20 mA per contact
- Gold contacts: a minimum contact current of 10 mA per contact
- Double Make Double Break contacts: a minimum contact current of 40 mA per contact
- When low currents are switched 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

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
BD

Ordering scheme

BD-				
				Cannot be combined with
Options	B		Magnetic arc blow-out	
(add as many options as needed)	C		Low temperature (-40 °C) - Max contact current 8 A	
	D		Back EMF protection diode	
	E		Gold plated contacts	M
	K		Extra dust protection, IP50	
	V		Wider operation range and ambient temperature	
	Y		Double make/ double break (-40 °C)	
Special options				
(minimum order quantity: 20)	M		$AgSnO_2$ contacts, highly resistant to welding	E
	S		Mechanical position indicator	
	X3		Reversed polarity	
Coil voltages		12 VDC		
		24 VDC		
		48 VDC		
		60 VDC		
		110 VDC		
		125 VDC		
		220 VDC		
		24 VAC 50 Hz		
		42 VAC 50 Hz		
		110-115 VAC 50 Hz		
Other voltages on request		220-230 VAC 50 Hz		

Example: BD-B 48 VDC
Description: BD-relay, Unom: 48 VDC, 3 C/O+1 N/C contacts, magnetic arc blow-out.

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

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