

D-B relay - High DC breaking capacity, power relay, 4 pole

Datasheet



Description

Plug-in industrial power relay with 4 change-over contacts and magnetic arc blow-out for high DC breaking capacity and long contact life. Standard equipped with a LED indicator and back EMF suppression diode (for DC voltages). Optional double make/double break contacts and increased contact gaps to further increase the breaking capacity and 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 D-B 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 D-B relay an easy and flexible solution to use.

Application

Rugged plug-in relays for extreme reliable, long endurance applications in harsh environment. Proven reliable operation in switching high DC voltage / inductive loads. These relay series are designed for demanding industrial applications such as power utilities and petrochemical industries. With the highly reliable D-relays applications with SIL levels can be achieved.

Features

- Compact plug-in design
- Instantaneous, 4 C/O contacts
- High DC breaking capacity
- LED indicator
- Back EMF suppression diode (DC versions)
- Flat, square silver plated relay pins for excellent socket connection
- Wide range of sockets for panel, rack or 35 mm rail
- Integrated snap-lock
- Solve-All relay application concept
- Optional positive mechanical keying relay to socket
- Optional trip indicator

Benefits

- Proven reliable
- Long term availability
- Used in safety critical applications
- Low life cycle cost
- No maintenance

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

D-B relay

Technical specifications



Standard LED



Smitt style pinning



Magnetic arc blow-out

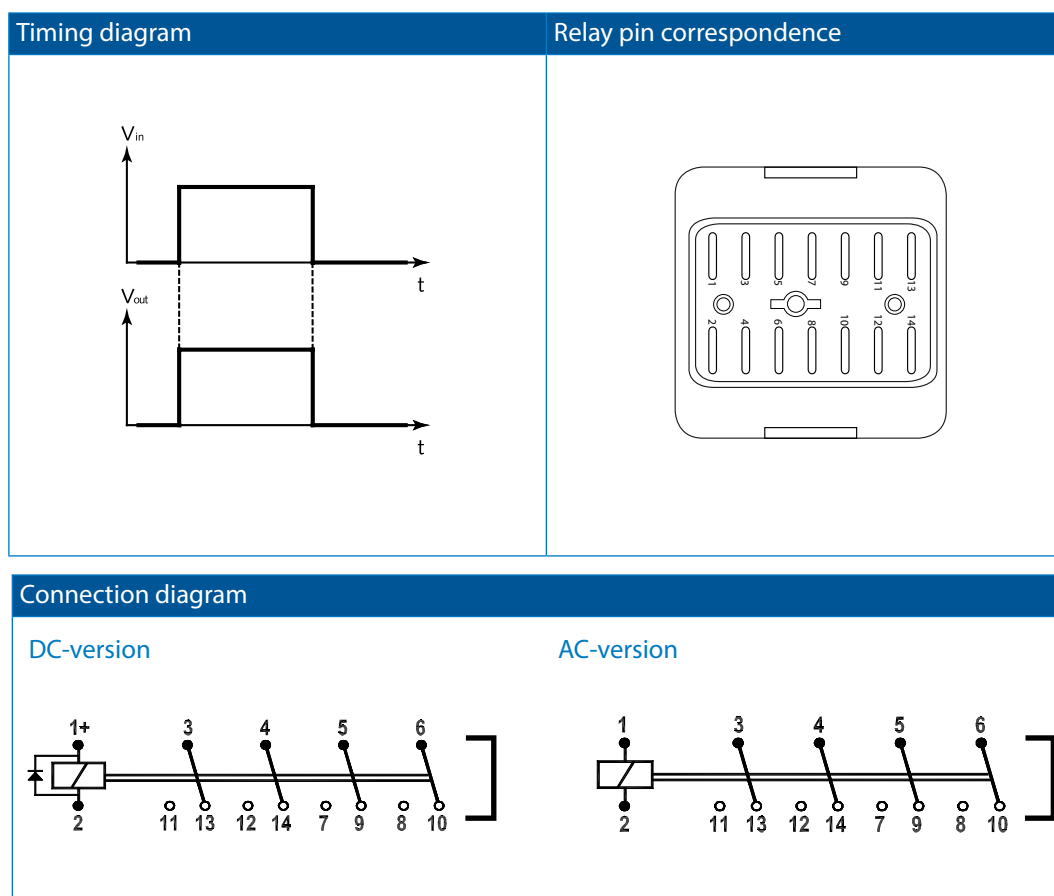


Transparent cover

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.

Functional and connection diagrams



D-B relay

Technical specifications

Coil characteristics DC-versions

Operating times at nominal voltage (typical):	
Pull-in time	≤ 20 ms
Release time	≤ 18 ms
Bounce time N/O contacts	≤ 4 ms
Bounce time N/C contacts	≤ 8 ms
Inductance L/R at U_{nom} (typical):	
Energized	11 ms
Released	8 ms
Nominal power consumption	2 W at U_{nom}
Operating voltage range	0.8 - 1.1 U_{nom}

Type	U_{nom} (VDC)	U_{min} (VDC)	U_{max} (VDC)	$U_{drop-out}$ (VDC)	$R_{coil}^*(\Omega)$
6 VDC	6	4.8	6.6	0.6	20
12 VDC	12	9.6	13.2	1.2	72
24 VDC	24	19.2	26.4	2.4	280
30-32 VDC	30-32	24	35.2	3	501
48 VDC	48	38.4	52.8	4.8	1124
60 VDC	60	48.0	66	6	1790
72 VDC	72	57.6	79.2	7.2	3238
100 VDC	100	80	110	10	5500
110 VDC	110	88	121	11	6278
120-125 VDC	120-125	96	137.5	12	8054
220 VDC	220	176	242	22	26422
250 VDC	250	200	275	25	33000

Other types on request

* The R_{coil} is measured at room temperature and has a tolerance of $\pm 10\%$

Remarks:

- U_{min} 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
- $U_{drop-out}$ 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



D-B relay

Technical specifications

Coil characteristics AC-versions

Operating times at nominal voltage (typical):	
Pull-in time	≤ 10 ms
Release time	≤ 5 ms
Bounce time N/O contacts	≤ 4 ms
Bounce time N/C contacts	≤ 8 ms
Nominal power consumption	2 VA at U_{nom}
Operational voltage range	0.8 - 1.1 U_{nom}

Type	U_{nom} (VAC)	U_{min} (VAC)	U_{max} (VAC)	$U_{drop-out}$ (VAC)	$R_{coil}^*(\Omega)$
6 V 50 Hz	6	4.8	6.6	1.8	3
24 V 50 Hz	24	19.2	26.4	7.2	44
24 V 60 Hz	24	19.2	26.4	7.2	34
42 V 50 Hz	42	33.6	46.2	12.6	133
42 V 60 Hz	42	33.6	46.2	12.6	94
60 V 50 Hz	60	48	66	18	280
110-115 V 50 Hz	110-115	88	126.5	33	1124
110-115 V 60 Hz	110-115	88	126.5	33	736
120-127 V 60 Hz	120	96	132	36	830
127 V 50 Hz	127	101.6	139.7	38.1	1300
220-230 V 50 Hz	220-230	176	253	66	4400
220 V 60 Hz	220	176	242	66	2953
230-240 V 50 Hz	230-240	184	264	69	3300
230-240 V 60 Hz	230-240	184	264	69	4800
380-400 V 50 Hz	380-400	304	440	114	12500
380 V 60 Hz	380	304	418	114	5500

Other types on request

* The R_{coil} is measured at room temperature and has a tolerance of $\pm 10\%$

Remarks:

- U_{min} 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
- $U_{drop-out}$ 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

D-B relay

Technical specifications

Contact characteristics

Amount and type of contacts	4 C/O
Peak inrush current (make and carry)	200 A for 10 ms 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 with option E)
Minimum switching current	10 mA (1 mA with option E)
Material	Ag standard (optional AgSnO ₂ , Au on Ag)
Contact gap	0.7 mm (up to 4 mm for YX5 option)
Contact force	> 200 mN
Contact resistance	<15 mΩ (initial)

Electrical characteristics

Dielectric strength	Pole-pole	IEC 61810-1	4 kV, 50 Hz, 1 min
	Cont-coil	IEC 61810-1	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	DC: 50 x 10 ⁶ operations AC: 10 x 10 ⁶ operations
Maximum switching frequency	Mechanical: 3600 ops/h Electrical: 1200 ops/h
Weight	140 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: -50 °C) -25 °C...+70 °C (with option V)
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)
Insulation materials	Cover: polycarbonate Base: polyester



D-B relay

Technical specifications

Options

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

Code	Description	Remark	Can not be combined with
A	Mechanical trip indicator (manually resettable). Indicates if the relay has been energized.		K, L, W
B	Magnetic arc blow-out. Ensures a high DC breaking capacity and longer contact life		
C	Lower temperature (-50 °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 hundred volts in value, enough to destroy a transistor.	Diode standard in DC coil (not necessary to add code D to product code)	
E	Gold plated contacts. Low contact resistance and good resistance against corrosive atmospheres. Suitable for switching low level dry circuit loads. 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		M
H	High burden protection. Provides immunity to capacitance discharge currents & power. Suitable for application in high security circuit breaker tripping circuits.	Thermistor (PTC) Height relay: 76 mm	T,A,R
K	Extra dust protection. Cover sealed with sealant.		T
L	LED integrated in coil.	Standard (not necessary to add code L to product code)	A
M	AgSnO ₂ contacts. Highly resistant to welding, for safety and vital applications.	Min. contact current 100 mA	E
P	Polarization diode. Protection against reversed polarity.		
Q	Double zener diode. Coil protection against transient voltage.	DC coil only Max. allowed peak voltage: 180 V. Higher voltage will damage the diode	
R	Faster switching contacts, pull in time < 7 ms For reduction of total switching time in critical circuits. Suitable for energy controlling systems. No normally open contact will make below 50 % U _{nom}	DC coil only 3 C/O contacts	H, L, W
T	'Push to Test' button. To operate the contact manually.		K, W
V	Wider operating range and ambient temperature. Operating range: 0.7 ... 1.25 U _{nom} Ambient temperature: -25 °C...+70 °C	Power consumption 2.22 W @ U _{nom} Operating range AC can differ	X5

D-B relay

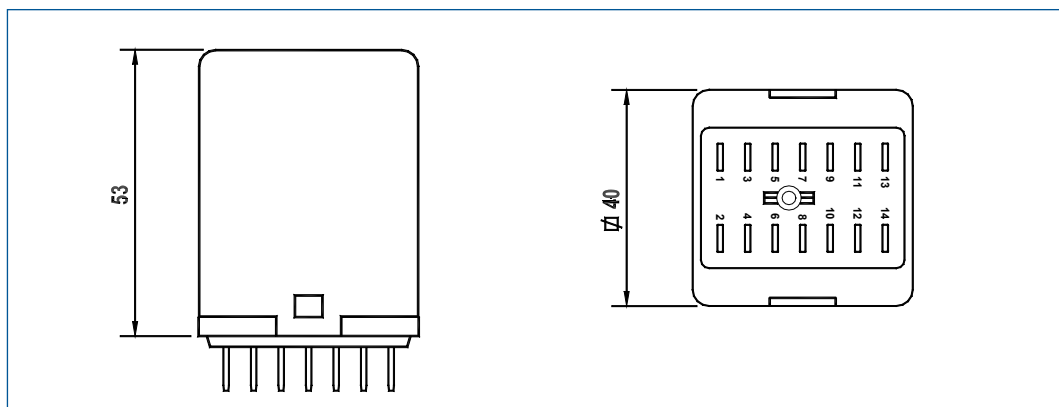
Technical specifications

Code	Description	Remark	Can not be combined with
W	Weld-no-transfer according EN 50205. Non welding contacts for safety critical applications 1 N/C / 3 N/O or 2 N/C / 2 N/O or 3 N/C / 1 N/O.	Option W and Y*	A, R, T, X4, X5, 11
X	Bidirectional LED.	Only for DC and in combination with option Z. ZX: no diode, with bidirectional LED	
X2	Universal AC/DC coil because of rectifier circuit.		
X3	Reversed polarity of coil contacts. Contact 1 = negative (-) and contact 2 = positive (+)		
X4	Make before break contacts. Contacts 5-7 and 6-8 will make before contacts 3-13 and 4-14 will break. During release, the contacts 3-13 and 4-14 will make before contacts 5-7 and 6-8 will break.	2 N/O and 2 N/C contacts	W
X5	Contact gap of 2 mm. Higher DC breaking capacity and longer contact life. To increase the breaking capacity and contact life more this option can be combined with option B and Y.	2 N/O and 2 N/C contacts	V, W
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 and X5.	2 C/O DM/DB contacts -50 °C	
Z	No diode and no LED.	Polarity independent	W
11	Make before break contacts. Contact 4-12 will make before contact 3-13 will break during pull-in. During release, contact 3-13 will make before contact 4-12 will break. Contact 5-7/9 is a normal change over contact.	2 C/O 1 N/O and 1 N/C contacts	W

Coloured cover and keying of relay on socket on request

* Option W and Y:
or 1 N/C, 1 N/O, 1 N/O DM/DB
or 1 N/C DM/DB, 1 N/O DM/DB
or 1 N/C, 1 N/C DM/DB, 1 N/O

Dimensions

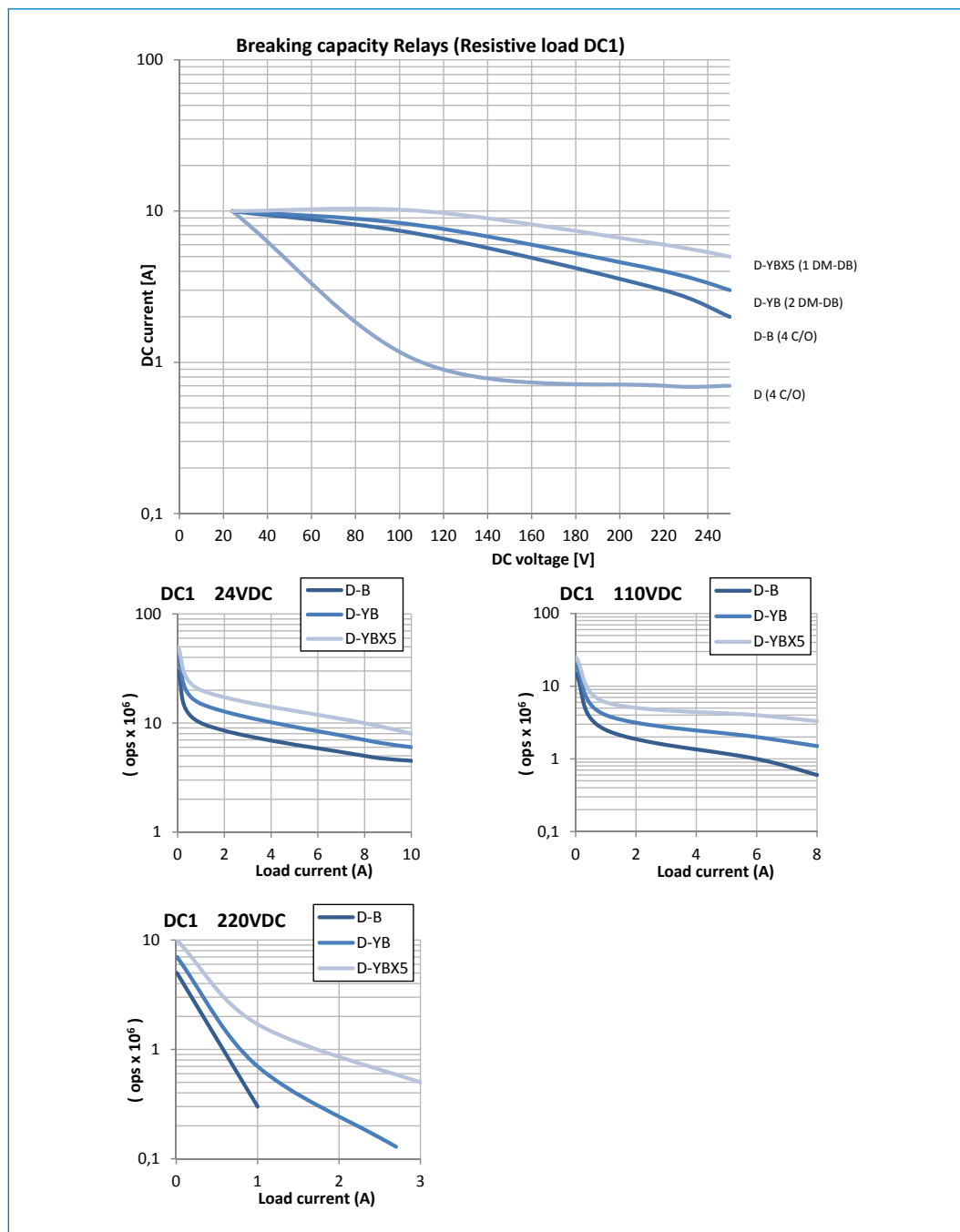


D-B relay

Technical specifications

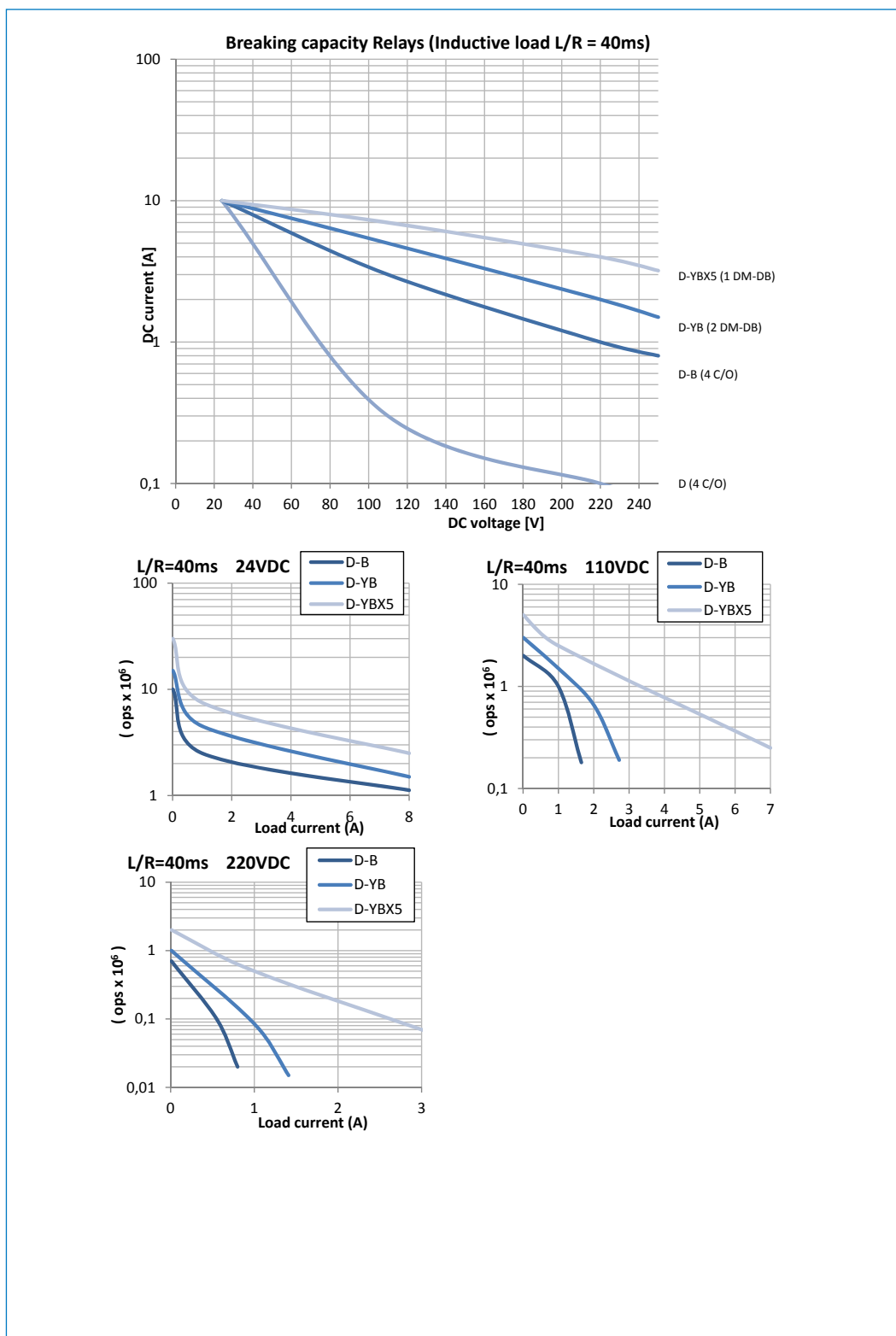
Electrical life expectancy and breaking capacity

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) and increasing contact gap (X5) will increase breaking capacity and life expectancy significantly.



D-B relay

Technical specifications

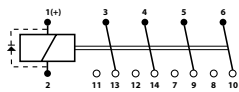


D-B relay

Technical specifications

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-B relays.

D

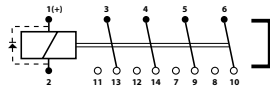


- 4 C/O contacts
- Contact gap : 0.7 mm

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	-

D-B

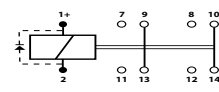


- 4 C/O contacts
- Magnetic arc blow out
- Contact gap : 0.8 mm

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	-

D-Y

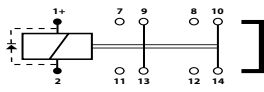


- 2 C/O contacts
- Double make double break
- Contact gap : 1.4 mm

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	-

D-YB

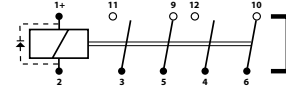


- 2 C/O contacts
- Double make double break
- Magnetic arc blow out
- Contact gap : 1.4 mm

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

D-BX5

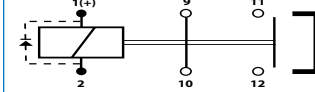


- 2 N/O + 2 N/C contacts
- Magnetic arc blow out
- Contact gap : 2 mm

Breaking capacity

DC1	110 VDC	10 A
	220 VDC	5 A
L/R=40 ms	110 VDC	6 A
	220 VDC	3 A
DC13	110 VDC	3 A
	220 VDC	1 A

D-YBX5



- 1 N/O + 1 N/C contacts
- Double make double break
- Magnetic arc blow out
- Contact gap : 4 mm

Breaking capacity

DC1	110 VDC	12 A
	220 VDC	6 A
L/R=40 ms	110 VDC	7 A
	220 VDC	4 A
DC13	110 VDC	4 A
	220 VDC	2 A



D-B relay Sockets

Mounting possibilities/sockets



Surface/wall mounting

338000100	V2	Bush connection screw socket, wall mount, front connection (2.5 mm ²)
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

338000200	V21	Bush connection screw socket, rail mount, front connection (2.5 mm ²)
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
338000560	V31	Faston connection socket, rear dual connection (2 x 4.8 mm)
338000570	V33	Spring clamp socket, flush mount, rear dual connection (2.5 mm ²)

PCB mounting

338000561	V32	PCB soldering socket
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D-B relays

Instructions

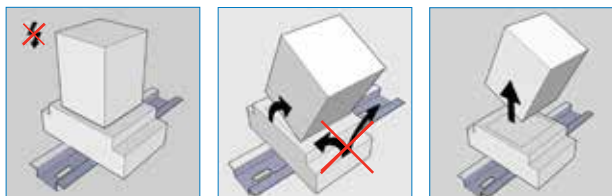
Installation, operation & inspection

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 presence 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 ($\leq 15 \text{ m}\Omega$ when new). When using silver contacts one can clean the contact by switching a contact load a few times using $>24 \text{ VDC}$ & $\sim 2\text{A}$. Increased contact resistance is not always problematic, as it depends on circuit conditions.

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 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.

D-B relays

Ordering scheme



1. Relay model 2. Options 3. Coil voltage

This example represents a D-YB 220 VDC.

Description: D-relay, U_{nom} : 220 VDC, including double make double break contacts and magnetic arc blow-out.

1. Relay model



2. Options

A	Trip indicator	W013	Weld no transfer, 1 NC / 3 NO
B	Magnetic arc blow-out (standard)	W022	Weld no transfer, 2 NC / 2 NO
C	Low temperature (-50°C)	W031	Weld no transfer, 3 NC / 1 NO
D	Back EMF diode (standard in DC coil)		(see separate datasheet D-W)
E	Gold plated contacts	X	Bidirectional LED
H	High burden protection	X2	Rectifier circuit
K	Cover sealed, special dust protection	X3	Reversed polarity
L	LED integrated in coil (standard)	X4	Make before break contacts
M	AgSnO ₂ contacts, highly resistant to welding	X5	Contact gap 2 mm
P	Polarisation diode	Y	Double make double break contacts
Q	Double zener diode	Z	No diode, no LED
R	Fast switching	11	Make before break contact
T	Push-to-test-button	Keying	Coil coding for relay and socket
V	Wider operation range and ambient temperature	Colour	Coloured cover for coil voltage

3. Coil voltage

6 VDC	6 VAC 50 Hz	24 VAC 60 Hz
12 VDC	24 VAC 50 Hz	42 VAC 60 Hz
30-32 VDC	42 VAC 50 Hz	110-115 VAC 60 Hz
48 VDC	60 VAC 50 Hz	120-127 VAC 60 Hz
60 VDC	100-115 VAC 50 Hz	220 VAC 60 Hz
72 VDC	127 VAC 50 Hz	230-240 VAC 60 Hz
100 VDC	220-230 VAC 50 Hz	380 VAC 60 Hz
110 VDC	230-240 VAC 50 Hz	
120-125 VDC	380-400 VAC 50 Hz	
220 VDC		
250 VDC		

Other voltages on request





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