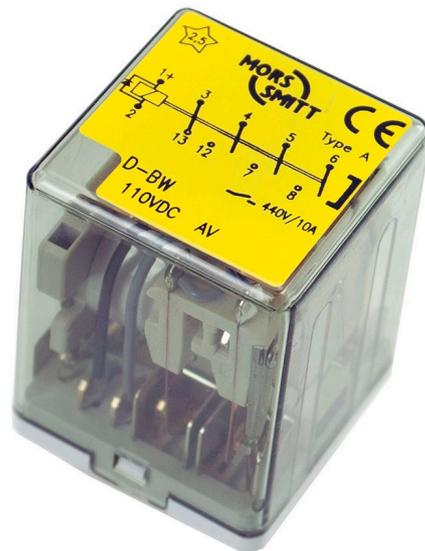


D-BW relay - Weld-no-transfer, high DC breaking capacity, 4 pole

Datasheet



Description

Plug-in safety critical industrial power relay with 4 N/O-N/C contacts. Weld-no-transfer contacts are standard. Including magnetic arc blow-out for high DC breaking capacity and long contact life. Also equipped with a LED indicator and back EMF suppression diode (for DC voltages). Optional double make/double break contacts 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-BW relay suitable to withstand corrosive atmospheres, low and high temperatures, shock & vibration and dry to very humid environments. Compact design, choice of many options and a wide range of sockets makes the D-BW relay an easy and flexible solution to use.

Application

Rugged plug-in relays for safety critical, extreme reliable and long endurance applications in harsh environment. Proven reliable operation in switching high DC voltage / inductive loads. These relays are designed for demanding industrial applications such as power utilities and petrochemical industries.

Features

- Compact plug-in design
- Instantaneous, 4 N/O-N/C 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

Benefits

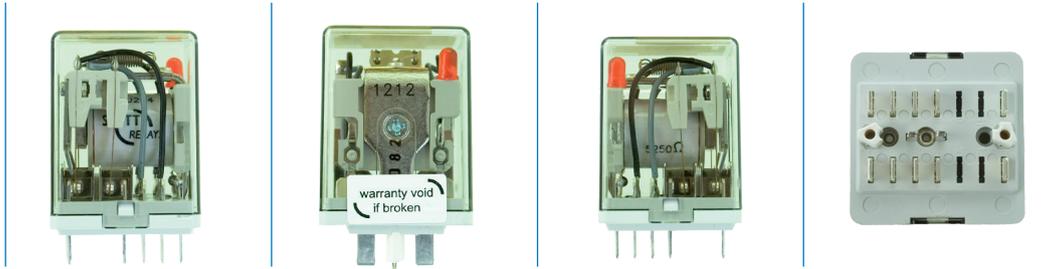
- Proven reliable
- Long term availability
- Used in safety critical applications
- Low life cycle cost
- No maintenance

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-BW relay

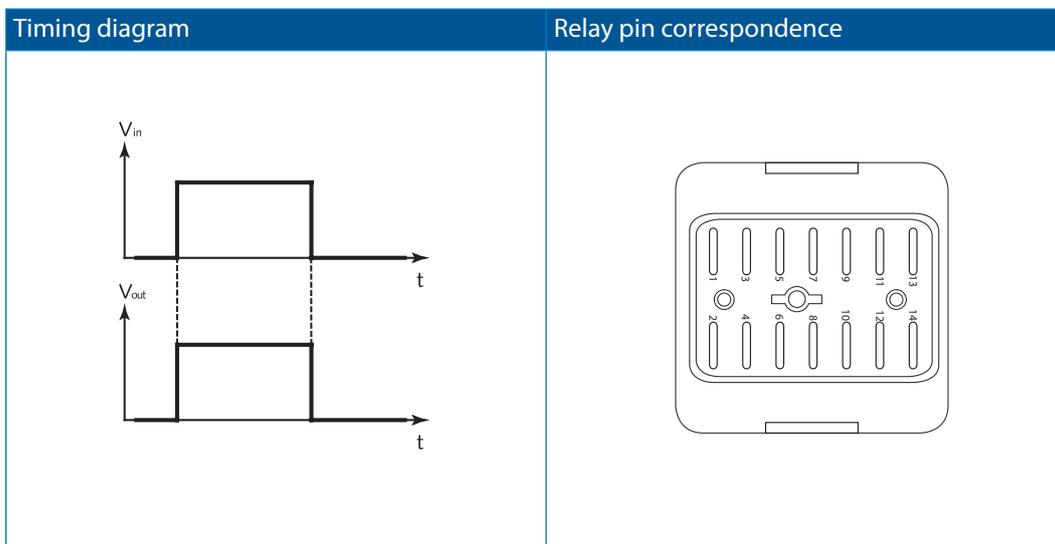
Technical specifications



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-BW relay

Technical specifications

Connection diagrams, available models

Bottom view relay

D-BW013
relay contact
combination
1 N/C 3 N/O

D-BW022
relay contact
combination
2 N/C 2 N/O

D-BW031
relay contact
combination
3 N/C 1 N/O

(No relay pins are placed at the black marked pin positions)

Top view socket

At the black marked positions the holes in the socket are blocked, so no relay pin can enter. Only correct contact configuration of the D-BW0XX model will fit.

To segregate between safety relays with identical coil voltage but different contact configuration, receptacles are placed in the socket (see black marked positions). When ordering sockets mention the appropriate contact configuration after the keying code.

For example when ordering V29 sockets for D-BW013 relays with keying code AS: order V29 code AS 013.

Note: For applications in France the relay and correct socket form an obligatory combination. Additional standard keying on page 13.

D-BW relay

Technical specifications

Coil characteristics DC-versions

Operating times at nominal voltage (typical):	
Pull-in time	≤ 25 ms
Release time	≤ 55 ms
Bounce time N/O contacts	≤ 5 ms
Bounce time N/C contacts	≤ 16 ms
Inductance L/R at U_{nom} (typical):	
Energized	11 ms (typical)
Released	8 ms (typical)
Nominal power consumption	2.2 W @ U_{nom} (typical)
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}^* (Ω)
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

Contact characteristics

Amount and type of contacts	4 N/O - N/C
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	≥ 1.5 mm
Contact force	> 200 mN
Contact resistance	<15 mΩ (initial)

D-BW relay

Technical specifications

Electrical characteristics

Insulation coordination

Section	Clearance	Creepage	Material group	Unom*
A	≥ 2.2	≥ 3.0	I (CTI600)	220 V
B	≥ 2.4	≥ 2.4	I (CTI600)	240 V
C	≥ 1.7	≥ 1.7	I (CTI600)	170 V

* For basic insulation, PD2 and OV3

Pulse withstanding IEC 60255-5 5 kV (1.2/50 μs)

Mechanical characteristics

Mechanical life	50 x 10 ⁶ operations
Maximum switching frequency	Mechanical: 3600 ops/h Electrical: 1200 ops/h
Weight	145 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...+85 °C (with option C: -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) (with option K: IP50)
Insulation materials	Cover: polycarbonate Base: polyester



D-BW relay

Technical specifications

Options

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

Code	Description	Remark	Can not be combined with
B	Magnetic arc blow-out. Ensures a high DC breaking capacity and longer contact life	Standard	
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 (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, 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	
K	Dust protection. Cover sealed with sealant.	IP50*	
L	LED integrated in coil.	Standard (not necessary to add code L to product code)	
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.	Max. allowed peak voltage: 180 V. Higher voltage will damage the diode	
V	Wider operating voltage range and ambient temperature. Operating voltage range: 0.7 ... 1.25 U _{nom} Ambient temperature: -25 °C...+70 °C	Power consumption 2.22 W @ U _{nom}	
W	Weld-no-transfer according EN 50205. Non welding contacts for safety critical applications	Standard	
X	Bidirectional LED.	Only 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 (+)		

D-BW relay

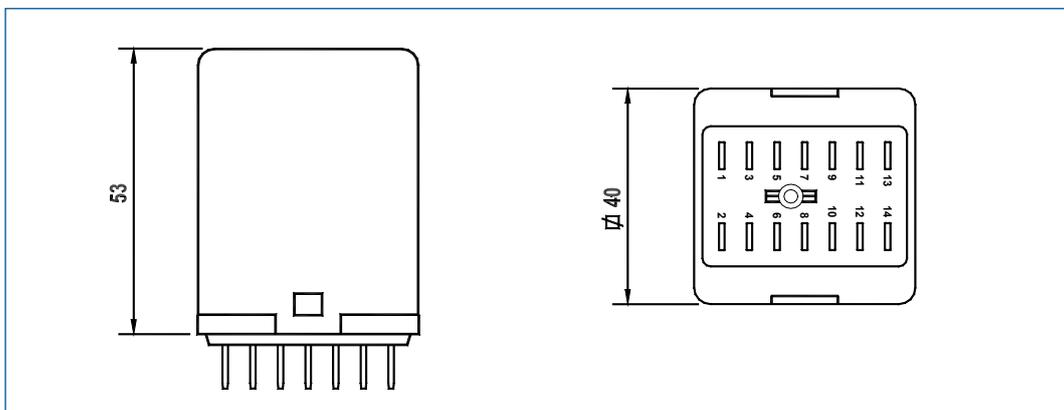
Technical specifications

Code	Description	Remark	Can not be combined with
Y	Double break / double make contacts. Breaking capacity increased by 50% and longer contact life.	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	
Z	No diode and no LED.	Polarity independent	

Coloured cover and keying of relay on socket on request

* IP50 Cat2 for relays mounted in a Mors Smitt socket, application PD1/PD2 and contact load >0.5A.

Dimensions



D-BW relay

Technical specifications

Electrical life expectancy

Due to the safety nature of the D-BW relays, please contact Mors Smitt with detailed contact load data. With this information, Mors Smitt can provide a correct advice in line with your specific application.

Required contact data:

- Voltage
- Current
- Inductance of load
- Kind of suppression used on load
- Required number of operations
- Switching frequency

Weld-no-transfer

The D-BWxxx relay with weld-no-transfer contacts complies to the standards NF F62-002 (§12.3.10) and meets the technical requirements listed in the EN 50205 standard as described below.

With the option weld-no-transfer a normally open contact will not close if a normally closed contact fails to open and the relay is energized. Also, a normally closed contact will not close if a normally open contact fails to open and the relay is de-energized.

Testing according to NF F62002 §12.3.10:

- With one N/C contact kept closed, none of the N/O contacts may close a test circuit of 10 mA @ 220 V 50 Hz when the coil is energized with 150 % of the maximum specified coil voltage (= 150 % * 125 % U_{nom} = 188 % U_{nom}). The other N/C contacts may open.
- With one N/O contact kept closed, none of the N/C contacts may close a test circuit of 10 mA @ 220 V 50 Hz when the coil is de-energized. The other N/O-contacts may open.

Testing according to EN 50205:

- If one N/C contact fails to open, all N/O contacts must maintain a contact gap ≥ 0.5 mm when the coil is energized with the maximum energizing quantity which can occur under worst case conditions:
 - maximum coil voltage
 - minimum ambient temperature
 - minimum coil resistance
- If one N/O contact fails to open, all N/C contacts must maintain a contact gap ≥ 0.5 mm when the coil is de-energized
- All tests must be performed under worst case conditions
- Above requirements apply throughout the specified endurance and under reasonable foreseeable single failure conditions
- Failure mode and effect analysis (FMEA) has been performed to verify the design.

Safety related application condition

In case the relays are used in safety relevant application conditions the relays shall be used in applications where the contacts are read back within a two channel safety structure.

D-BW relay

Technical specifications

Mounting possibilities/sockets



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 (6.3 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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For more details see datasheets of the sockets



D-BW relay

Technical specifications

Installation, operation & inspection

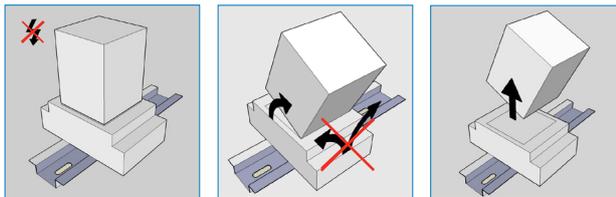
Installation

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

When rail mounting is used, always mount the socket in the direction of the UP arrow, to have proper fixation of the socket on the rail.

Warning!

- Never use silicon in the proximity of the relays.
- Do not use the relay in the 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. In general a contact resistance of 1Ω is no problem, consult Mors Smitt for more information.

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

Inspection

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

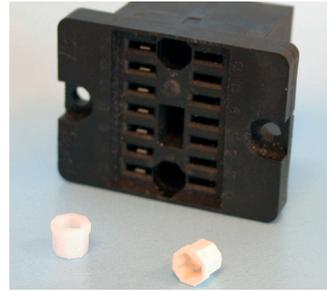
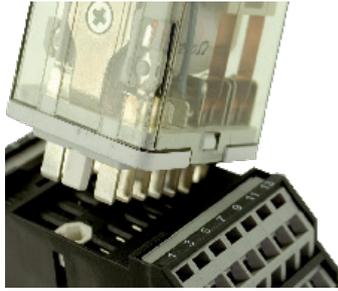
If the relay doesn't work after inspection, replace the relay unit with a similar model. Do not attempt to open the relay cover or try to repair. Contacts are calibrated and in balance, touching can affect proper operation. Also re soldering may affect correct operation. Since 2009 relays have tamper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

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

D-BW relay

Technical specifications

Mechanical keying relay and socket (optional)



Function:

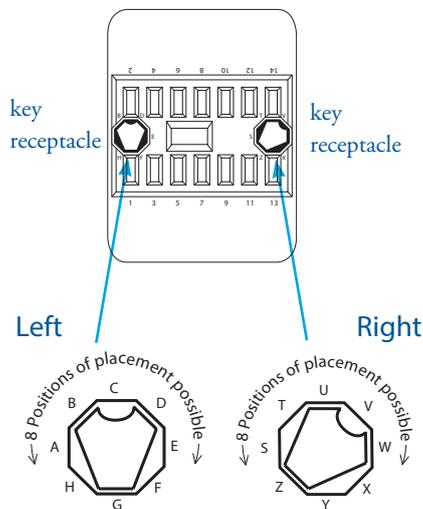
- To prevent wrong installation
- To prevent damage to equipment
- To prevent unsafe situations

Keyed relays and sockets prevent the relay to be 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.

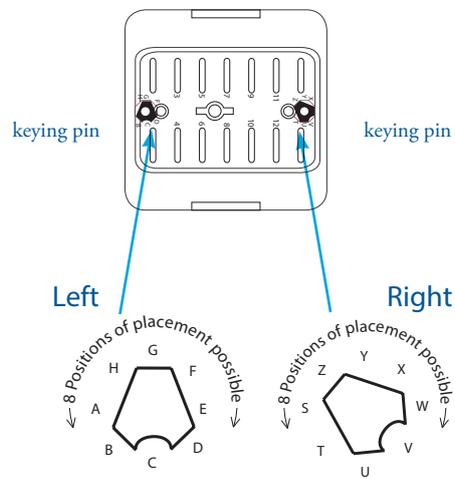
Remark: Sockets and relay shown are examples.

Top view socket



Example keying position G-Z on socket

Bottom view relay



Example keying position G-Z on relay

D-BW relays

Ordering scheme



1. Relay series 2. Options 3. Contact config. 4. Coil voltage 5. Keying

This example represents a D-YBW013 24 VDC, code AS.

Description: D relay, Unom: 24 VDC, double make double break contacts, weld-no-transfer
1 N/C - 3 N/O contacts, keying code AS.

1. Relay model

D-BW

2. Options

B	Magnetic arc blow-out (standard)
C	Low temperature (-50°C)
D	Back EMF diode (standard)
E	Gold plated contacts
H	High burden protection
K	Cover sealed, dust protection, IP50
L	LED integrated in coil (standard)
M	AgSnO ₂ contacts, highly resistant to welding
P	Polarisation diode
Q	Double zener diode
V	Wider operation range and ambient temp.
X	Bidirectional LED
X2	Rectifier bridge
X3	Reversed polarity
Y	Double make / double break
Z	No diode

4. Contact configuration

W013	Weld no transfer, 1 N/C - 3 N/O
W022	Weld no transfer, 2 N/C - 2 N/O
W031	Weld no transfer, 3 N/C - 1 N/O



D-B W relays

Ordering scheme

4. Coil voltages

12 VDC
24 VDC
30-32 VDC
48 VDC
60 VDC
72 VDC
100 VDC
110 VDC
120-125 VDC
220 VDC
250 VDC

5. Keying (optional)*

Standard, silver contacts

Code AS	24 VDC	D-BW code AS
Code AY	36 VDC	D-BW code AY
Code AT	48 VDC	D-BW code AT
Code AU	72 VDC	D-BW code AU
Code AV	110 VDC	D-BW code AV

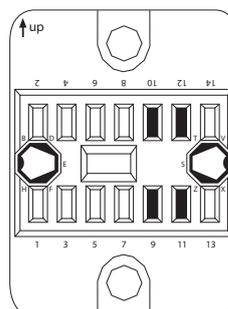
Option E, gold contacts

Code DT	24 VDC	D-BW code DT
Code FV	36 VDC	D-BW code FV
Code HU	48 VDC	D-BW code HU
Code AZ	72 VDC	D-BW code AZ
Code HV	110 VDC	D-BW code HV

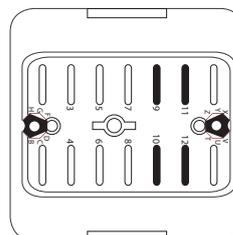
Option M, silver tin oxide contacts

Code GT	24 VDC	D-BW code GT
Code HT	36 VDC	D-BW code HT
Code GU	48 VDC	D-BW code GU
Code GV	72 VDC	D-BW code GV
Code GW	110 VDC	D-BW code GW

Top view socket



Bottom view relay



* Obligatory for applications in France.

Other keying codes on request.





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