

## PLUG-IN INDUSTRIAL RELAY WITH 4 C/O CONTACTS

RUGGED PLUG-IN RELAYS FOR EXTREME RELIABILITY, WITHIN LONG ENDURANCE APPLICATIONS AND HARSH ENVIRONMENTS

# D

**Instantaneous relay**

*Part of D-platform*



### FEATURES

- > Instantaneous compact plug-in relay, 4 C/O contacts
- > LED indicator (standard in Red, optional in green)
- > Integrated back EMF suppression diode (DC versions)
- > Coil voltages 6 to 250 VDC, 6-400 VAC
- > High DC breaking capacity
- > Maximum continuous current 10 A
- > Maximum switching voltage 250 VDC, 440 VAC
- > Minimum switching current 10 mA (optional 1 mA)
- > Mechanical life 50 million operations (DC versions)
- > Solve-All relay application concept
- > Transparent cover for easy visual inspection
- > Integrated snap-lock, no external retaining clip needed
- > Wide range of sockets for panel, rack or 35 mm rail
- > Flexibility with many options
- > Optional positive mechanical keying relay to socket

### DESCRIPTION

Plug-in industrial power relay with 4 change-over contacts. Standard equipped with a LED indicator and back EMF suppression diode (for DC voltages). Optionally magnetic arc blow-out, 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 D-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-relay an easy and flexible solution to use.

### APPLICATION

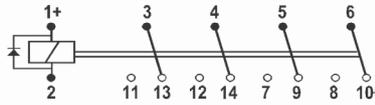
Demanding industrial applications such as power utilities and petrochemical industries. Designed for extreme reliability, within long endurance applications and harsh environments.

With the highly reliable D-relays applications with SIL levels can be achieved.

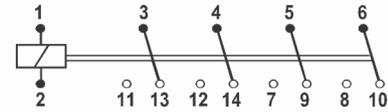
# Functional Description

## CONNECTION DIAGRAM

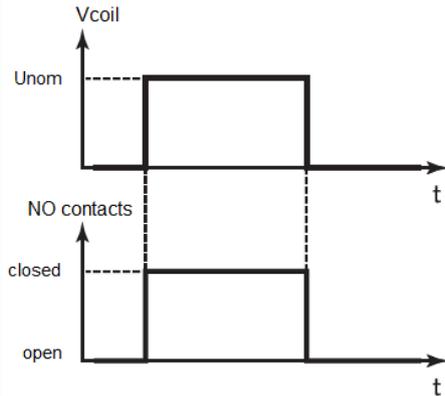
### DC - VERSION



### AC - VERSION



## TIMING DIAGRAM

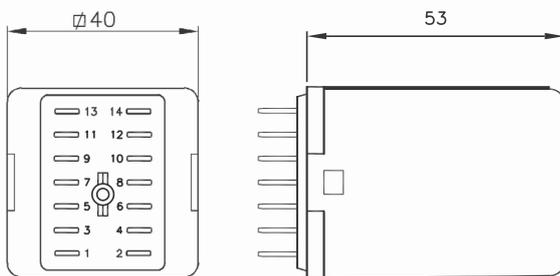


## COMPLIANCY

IEC 61810  
IEC 60947  
IEC 60947-5  
IEC 60255



## 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.

### OPTIONS

- > Magnetic arc blow-out
- > Standard -50 . . . +70°C
- > Gold plated contacts
- > Extra dust protection
- > Double zener diode
- > Wider operating range and ambient temperature
- > Weld-no-transfer contacts
- > Double make/double break contacts
- > No surge protection diode and no LED
- > High burden protection
- > AgSnO2 contacts
- > Polarizing diode
- > Fast switching contacts, 4 C/O contacts
- > Mechanical on/off position indicator
- > Push-to-test button
- > Bipolar LED
- > Rectifier bridge
- > Reversed polarity of coil contacts
- > Make before break contacts
- > Contact gap of 2 mm

| Terminal connection | Sockets                | Mounting       |            |               |     |
|---------------------|------------------------|----------------|------------|---------------|-----|
|                     |                        | Surface / Wall | 35 mm rail | Panel / Flush | PCB |
|                     | Screw                  | V23            | V23        | -             | -   |
|                     | Screw - wide terminals | V22BR          | V23BR      | -             | -   |
|                     | 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](http://www.morssmitt.com)

## 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 Unom (typical)              |                |
| Energized                                     | 11 ms          |
| Released                                      | 8 ms           |
| Nominal power consumption                     | 2 W at Unom    |
| Operating voltage range                       | 0.8 - 1.1 Unom |

| Type        | U <sub>nom</sub> (VDC) | U <sub>min</sub> (VDC) | U <sub>max</sub> (VDC) | U <sub>drop-out</sub> (VDC) | R <sub>coil</sub> * (Ω) |
|-------------|------------------------|------------------------|------------------------|-----------------------------|-------------------------|
| 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 Rcoil is measured at room temperature and has a tolerance of ± 10%

### Remarks:

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

## 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 $U_{nom}$   |
| Operating 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 60Hz       | 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 Rcoil 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

## MECHANICAL CHARACTERISTICS

|                             |                         |
|-----------------------------|-------------------------|
| Mechanical life             | DC: 50 million          |
|                             | AC: 10 million          |
| Maximum switching frequency | Mechanical: 3600 ops/h  |
|                             | Electrical: 1200 ops/h  |
| Weight                      | 125 g (without options) |

## CONTACT CHARACTERISTICS

|                                      |   |                 |
|--------------------------------------|---|-----------------|
| Amount and type of contacts          | 4 C/O                                   |                 |
| Peak inrush current (make and carry) | NF F62-002                              | 200 A for 10 ms |
|                                      |   | 40 A for 0.5 s  |
|                                      |   | 30 A for 1 s    |
| Maximum continuous current           | 10 A                                    |                 |
| 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 , Au on Ag) |                 |
| Contact gap                          | 0.7 mm (1.4mm for option Y)             |                 |
| Contact force                        | > 200 mN                                |                 |
| Contact resistance                   | <15 mΩ (initial)                        |                 |

## ELECTRICAL CHARACTERISTICS

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

## INDUSTRY CHARACTERISTICS

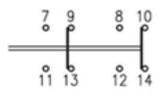
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|---------------|--|
| IEC 61810     | Electromechanical elementary relays                              |
| IEC 60947     | Low voltage switch gear and control gear                         |
| IEC 60947-5-1 | Electromechanical control circuit devices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

## 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 | -50 °C...+55 °C (with option Y: -50 °C)                       |
|                       | -50 °C...+70 °C (with option V) But -25...+55°C for option R4 |
| Humidity              | 95% (condensation is permitted temporarily)                   |
| Salt mist             | IEC 60068-2-11, NaCl, 35 oC 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   |

## OPTIONS

Available options for D-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.  |   |                          |
| E                | Gold plated contacts.<br>Low contact resistance and good resistance against corrosive atmospheres. Suitable for switching low level loads.<br><br>Gold plated contacts characteristics: Material Ag, 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.   | T                        |
| Q                | Double zener diode.<br>Coil protection against transient voltage.  | DC coil only. Max. allowed peak voltage: 180 V. Higher voltage will damage the diode. Replaces back EMF diode                                       | Z                        |
| 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 @ Unom<br>Operating range AC can differ  | R4                       |
| W                | Weld-no-transfer according EN 50205.<br>Non welding contacts for safety critical applications<br>1 N/C / 3 N/O or 2 N/C / 2 N/O or 3 N/C / 1 N/O.  | Option W and Y*   | R4, T                    |
| Y                | Double break / double make contacts.<br>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, -50 °C<br>                               |                          |
| Z                | No diode and no LED.   | Polarity independent  | Q, R4, P                 |
| Special options: |  |   |                          |
| E1M3             | 1 Gold plated signaling contact (terminals 8-10) and 3 AgSnO contacts  |   | E, M                     |
| H                | High burden protection. Provides immunity to capacitance discharge currents & power. Suitable for application in high security circuit breaker tripping circuits.  | Thermistor (PTC)<br>Height relay: 76 mm   | R4, T                    |
| M                | AgSnO <sub>2</sub> contacts. Highly resistant to welding, for safety and vital applications.   | Min. contact current 100 mA.  | E                        |
| P                | Polarisation diode. Protection against reversed polarity.  |   | X, Z                     |
| R4               | 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 60 % Unom.<br>Ambient temperature: -25 °C...+70 °C.<br>Input voltage must be a rising edge with<br>- minimum slew rate: 1 V/ms<br>- minimum time: 10 ms  | DC coil only.<br>4 C/O contacts.<br>Integrated polarization and protection diode (option D and P).<br>Mechanical life: 1 million operations. No LED | H, V, W, X, X2, Z        |
| T                | 'Push to Test' button. To operate the contact manually.  |   | K, W                     |
| X                | Bidirectional LED.   | Only for DC and in combination with option Z. ZX: no diode, with bidirectional LED  | P, Q, R4, Z              |
| X2               | Universal AC/DC coil because of rectifier circuit.   | No LED. In combination with Option Z.   | H, P, R4, X, Z           |

\* Option W and Y:

W013 Weld no transfer, 1 N/C - 3 N/O (option Y: YW012: N/C 3-13, N/O 5-7, N/O\*\* 8-12)

W022 Weld no transfer, 2 N/C - 2 N/O (option Y: YW011: N/C\*\* 13-14, N/O\*\* 7-8)

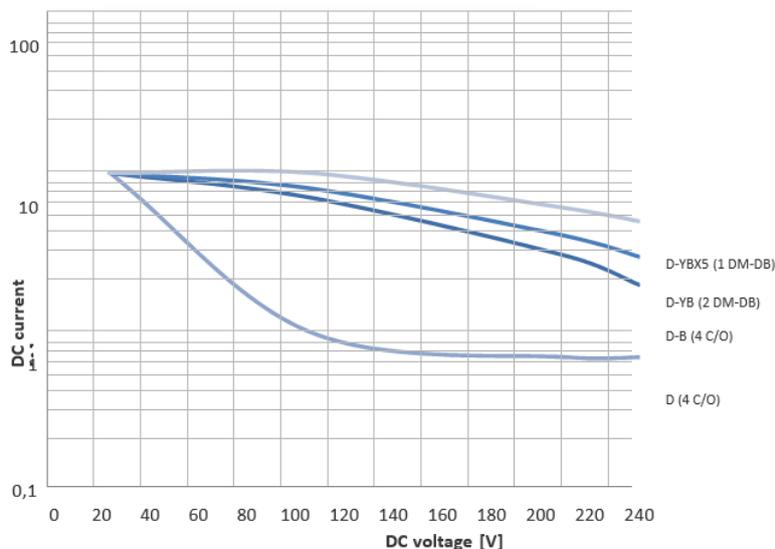
W031 Weld no transfer, 3 N/C - 1 N/O (option Y: YW021: N/C 3-13, N/O 5-7, N/C\*\* 10-14)

\*\*double make /double break

## 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.

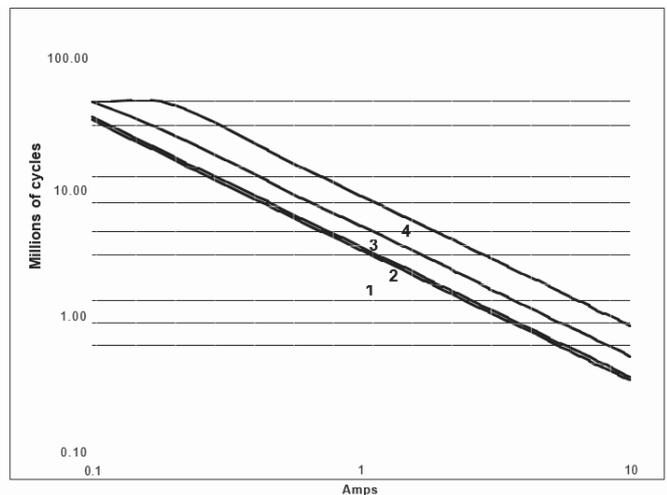
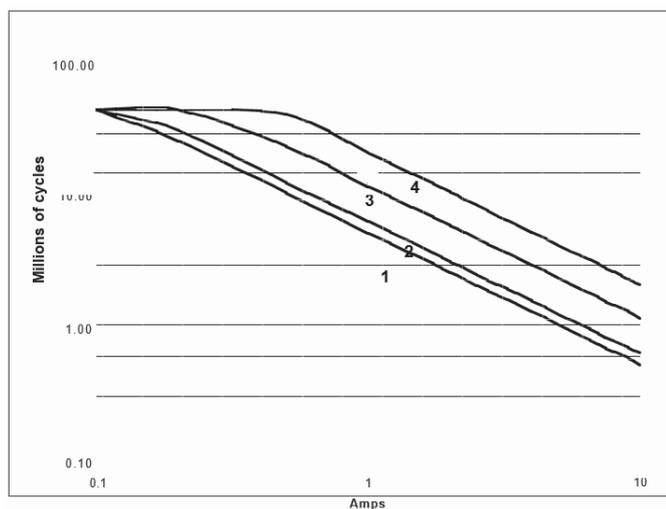
RATE OF CONTACTS OPENING AND CLOSING = 1200 OPERATIONS PER HOUR.

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

| Curve | 1   | 2   | 3  | 4  |
|-------|-----|-----|----|----|
| VAC   | 220 | 125 | 48 | 24 |

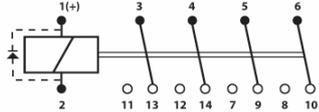
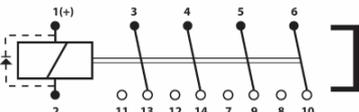
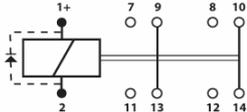
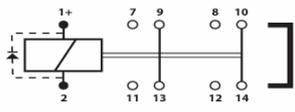
DC Current breaking capacity at L/R = 0

| 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 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.

| D   | D-B     | D-Y  |     |         |         |       |           |         |           |         |         |       |         |         |      |         |         |   |  |       |         |     |  |         |     |           |         |     |  |         |     |      |         |   |  |         |   |   |     |         |       |  |         |     |           |         |       |  |         |       |      |         |   |  |         |   |
|---|---------|--|-----|---------|---------|-------|-----------|---------|-----------|---------|---------|-------|---------|---------|------|---------|---------|---|--|-------|---------|-----|--|---------|-----|-----------|---------|-----|--|---------|-----|------|---------|---|--|---------|---|---|-----|---------|-------|--|---------|-----|-----------|---------|-------|--|---------|-------|------|---------|---|--|---------|---|
|  <ul style="list-style-type: none"> <li>• 4 C/O contacts</li> <li>• Contact gap: 0.7 mm</li> </ul> <p><b>Breaking capacity</b></p> <table border="0"> <tr> <td>DC1</td> <td>110 VDC</td> <td>1 A</td> </tr> <tr> <td></td> <td>220 VDC</td> <td>0.7 A</td> </tr> <tr> <td>L/R=40 ms</td> <td>110 VDC</td> <td>0.3 A</td> </tr> <tr> <td></td> <td>220 VDC</td> <td>0.1 A</td> </tr> <tr> <td>DC13</td> <td>110 VDC</td> <td>-</td> </tr> <tr> <td></td> <td>220 VDC</td> <td>-</td> </tr> </table> | 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 | - |  <ul style="list-style-type: none"> <li>• 4 C/O contacts</li> <li>• Magnetic arc blow out</li> <li>• Contact gap: 0.7 mm</li> </ul> <p><b>Breaking capacity</b></p> <table border="0"> <tr> <td>DC1</td> <td>110 VDC</td> <td>7 A</td> </tr> <tr> <td></td> <td>220 VDC</td> <td>3 A</td> </tr> <tr> <td>L/R=40 ms</td> <td>110 VDC</td> <td>3 A</td> </tr> <tr> <td></td> <td>220 VDC</td> <td>1 A</td> </tr> <tr> <td>DC13</td> <td>110 VDC</td> <td>-</td> </tr> <tr> <td></td> <td>220 VDC</td> <td>-</td> </tr> </table> | 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 | - |  <ul style="list-style-type: none"> <li>• 2 C/O contacts</li> <li>• Double make double break</li> <li>• Contact gap: 1.4 mm</li> </ul> <p><b>Breaking capacity</b></p> <table border="0"> <tr> <td>DC1</td> <td>110 VDC</td> <td>1.5 A</td> </tr> <tr> <td></td> <td>220 VDC</td> <td>1 A</td> </tr> <tr> <td>L/R=40 ms</td> <td>110 VDC</td> <td>0.5 A</td> </tr> <tr> <td></td> <td>220 VDC</td> <td>0.2 A</td> </tr> <tr> <td>DC13</td> <td>110 VDC</td> <td>-</td> </tr> <tr> <td></td> <td>220 VDC</td> <td>-</td> </tr> </table> | 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 | - |
| 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 | -  |     |         |         |       |           |         |           |         |         |       |         |         |      |         |         |   |  |       |         |     |  |         |     |           |         |     |  |         |     |      |         |   |  |         |   |   |     |         |       |  |         |     |           |         |       |  |         |       |      |         |   |  |         |   |
| 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 | -  |     |         |         |       |           |         |           |         |         |       |         |         |      |         |         |   |  |       |         |     |  |         |     |           |         |     |  |         |     |      |         |   |  |         |   |   |     |         |       |  |         |     |           |         |       |  |         |       |      |         |   |  |         |   |
| 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   |     |         |         |       |           |         |           |         |         |       |         |         |      |         |         |   |  |       |         |     |  |         |     |           |         |     |  |         |     |      |         |   |  |         |   |   |     |         |       |  |         |     |           |         |       |  |         |       |      |         |   |  |         |   |
|   |         |  <ul style="list-style-type: none"> <li>• 2 C/O contacts</li> <li>• Double make double break</li> <li>• Magnetic arc blow out</li> <li>• Contact gap: 1.4 mm</li> </ul> <p><b>Breaking capacity</b></p> <table border="0"> <tr> <td>DC1</td> <td>110 VDC</td> <td>8 A</td> </tr> <tr> <td></td> <td>220 VDC</td> <td>4 A</td> </tr> <tr> <td>L/R=40 ms</td> <td>110 VDC</td> <td>5 A</td> </tr> <tr> <td></td> <td>220 VDC</td> <td>2 A</td> </tr> <tr> <td>DC13</td> <td>110 VDC</td> <td>1.5 A</td> </tr> <tr> <td></td> <td>220 VDC</td> <td>0.5 A</td> </tr> </table> | 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 |         |     |  |         |     |           |         |     |  |         |     |      |         |   |  |         |   |   |     |         |       |  |         |     |           |         |       |  |         |       |      |         |   |  |         |   |
| 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  |     |         |         |       |           |         |           |         |         |       |         |         |      |         |         |   |  |       |         |     |  |         |     |           |         |     |  |         |     |      |         |   |  |         |   |   |     |         |       |  |         |     |           |         |       |  |         |       |      |         |   |  |         |   |

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

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

### 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)                 |
| 338000570 | V33 | Spring clamp socket, flush mount, rear dual connection (2.5 mm <sup>2</sup> ) |

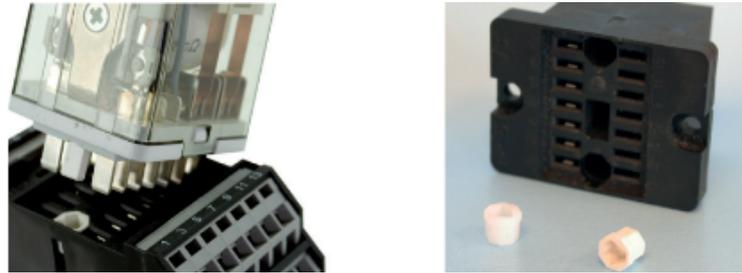
### PCB mounting

|           |     |                      |
|-----------|-----|----------------------|
| 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](http://www.morssmitt.com)

# Mounting Of Relays



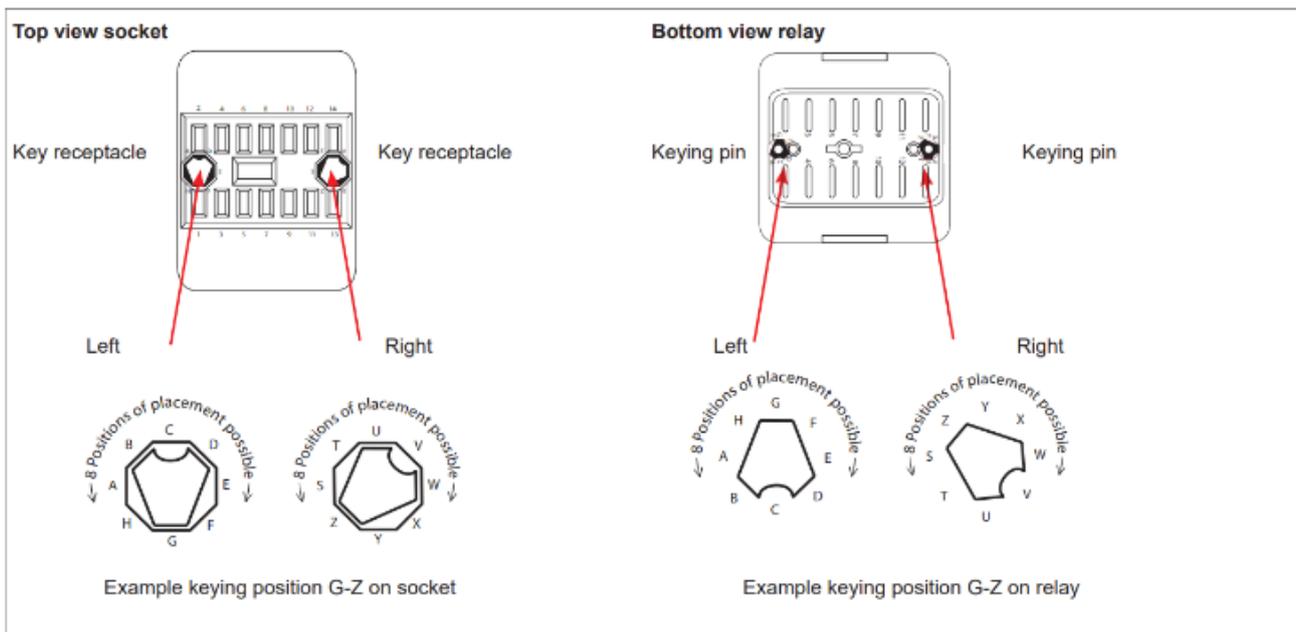
Function:

- 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

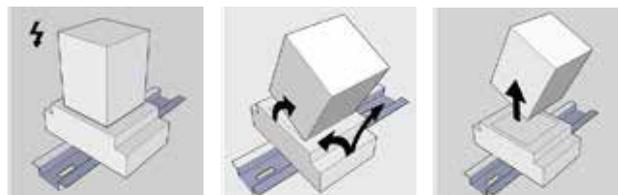
## INSTRUCTIONS FOR USE

### 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 D8FR8 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 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



- 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](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)

# Order Codes

|  |  |         |  |      |                      |   |
|--|--|---------|--|------|----------------------|---|
| D-   |  | N       |  | Code |                      | Cannot be combined with                           |
| Coil voltages  | 220 VDC                                    |         |  |      |                      | This is an example, all voltages on pages 3 & 4   |
| Options<br>(add as many options as needed)   |  | B       |  |      |                      | Magnetic arc blow-out                             |
|  |  | E       |  |      |                      | Gold plated contacts                              |
|  |  | K       |  |      | M                    | Extra dust protection, IP50                       |
|  |  | Q       |  |      | T                    | Double zener diode                                |
|  |  | V       |  |      | Z                    | Wider operation range and ambient temperature     |
|  |  | W013    |  |      | R4                   | Weld no transfer, 1 NC / 3 NO (see datasheet D-W) |
|  |  | W022    |  |      | R4, T                | Weld no transfer, 2 NC / 2 NO (see datasheet D-W) |
|  |  | W031    |  |      |                      | Weld no transfer, 3 NC / 1 NO (see datasheet D-W) |
|  |  | Y       |  |      |                      | Double make/ double break (-50 °C)                |
|  |  | Z       |  |      | P, Q, R4             | No diode, no LED                                  |
| Special options<br>(minimum order quantity: 20)  |  | E1M3    |  |      | E, M                 | 1 Gold, 3 AgSnO2 contacts                         |
|  |  | H       |  |      | R4, T                | High burden protection                            |
|  |  | M       |  |      | E                    | AgSnO2 contacts, highly resistant to welding      |
|  |  | P       |  |      | X, Z                 | Polarisation diode                                |
|  |  | R4      |  |      | H, V, W, X, X2, Z    | Fast switching 4 C/O contacts                     |
|  |  | T       |  |      | K, W                 | Push-to-test-button                               |
|  |  | X       |  |      | P, Q, R4, Z          | Bipolar LED                                       |
|  |  | X2      |  |      | H, P, R4, X, Z       | Coil for both DC and AC                           |
| Keying code (optional, leave blank if not required)<br><br>Remark: keying codes are available for all possible coil voltages | <b>Standard, silver contacts</b>           |         |  |      |                      |   |
|  | AS   | 24 VDC  |  |      | D 24 VDC, code AS    |   |
|  | AT   | 48 VDC  |  |      | D 48 VDC, code AT    |   |
|  | AU   | 72 VDC  |  |      | D 72 VDC, code AU    |   |
|  | AV   | 110 VDC |  |      | D 110 VDC, code AV   |   |
|  | <b>Option E, gold contacts</b>             |         |  |      |                      |   |
|  | DT   | 24 VDC  |  |      | D-E 24 VDC, code DT  |   |
|  | HU   | 48 VDC  |  |      | D-E 48 VDC, code HU  |   |
|  | AZ   | 72 VDC  |  |      | D-E 72 VDC, code AZ  |   |
|  | HV   | 110 VDC |  |      | D-E 110 VDC, code HV |   |
|  | <b>Option M, silver tin oxide contacts</b> |         |  |      |                      |   |
|  | GT   | 24 VDC  |  |      | D-M 24 VDC, code GT  |   |
|  | GU   | 48 VDC  |  |      | D-M 48 VDC, code GU  |   |
|  | GV   | 72 VDC  |  |      | D-M 72 VDC, code GV  |   |
|  | GW   | 110 VDC |  |      | D-M 110 VDC, code GW |   |

**Example: D-220N-BV 220V DC**

Description: D-relay, Unom: 220 VDC, magnetic arc blow-out, wider operation range and ambient temperature

**Example: D-24N-CE code DT 24V DC**

Description: D-relay, Unom: 24 VDC, low temperature, gold contacts, keying code DT

**Example: D-220N-BV 220V 50Hz**

Description: D-relay, Unom: 220 V 50Hz, magnetic arc blow-out, wider operation range and ambient temperature

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

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