

TDE4-U200 relay - Timer, delay-off, 4 pole

Datasheet

TDE4-U200 relay is obsolete from May 1, 2016. Replacement by TDE4N-U relay



(Model TDE4-200 shown)

Description

Plug-in electronic railway timer relay with four change-over contacts. When the relay is not energized anymore there is a delay on drop-out, without any auxiliary power supply. The delay time is adjustable with a lockable knob. The relay can also be supplied with a fixed time delay (no knob).

The relay is equipped with a LED which indicates the presence of energizing voltage. Standard equipped with magnetic arc blow-out for high breaking capacity and long contact life.

The construction of the relay and choice of materials makes the TDE4-U200 relay suitable to withstand low and high temperatures, shock & vibrating and dry to humid environments.

No external retaining clip needed as integrated 'snap-lock' will hold relay into socket under all circumstances and mounting directions.

Compact design, choice of many options and a wide range of sockets makes the TDE4-U200 relay an easy and flexible solution to use.

Application

These relay series are designed for demanding rolling stock applications. The TDE4-U200 is used in applications where a time delay on drop-out is necessary after de-energizing the relay.

Features

- Time delay relay
- Delay on drop-out (without auxiliary power supply)
- Compact plug-in design, 4 C/O contacts
- Delay time adjustable with a lockable knob
- Also available with fixed time delay
- Total time delay range: 0.1 s...100 s
- Magnetic arc blow-out
- One LED for voltage presence
- Flat, square and silver plated relay pins for excellent socket connection
- Integrated snap lock
- Optional positive mechanical keying relay to socket
- Flexibility by many options
- Optional positive mechanical keying relay to socket

Benefits

- Proven reliable
- Long term availability
- Easy to maintain
- Low life cycle cost

Railway compliance

- EN 50155 Electronic equipment used on rolling stock for railway applications
- IEC 60571 Electronic equipment used on railway vehicles
- IEC 60077 Electrical equipment for rolling stock in railway applications
- IEC 60947 Low voltage switch gear and control gear
- IEC 61373 Rolling stock equipment - Shock and vibration test
- IEC 60947-5-4 Electromechanical components for control applications. This standard examines both coil and contact specifications in depth
- EN 50121 Electromagnetic compatibility for railway applications
- NF F 16-101/102, EN 45545-2 Fire behaviour - Railway rolling stock
- NF F 62-002 On-off contact relays and fixed connections



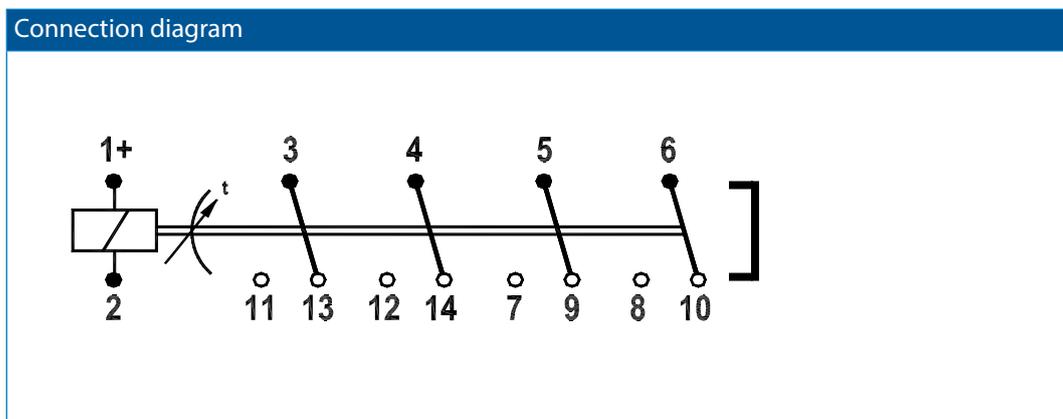
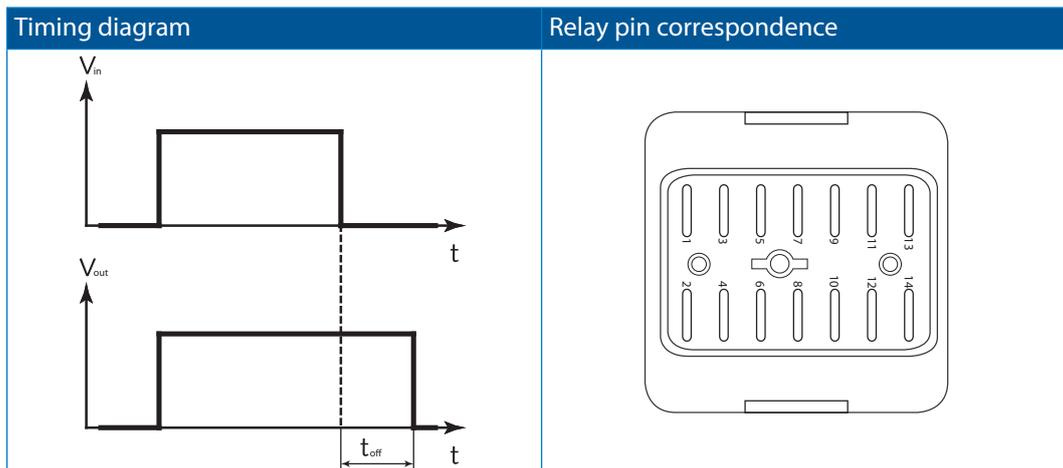
TDE4-U200 relay

Technical specifications



(Model TDE4-200 shown)

Functional and connection diagrams



Please note the relay will leave production in open state (with open armature) with all contacts in the position shown in the connection diagram. Due to severe shocks far exceeding maximum levels mentioned in IEC 61373 (Category I, Class B, Body mounted), it can happen the armature closes and stay closed.

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



TDE4-U200 relay

Technical specifications

Time delay specifications

| | |
|--|---|
| Time delay function | Delay on drop-out (without auxiliary power supply) |
| Available time ranges, adjustable (xx) | 0.1 - 1 s 0.3 - 3 s 0.6 - 6 s 1 - 10 s 3 - 30 s 6 - 60 s 10 - 100 s |
| Accuracy - adjustment | < 10 % of full scale value After adjusting / fixed time setting: no variation in setpoint |
| Accuracy - repeatability | ± 2.0 % |
| Time variation - vs. voltage variation | ± 0.1 % / % U_{nom} |
| Time variation - vs. temperature variation | ± 0.2 % / K |
| Recovery time | < 0.3 s for U_{nom} < 1.5 s for U_{min} |
| Pull-in time | < 40 ms |
| Release time | Depending on drop-out time setting (xx) |
| The energizing / de energizing voltage must have a step function for correct working. Supply voltage slew rate | > 0.03 x U_{nom} / ms |
| Minimum impulse time | < 0.3 s for 70% U_{nom} < 0.2 s for U_{nom} |
| <p>Example time delay : Time range 0.3 - 3 s Time delay set on 2 s : delay will be between 1.7 s - 2.3 s. For example: 2.0 s. The ambient temperature is 30 degrees Celsius which is 10 degrees different compared to the standard 20 degrees Celsius. This results in 2.0% extra time variation. The applied voltage is 15% lower than the nominal voltage. This results in 1.5% extra time variation. The total maximum time variation is then 0.5% (repeatability) + 2.0% (temperature variation) + 1.5% (voltage variation) = 4.0%. In this case every new delay time will be between 1.92 s and 2.08 s.</p> | |

Remarks

- Inside the TDE4 a bistable relay is used which is controlled by electronics; the relay can stay in energized mode after removing the control voltage in case the electronics are damaged (e.g. due to a power surge). For critical applications the TDE3 relay is recommended which doesn't use a bistable relay inside.

Coil characteristics

| | |
|-------------------------|---|
| Operating voltage range | 0.7 - 1.25 U_{nom} |
| Power consumption | Nominal < 1 W Switching on ($\tau < 80$ ms) < 9 W |

| Type | U_{nom} (VDC) | U_{min} (VDC) | U_{max} (VDC) |
|--------------|-----------------|-----------------|-----------------|
| TDE4-U201-xx | 24 | 16.8 | 30 |
| TDE4-U202-xx | 48 | 33.6 | 60 |
| TDE4-U203-xx | 72 | 50.4 | 90 |
| TDE4-U204-xx | 110 | 77.0 | 138 |
| TDE4-U205-xx | 96 | 67.2 | 120 |
| TDE4-U207-xx | 36 | 25.2 | 45 |

Other types on request

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



TDE4-U200 relay

Technical specifications

Contact characteristics

| | |
|-----------------------------|---|
| Amount and type of contacts | 4 C/O |
| Maximum make current | 16 A |
| Peak inrush current | 200 A (withstand > 10 x 200 A @ 10 ms, 1 min) |
| Maximum continuous current | 10 A (AC1 ; IEC 60947) |
| Maximum switching voltage | 250 VDC, 440 VAC |
| Minimum switching voltage | 12 V |
| Minimum switching current | 10 mA |
| Maximum breaking capacity | 110 VDC, 8 A (L/R ≤ 15 ms) 230 VAC, 10 A (cos φ ≥ 0.7) |
| Contact resistance | 15 mΩ (initial) |
| Material | Ag standard (optional AgSnO ₂ , Au on Ag) |
| Contact gap | 0.7 mm |
| Contact force | > 200 mN |

Electrical characteristics

| | |
|----------------------------------|-----------------------------------|
| Dielectric strength | EN 50155 |
| Pole-pole | IEC 60255-5 4 kV, 50 Hz, 1 min |
| Cont-coil | IEC 60077 2 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) |
| EMC | EN 50121-3-2 compliant |

Mechanical characteristics

| | |
|---|--|
| Mechanical life | 30 x 10 ⁶ operations |
| Maximum switching frequency | Mechanical: 3600 ops/h Electrical: 1200 ops/h |
| Maximum torque value screw to lock knob | 0.15 Nm |
| Weight | 225 g (without options) |

Environmental characteristics

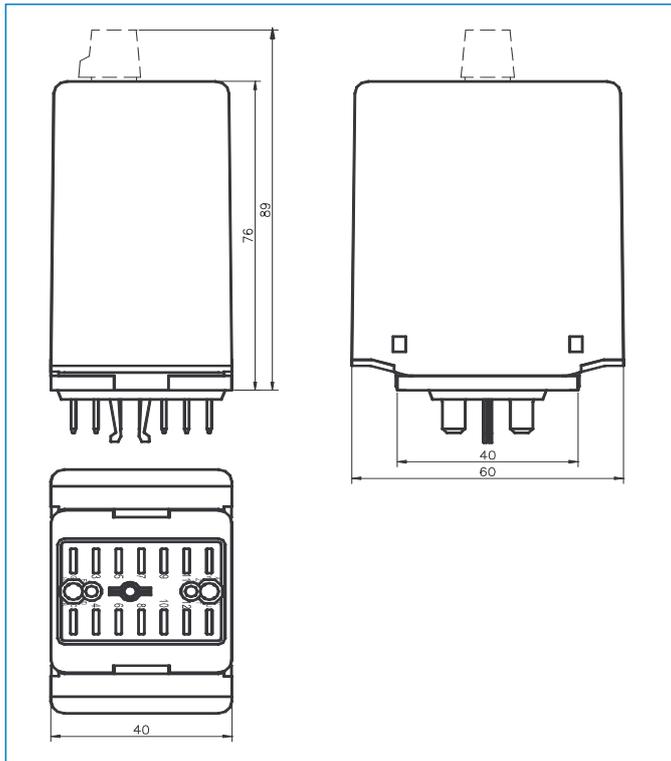
| | |
|-----------------------|--|
| Environmental | EN 50125-1 and IEC 60077-1 |
| Vibration | IEC 61373, Category I, Class B, Body mounted |
| Shock | IEC 61373, Category I, Class B, Body mounted |
| Operating temperature | -25 °C...+70 °C (with option C : -40 °C) |
| Humidity | 90 % |
| Salt mist | IEC 60068-2-11, class ST4 |
| Damp heat | IEC 60068-2-30, Test method Db variant 1 |
| Protection | IEC 60529, IP40 (relay on socket) |
| Fire & smoke | NF F 16-101, NF F16-102, EN 45545-2 |
| Insulation materials | Cover: polycarbonate Base: polyester |



TDE4-U200 relay

Technical specifications

Dimensions (mm)



Options

| Code | Description | Remark | Cannot be combined with: |
|----------------------|--|--------------------------------|--------------------------|
| C | Low temperature (-40 °C) | Icontact < 8 A | |
| E* | Au; Gold plated contacts (10 µm) | | |
| K | Extra dust protection | Only for fixed voltage setting | |
| N | No magnetic arc blow-out | | |
| Keying | Coil coding relay and socket | | |
| Colour coding | Coloured cover for coil voltage coding | | |

| | |
|--|---|
| * 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 |



TDE4-U200 relay

Technical specifications

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

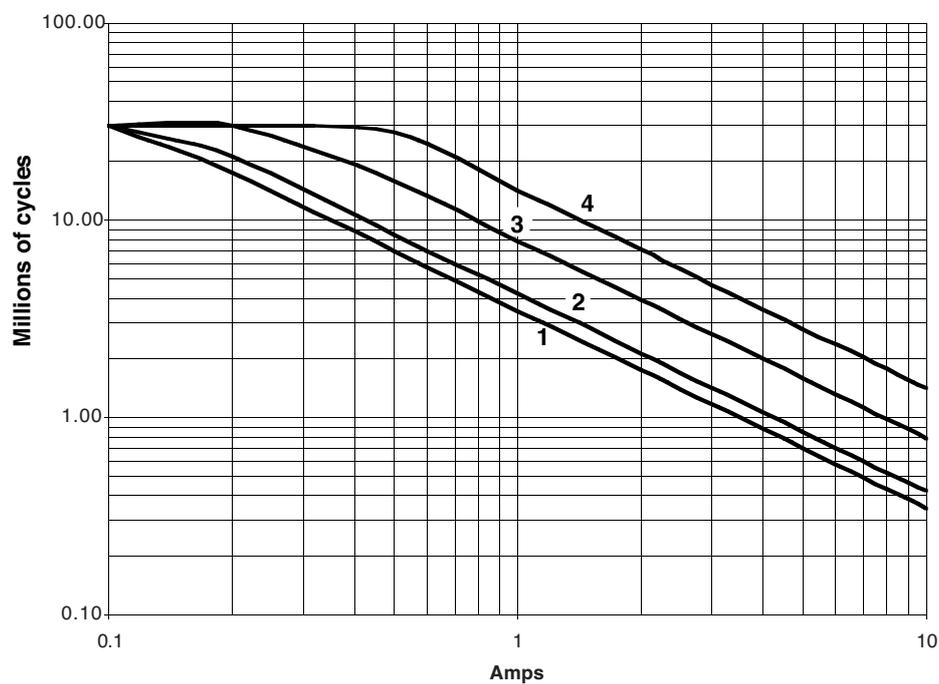
AC Current breaking capacity versus life expectancy in millions of cycles.

Rate of contacts opening and closing = 1200 operations per hour.

Curves shown for resistive load (Power Factor = 1).

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

AC Current breaking capacity



TDE4-U200 relay

Technical specifications

AC Current breaking capacity at $\cos\phi = 0.7; 0.5; 0.3$

AC Current breaking capacity versus life expectancy in millions of cycles.

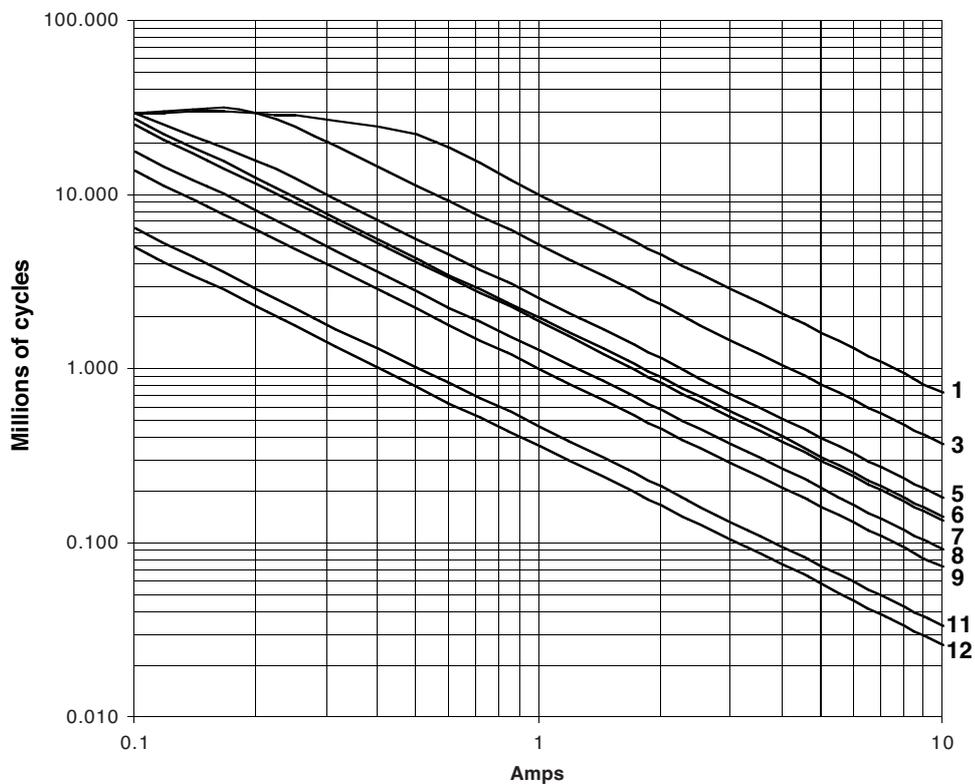
Rate of contacts opening and closing = 1200 operations per hour.

Values shown for inductive loads -

- $\cos\phi = 0.7$
- $\cos\phi = 0.5$
- - - - $\cos\phi = 0.3$

| Curves | 1 | 3 | 5 | 6 | 7 | 8 | 9 | 11 | 12 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| VAC | 24 | 24 | 125 | 220 | 24 | 125 | 220 | 125 | 220 |
| $\cos\phi$ | 0.7 | 0.5 | 0.7 | 0.7 | 0.3 | 0.5 | 0.5 | 0.3 | 0.3 |

AC Current breaking capacity



TDE4-U200 relay

Technical specifications

DC Current breaking capacity at L/R = 0

DC Current breaking capacity versus life expectancy in millions of cycles.

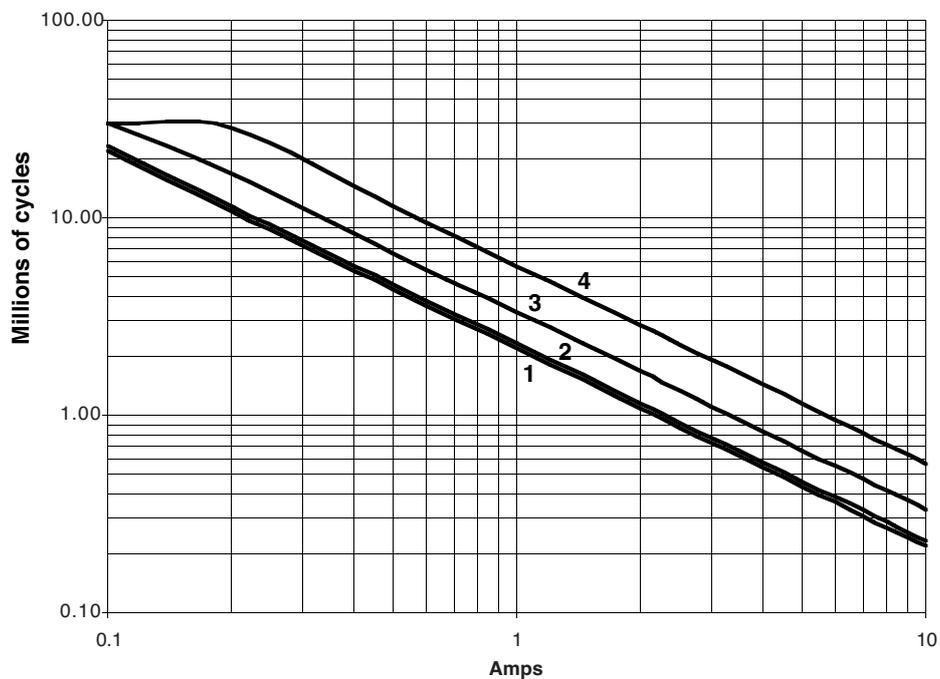
Rate of contacts opening and closing = 1200 operations per hour.

Curves shown for resistive load (L/R = 0). Continuous current.

* By connecting 2 contacts in series, we increase the DC current breaking capacity by 50%

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

DC Current breaking capacity



TDE4-U200 relay

Technical specifications

DC Current breaking capacity L/R = 20 ms ; 40 ms

DC Current breaking capacity versus life expectancy in millions of cycles.

Rate of contacts opening and closing = 1200 operations per hour.

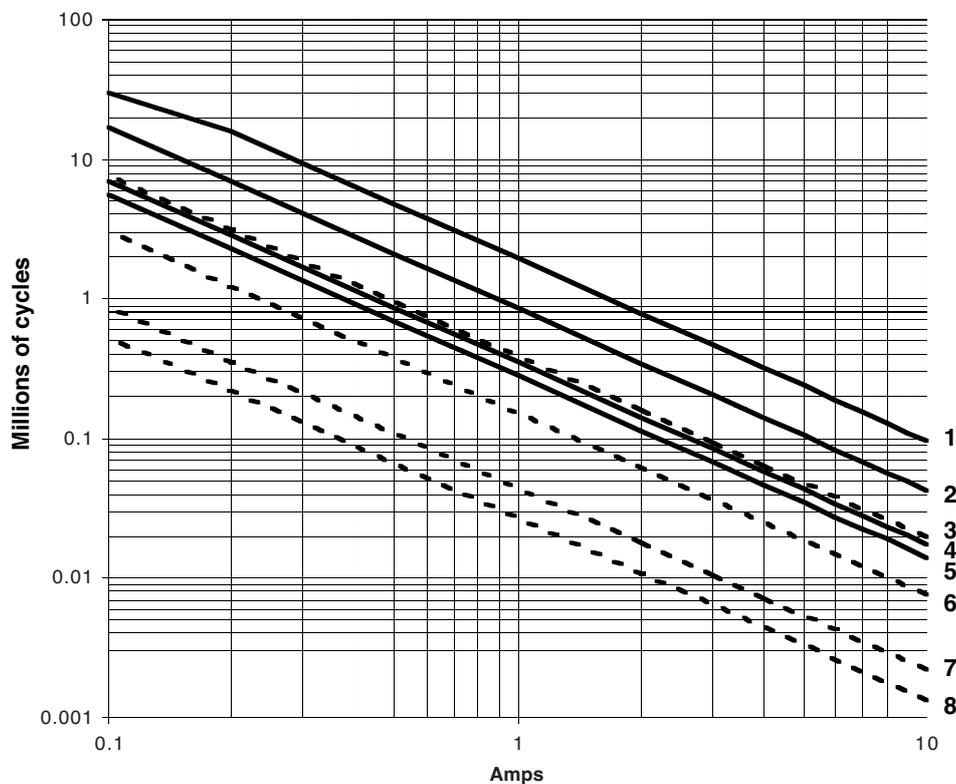
Curves shown for inductive load -

- L/R = 20 ms continuous current
- - - - L/R = 40 ms continuous current

* By connecting 2 contacts in series, we increase the DC current breaking capacity by 50%

| Curves | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|----------|----|----|----|-----|-----|----|-----|-----|
| VDC | 24 | 48 | 24 | 125 | 220 | 48 | 125 | 220 |
| L/R (ms) | 20 | 20 | 40 | 20 | 20 | 40 | 40 | 40 |

DC Current breaking capacity



TDE4-U200 relay Sockets

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 |
|-----------|-----|----------------------|

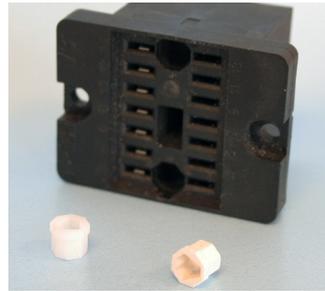
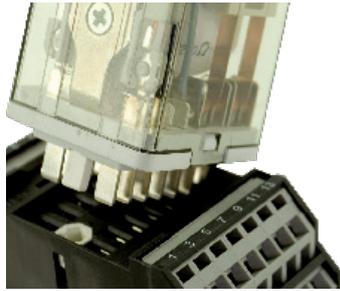
For more details see datasheets of the sockets



TDE4-U200 relay

Keying

Mechanical keying relay and socket (optional)



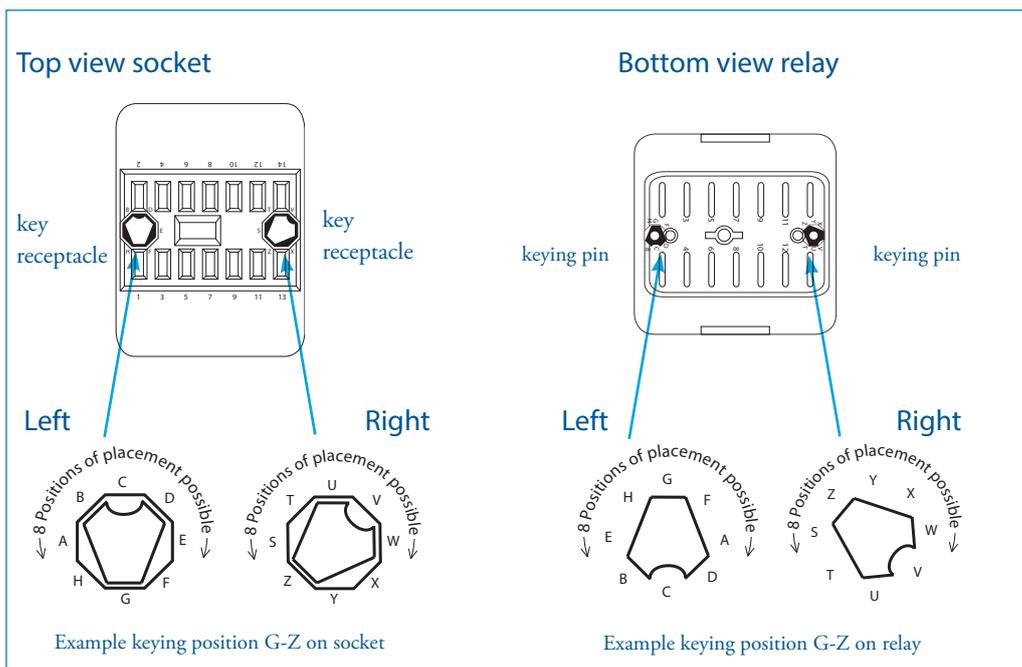
Function:

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

Using keyed relays and sockets prevents a relay is inserted in a wrong socket. For example it prevents that a 24 VDC relay is put in a 110 VDC circuit. Positive discrimination is possible per different function, coil voltage, timing, monitoring, safety and non-safety.

The D-relay socket keying option gives $8 \times 8 = 64$ possibilities. Upon ordering the customer simply indicates the need for the optional keying. Mors Smitt will assign a code to the relay and fix the pins into the relay. The sockets are supplied with loose key receptacles. Inserting the keys into the socket is very simple and self explaining.

Remark: Socket and relay shown are examples.



TDE4-U200 relay

Instructions

Installation, operation & inspection

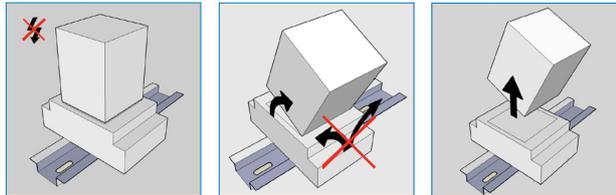
Installation

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.



TDE4-U200 relay

Ordering scheme

Configuration:



1. Relay model

2. Coil voltage

3. Options

4. Time range

This example represents a **TDE4-U204-EC 1 - 10 s**

Description: TDE4-U200 relay, U_{nom} : 110 VDC, gold plated contacts, low temperature (-40 °C), time range 1 - 10 s

1. Relay model

TDE4 - U2

2. Coil voltages

| | |
|-----------|---------|
| 01 | 24 VDC |
| 02 | 48 VDC |
| 03 | 72 VDC |
| 04 | 110 VDC |
| 05 | 96 VDC |
| 07 | 36 VDC |

3. Options

| | |
|----------|--|
| C | Low temperature (-40 °C) (max. contact current = 8 A) |
| E | Gold plated contacts |
| K | Special dust protection (only for fixed time setting) |
| N | No magnetic arc blow-out |

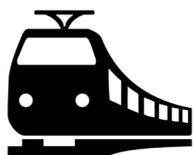
Upon ordering indicate keying if necessary.

4. Time ranges

| | |
|------------------|-------------------|
| 0.1...1 s | 1...10 s |
| 0.3...3 s | 3...30 s |
| 0.6...6 s | 6...60 s |
| | 10...100 s |

or fixed (no knob, max. time 100 s)





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