

/// Plug-in railway relay with 4 contacts

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

TDBE4-U200/300

Timer relay

Part of D-platform



Description

Plug-in electronic railway timer relay with delay-on and delay-off function and three change-over contacts and one normally-closed contact. The delay times are independently adjustable with two lockable knobs. The relay can also be supplied with one or two fixed time delays (one knob or none). The relay needs an auxiliary supply and can be activated with an external N/O contact or with AC or DC supply voltage.

The relay is equipped with two LEDs which indicate the presence of power supply and the energizing of the coil. 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 TDBE4-U200/300 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 TDBE4-U200/300 relay an easy and flexible solution to use.

Application

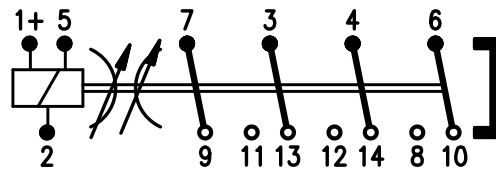
These relay series are designed for demanding rolling stock applications.

The TDBE4-U200/300 is used in applications where a delay on pull-in and on drop-out is necessary.

Features

- Time delay relay with auxiliary supply
- Delay on pull-in and on drop-out
- 3 C/O contacts and 1 N/C contact
- Both delay times independently adjustable with 2 lockable knobs
- Also available with 1 or 2 fixed time delays (1 knob or none)
- Total time delay range: 0 s...120 min
- Magnetic arc blow-out
- Two LEDs for status indication
- Suitable for AC or DC voltage
- Flat, square and silver plated relay pins for excellent socket connection
- Integrated snap lock
- Optional positive mechanical keying relay to socket

Connection diagram

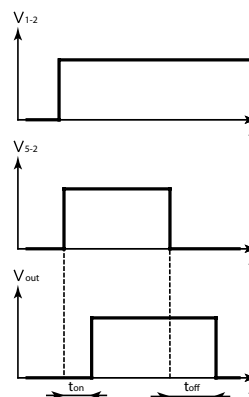


Remark: diagram shown is DC version with delay-on and delay-off both adjustable.

There are two possibilities for activating the relay:

1. Close N/O contact between input terminals 1 and 5
2. Supply voltage on input terminal 5

Timing diagram



Railway compliancy

EN 50155	EN 50121
IEC 60571	EN 45545-2
IEC 60077	NF F16-101/102
IEC 60947	NF F 62-002
IEC 61373	IEC 60947-5-4

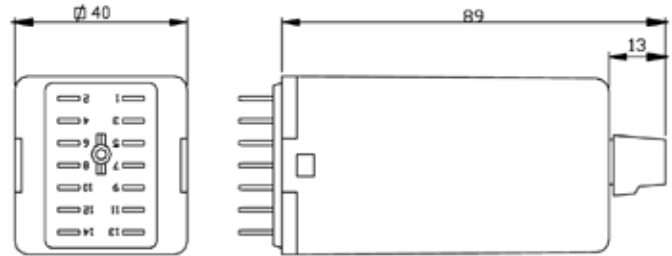
Timer relay TDBE4-U200/300

Options

- Low temperature (-40 °C), max. contact current 8 A
- Gold plated contacts
- Extra dust protection
- AgSnO₂ contacts, high resistant to welding
- No magnetic arc blow-out
- Double zener diode

Remark: Not all combinations possible

Dimensions (mm)



Sockets

		Mounting			
		Surface / Wall	35 mm rail	Panel / Flush	PCB
Terminal connection	Screw	V23	V23	-	-
	Screw - wide terminals	V22 BR	V23 BR	-	-
	Spring clamp	V29	V29	V33	-
	Faston	-	-	V31	-
	Crimp	-	-	V26	-
	Solder tag	-	-	V3	-
	PCB	-	-	-	V32

For more information see the respective datasheets

Timer relay TDBE4-U200/300

Technical specifications

Time delay characteristics

Time delay function Available time ranges, independently adjustable for pull-in (x) and drop-out (y)		Delay on pull-in and delay on drop-out 0...1 s 0...3 s 0...6 s 0...10 s 0...30 s 0...60 s 0...3 min 0...6 min 0...10 min 0...30 min 0...60 min 0...120 min Every combination of tx and ty is possible Other ranges on request
Accuracy - adjustment	adjustable time setting	<10 % of full scale* After adjusting: no variation in setpoint
	fixed time setting	<2.5 %*
Accuracy - repeatability		< 2 %*
Time variation	vs voltage variation	± 0.02% / % U _{nom}
	vs. temperature variation	± 0.02 % / K
Pull-in time		Depending on pull-in time setting
Release time		Depending on release time setting

* For DC supply voltage. For AC supply voltage the value will be maximum 20 ms higher.

Example time delay : Time range 0...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 40 °C which is 20 degrees different compared to the standard

20 °C. This results in 0.4 % extra time variation. The applied voltage is 30 % lower than the nominal voltage. This results in 0.6 % extra time variation. The total maximum time variation is then 2 % (repeatability) + 0.4 % (temperature variation) + 0.6 % (voltage variation) = 3 %. In this case every new pulse will be between 1.94 s and 2.06 s.

Technical specifications

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Coil characteristics

Operating voltage range	DC	0.7...1.25 U _{nom}
	AC	0.8...1.2 U _{nom}
Nominal power consumption	During time delay	< 0.875 W (220 V) < 0.375 W (110 V) Lower voltage = lower power
	After time delay	< 3.6 W (220 V) < 3 W (110 V) Lower voltage = lower power
Input impedance		Approx. 250 kΩ (72 V)

Type	U _{nom} (VDC)	U _{min} (VDC)	U _{max} (VDC)	U _{drop-out} (VDC)
TDBE4-U201	24	16.8	30	2.4
TDBE4-U207	36	25.2	45	3.6
TDBE4-U202	48	33.6	60	4.8
TDBE4-U203	72	50.4	90	7.2
TDBE4-U205	96	67.2	120	9.6
TDBE4-U204	110	77.0	138	11.0

Type	U _{nom} (VAC)	Frequency (Hz)	U _{min} (VAC)	U _{max} (VAC)	U _{drop-out} (VAC)
TDBE4-U301	24	50/60	19.2	28.8	2.4
TDBE4-U325	96	50/60	76.8	115.2	9.6
TDBE4-U305	110	50/60	88.0	132.0	11.0
TDBE4-U303	220	50/60	176.0	264.0	22.0

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
- 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 (U_{release})
- To reset the time function, the voltage must drop below U_{drop-out}
- Always select the nominal voltage as close as possible to the actual voltage in the application

Remark: In June 2019 the coil tape color is changed to yellow. This change has no effect on any of the relay specifications or technical performance.

Contact characteristics

Amount and type of contacts	3 C/O + 1 N/C
Maximum make current	16 A
Peak inrush current	NF F 62-002 200 A (withstand > 10 x 200 A @ 10 ms, 1 min)
Maximum continuous current	10 A
Maximum switching voltage	250 VDC, 440 VAC
Minimum switching voltage	12 V
Minimum switching current	10 mA
Maximum breaking capacity (> 50.000 operations)	72 VDC, 5 A (L/R ≤ 40 ms) 110 VDC, 10 A (resistive load) 110 VDC, 0.5 A (L/R ≤ 40 ms)
Contact resistance	15 mΩ (initial)
Material	Ag standard (optional AgSnO ₂ , Au on Ag)
Contact gap	0.7 mm
Contact force	> 200 mN

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Electrical characteristics

Dielectric strength	IEC 60255-5	Pole-pole	4 kV, 50 Hz, 1 min
	IEC 60077	Cont-coil	2.5 kV, 50 Hz, 1 min
Pulse withstanding	IEC 60255-5	Open contacts	2.5 kV; 50 Hz; 1 min
			5 kV (1.2/50 μ s)
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	190 g (without options)

Environmental characteristics

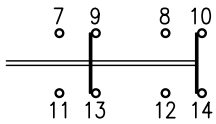
Environmental	EN 50125-1 and IEC 60077-1
Vibration	IEC 61373, Category I, Class B, Body mounted
Shock	IEC 61373, Category I, Class B, Body mounted
Operating temperature	-25 °C...+55 °C (with option C: -40 °C, with option V: +70 °C)
Humidity	93%
Maximum altitude	2000 meter. Higher altitudes are possible but have consequences mentioned in IEC 60664 (for example 5000 meter with bigger clearance distance)
Salt mist	IEC 60068-2-11, class 4
Damp heat	IEC 60068-2-30, Test method Db variant 1
Protection	IEC 60529, IP40 (relay on socket) (with option K: IP50)
Fire & smoke	NF F 16-101, NF F 16-102, EN 45545-2
Insulation materials	Cover: polycarbonate Base: polyester

Railway compliancy

EN 50155	Railway applications - Rolling stock - Electronic equipment
IEC 60571	Railway applications - Electronic equipment used on rolling stock
IEC 60077	Railway applications - Electric equipment for rolling stock
IEC 60947	Low-voltage switchgear and controlgear
IEC 61373	Railway applications - Rolling stock equipment - Shock and vibration tests
EN 50121	Railway applications - Electromagnetic compatibility
NF F16-101/102	Railway rolling stock - Fire behavior
EN 45545-2	Railway applications - Fire protection on railway vehicles Part 2: Requirements for fire behavior of materials and components
NF F 62-002	Railway rolling stock - On-off contact relays and fixed connections

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Options

Code	Description	Remark	Cannot be combined with:
Standard options:			
C	Low temperature (-40 °C)	Icontact < 8 A	
E*	Au; Gold plated contacts (10 µm)		M
K	Extra dust protection	IP50 Cat 2 for the relays mounted in a Mors Smitt socket. Application PD1/PD2 and contact load > 0.5 A.	
N	No magnetic arc blow-out		
Q	Double zener diode over coil	Coil protection against transient voltage. Maximum allowed peak voltage 180 V, higher voltage will damage the diode	
Y	Double make/double break contacts	2 C/O DM/DB, -40 °C 	
Keying	Coil coding relay and socket		

Special options:

M	AgSnO ₂ ; "non-weldable" contacts	Icontact > 100 mA	E
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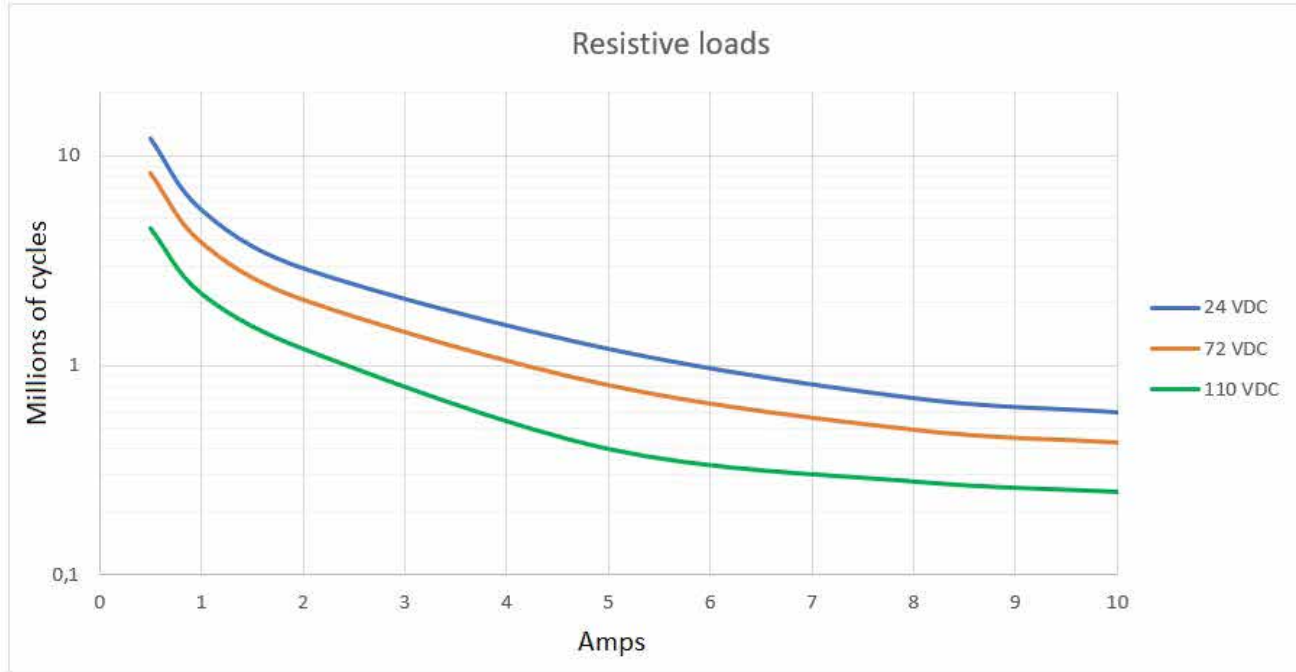
* Gold plated contacts characteristics

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

Remark: For application support or technical product support, contact your local Mors Smitt sales office (see contact details on last page).

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Electrical life expectancy



By connecting 2 contacts in series the DC current breaking capacity is increased by 50 %. Electrical lifetime is tested under laboratory conditions with switching frequency 0.33 Hz.

Note: The actual electrical lifetime in the application is affected by the switching frequency, type of contact (N/O or N/C), environmental conditions, etc.

Expected electrical lifetime inductive loads:

Inductance	Voltage	% of resistive load	Remark
15 ms	24 VDC	30 %	
15 ms	72 VDC	25 %	Tested up to 8 A
15 ms	110 VDC	20 %	Tested up to 0.5 A
40 ms	24 VDC	10 %	
40 ms	72 VDC	4 %	Tested up to 5 A
40 ms	110 VDC	2 %	Tested up to 0.5 A

For other contact loads: contact Mors Smitt.

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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 (4.8 x 0.8 mm)
338000570	V33	Spring clamp socket, flush mount, rear dual connection (2.5 mm ²)

PCB mounting

338000561	V32	PCB soldering socket
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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

Timer relay TDBE4-U200/300

Mechanical keying relay and socket (optional)



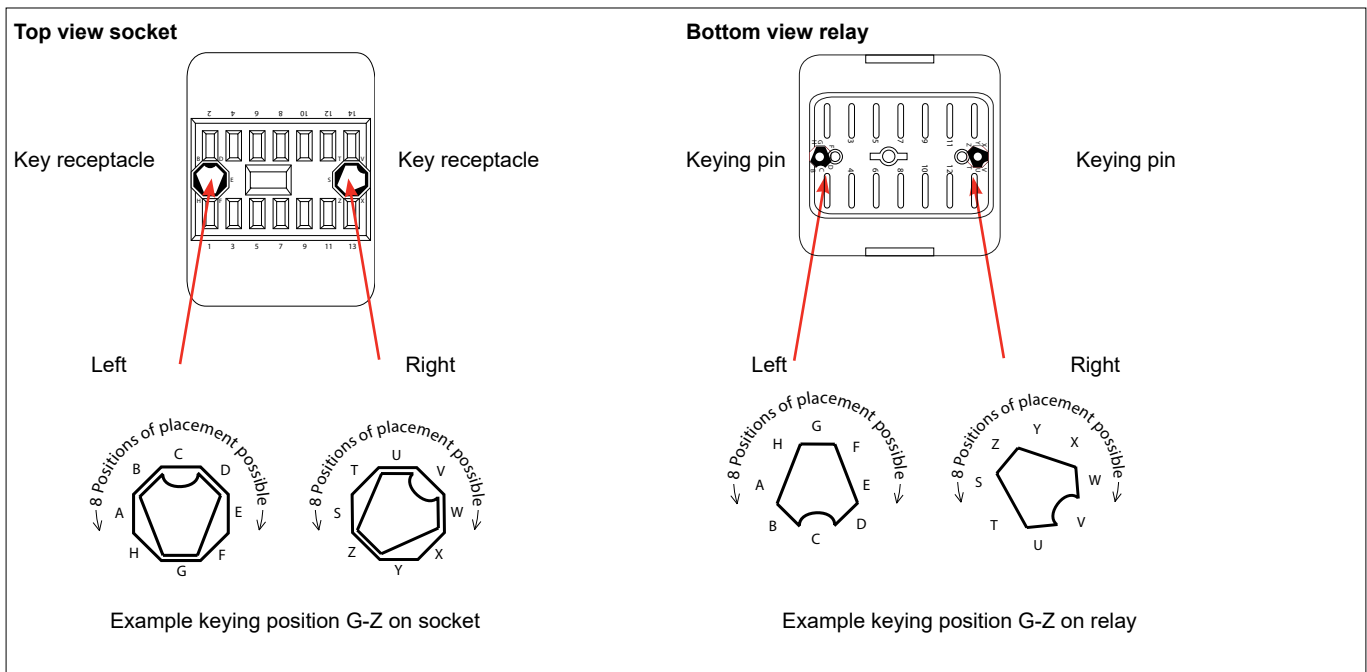
Function:

- 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: Sockets and relay shown are examples.



Timer relay TDBE4-U200/300

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

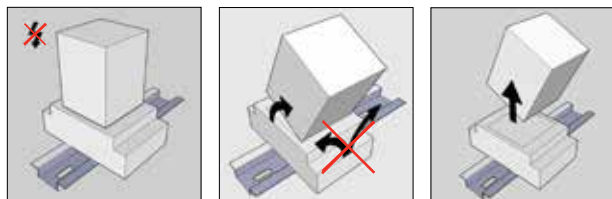
Instructions for use

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

Warning!

- Never use silicon in the proximity of the relays
- Do not use the relay in the presense of flammable gas as the arc generated from switching could cause ignition
- To remove relays from the socket, employ up and down lever movements. Sideway movement may cause damage to the coil wires



- Relays should never be swapped to other circuit positions when taken out of its socket for inspection or fault finding, always place it back into the original position to prevent contact resistance problems. Contact resistance problems can be created when swapping relays between different circuit loads due the contact wear/condition having changed during its operational life.

Operation

After installation always apply the rated voltage to the coil to check correct operation. Long term storage may corrode the silver on the relay pins. When plugging the relay into the socket, the female bifurcated or trifurcated receivers will automatically cut through the corrosion on the pins and guarantee a reliable connection.

Before actual use of relays, it is advised to switch the load several times with the contacts. The contacts will both be electrically and mechanically cleaned due to the positive wiping action. Sometimes a contact can build up increased contact resistance (≤ 15 m Ω when new). When using silver contacts one can clean the contact by switching a contact load a few times using >24 VDC & ~ 2 A. 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.

Timer relay TDBE4-U200/300

Inspection / maintenance

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

Relays can easily be tested with the Mors Smitt Relay Tester. More information on: www.morssmitt.com.

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

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

RMA procedure see www.morssmitt.com

Timer relay

TDBE4-U200/300

Ordering scheme

TDBE4-U	-						
Coil voltages	201						24 VDC
	207						36 VDC
	202						48 VDC
	203						72 VDC
	205						96 VDC
	204						110 VDC
	301						24 VAC 50/60 Hz
	325						96 VAC 50/60 Hz
	305						110 VAC 50/60 Hz
	303						220 VAC 50/60 Hz
Options (add as many options as needed)		C					Low temperature (-40 °C) - Max contact current 8 A
		E					Gold plated contacts M
		K					Extra dust protection, IP50 T
		N					No magnetic arc blow-out
		Q					Double zener diode
		Y					Double make/double break
Special options (minimum order quantity: 20)			M				AgSnO ₂ contacts, highly resistant to welding E
Time ranges Delay-on and Delay-off			0...1 s	0...1 s			
			0...3 s	0...3 s			
			0...6 s	0...6 s			
			0...10 s	0...10 s			
			0...30 s	0...30 s			
			0...60 s	0...60 s			
			0...3 min	0...3 min			
			0...6 min	0...6 min			
			0...10 min	0...10 min			
			0...30 min	0...30 min			
			0...60 min	0...60 min			
			0...120 min	0...120 min			
			Fixed	Fixed			No knob

Examples:

TDBE4-U204-C 0-10 s / 2 min

Description: TDBE4-U204 relay, Unom 110 VDC, low temperature (-40 °C), adjustable delay-on with time range 0...10 s, fixed delay-off time of 2 minutes.

TDBE4-U203-E 0...6 s/0...10 min

Description: TDBE4-U203 relay, Unom: 72 VDC, gold plated contacts, adjustable delay-on time with time range 0...6 s, adjustable delay-off time with time range 0...10 min

TDBE4-U205-M 1 min/0...3 min

Description: TDBE4-U205 relay, Unom: 96 VDC, AgSnO₂ contacts, high resistant to welding fixed delay-on time 1 min, adjustable delay-off time with time range 0...3 min

TDBE4-U303-Q 1 min/5 min,

Description: TDBE4-U303 relay, Unom: 220 VAC 50/60 Hz, double zener diode, fixed delay-on time 1 min, fixed delay-off time of 5 minutes

Timer relay
TDBE4-U200/300

 **Over 11 million Mors Smitt relays in use in rail transport applications worldwide!**

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