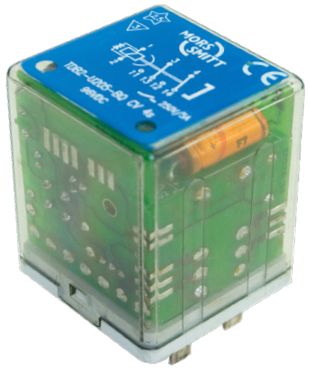
/// Plug-in railway relay with 2 C/O contacts

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

TDB2-U200

Timer relay

Part of D-platform



Description

Plug-in electronic railway timer relay with two change-over contacts.When the relay is activated there is a delay on pull-in. The delay time is adjustable with a lockable knob. The relay can also be supplied with a fixed time delay (no knob).

The construction of the relay and choice of materials makes the TDB2-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 TDB2-U200 relay an easy and flexible solution to use.

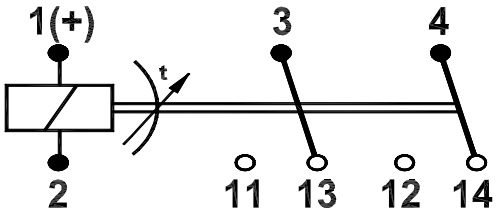
Application

hese relay series are designed for demanding rolling stock applications.The TDB2-U200 is used in applications where a time delay is necessary after activating the relay.

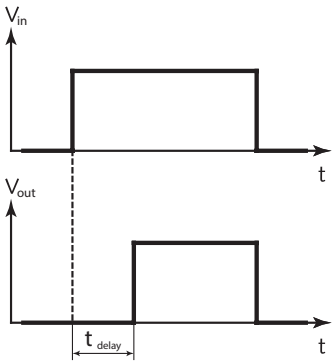
Features

- Time delay relay, delay on pull-in
- Compact plug-in design
- 2 C/O contacts
- Delay time adjustable with a lockable knob
  Also available with fixed time delay
- Total time delay range: 0.1 s...30 min
- Weld-no-transfer contacts
- Flat, square and silver plated relays pins for excellent socket connection
- Wide range sockets
- Integrated snap lock
- Transparent cover
- Optional positive mechanical keying relay to socket

Connection diagram



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

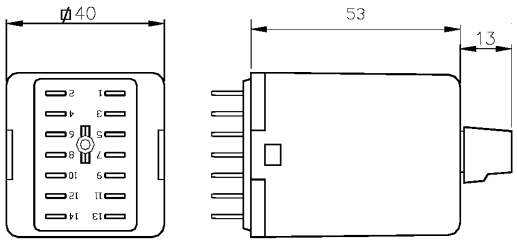
Timer relay
TDB2-U200

Options

- Magnetic arc blow-out
- Low temperature (-40 °C), max. contact current 8 A
- Gold plated contacts
- Extra dust protection
- Double zener diode
- Double make/double break contacts

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

Technical specifications

Timer relay
TDB2-U200

Time delay characteristics

Time delay function Available time ranges, adjustable (xx)		Delay on pull-in 0.1...1 s 0.3...3 s 0.6...6 s 1...10 s 3...30 s 6...60 s 0.3...3 min 0.6...6 min 1...10 min 3...30 min
Accuracy - adjustment		<10 % of full scale After adjusting/fixed time setting: no variation in setpoint
Accuracy - repeatability		< 0.5 %
Time variation	vs voltage variation vs. temperature variation	± 0.05 % / % U_{nom} ± 0.02 % / K
Pull-in time		Depending on pull-in time setting (xx)
Recovery time		< 0.2%
Release time		< 40 ms
Maximum permissible ripple		50 %
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 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 1.5 % extra time variation. The total maximum time variation is then 0.5 % (repeatability) + 0.4 % (temperature variation) + 1.5 % (voltage variation) = 2.4 %. In this case every new pulse will be between 1.95 s and 2.05 s.		

Coil characteristics

Operating voltage range		0.7...1.25 U_{nom}
Nominal power consumption	During time delay	< 0.5 W
	After switching on	< 2.0 W

Type	U_{nom} (VDC)	U_{min} (VDC)	U_{max} (VDC)
TDB2-U201-xx	24	16.8	30
TDB2-U202-xx	48	33.6	60
TDB2-U203-xx	72	50.4	90
TDB2-U204-xx	110	77.0	138
TDB2-U205-xx	96	67.2	120
TDB2-U207-xx	36	25.2	45

Other types on request

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

Contact characteristics

Amount and type of contacts	2 C/O
Maximum make current	15 A
Maximum continuous current	6 A (AC1 ; IEC 60947)
Maximum switching voltage	300 VDC (then max. current = 300 mA) 250 VAC (then max. current = 2.6 A)
Maximum breaking capacity	See graph page 6
Contact resistance	15 mΩ (initial)
Material	Ag standard (optional Au on Ag)
Contact gap	0.3 mm
Contact force	> 200 mN

Electrical characteristics

Dielectric strength	IEC 60255-5	Pole-pole	2 kV, 50 Hz, 1 min
	IEC 60077	Cont-coil	2 kV, 50 Hz, 1 min
		Open contacts	1 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
Torque value screw to lock knob	0.2-0.4 Nm
Weight	110 g (without options)

Environmental characteristics

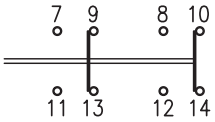
Environmental	EN 50125-1 and IEC 60077-1
Vibration	IEC 61373, Category I, Class B, Body mounted
Shock	IEC 61373, Category I, Class B, Body mounted
Operating temperature	-25 °C...+70 °C (optional: -40 °C)
Humidity	80 %
Salt mist	IEC 60068-2-11, class ST4
Damp heat	IEC 60068-2-30, Test method Db variant 1
Protection	IEC 60529, IP40 (relay on socket) (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

Timer relay
TDB2-U200

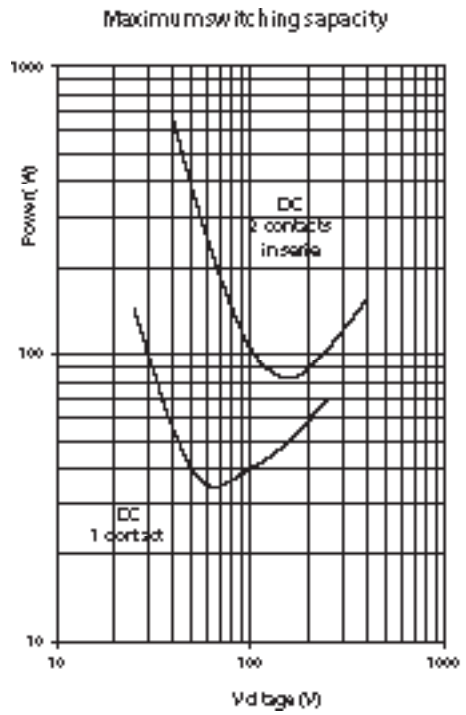
Options

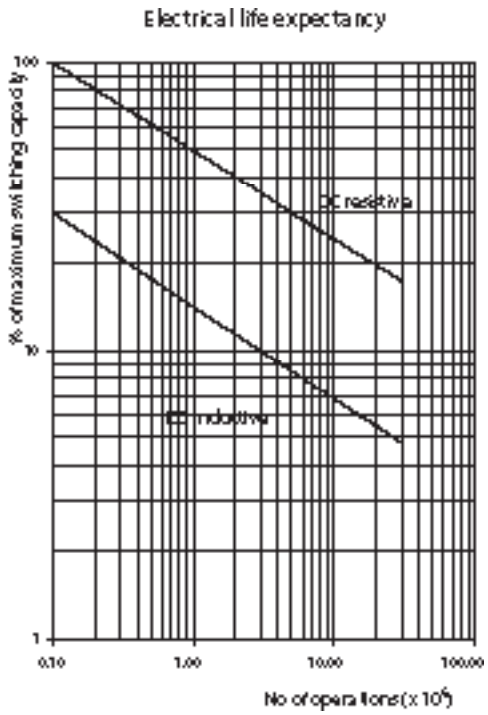
Code	Description	Remark	Cannot be combined with:
Standard options:			
B	Magnetic arc blow-out		
C	Low temperature (-40 ºC)	Icontact < 8 A	
E*	Au; Gold plated contacts		
K	Extra dust protection	IP50 Cat 2 for the relays mounted in a Mors Smitt socket. Application PD1/PD2 and contact load > 0.5 A.	
Q	Double zener diode over coil	Maximum allowed peak voltage 180 V, higher voltage will damage the diode	
Y	Double make/double break contacts	1 C/O DM/DB, -40 °C 	
Keying	Coil coding relay and socket		

* Gold plated contacts characteristics	
Material	Ag, gold plated
Maximum switching voltage	60 V (higher voltages may be possible, contact Mors Smitt for more information)
Maximum switching current	400 mA (at higher rate gold will evaporate, then the standard silver contact rating of minimum 10 mA and 12 V is valid)
Minimum switching voltage	5 V
Minimum switching current	1 mA

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

Switching capacity and contact life





Step 1: Determine switching voltage out of the application.
Step 2: Select the maximum switching capacity (in Watt) at this voltage in graph ‘Maximum switching capacity’.
Step 3: Calculate the actual switched load (in Watt) out of the application.
Step 4: Calculate the % of maximum switching capacity: $\frac{\text{Actual load}}{\text{Max switching capacity}}$
Step 5: Pick the life at this load out of the graph ‘Electrical life expectancy’.

Mounting possibilities/sockets

 V3	 V22BR	 V23	 V23BR	 V26
 V29	 V31	 V32	 V33	

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)
338000670	V33	Push-in terminal socket, panel mount, rear dual connection (3.3 mm^2)

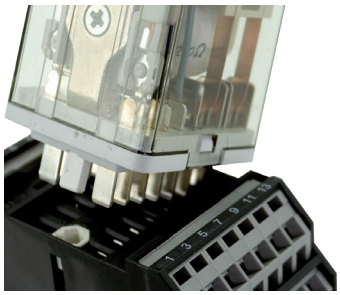
PCB mounting

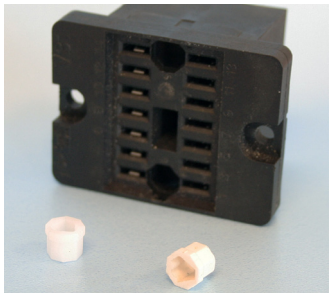
338000561	V32	PCB soldering socket

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

Mechanical keying relay and socket (optional)





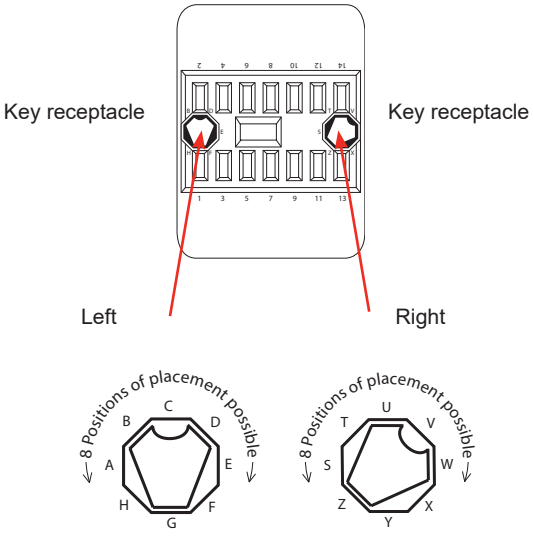
Function:
- To prevent wrong installation
- To prevent damage to equipment
- To prevent unsafe situations

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

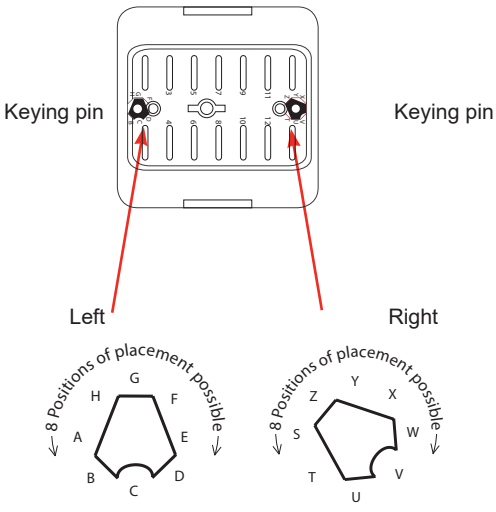
Remark: Sockets and relay shown are examples.

Top view socket



Example keying position G-Z on socket

Bottom view relay



Example keying position G-Z on relay

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.

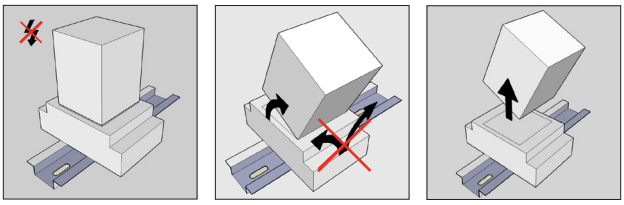
Therefore for long time contact reliability we recommend:
- Silver contacts: a minimum contact current of 20 mA per contact
- Gold contacts: a minimum contact current of 10 mA per contact
- Double Make Double Break contacts: a minimum contact current of 40 mA per contact
- When low currents are switched 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. Torque value screw to lock knob: 0.2-0.4 Nm

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 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.

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
TDB2-U200

Ordering scheme

TDB2-U				
Coil voltages	201			24 VDC
	207			36 VDC
	202			48 VDC
	203			72 VDC
	205			96 VDC
	204			110 VDC
Options (add as many options as needed)		B		Magnetic arc blow-out
		C		Low temperature (-40 °C) - Max contact current 8 A
		E		Gold plated contacts
		K		Extra dust protection, IP50
		Q		Double zener diode
		Y		Double make/double break (CY -40 °C)
Time ranges Delay-on and Delay-off			0.1...1 s	
			0.3...3 s	
			0.6...6 s	
			1...10 s	
			3...30 s	
			6...60 s	
			0.3...3 min	
			0.6...6 min	
			1...10 min	
			3...30 min	
			Fixed	No knob

Examples:

TDB2-U204-B 1-10 s
Description: TDB2-U204 relay, Unom 110 VDC, magnetic arc blow-out, time range 1...10 s

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

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