/// Plug-in timer relay, delay-on with 4 C/O contacts

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

TDB4

Timer relay, delay-on

Part of D-platform

(TDB4-U200 is shown)

Description

Plug-in industrial electronic timer relay with four 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 relay is standard equipped with two LEDs which indicate the presence of power supply and the energizing of the coil. Optionally equipped with magnetic arc blow-out 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 TDB4 relay suitable to withstand low and high temperatures, shock & vibrating and dry to humid environments.

Compact design, choice of many options and a wide range of sockets makes the TDB4 relay an easy and flexible solution to use.

Application

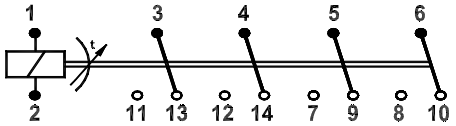
Rugged plug-in relays for extreme reliable, long endurance applications in harsh environment. These relay series are designed for demanding industrial applications such as power utilities and petrochemical industries.

The TDB4 relay is used in applications where a time delay is necessary after activating the relay.

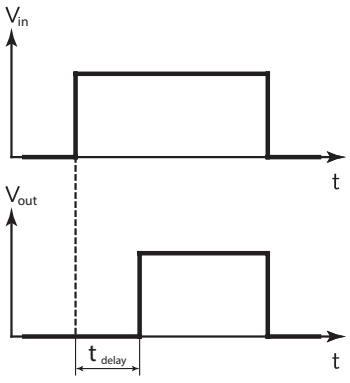
Features

- Time delay relay, delay on pull-in
- Compact plug-in design
- 4 C/O contacts
- Delay time adjustable with a lockable knob
- Also available with fixed time delay
- Suitable for DC and AC input
- High DC breaking capacity
- Two LEDs for status indication
- Flat, square and silver plated relay pins for excellent socket connection
- Wide range sockets
- Integrated snap lock
- Transparent cover
- Optional positive mechanical keying relay to socket

Connection diagram



Timing diagrams



Compliancy

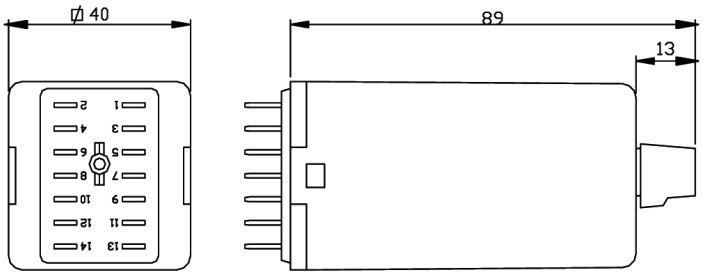
IEC 61812-1
IEC 60947
IEC 60947-5-1
IEC 60255
EMC Directive

Timer relay
TDB4

Options

- Magnetic arc blow-out
- Low temperature (-40 ^{O}C)
- Gold plated contacts
- Extra dust protection
- $AgSnO_2$ contacts, high resistant to welding
- Double zener diode
- Double make / double break contacts (-40 ^{O}C)

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
TDB4

Technical specifications

Time delay characteristics

Time delay function		Delay on pull-in
Available time ranges	Adjustable	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 6...60 min Other time ranges on request
Accuracy	Adjustment	< 10 % of full scale After adjusting / fixed time setting: no variation in setpoint
	Repeatability	± 0.5 %
Time variation	vs. voltage variations	± 0.05 % / % U_{nom}
	vs. temperature variation	± 0.02 % / K
Recovery time		± 0.1 s
Pull-in time		Depending on pull-in time setting (xx)
Release time		< 30 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 20% lower than the nominal voltage. This results in 1.0 % extra time variation. The total maximum time variation is then 0.5 % (repeatability) + 0.4 % (temperature variation) + 1.0 % (voltage variation) = 1.9 %.In this case every new pulse will be between 1.96 s and 2.04 s. In this case every new delay time will be between 1.90 s and 2.10 s

Coil characteristics

Operating voltage range	0.8...1.1 Unom

					Nominal power consumption	
Type	U_{nom} (VAC/DC)	U_{min} (VAC/DC)	U_{max} (VAC/DC)	$U_{dropout}$ (VAC/DC)	During time delay (W)	After time delay (W)
TDB4-024-xx	24	19.2	26.4	2.4	< 0.10	< 2.0
TDB4-048-xx	48	38.4	52.8	4.8	< 0.15	< 2.2
TDB4-060-xx	60	48.0	66.0	6.0	< 0.20	< 2.1
TDB4-110-xx	110	88.0	121.0	11.0	< 0.45	< 2.5
TDB4-125-xx	125	100.0	137.5	12.5	< 0.45	< 2.5
TDB4-220-xx	220	176.0	242.0	22.0	< 0.90	< 2.9

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
- 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
- To reset the time function, the voltage must drop below Urelease
- Always select the nominal voltage as close as possible to the actual voltage in the application

Timer relay
TDB4

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 (AC1; IEC 60947)
Maximum switching voltage		250 VDC, 440 VAC
Minimum switching voltage		12 V (5 V with option E)
Minimum switching current		10 mA (1 mA with option E)
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	Pole-pole	4 kV, 50 Hz, 1 min
	Cont-coil	2.0 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)

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	140 g (without options)

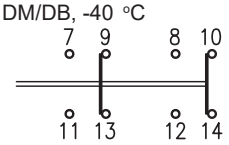
Environmental characteristics

Environmental	IEC 61810
Vibration	IEC 61373, Category I, Class B, Body mounted
Shock	IEC 61373, Category I, Class B, Body mounted
Operating temperature	-25 °C...+55 °C (with option C : -40 °C, with option V: +70 °C)
Humidity	93%
Salt mist	IEC 60068-2-11, NaCi, 35 °C for 4 days
Damp heat	IEC 60068-2-30, Test method Db variant 1
Protection	IEC 60529, IP40 (relay on socket) (with option K: IP50)
Fire & smoke	NF F 16-101, NF F16-102, EN 45545-2
Insulation materials	Cover: polycarbonate Base: polyester

Industry compliancy

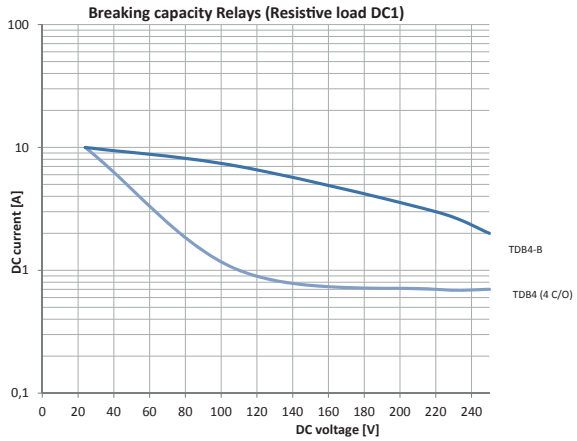
IEC 61810	Electromechanical elementary relays
IEC 60947	Low voltage switch gear and control gear
IEC 60947-5-1	Electromechanical control circuit devices and switching elements
IEC 60255	Relay design and environmental conditions
CE	

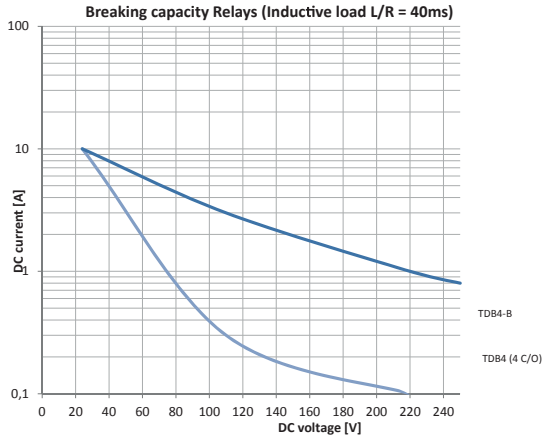
Options

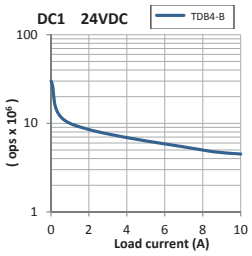
Code	Description	Remark	Cannot be combined with:
Standard options:			
B	Magnetic arc blow-out.	Ensures a high DC breaking capacity and longer contact life	
C	Low temperature (-40 ºC)	Max contact current 8A	
E*	Gold plated contacts. Low contact resistance and good resistance against corrosive atmospheres. Suitable for switching low level loads. 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	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. Coil protection against transient voltage.	DC coil only. Max. allowed peak voltage: 180 V. Higher voltage will damage the diode. Replaces back EMF diode	
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 Operating range AC can differ	
Y	Double break / double make contacts. Breaking capacity increased by 50% and longer contact life. To further increase the breaking capacity and contact life this option can be combined with option B	2 C/O DM/DB, -40 °C 	
Keying	Coil coding relay and socket		
Special options:			
M	AgSnO2 contacts. Highly resistant to welding, for safety and vital applications.	Min. contact contact > 100 mA	E

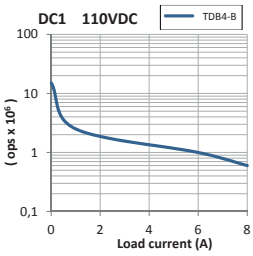
Electrical life expectancy and breaking capacity

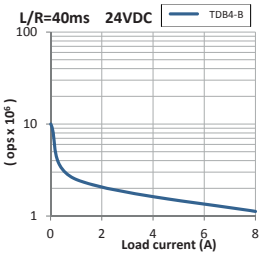
The life expectancy values shown below are based on factory tests (test frequency at 1/3 Hz). These values could be different in real life applications as environmental conditions, switching frequencies and duty cycles will influence these values. Putting more contacts in series (Y) will increase breaking capacity and life expectancy significantly.

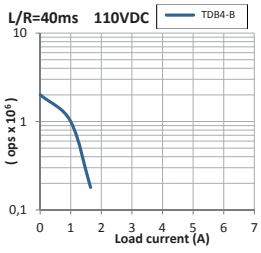


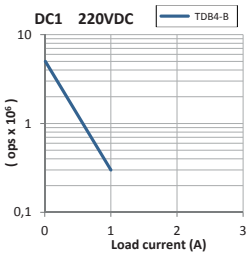


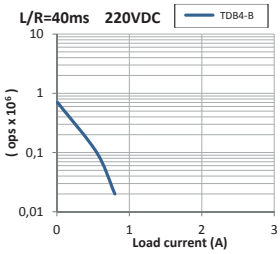












Timer relay
TDB4

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 TDB4-relays

TDB4	TDB4-B
• 4 C/O contacts • Contact gap: 0.7 mm **Breaking capacity** 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 -	• 4 C/O contacts • Magnetic arc blow out • Contact gap: 0.8 mm **Breaking capacity** 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 -

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	Spring clamp socket, flush mount, rear dual connection (2.5 mm^2)

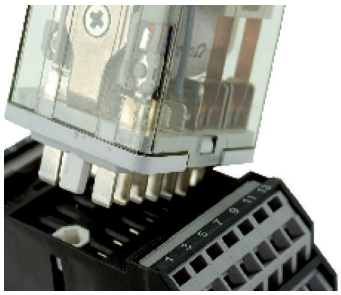
PCB mounting

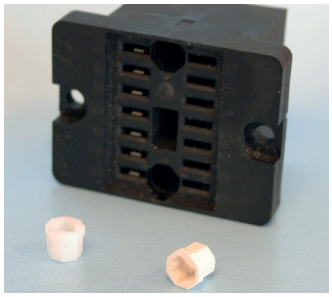
338000561	V32	PCB soldering socket

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)





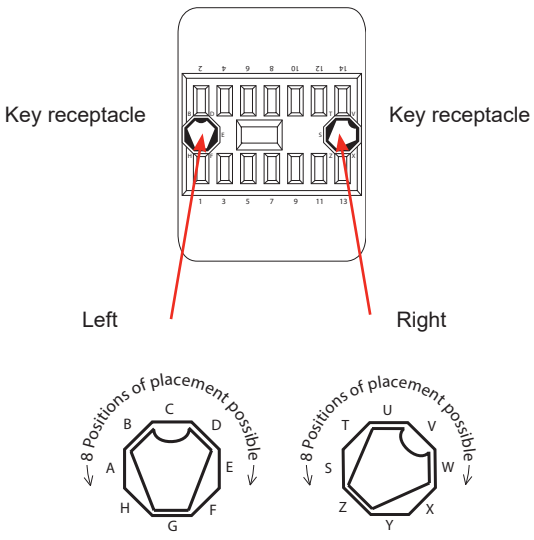
Function:
- To prevent wrong installation
- To prevent damage to equipment
- To prevent unsafe situations

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.

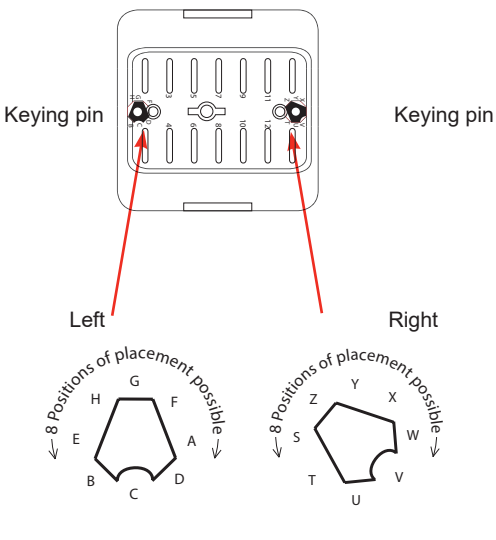
Remark: Sockets and relay shown are examples.

Top view socket



Example keying position G-Z on socket

Bottom view relay



Example keying position G-Z on relay

Keying codes

	Coil voltage code	
	24-60	72-230
Silver contacts (standard)	AS	AU
Gold contacts (option E)	DT	AZ
Silver tin oxide (option M)	GT	GV

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.

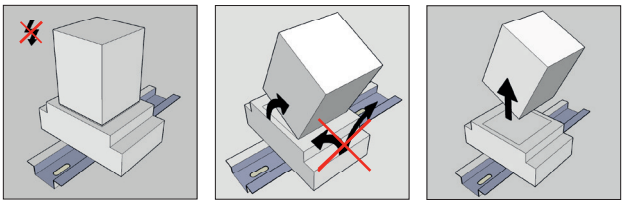
Therefore for long time contact reliability we recommend:
- Silver contacts: a minimum contact current of 20 mA per contact
- Gold contacts: a minimum contact current of 10 mA per contact
- Double Make Double Break contacts: a minimum contact current of 40 mA per contact
- When low currents are switched 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
TDB4

Ordering scheme

TDB4					
Coil voltages	24 VAC/DC				Cannot be combined with
	48 VAC/DC				
	60 VAC/DC				
	110 VAC/DC				
	125 VAC/DC				
	220 VAC/DC				
Options		B		Magnetic arc blow-out	
(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	
		Q		Double zener diode	
		V		Wider operation range and ambient temperature	
		Y		Double make / double break contacts	
Special options					
(minimum order quantity: 20)		M		$AgSnO_2$ contacts, highly resistant to welding	E
Time ranges			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		
			6-60 min		
			Fixed	Value between 0-180 s, no knob	

Example: TDB4-048-C 1-10 s
Description: TDB4 relay, Unom: 48 VDC/AC, low temperature (-40 °C), time range 1-10 s

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

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