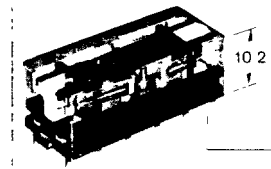
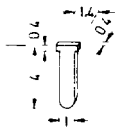
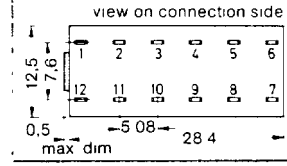


177-231
Tc
177-254

Power switching range from 1nW to 1KVA
New 5 layered twin linear contacts
Volumetric/contact resistance
approx 30/20 mΩ
Highly efficient
Good → HF and → capacitance value 15 pF
Low → thermovoltage approx 2 or < 1μV
100 A (1ms) short circuit capability
Long → operational life
(up to 2x10⁸ operations)



Sealed plastic enclosure IP67
weight approx 7 g
p-c b hole dia Ø 1.3 ± 0.1
p-c board stand off 0.4



The arrows refer to more specific information in the text

Data sheet

Ratings

Max current make/const/break	A 20 / 5 / 5	Test voltage contact/contact/coil	V _{eff} 750 / 1500
Max break voltage	V 250	Upper temp limit (max storage temp)	C + 85
Max break power without → contact protection	W(VA) 100 (1000)	Permissible ambient temp for 100% utilisation	C -55 / +65
Shock/vibration resistance	g-g/Hz 50-20 / 1000	Thermal resistance	K/W 65
Pick up/drop out/bounce time S2 S3 S4	ms 8/5/1 9/5/2 10/5/2	Life 0.1 A, 10 V d.c / 4 A 250 V a.c	operations 2 · 10 ⁸ / 10 ⁵
Pick up/operating power, bi/monostable	mW 50-100 / 100-200	Life at various loadings (see fig 4)	
Insulation resistance 500 V d.c	Ω 10 ¹⁰	Efficiency η = $\frac{\text{max. switching power} \times \text{no. of contacts (VA)}}{\text{pers. to power (W) \times \text{relay volume (cm}^3\text{)}}$	at 10 ⁵ operations 5700 (11400)

Type	S2	S3	S4	S2-L	S3-L	S4-L	S2-L2	S3-L2	S4-L2						
Contact arrangement	2NO + 2NC (2CO)	3NO + 1NC (2NO + 1CO)	4NO	2NO + 2NC (2CO)	3NO + 1NC (2NO + 1CO)	4NO	2NO + 2NC (2CO)	3NO + 1NC (2NO + 1CO)	4NO						
Connection diagram viewed from wiring side Attention to polarity!															
The contact configuration given in brackets is achieved by p-c-board connection of pins 3/4 on S3 or 3/4 and 9/10 on S2. Parallel switching of contacts increases permissible current. Series switching increases voltage capability.															
Switching parameters	Monostable relay, shown de-energised Switched by application of correct polarity			Bistable relay with 1 or 2 coils. Contact operation after or during excitation by indicated polarity. Switched after impulse (8 ms) or permanent excitation of a coil with opposite polarity or C-circuit (fig 10)											
Coilvoltage	Coil-			Coil-				Coil-							
rated voltage	pick up voltage at 20 °C	drop out voltage at 20 °C	permissible voltage at 40 °C	resistance ± 10%	no of turns	inductance ± 10%	permissible voltage at 40 °C	resistance ± 10%	no of turns	inductance ± 10%	permissible voltage at 40 °C	resistance per coil ± 10%	no of turns	inductance per coil ± 10%	
V	V	V	V	Ω		H	V	Ω		H	V	Ω		H	
1.5	1.1	0.15	2.7	11.3	700	0.006	4.2	22.5	810	0.009	3.6	11.3	400	400	0.002
3	2.1	0.3	5.9	45	1400	0.023	8.4	90	1700	0.04	5.9	45	800	800	0.01
5	3.5	0.5	10.1	130	2350	0.065	15.3	300	3100	0.14	10.1	130	1500	1500	0.031
6	4.2	0.6	11.9	180	2800	0.093	16.8	360	3100	0.14	11.9	180	1700	1700	0.04
9	6.3	0.9	17.7	400	4050	0.194	25.0	800	4700	0.31	17.7	400	2500	2500	0.087
12	8.4	1.2	23.7	720	5600	0.37	33.7	1450	6500	0.6	23.7	720	3500	3500	0.17
16	11.2	1.6	29.7	1130	7550	0.673	41.9	2250	7700	0.85	31.6	1280	4350	4350	0.235
24	16.8	2.4	47.2	2850	11000	1.427	66.7	5700	12000	2.05	47.2	2850	7000	7000	0.68
48	33.6	4.8	81.5	8500	17000	3.41	111.0	16000	25000	8.9	71.3	6500	9500	10000	125/139

Ordering example

S2-L - 12 V

type (see connection diagram) _____

coil voltage _____

Prices (excl VAT) in £/pce in qtls of

	1	50	100	500	1000	5000	10000
S2-/S3-/S4-	15, 3, 5, 6, 9	12 V					
		16	24 V				
		48 V					
S2-L-/S3-L-/S4-L-	15, 3, 5, 6 V						
		9	12 V				
		16	24 V				
		48 V					
S2-L2-/S3-L2-/S4-L2-	15, 3, 5, 6 V						
		9, 12 V					
		16, 24 V					
		48 V					
Plug-in socket type S-SS, S-NS							
Active plug-in socket type S-NS -		12, 24 V					

Approvals:

UL-approval E 43028
CSA LR 26550
VDE 0435/0110
Insulation class C to 250 V a.c (300 V d.c) for circuits not connected to the main system network
Insulation class B to 125 V a.c (150 V d.c) for circuits connected to the main system network

Patents:

A 357 622, AUS 472 096, 496 595, 502 682, BR 7 308 012, CDN 1 008 904, 1 027 155, 1 037 532, CH 571 273, 599 679, CSSR 185 214, D 2 345 638, 2 454 967, DDR 109 766, 117 562, E 4 216 97, F 2 225 827, 2 271 654, GB 1 456 861, 1 456 862, 1 456 863, 1 506 284, I 995 850, 1 038 135, IRL 39 962, R 76 316, S 396 503, 407 305, UDSSR 704 483, 778 718, USA 3 946 347, 3 993 971, ZA 73/9 725

All statements and data have been carefully tested by modern methods. There could, however, be some deviation due to product tolerance spread. Unless agreed in writing, all statements are nonbinding. We reserve the right to make changes as deemed necessary. Our Terms and Conditions of Sale apply.

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Milton Keynes MK11 3HF, England
Tel (09 08) 56 77 25
Telex 8 26 685, Telefax (09 08) 56 90 97

S relay – The multi featured relay

HF characteristics

The relatively good HF characteristics of this S relay are due to the following

- Low → capacitance
- Short twin contact finger springs
- High through power
- Low contact resistance
- Contacts shielded from armature

By series connection of the contacts the cross-talk attenuation can be improved

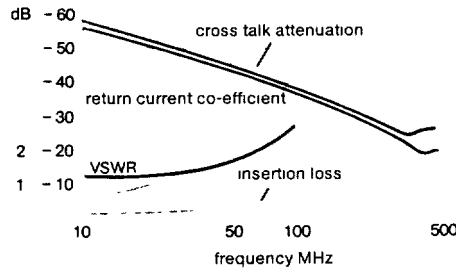


fig 6 HF characteristics of the S relay

Capacitance values ± pF

contact ungrounded	0,7
contact (coil grounded)	0,35
coil/fixed contact	1,15
coil/fixed contact (moving contact grounded)	0,9
coil/moving contact	1,4
coil/moving contact (fixed contact grounded)	1,15
contact set/contact set	0,6
contact set/contact set (coil grounded)	0,1

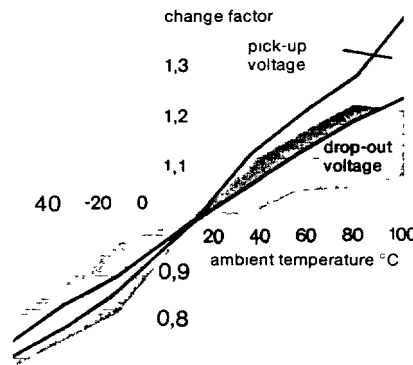
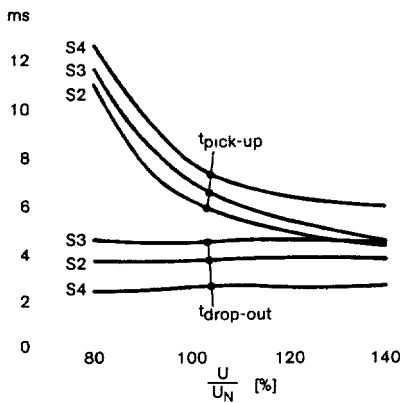
Thermovoltage

At normal coil excitation after 30 min at 25 – 29°C and 60 – 75% relative humidity

type S2 Connections	4-5	10-11		
U _{th} [μV]	1,3 ± 0,6	2 ± 1		
type S4 Connections	2-3	4-5	8-9	10-12
U _{th} ± 0,3 [μV]	2,3	1,5	1,8	1,9

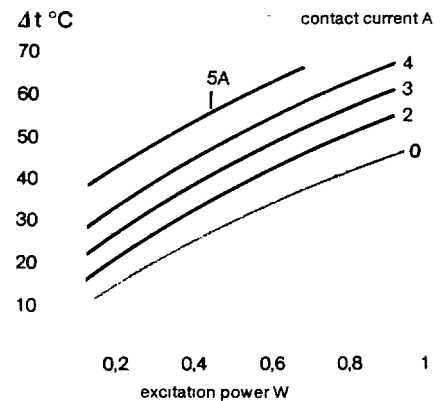
With impulse operation of bistable S relays or switching via a C switching network (fig 10) the thermovoltage < 1 μV

Pick-up/drop-out times ± 20% Temperature influence



Example A relay with a pick-up voltage of 8 V (20°C) picks up at 1 2 x 8 = 9 6 V at 60°C and at -40°C at 0 8 x 8 = 6 4 V

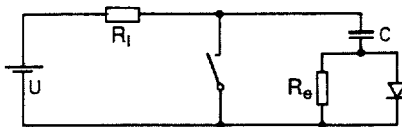
Coil heating (after 30 min switching)



If 4 contacts are simultaneously carrying 5 A then with normal excitation of 0 2 W, the max ambient temperature can be 50°C

Contact protection for d.c. operation

The following contact protection circuit is recommended to increase the contact life when switching high loads



R_l = Load resistance
R_e = Discharge resistor

Thus it is then possible to switch loads considerably in excess of 100 W To completely suppress an arc the value of the capacitor should be approx. 1 μF per ampère of switch-off current Thus with a current of 5 A a 4 7 μF capacitor should be used

The size of the discharge resistor R_e depends on the switching voltage and frequency Generally care should be taken that charging current + contact current are kept below 20 A. The overload current capacity of the diode must exceed the switching current.

Historical experience with the S relay

At „Electronica 74“ the S relay was still the „Relay of the future“ In October 1975 the first unit was delivered and today it has become one of the most specified relays on the world market

The S relay is unique in many respects, for its high efficiency, the switching range of between 1 nW to 1 kVA or its universal acceptability for mono- or bistable switching requirements with 4 contacts of various configurations

Since additionally it is hermetically sealed, has good HF characteristics and a low thermovoltage as well as being energy saving and highly reliable in operation, it finds wide use in such fields as measurement, control, information, signal and process technologies

S relays can also be used as coupling and linking elements within electronic circuits as well as interface relays for microprocessors or as storage elements

The rejection rate has sunk from an initial value of 1% to the current level of below 0 01% Only the sales price has in real terms, fallen by 15% since 1975 The supply is secured since S relays are now manufactured in West Germany, Japan and soon also in the USA

Due to the surface characteristics of the high quality gold contact assembly it is recommended that ultrasonic cleaning methods be avoided

Operation of the S relays

The S relay has a rotating armature. A permanent magnetic field is superimposed with the excitation flux across 4 air gaps. This results in high efficiency and contact pressure at low energising power. With monostable S relays the opposite pole faces are dissimilar. Fig 8 shows the switching operation with mono or bistable configurations with one or two coils depending on the polarity of the exciting voltage.

Thus at any given time a NO and a NC contact are linked like a changeover contact. For NO contacts, the top half, and for NC contacts the bottom half of the time axis is used. The excitation pulses ABEFHJL indicate that a

monostable polarised relay with constant polarity applied operates in normal circumstances like an un-polarised relay. Changing over the polarity at the coil does not affect the contact operation. Bistable relays change the contact position with the applied voltage polarity and remain in that state even when the excitation voltage is interrupted.

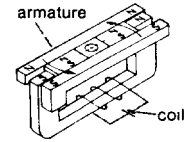


fig 7 Magnet system of the S relay

Uses Amplifiers, choppers changing sine waveform into rectilinear pulses (FGH). Bistable relays with two coils permit particularly elegant efficient solutions to switching

problems e.g. If a coil is pulsed for > 4 ms then a contact will open or close as appropriate until the other coil is pulsed with the opposite polarity.

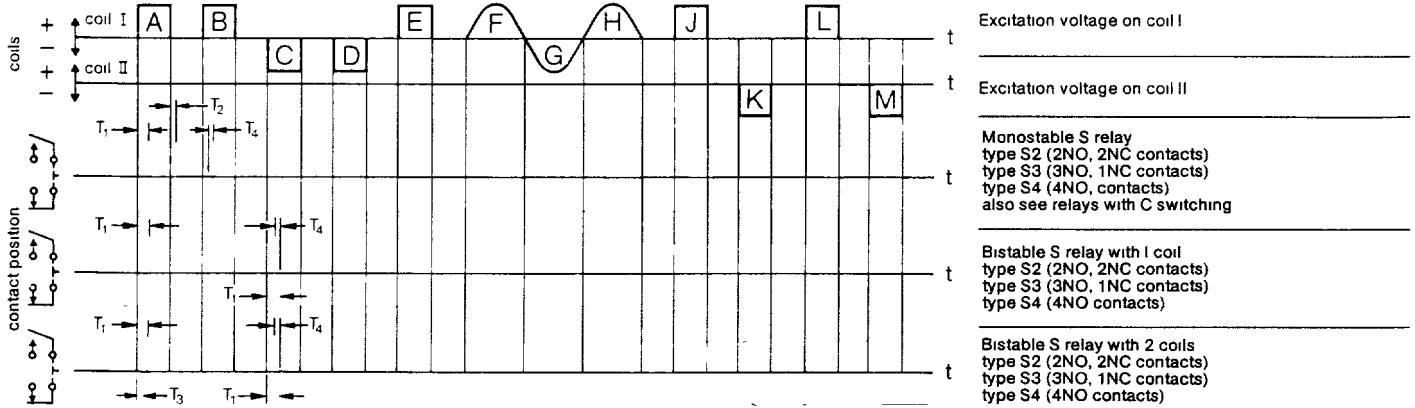


fig 8 Switching mode of various S relays with an example of a NO and NC contact or alternatively of a combined changeover pair

Excitation voltage on coil I
Excitation voltage on coil II

Monostable S relay
type S2 (2NO, 2NC contacts)
type S3 (3NO, 1NC contacts)
type S4 (4NO, contacts)
also see relays with C switching

Bistable S relay with 1 coil
type S2 (2NO, 2NC contacts)
type S3 (3NO, 1NC contacts)
type S4 (4NO contacts)

Bistable S relay with 2 coils
type S2 (2NO, 2NC contacts)
type S3 (3NO, 1NC contacts)
type S4 (4NO contacts)

T₁ = pick-up time T₂ = drop-out time
T₃ = response time T₄ = transition time

Special user examples of the S relay

As an electronic relay

If the electronic switching element shown in fig 9 is connected with a relay of type S2-L2, S3-L2 or S4-L2, then the relay assumes the properties of a latch relay e.g. with an impulse of the same polarity the relay switches momentarily in the opposite sense. A relay contact is used in this control circuit. All other data on the S relay remains the same.

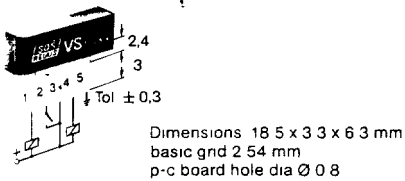


fig 9 VS Electronic module

As an ultra-modern relay

- 99% saving of energising power
 - Thermovoltage < 1 μV at 100% operation
 - Pick-up/drop-out time approx 3 or 2 ms
 - Ratio, pick-up/drop-out voltage approx 1:2
- The C switching circuit shown in fig 10 bestows monostable operation on bistable relays so that only during the pick-up time is there any power consumed (See SDS IC data sheet)

See also plug-in socket with C switching

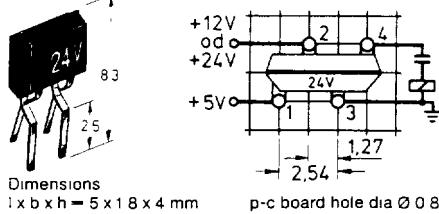


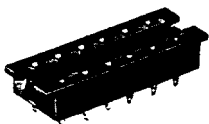
fig 10 IC for C switching

As time relay

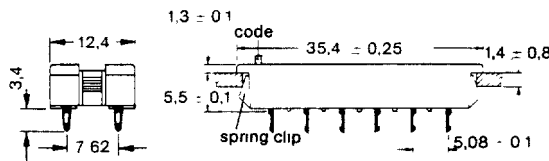
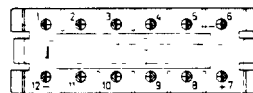
By using the C switching circuit and parallel switching of the capacitor at the input to the IC module, it is possible to increase the drop-out time to approx. 30 s. The achievable drop-out time delays are then ≈ 0.26 s/μF

Plug-in socket type S-NS

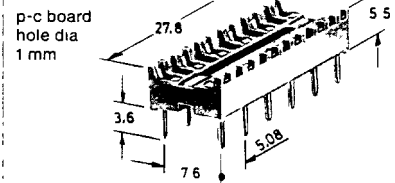
For p-c board or chassis mounting



p-c board hole dia 1.3 ± 0.1
chassis punching 12.6 x 33.1 ± 0.1



Plug-in type S-SS



Plug-in circuit with C switching circuit

The S-NS is also available with an in-built C switching circuit to become an active plug-in socket for 12 V and 24 V coil voltages. It bestows monostable switching capability on single coil bistable relays whose rated coil voltage is approx. 50% less. e.g. relay S2-L-6 V for plug-in socket S-NS-12 V excitation voltage. → Ultra modern relay. The internal connection of the C switching circuit are shown in blue. Control is made via connections 7 (+) and 12 (-).

When using the active S-NS in existing p-c boards which have been designed for S2- and S4-relays the S-NS socket must be turned in relation to the p-c board by 180°.

Distributor

4