SIEMENS

Relays

Data Book 1988

SIEMENS AKTIENGESELLSCHAFT

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Data book in German	Order No. A23999-A310-A997-★-04
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Relays

Data book in German	Order No. A23999-A311-A959-★-04
English	A23999-A311-A959-★-7604
French	A23999-A311-A959-★-7704

Substantial changes compared with the relay data-book 1983/84

Since the printing of the 1983/84 relay data book, our range of relays has been extended, previously, information on new types of relays was available on individual leaflets only, but are now listed in full detail in this issue.

Added:
Miniature relay P1
Miniature relay D2
Power relay ZW
Power relay K-B, K-D and K-S
Mini-power relay K
Mini-power relay F

Deleted:
Power relay 16
Reed relay V85
Counter relay

This publication supersedes the previous issue of the data book 1983/84.

Please contact our inland regional offices, department VB regarding technical questions, price enquiries and availability, or our companies office in the appropriate foreign countries (see index for locations of offices).

Contents

Straightforward ordering with the catalog "Siemens Components Service, Preferred Products"

If you are not yet familiar with the SCS catalog on Preferred Products, this is the occasion to introduce our fast, reliable delivery service to you. Every year, a revised edition of the SCS catalog is published. It comprises all Preferred Products of the Siemens components spectrum together with their most important technical specs.

Preferred standard types*)

Most types of relays in the data book show a selection of preferred standards, complete with the ordering code. These preferred standard types are listed as stock items as part of the Siemens Components Service, and are readily available from our central warehouse in Fürth. We recommend that this be taken into consideration for new design, as these preferred standard types are distinguished to be more economical due to lower cost.

Please direct orders for components as well as for the SCS catalog to your nearest Siemens Office, Components Division, or Distributor.

*) Regarding availability of these components, we reserve the right to changes in isolated cases, during the period of validity of this data book.

General

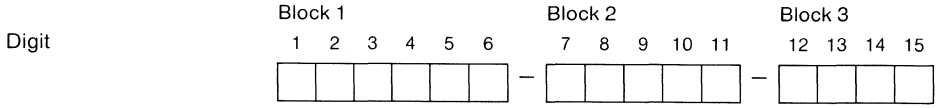
1

Ordering information

Definition of Ordering Code

The relay data book is laid out in such form that the ordering code can be determined without difficulty irrespective of relay type. Provided that the user of the data book methodically folows the ordering system and is in possession of all essential details necessary to define the code.

Ordering Code Systems



Simplification of Ordering Code

The ordering code can be simplified as follows:
In blocks 2 and 3 of the ordering code "any zeros" (space digits) immediately following digits 7 and 12 can be omitted.

Examples:

V23012-A0105-B001 becomes V23012-A105-B1
V23016-B0006-A101 becomes V23016-B6-A101

All dimensions in mm

Classification in accordance with DIN 40040 (typical values)

Relay type	Section	Classification class in accordance with DIN 40040						
		1	2	3	4	5	6	7
		Min. temperature[1]	Max. temperature[2]	Humidity limit	Failure quotient	Duration of stress	Shock and vibration limits	Atmospheric pressure
Miniature relay P1	2	G	P	F	X	X	S	U
Miniature relay D1		G	P	F	X	X	X	U
Miniature relay D2		G	N	F	X	X	S	U
Miniature relay W11		H	M	F	X	X	Z	N
Miniature relay W12		H	M	F	X	X	Z	N
Cradle relay N (dust cover)	3	G	M	F	X	X	U	S
Cradle relay N (hermetically sealed)		G	M	F	X	X	U	U
Cradle relay P (dust cover)		G	M	F	X	X	V	S
Cradle relay S (dust cover)		G	M	F	X	X	U	S
Cradle relay W		G	M	F	X	X	X	S
Card relay N	4	F	M	F	X	X	Z	S
Card relay P		H	M	F	X	X	V	S
Card relay SN		G	L	F	X	X	T	S
Card relay SP		G	L	F	X	X	T	S
Card relay E		G	L	F	X	X	Z	S
Card relay R		G	L	F	X	X	Z	S
Miniature power relay N	5	F	L	F	X	X	Z	S
Miniature power relay P		H	M	F	X	X	V	S
Miniature power relay E1		G	L	F	X	X	V	S
Miniature power relay E2		G	L	F	X	X	V	S
Industrial relay 1	6	J	M	F	X	X	V	S
Industrial relay 10		G	M	F	X	X	U	S
Power relay 15		G	M	F	X	X	V	S
Power relay ZW		H	M	F	X	X	U	S
Small general purpose relay		G	M	F	X	X	V	S
Power relay K, K-B, K-D and K-S	7	G	H	F	X	X	V	S
Mini-power relay K		G	H	F	X	X	V	S
Buzzer version		G	L	F	X	X	V	S
Power relay F2, F4 and F7	8	G	H	F	X	X	V	S
Mini-power relay F		G	H	F	X	X	V	S
DIR-reed relay	9	G	L	F	X	X	S	U
Reed relay V6		H	M	F	X	X	S	U
Encapsulated reed relay		H	M	F	X	X	S	U
Small polarised relay (dust cover)		F	P	F	X	X	Z	U
Miniature polarised relay		F	P	F	X	X	V	W
Sub-miniature polarised relay		E	L	F	X	X	S	V
Solid state relays	10	H	M	F	X	X	U	U

[1]) Refers to the ambient temperature

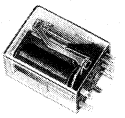
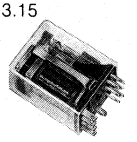
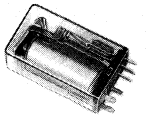
[2]) The sum of ambient temperature and temperature rise due to self heating.

Selection chart

Relay type		Miniature relay P1	Miniature relay D1	Miniature relay D2	
Section/page		2.3 	2.9 	2.17 	2
Dimensions l x w x h	mm	13.0 x 7.62 x 6.9	20 x 10 x 8.2	20.2 x 10 x 10.2 20.2 x 10 x 10.65	3
Type of relay		polarised, mono- or bistable	polarised, mono- or bistable	polarised, mono- or bistable	4
Control side					
Nominal voltage	Vdc Vac	24	24	24	5
Nominal power consumption	W VA	0.03...0.15	0.035...0.2	0.1...0.28	6
Max. No. of windings		2	2	2	7
Contact side					
Contact arrangement		1 changeover	1 changeover	2 changeovers	8
Max. switching voltage	Vdc Vac	150 125	150 125	250 220	9
Max. switching current	A	1	2	5	10
Max. power rating	W VA	30 60	35...60 60	50...150 250	11
Continuous current	A	1	2	2	12
General					
Ambient temperature	°C	−40 to +70	−40 to +70	−40 to +70	13
Operate/release/ reverse operate time[1])	ms	1/0.35/0.9	2/0.6/2	5/3/5	14
Max. switching rate	ops/sec	200	100	100	15
Test voltage: winding/frame contact/frame contact/winding	 V_{rms} V_{rms} V_{rms}	 1500	 1000 1000 1500	 1000	16
Mechanical life[1])	ops.	10^8	10^8	2×10^7	17
Termination		printed circuit	printed circuit	printed circuit	18
Protection class in accordance with DIN 40050 (housing)	dust cover hermetically sealed washable	 IP 67	 IP 67	 IP 67	19
Approvals			UL, CSA	UL	20

[1]) Typical values

Selection chart

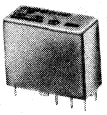
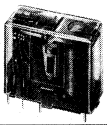
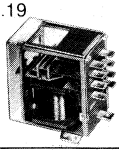
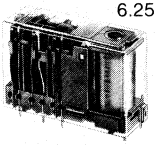
1	Miniature relay W11	Miniature relay W12	Cradle relay N Cradle relay S		Cradle relay P	Cradle relay W	Card relay N Card relay P	
2	2.25 	2.33 	3.3 	3.25	3.15 	3.35 	4.2 	4.9
3	15.6 x 10.6 x 10.8 17.1 x 12.1 x 11.5 20.2 x 9.8 x 10	23.5 x 15 x 18	24 x 19 x 30 30 x 19 x 30	35 x 19 x 30	24 x 19 x 30 30 x 19 x 30 35 x 19 x 30	24 x 19 x 40 30 x 19 x 40	29.6 x 19.8 x 10.2 30 x 20 x 10.8	
4	neutral, monostable	neutral, monostable	N neutral, monost.	S neutral, monost.	polarised, bistable	A. C. operated relay monostable	N neutral, monost.	P polaris., bistable
	Control side							
5	24	24	125	220	60	220	60	48
6	0.2...0.5	0.45...0.6	0.17...1.0	0.25...1.2	1.45...1.7	1,15	0.45	0.6
7	1	1	2		2	1	2	
	Contact side							
8	1 changeover 2 changeovers	1 changeover 2 changeovers	max. 2 changeov. max. 4 changeov. max. 6 changeov.		max. 2 changeov. max. 4 changeov. max. 6 changeov.	max. 2 changeov. max. 4 changeov.	2 changeovers	
9	125 125	60 250	250 250		250 250	250 250	150 125	110 110
10	1.25	3	5		5	5	2	
11	30 60	85 360	5...140 500		5...140 500	5...140 500	30 60	
12	2	3	5		5	5	2	
	General							
13	−30 to +75	−30 to +50	−40 to +70		−40 to +70	−40 to +70	−40 to +70	−25 to +70
14	5/2	6/2.5	7.5/3	16/2	4/−/4	10/10	8/6	8/−/7
15	20	20	50		20	20	50	40
16	500	500	500 1000		500 1000	2000 1000	500 500	
17	2×10^7	10^7	10^8		10^7	10^7	2×10^8	10^8
18	printed circuit	printed circuit	solder and plug-in pc.		solder and plug-in	solder and plug-in	printed circuit	
19	IP 40 IP 67	IP 40	IP 30 IP 67	IP 30	IP 30	IP 40	IP 40 IP 67	
20			PTB		PTB	PTB		

Selection chart

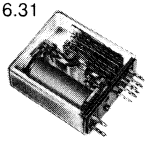
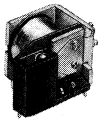
Relay type		Card relay SN Card relay SP		Card relay E Card relay R		Min. power rel. N Min. power rel. P		1
Section/page		4.15 | 4.25		4.33 | 4.47		5.3 | 5.15		2
Dimensions l x w x h	mm	39.7 x 32.4 x 10.2 39.7 x 37.4 x 10.2		27.9 x 24.7 x 10.4 27.9 x 10.4 x 24.7 29 x 25.7 x 11 29 x 11 x 25.7		20 x 13 x 31		3
Type of relay		SN neutral, monost.	SP polaris., bistable	E neutral, monost.	R remanent rel., bist.	N neutral, monost.	P polaris., bistable	4
Control side								
Nominal voltage	Vdc Vac	60		60		60	48	5
Nominal power consumption	W VA	0.7	1.5	0.45	2.7...3.5	0.6	0.75	6
Max. No. of windings		2		1	2	1	2	7
Contact side								
Contact arrangement		4 changeovers 6 changeovers		1 N/C 1 N/O 1 C/O	1 N/O 1 C/O	1 twin make 1 C/O	1 C/O	8
Max. switching voltage	Vdc Vac	250 250		300 250		300 250		9
Max. switching current	A	3		15		15		10
Max. power rating	W VA	5...75 100		35...330 2000		35...420 3750		11
Continuous current	A	2		8		7.5		12
General								
Ambient temperature	°C	−40 to +70		−40 to +70		−40 to +70	−25 to +70	13
Operate/release/ reverse operate time[1])	ms	8/2	7/−/6	6/4	10/−/10	7/5	8/−/7	14
Max. switching rate	ops/sec	30	40	20		40		15
Test voltage: winding/frame contact/frame contact/winding	 Vrms Vrms Vrms	 500 1000 1000		 4000	 2500	 1500 2500 2500		16
Mechanical life[1])	ops.	10^8	10^7	2×10^7		2×10^8	10^8	17
Termination		printed circuit		printed circuit		pc, plug-in and/or push-on connect.		18
Protection class in accordance with DIN 40050 (housing)	dust cover hermetically sealed washable	IP 40 IP 67	IP 40	IP 40 IP 67	IP 40	IP 40		19
Approvals		UL PTB	PTB	PTB, SEV, CSA, UL VDE, SEMKO		CSA,DEMKO NEMKO, SEMKO,SEV, PTB, UL	SEV	20

[1]) Typical values

Selection chart

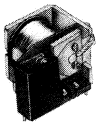
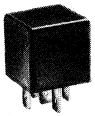
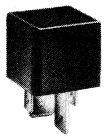
1	Miniature power relay E1	Miniature power relay E2	Industrial relay 1	Industrial relay 10	Power relay 15	Power relay ZW
2	5.23 	5.29 	6.3 	6.11 	6.19 	6.25 
3	29 x 13.2 x 25	29 x 13 x 25	28 x 20.7 x 34.4	32.5 x 36.5 x 50.5	53 x 34.5 x 51.5	60.2 x 20.4 x 40
4	neutral, monostable	neutral, monostable	neutral, monostable	neutral, monostable	neutral, monostable	neutral, monostable (forcible retained)
	Control side					
5	60	60	60 220	24 220	220 380	220
6	0.8	05	0.8 1,4	1.3 2,4	1.6...2.4 3,4	1.25
7	1	1	1	1	1	
	Contact side					
8	1 make 1 break 1 changeover	2 makes 2 breaks 2 changeovers	2 changeovers 4 changeovers	2 changeovers 3 changeovers	2 makes 2 changeovers 3 changeovers	4 makes and 2 breaks
9	300 250	300 250	110 250	250 250	300 250	300 250
10	25	10	5	10	40	4
11	35...500 4000	35...250 1250	36...150 1250	...240 1500	80...360 10000	50...120 1000
12	16	5	5	10	15	4
	General					
13	−40 to +110	−40 to +60	−20 to +50	−40 to +50	−40 to +65	−25 to +70
14	8/3	8/3	20/20	15/8	15/12	25/8
15	20	20	0,5	10	10	20
16	4000	4000	2500	2000 2000	2500 2500	4000
17	10^7	2×10^7	5×10^7	2×10^6	10^7	10^7
18	printed circuit	printed circuit	pc or solder and plug-in	plug-in	plug-in	printed circuit
19	IP 40	IP 40	IP 40	IP 50	IP 20	IP 40
20	SEMKO, UL, DEMKO, CSA, SEV, VDE	CSA, SEMKO, SEV, UL, VDE			SEV	TÜV, UL, SEV

Selection chart

Relay type		Small general-purpose relay	Power relay K	Power relay K-B	1
Section/page		6.31 	7.3 	7.3 	2
Dimensions l x w x h	mm	45/58 x 20.5 x 54 54.3 x 17.5 x 47.5	24 x 19 x 18.5	28 x 19 x 18.5	3
Type of relay		neutral, monostable	neutral, monostable	neutral, monostable	4
Control side					
Nominal voltage	Vdc Vac	220	24	24	5
Nominal power consumption	W VA	1.8...3.8	1.6	2.5	6
Max. No. of windings		2	1	1	7
Contact side					
Contact arrangement		max. 6 makes max. 8 changeov.	1 make 1 break 1 changeover	Bridging make	8
Max. switching voltage	Vdc Vac	450 380	75 60	200 160	9
Max. switching current	A	20	100/30	80	10
Max. power rating	W VA	...400	...500 1000	...1000 1600	11
Continuous current	A		45/30	35	12
General					
Ambient temperature	°C	−45 to +70	−40 to +85	−40 to +85	13
Operate/release/ reverse operate time[1])	ms	10/3	5/3	4/3	14
Max. switching rate	ops/sec	20	20	20	15
Test voltage: winding/frame contact/frame contact winding	 V_{rms} V_{rms} V_{rms}	 1500 1500	 500	 500	16
Mechanical life[1])	ops.	10^8	10^7	10^6	17
Termination		solder and/or plug-in	printed circuit	printed circuit	18
Protection class in accordance with DIN 40050 (housing)	dust cover hermetically sealed washable	IP 00, IP 30	IP 00	IP 00	19
Approvals					20

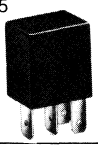
[1]) Typical values

Selection chart

	Power relay K-D	Power relay K-S	Mini-power relay K	Power relay F2	Power relay F4	Power relay F7
1						
2	7.3 	7.3 	7.21 	8.1 		8.1 
3	28 x 19 x 18.5	25 x 19 x 18.5	16 x 13 x 18 17.5 x 15 x 19.5	26.2 x 26.2 x 25.2	26.2 x 26.2 x 25.2	26.2 x 26.2 x 25.2
4	neutral, monostable	neutral, monostable	neutral, monostable	neutral, monostable	neutral, monostable	neutral, monostable
	Control side					
5	24	24	24	24	24	24
6	2.25	2.25	1.1	1.6	1.6	1.6
7	1	1	1	1	1	1
	Contact side					
8	Twin make	1 make	1 break[2]) 1 make[3]) 1 changeover	1 make 1 changeover 1 twin make	1 make 1 changeover 1 twin make	1 make
9	75 160	75 60	75 60	75 60	75 60	150 60
10	2 x 80	300	60	120	120	240
11	...500 1600	...600 1200	...200 500	...500 900	...500 900	...800 1400
12	2 x 20	70	15	30	60	70
	General					
13	−40 to +85	−40 to +85	−40 to +85	−40 to +85	−40 to +85	−40 to +85
14	4/3	4/3	3/1,5	5/3	5/3	5/3
15	20	20	20	20	20	20
16	500	500	500	500	500	500
17	10^6	10^6	10^7	10^7	10^7	10^7
18	printed circuit	printed circuit	printed circuit	plug-in, solder or pc	plug-in, solder or pc	plug-in
19	IP 00	IP 00	IP 00 IP 67	IP 50	IP 50	IP 50
20						

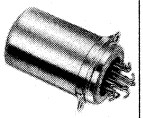
[2]) or bridging twin break
[3]) or bridging twin make

Selection chart

Relay type		Mini-power relay F	DIL-reed relay	Reed relay V6	1
Section/page		8.15 	9.3 	9.11 	2
Dimensions l x w x h	mm	20.5 x 15.5 x 23	19.6 x 6.4 x 5.1 19.1 x 6.6 x 6.8	26 x 10.5 x 10.5	3
Type of relay		neutral, monostable	neutral, monostable	neutral or polarised, monostable	4
Control side					
Nominal voltage	Vdc Vac	24	24	24	5
Nominal power consumption	W VA	1.5	0.06...0.28	0.06...0.15	6
Max. No. of windings		1	1	1	7
Contact side					
Contact arrangement		1 make 1 break 1 changeover	1 make 1 changeover 2 makes	1 make 2 makes 1 N/O + 1 N/C	8
Max. switching voltage	Vdc Vac	75 60	100 100	100	9
Max. switching current	A	90	0,5	0,5	10
Max. power rating	W VA	...250 500	10 10	10	11
Continuous current	A	20	1	0.75	12
General					
Ambient temperature	°C	−45 to +85	−40 to +85	−25 to +70	13
Operate/release/ reverse operate time[1])	ms	3/1.5	0.4/0.7	0.7/0.5	14
Max. switching rate	ops/sec	20	650	500	15
Test voltage: winding/frame contact/frame contact/winding	 V_{rms} V_{rms} V_{rms}	 500	 350	 1500	16
Mechanical life[1])	ops.	10^7	3×10^8	10^9	17
Termination		plug-in, solder or pc	printed circuit	printed circuit	18
Protection class in accordance with DIN 40050 (housing)	dust cover hermetically sealed washable	IP 50	IP 67	IP 50	19
Approvals					20

[1]) Typical values

Selection chart

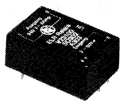
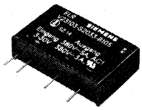
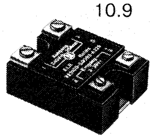
1	Encapsulated min. reed relay	Small polarised relay	Miniature polarised relay	Sub-miniature polarised relay		
2	9.17 	9.23 	9.27 	9.31 		
3	30 x 12 x 10 30 x 15 x 10 30 x 22 x 10	39 x 28 x 84	28.7 ∅ x 49 28.7 ∅ x 45	20.5 x 10.5 x 25.2 36.6 x 24.2 x 11		
4	neutral, monostable	polarised, mono- or bistable	polarised, mono- or bistable	polarised, mono- or bistable		
	Control side					
5	24	110	110	60		
6	0.13...0.58	⩽ 0.01	⩽ 0.04	⩽ 0.09		
7	1	up to 7	3	2		
	Contact side					
8	1 to 4 makes	1 changeover	1 changeover 2 changeovers	1 changeover 2 changeovers		
9	200	220	110 125	60 110		
10	0,5	5	1	1		
11	10	30	30	30		
12	0.75					
	General					
13	−25 to +70	−55 to +80	−55 to +75	−25 to +115		
14	1/0.2					
15		200	50	50		
16	1500	500 500	500 350	500 500		
17	10^9	$>10^9$	10^7	10^7		
18	printed circuit	plug-in	solder and plug-in	pc, solder and plug-in		
19	IP 67	IP 40	IP 67	IP 67		
20						

Selection chart

Relay type		Solid state relays				
		B3[1])	B4		B5	1
Section/page		10.9 	10.9 		10.9 	2
Zero point switch		with	with	without	with	3
Dimensions l x w x h	mm	42 x 27 x 11.9	40 x 11 x 21		40 x 11 x 26	4
Control circuit						
Control voltage	Vdc	3...6	3...30	3...20	3...20	5
Pick-up voltage	Vdc	≤ 3				6
Release voltage	Vdc	>1				7
Control current	mA	< 18	< 30		< 30	8
Load circuit						
Switching current	A_{rms}	2	2.5		2.5	9
Switching voltage	V_{rms}	240	240		240	10
Switching voltage range	V_{rms}	24...280	24...280		24...280	11
Repetitive peak blocking voltage	V_{pk}	600	600		600	12
Frequency range	Hz	47...63				13
Peak surge current[3])	A_{pk}	100	100		100	14
Critical rate of rise of off-state voltage (dv/dt)	V/µs	200				15
Critical rate of rise of on-state current (di/dt)	A/µs	20				16
Operating delay	ms	max. 1 half cycle		—	max. 1 half cycle	17
General						
Operating temperature range, typical	°C	−25 to + 80				18
Isolation voltage input – output input – case output – case	 Vrms Vrms Vrms	 2500 — —	 2500 — —		 3750 — —	19
Insulation resistance	Ω	10^{10}				20
Termination		printed circuit	printed circuit		printed circuit	21
Protection class in accordance with DIN 400500 (housing) dust protected / washable		IP 67	IP 67		IP 67	22
Approvals		SEV, UL			VDE	23

[1]) SSR with improved immunity to line transient
[2]) Load circuit with 2 anti-parallel thyristors
[3]) Admissible only occasionally for 1 cycle
[4]) VDE version 3750 Vac

Selection chart

	A3	B1			A2			A8	
1	Solid state relays A3	B1[2])			A2			A8	
2	10.9 	10.9 			10.9			10.9 	
3	with	with		without	with			with	
4	38 x 25.4 x 15.9	50 x 40 x 31			58.5 x 44.5 x 27			58.5 x 44.5 x 27	
	Control circuit								
5	3...30	3...20	3...30	3...20	3...30			3...30	
6	≤ 3								
7	> 1								
8	< 20	< 20	< 30	< 30	< 20			< 20	
	Load circuit								
9	3	5			10	25	40	25	40
10	240	380			240			415	
11	24...280	24...480			24...280			24...480	
12	600	1200			600			1000	
13	47...63								
14	50	100			90	230	350	230	350
15	200								
16	20								
17	max. 1 half cycle			—	max. 1 half cycle				
	General								
18	−25 bis +80								
19	2500 — —	2500 or 4000 — —			2500[4]) 2500 2500			2500 2500 2500	
20	10^{10}								
21	printed circuit	printed circuit			screw terminals				
22	IP 60	IP 67			IP 60			IP 60	
23		SEV, UL, VDE, CSA			VDE				

Definitions and explanations

In order to select a relay for a given application, the properties in this data book are expressed in terms of characteristic parameters for each type of relay.

To meet certain demands during the life of the relay, the characteristics of a given value are in accordance with DIN 41215.

Following a system of standard definitions, which, depending on the origin of a relay and its range of application can lead more or less to different statements, in particular where the function of the relay is concerned. Where such differences occur, preferable definitions in accordance with DIN IEC 255 part 1-00 and VDE 0435 part 201 have been used in this summary.

The definitions and characteristics are sub-divided, in the general part (electromechanical and static relays) and in the section for mechanical relays only. Definitions and characteristics for static relays can be found in the section "solid state relays".

General

(Electromechanical and static relays)

Mounting position

All the relays listed in this Data Book can be mounted in any position, unless otherwise stated.

Instructions for handling

Soldering

When soldering relays into printed circuit boards, it is advisable to observe the following points to avoid damage to the relays by the solder itself, the cleaning solvent, vapour from the flux or damage due to mechanical stresses.

- After the relay has been mounted onto the printed circuit board, the pins should not be bent over. If it is necessary to secure the relay for soldering, only the protruding coil terminals should be bent over slightly.
- The flux must not be too thin otherwise there is a danger that it wil penetrate, possibly by capillary action, into the relay.
- Before running through the solder bath, the flux must be pre-dried and the printed circuit board must not be heated above 65 °C. This maximum temperature has been proved to be ideal for the soldering process which follows.
- The depth of immersion for the printed circuit board should be selected in such a way that the flux or the solder should not overflow on to the components when running through the solder bath.
- The speed through the bath should be selected in such a way, so that the temperature rise of the relay does not exceed 110 °C.
- If overflowing is unavoidable during the solder process and where, for example a quick flowing flux is employed, it is recommended that component spacers be used between the relay and printed circuit board.

Technical directions (recommendations)

Parameter	Flow solder bath
Solder	Type L-Sn 60 Pb or L-Sn 63 Pb in accordance with DIN 1707
Solder wave	To be adjusted as level as possible. Speed of solder stream ≤ carrier speed.
Temperature of solder bath	260 ± 5 °C
Fluxing agent	Type FSW-32 in accordance with DIN 8511, e. g. C30, from ZEVA Co.
Fluxing	The employment of foam flux requires the foam to remain smooth at the vertex and great care must be taken by immersing the printed circuit board approximately 1 mm into the crest of the foam in order to achieve an unbroken wetting.
Pre-heating temperature	Components side approximately 60°C
Carrier speed	Approximately 1.2 m/min.
Time for solder to make contact	1 to 3 seconds
Depth of immersion of the printed circuit board into the solder bath/ solder wave.	1 mm
Setting angle	7°

Cleaning

In cases of need, flux residues can be removed after the solder process:

- The cleaning method of dust protected relays must be carried out in such a way as to avoid immersion of the relays into the solvent, also any wetting of the relay must be avoided by condensation of the solvent, otherwise there is a danger of contact contamination. Ultrasonic cleaning methods would be suitable, whereby only the underside of the printed circuit board is treated, or the underside of the board may be brushed or wiped with a solvent soaked sponge.
- Cleaning methods also apply to washable or hermetically sealed relays, whereby the relays can be immersed into the solvent. We would like to draw your attention to the fact that not all washable or hermetically sealed relays are suited for ultrasonic cleaning methods. Appropriate directions under individual types.

Technical directions

Parameter	Ultrasonic cleaning method
Solvents	Pure or derivatives of Chlorine Hydro-carbon, e. g. Freon TP 35, Freon TE 35, Freon TF, Kaltron 113 MDR, Kaltron 113 MDA, Kaltron 133 MDE; pure alcohols such as Ethy- or Isopropyl alcohols are also suitable.
Temperature of bath	48 °C max.
Transit time through the bath	30 seconds max.
Ultrasonic frequency	20 to 40 kHz

Approvals

Local, national (european) and international (world wide) regulations contain rules, according to the particular applications, for persons using electrical appliances to avoid danger to health and human life or risk of fire. In order to observe these rules, for relays to be used in plants and equipment, it is frequently required to acknowledge the recognised testing authorities and if need be, to keep the manufacturing plant under surveillance on a regular basis. Above all, the following data are hereby monitored:

- Air gaps and creepages distances between voltage carrying parts of different polarity (e. g. winding/contact, contact/contact).
- Test voltages between relative points.
- Characteristics of insulation materials, e. g. flame resistance and leakage current stability.
- Contact carrying capacity.
- Contact gaps.
- Forcible guided contacts.

The testing authority allocate a number for approved relays. The relays can be supplied with the test approval mark on customers request.

The approvals are listed under the relevant type of relays.
They do not necessary apply to the complete range in every case.

Appropriate testing authorities within the Federal Republic of Germany

VDE-testing centre.

On application, the VDE testing office issue a certificate with reference to "monitoring of manufacturing". It contains the first test results of the relays in accordance with the applicable VDE-regulations, inspection of the factory and monitoring of manufacturing by the VDE-testing authority.

In addition, the VDE-authority can carry out tests on samples in accordance with specified VDE-regulations, but without the monitoring of manufacturing and those results can be confirmed with a certificate. Furthermore, it is possible to get information checked that individual sections of VDE-regulations have been observed. For information to an applicant, those results can be verified by a test report.

Results of a single test are shown in the "Test report" as well as in the "Certificate without monitoring of manufacturing." they do not portray findings by the VDE-testing authority of universal validity regarding characteristics of the tested relays of the current run in the factory. A copy of the certificate or test report can be made available on request.

PTB

Goods or material of electrical nature can only be used in explosive hazardous areas, if a certificate can be provided that samples have been tested. On application, the German Federal Institute for Technical Physics (PTB) will conduct the hereto necessary examinations and a corresponding test certificate is issued. PTB has access to the factory to carry out on the spot inspection of the production.

TÜV

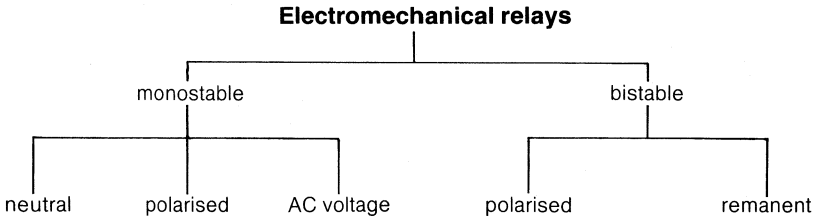
Relays are tested by the German Technical Control Commission (TÜV) to the relevant VDE regulations and also in accordance with "Safety rules", e. g. complying with the forcible guidance of contacts controlling power-actuated presses and is verified by the issue of an approval certificate.

Monogram and appropriate authority

	VDE	VDE-testing place, Germany (Certificate for monitoring of manufacturing)
	PTB	Federal Institute for Technical Physics Germany
	TÜV	Technical Control Commission Germany
	SEV	Electrical Engineering Association Switzerland
	SEMKO	Control Institute for Electrical Materials Sweden
	DEMKO	Control Institute for Electrical Materials Denmark
	NEMKO	Control Institute for Electrical Materials Norway
	UL	Underwriters Laboratories, INC. USA
	CSA	Canadian Standards Association Canada

INTRODUCTION

Different designs of the control system results in various types of relays:



Monostable relays

Relays, whose contacts return to the original position after the excitation has been switched off.

- Neutral – operates independant of the direction of the dc energising current.
- Polarised – only operates by dc energising current with a definite direction to the on-position.
- AC voltage – operates by an energising current of alternating direction of sinusoidal wave form in normal cases.

Bistable relays

Relays, whose contacts remain in the changed-over position after the excitation has been switched off.

- Polarised – takes one position by dc energising current with a definite direction and goes to another position by dc energising current of opposite direction.
- Remanent – takes a definite position by dc energising current of optional direction and is held in that position by remanence in the magnetic circuit. The contacts change over to the other position by an energising current of opposite direction and limited amplitude.

RELAY FUNCTIONS

Off-position (Neutral position)

For a monostable relay, the position in unenergized condition. For a bistable relay, the position declared by the manufacturer.

On-position (Functional position)

For a monostable relay, the position in energized condition. For a bistable relay, the position inverse to the off-position.

Operation

Action, a relay operates when it changes from the off-position to an on-position.

Release

Action, transition of a monostable relay returning from the on-position to the off-position.

Reverse operation

Action, transition of a bistable relay returning from the on-position to the off-position.

Bounce

One or more temporary opening or closing of the relay contacts during the switching operation.

ENERGISING SIDE

Excitation

Electrical circulation of the magnetic circuit by means of an energising current through the winding of the relay (product of energising current and the number of turns).

Nominal value (voltage, current, resistance etc.)

Value to meet the specification for which the relay has been designed.

Nominal power rating

Power consumption of the relay coil at nominal volts and nominal value of resistance of the winding.

Non-operate value (current, voltage)

Value of excitation at which the relay must not function.

Pick-up value (current, voltage)

Value of excitation by which the relay must have operated.

Holding value (current, voltage)

Value of excitation at which a monostable relay must not drop-out.

Release value (current, voltage)

Value of excitation by which a monostable relay must have dropped-out.

Reverse operation value (current, voltage)

Value of excitation by which a bistable relay must have changed position.

Minimum voltage U_{I20}

The point at which the relay picks-up at an ambient temperature of 20 °C after pre-energising with U_{I20} is the lowest admissible operating voltage to the winding.

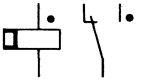
Minimum voltage $U_{min\ 20}$

Lowest admissible operating voltage to the winding at which the relay picks-up at a coil temperature of 20 °C.

Maximum voltage $U_{II\ 20}$, $U_{max\ 20}$

Maximum admissible voltage to the winding of the relay of continuous energisation and at an ambient temperature of 20 °C without exceeding the limit of the maximum temperature for the relay.

Winding and coil symbols in accordance with DIN 40713

Discription	Circuit symbol
Relay neutral, monostable	
Relay for ac operation	
Remanent relay	
Relay polarised mono- or bistable with (● dot) indicating switching position if positive potential on coil start	

CONTACT SIDE

Switching voltage

Voltage between the contacts before making or after breaking.

Switching current

Current which a relay contact carries immediately before making or after breaking.

Maximum continuous current

Highest admissible current (r. m. s. if ac voltage) which a previously closed contact can carry continuously.

Max. Power rating

Maximum admissible result from switching current and switching voltage.

Type of contact

The type of contact is differentiated according to the various switching functions of the relay and the description of all contacts are laid down by DIN 41020. The contact blades actuated by the operating systems are defined as active contact blades, those not moving are passive contact blades.

Table listing the most important types of contacts

Designation	Abbreviation	Contact design	Circuit symbol
Make	1		
Break	2		
Changeover	21		
Changeover	12		
Bridging make	1		
Twin make	(11)		
Sequential make	11		
Bridging break	2		
Twin break	(22)		

Contact versions

Make

Contact pile-up which is open in the off-position of the relay and closed in the on-position.

Break

Contact pile-up which is closed in the off-position of the relay and open in the on-position.

Changeover (break and make)

Three blade contact pile-up consisting of one break and one make. During the switching function of changing over, at first the previously closed contact will open, and after that, the up to now open contact with close.

Twin make

Contact pile-up made up of two simultaneously operating makes with one common contact blade.

Bridging make

Contact pile-up with two in series connected simultaneously operating makes.

Twin break

Contact pile-up made up of two simultaneously operating breaks with one common contact blade.

Single contact

Contact version at which each blade is fitted with one contact rivet only, mainly to be used for switching higher voltages and heavy currents.

Bifurcated contact

Contact version at which each blade is fitted with two contact rivets. Both contact rivets operate in parallel, switching most likely simultaneously and are mechanically vastly independant from each other. Contact reliability is herewith substantially increased, mainly to be used for switching small currents and very low voltages (dry circuit).

Forcible guided contacts

Relay with a contact arrangement, at which the breaks and makes can not be closed at the same time, not even as a result of fusing in the event of a fault. Such relays are employed in control systems where malfunctions can cause material damage or personal injury.

Contact pile-up

Amalgamation of all contact members of a relay.

Contact tip

That part of a relay contact which according to the rules, creates the electrical circuit.

Contact gap

Distance between contact members of an open relay contact.

Contact wear

Loss of material on the contact tip, e. g. vapourising during the process of arcing.

Contact continuity resistance

Electrical resistance between the terminals of a closed contact.

Contact force

Pressure, which the contact members of a closed contact bring to bear on one and another.

Contact material

Depending on the required characteristics of a relay contact, a great many different materials are used, in particular alloys of precious metals.

In practice, the contacts of a relay operate in a different variety of electrical loads based on voltage, current and power ratings. This can also be seen in fig. 1. "Fundamental usage of switching contacts" which is showing the rough outline of multiple applications and is presented by a logarithmically grid of current and voltage. It has to be noted that high voltage surges can arise during the switching-off operation due to inductance in the load circuit, whereas capacitance could cause peak currents at the switching-on function; also, the effectiveness of a possible spark suppression forms part of contact loads.

There is no known universal contact material which can be used in the multiple range of applications. Experience over decades, not only by the manufacturer of contact materials, but also by the developer and user of switching devices have established that the important criteria for the suitability of contact materials are as follows:

- contact resistance
- contact wear
- material transfer
- tendency to fuse together

According to those criteria, the most important contact materials with their characteristics of typical behaviour in the field of applications, can be grouped in regard to current and voltage; see the following table. Fig. 2. "Suitable contact materials for switching contacts" also portrays this table (system of co-ordinates correspond to that of fig. 1).

The lower limits for current and voltage are based on the contacts being exposed to the atmosphere, that means that climatic influences in the environment have been taken into consideration. For this reason, the limits for sealed relays can shift to even lower values. This also applies when the surface of a contact material is covered by a sandwich layer of precious metal.

Only the fundamental contact materials are listed in the table and shown in fig. 2. Quite a number of contact materials not mentioned here have proved to be suitable for specific loads only. Those special variants are not catalogued and please enquire if the occasion arises.

The specification of each individual relay indicates the availability with different contact materials together with the max. load capacity. As the contact ratings and the life of the contact do not only depend upon the contact material, but also on the constructional characteristics (e. g. contact force, geometrical dimensions of the contact pile-up etc), the choice of contact material must be made for each individual relay, and this choice cannot necessarily be applied to other types.

To a great extent, the environmental conditions must be taken into account for unsealed relays in order to achieve reliability in use. Please request consultation for critical cases.

Characteristic capacities of contact materials

Contact material	Typical characteristics	Standard values for the range of applications
Au Ag 8 (Gold F)	– For application of low resistance at small power loads – Constant low contact resistance – For measuring currents, dry circuits	μA – 24 V μA – 0,2 A < 5 W
Rh	– For application of high resistance at small power loads – Electroplated contact layer in the region of μm for reed-contacts with a great life expectancy	< 150 V < 2 A
Pd Ni[1])	– Electroplated contact layers with similar characteristics as Rh. – Powder metallurgy on contacts also possible – Surface material transfer	< 150 V < 5 A
Ag[1])	– Most common contact material for universal use. – Sensitive to sulphur, therefore very often gold-flashed – Also suited for ac currents	1 V – 150 V 50 mA – 100 A > 1 W
Ag Pd[1])	– Significant contact material for commun. technics – Resistance to arcing – Not sensitive to sulphur – Slightly higher contact resistance than just Ag.	1 V – 150 V 50 mA – 5 A
Ag Ni	– Significant contact material for inductive loads – Suitable for inrush currents – Resistance to arcing – Little tendency to weld – Higher contact resistance than just Ag	6 V – 380 V 10 mA – 100 A
Pd Cu	– For lamp loads in automotive applications – Resistance to arcing – Surface material transfer – Not constant higher continuity contact resistance	6 V – 24 V > 5 A to 20 A

[1]) Partial in sandwich form or additionally plated with a gold-alloy, mainly for relays which are intended for use in circuits to switch low currents.

Characteristic capacities of contact materials

Contact material	Typical characteristics	Standard values for the range of applications
Ag Cd O	– Contact material for ac current – Resistance to arcing – Little tendency to weld	>12 V – 380 V > 0,5 A > 10 W
W	– For high inrush currents (as preselected contacts) – For high switching rate – Arc resistant, little tendency to weld – Prone to corrosion	> 60 V > 1 A > 50 W

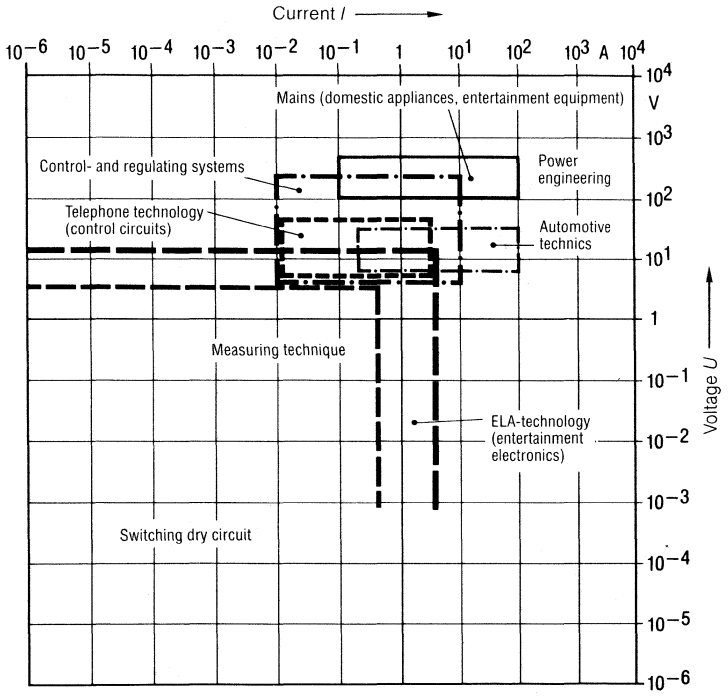


Fig. 1

Fundamental usage of switching contacts

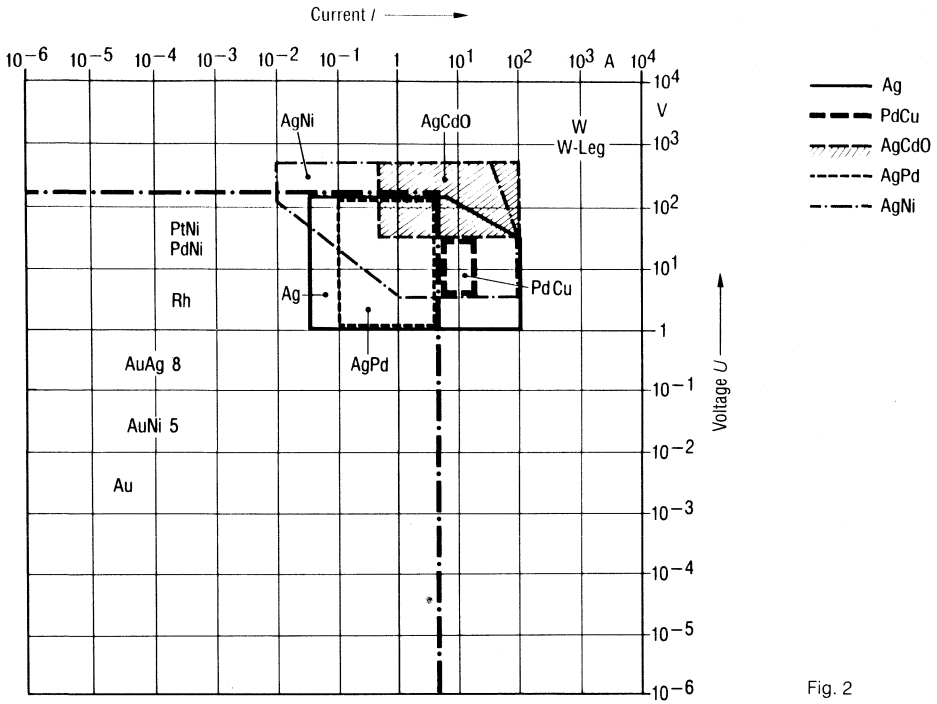


Fig. 2

Suitable contact materials for switching contacts

Power limiting curves for dc voltage
(see fig. 3)

Power limit curve I (≙ arc extinguished during the transit period)

Values of the maximum admissible switching voltage U_{max} and the maximum admissible switching current I_{max} of the corresponding relay kept below the limiting curve I will ensure safe making and breaking so that the arc will extinguish within the transit period before making with its counter contact. This is of great importance for a changeover pile-up with a different potential on the make-and break contact.

Power limit curve II (≙ safe breaking, arc extinguished)

Values of the maximum admissible switching voltage U_{max} and the maximum admissible switching current I_{max} of the corresponding relay kept below the limit curve II will ensure safe making and breaking: arc does extinguish. Consequently, longer arcing is permitted. Therefore, power ratings for the limit curve II lie higher than that of the limit curve I.

The essential parameters which influence the curves are determined by the contact material and relay design (contact gap, speed of contacts opening etc). The curve itself does not assert the electrical life of the contacts. Values referring to life expectancy are listed separately.

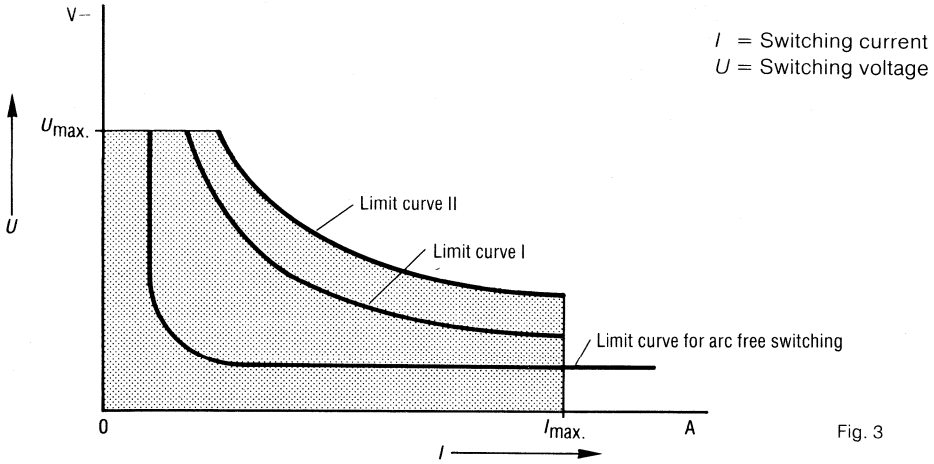


Fig. 3

Arc

Flow of current across open contacts, made possible through ionisation of gases surrounding the contact points. As a rule, the ionisation is started off by the spark on breaking of a previously closed contact. The locally occuring high temperatures, can at the same time lead to severe abrasion of the contact tips. A spark suppression is absolutely necessary in such cases. The stability of the arc depends on many parameters, e. g. contact material, atmospheric pressure, contact gap etc.

Limit curve for arc free switching

See fig. 3. In principle, arcing will not occur if the range of power is kept below that curve.

Spark suppression

Preventive measure to stop arcing during switching. Suitable steps are for instance the use of RC-networks, rectifiers (diodes), voltage dependant resistors etc. It has to be observed that the timing characteristics of the circuit will more or less be influenced according to which measures were taken.

Dry circuit

Contact is switching no load (making without voltage, breaking no current) or switching also very low voltages and currents.

Getter

Description for materials with mostly large internal active surfaces. They exhibit thereby the ability to absorb foreign molecules of surrounding agents (gases, liquids etc).

TERMS RELATING TO TIMES

All times stated in this data book are based on energising at nominal voltage.

Operate time

The interval of time between the closing of the energising circuit and the instant of the first closing of a make contact or the first opening of a break contact.

Release time (drop-out time)

The interval of time between the energising circuit of a monostable relay after switch off and the instant of the first opening of a make contact or the first closing of a break contact.

Reverse operate time

The interval of time between the closing of the energising circuit and the instant of the first opening of a make contact or the first closing of a break contact.

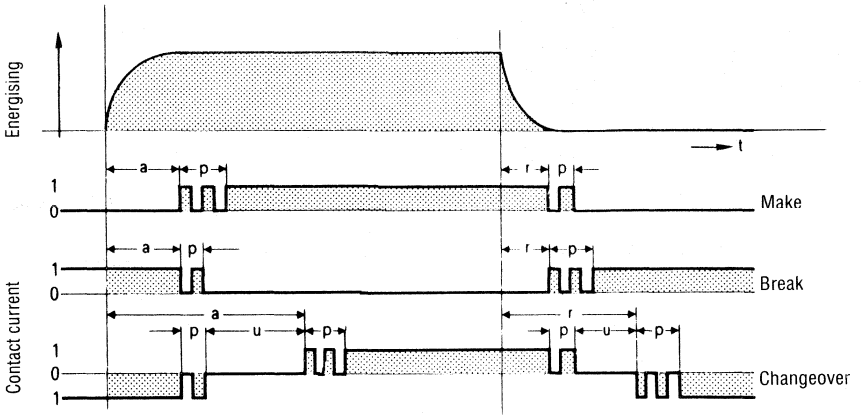
Bounce time

The interval of time between the first and final closing or opening of a relay contact

Relay time constant (time reaction)

The relay does not react instantly when operated, which is due to the inertia of the magnetic flux and piece parts to be set in motion. The following diagram relating to operating characteristics (fig. 4) show the different times for the most important types of contacts on relays without delayed action.

Neutral relays



Polarised relays (bounce time not shown)

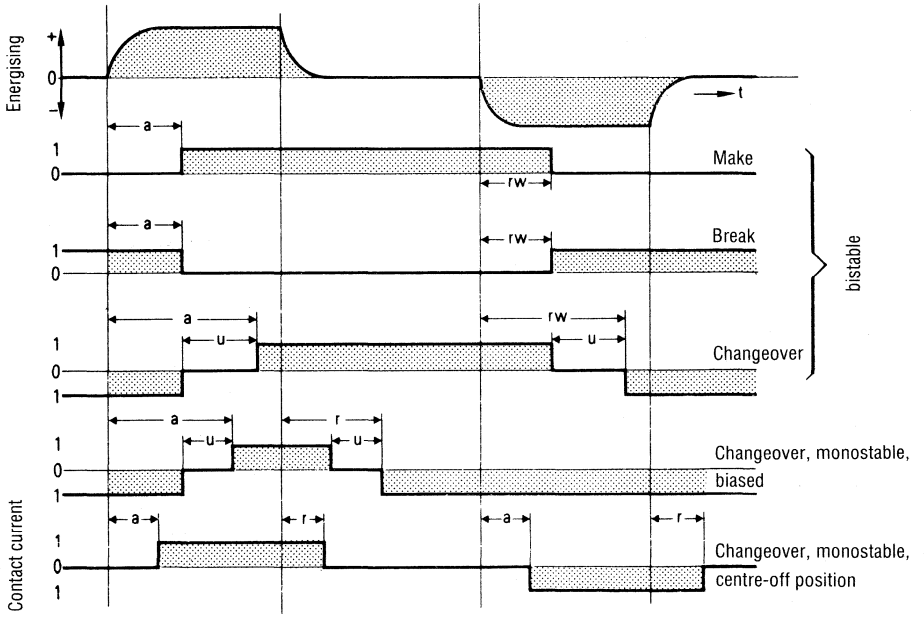


Fig. 4

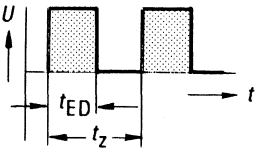
Key:

a = operating time
r = release time
rw = reverse operate time
u = transit time
p = bounce time
0 = contact open
1 = contact closed

Duty cycle, relative

Duty cycle is the ratio of the pulse width (on-time) to the cycle time with recurrent energisation.

$$r = \frac{t_{ED}}{t_z} \cdot 100\ (\%)$$



t_{ED} = pulse width
t_z = cycle time

Cycle time

Sum from the duration of on-time and the time interval of a periotically energised relay.

GENERAL TERMS

Switching cycle

A single operation of pick-up and drop-out or reverse operation of a relay.

Mechanical life

Number of operations without load on the contacts at which the relay remains operative.

Electrical life

Number of operations with electrical load on the contacts at which the relay remains operative

Switching rate, switching frequency

Number of operations per second. The "Maximum switching rate" stated for the individual types of relays is applicable without load on the contacts.

Upper temperature limit

Highest temperature the relay can withstand during the operation without jeopardising the specified life expectancy.

Ambient temperature

The temperature in the immediate vicinity of the relay.

Continuous thermal load

Maximum permissible power consumption of the relay under continuous operation at which the relay does not exceed the upper temperature limit.

Thermal resistance

Ratio of the average temperature rise of the coil to the power consumption of the winding.

Test voltage

Voltage applied between those parts of the relay which are insulated from each other.

Creepage distances, air gaps

Specified distances between conductive, electrically separated parts, measured across surfaces of insulating materials or air clearance. They assure a degree of safety and are laid down by VDE 0100 subject to the application conditions, series voltage and characteristics of the insulating materials.

Environmental stability

A collective term for the performance under various environmental conditions. Test regarding environmental requirements are described and classified in DIN 40040.

Industrial atmosphere

Quoted so, without precise details, the atmosphere enriched through industrial discharge of exhaust gases (combinations of sulphur, chlorine, nitrogen and many others).

Mechanical stress

Relays succumb to stress at the wiring-up process, being mounted onto machines or fitted into vehicles. Demands – vibration, shock, acceleration etc. – are simulated during the initial testing of the relays.

Resistance to vibration

Specified particulars for the behaviour of the relay under stress of vibration.

Resistance to shock

Specified particulars for the behaviour of the relay under stress of shock.

Protection class

Specifications regarding covers, housing, encapsulation etc. to give protection against external influences such as water, dampness, dust and making contact through touching, are in accordance with DIN 40050. Two reference numbers succeed the identification letters IP.

Washable relays

Relays, which can be cleaned together with the printed circuit board, varnished or encapsulated after the soldering process. Suitable solvents are a necessity for the cleaning process and attention must be paid to the limit values for the temperature, the time period and frequency when ultrasonic cleaning techniques are employed.

Electromechanical relays

Miniature relay P 1

for dc operation, polarised, monostable or bistable

V23026 **2**

Outstanding features

- Universal switching element with great operational possibilities in applications for data and communication technics, exchanges and subscribers extension systems, telecommunications, medical equipment as well as control, and regulating systems.
- Immense advantages in circuits controlled by standard components such as ALS, TTL and CMOS.
- Employed as cross-point element in microcomputer systems and storage element for in- and output equipment.
- Extremely small dimensions: base area only 0.98 cm^2
  volume only 0.68 cm^3.
- High switching capacity and very sensitive.
- Relay system encapsulated in epoxy resin.
- Getter protected contact chamber.

Versions

- Tpye of relay: monostable, 1 winding or
  bistable, 2 windings or
  bistable, 1 winding.
- Contact arrangement: 1 changeover.
- Bifurcated contacts.
- Terminations: printed circuit.
- Protected by plastic cover against damage.
- Washable: protection class IP67 in accordance with DIN 40050 (IEC 529), sealing of the relay to DIN IEC 68, section 2–17, tested in accordance with group Qc 2 (1 min. testing time)

Miniature relay P1

V23026-A1★★★ monostable, 1 winding
V23026-B1★★★ bistable, 2 windings
V23026-C1★★★ bistable, 1 winding

With 1 changeover, bifurcated contacts

Washable

For mounting into printed circuits,
pin arrangement for 2.54 mm grid in
accordance with DIN 40801 and DIN 40803

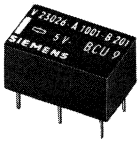
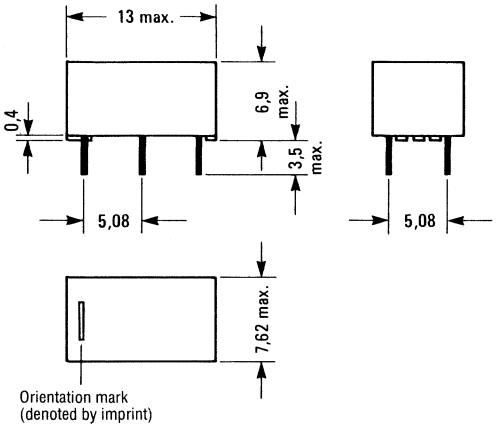
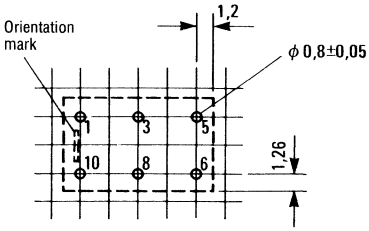


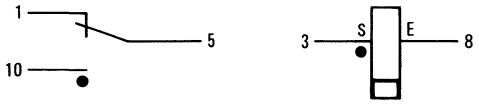
Illustration slightly
larger than original
Approx. weight 1.8 g





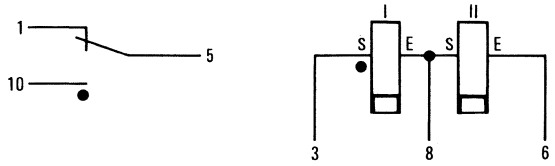
Mounting hole layout
View from the wiring side

Base terminals
V23026-A1 ... monostable and V23026-C1 ... bistable (1 winding)



Circuit symbol drawn in "Off" position.
If a positive potential is applied to terminal 3 the relay assumes the "On" position.

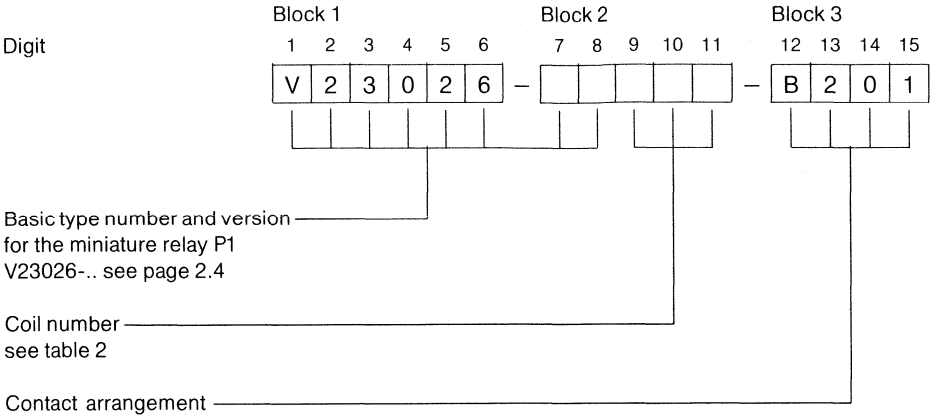
V23026-B1 ... bistable (2 windings)



Circuit symbol drawn in "Off" position. If a positive potential is applied to terminal 3 or a negative potential on terminal 6 against terminal 8, the relay assumes the "On" position.

Miniature relay P1

Ordering code



Ordering example: V23026-B1102-B201
Miniature relay P1, bistable, coil with 2 windings, 12 V nominal voltage

Preferred standard types

V23026-A1001-B201
-A1002-B201
-A1003-B201
-A1004-B201

V23026-B1101-B201
-B1102-B201
-B1103-B201

V23026-C1051-B201
-C1052-B201
-C1053-B201
-C1054-B201

Miniature relay P1

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 2
Nom. power consumption: monostable, 1 winding	mW	65 to 130[1])
bistable, 2 windings	mW	65 to 150[1])
bistable, 1 winding	mW	30 to 130[1])
Maximum temperature	°C	85
Continuous thermal load at 20 °C ambient temperature	mW	500
Thermal resistance at continuous load	K/W	130

Contact side

Order No. block 3		B201
Contact material		Rhodium (sandwich layers)
Contact designation		21
Symbol (see also base terminals)		
Maximum switching voltage[2])	Vdc Vac	150 125
Maximum switching current	A	1
Maximum power rating with dc voltage with ac voltage	 W VA	 30 60
Maximum continuous current	A	1

General

Admissible ambient temperature	°C	−40 to +70
Operating time[3])	ms	approx. 1
Reverse operate time[3])	ms	approx. 0.9
Release time[3])	ms	approx. 0.35
Bounce time	ms	approx. 0.6
Maximum switching rate	ops./sec.	200
Test voltage contact/winding	 Vrms	 1500
Life with contacts loaded dc voltage 6 V, 100 mA dc voltage 24 V, 1.0 A	 operations operations	 approx. 5×10^7 approx. 2×10^6
Mechanical life	operations	approx. 10^8

[1]) Depending on winding.

[2]) It is feasible to switch voltages of 250 Vac/dc at the expense of a reduction in electrical life. Creepage and clearance distances in accordance with VDE 0110, group B are applicable at a voltage level of 250 Vac/300 Vdc.

[3]) Measured at nominal voltage without series resistor

Table 2 List of coils

Nominal voltage Vdc	Winding	Operating voltage range at 20 °C: Minimum voltage U_I Vdc	Operating voltage range at 20 °C: Maximum voltage U_{II} Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2.
Monostable, 1 winding					
5		3.75	14.5	370 ± 37	001
12		9	35	2250 ± 300	002
15		11.25	42	3100 ± 400	003
24		17.5	50	4500 ± 580	004
Bistable, 2 windings					
5	I	3.75	14.75	390 ± 50	101
	II	3.75	14.75	390 ± 50	
12	I	9	29	1500 ± 200	102
	II	9	29	1500 ± 200	
15[1])	I	10.5	29	1500 ± 200	103
	II	10.5	29	1500 ± 200	
Bistable, 1 winding					
5		3.75	20	740 ± 74	051
12		9	50	4500 ± 580	052
15		11.25	50	4500 ± 580	053
24		17.5	50	4500 ± 580	054

Only one winding may be operated at any time within the specified voltage range.

The operating voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_U	−40 °C	−30 °C	−20 °C	−10 °C	0 °C	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1	1	1	1	1	1	1.01	1.02	1.03	1.04	1.045
k_{II}	1.36	1.31	1.25	1.20	1.14	1	0.92	0.84	0.74	0.63	0.49

The sum of ambient temperature and excess temperature in the coil must not exceed 85 °C.

The maximum operating voltage is calculated such, that with the factor k_{II} taken into account the maximum admissible temperature is not exceeded with the relay operated continuously.

[1]) Energising continuously at 1.1 times of the nominal energising current is only permitted at an ambient temperature of up to 65 °C.

Miniature relay D1

for dc operation, polarised, monostable or bistable

V23040

2

Outstanding features

- Best possible adaptation to various switching conditions.
- Meets the requirements in the highly integrated semi-conductor technology.
- Operational possibilities in measuring circuits, control, regulating and process systems, entertainment industry, telecommunications, signal systems and medical equipment
- Can also be used as interphase element between groups of electronic components, as cross-point element in micro computer systems, as well as storage element for in and output equipment
- Relay system encapsulated in epoxy resin

Versions

- Type of relay: monostable, 1 winding or
  bistable, 2 windings or
  bistable, 1 winding
- Standard or sensitive
- Contact arrangement: 1 changeover
- Bifurcated contacts
- Terminations: printed circuit
- Protected by metallic cover against damage
- Washable: protection class IP67 in accordance with DIN 40050 (IEC 529), sealing of the relay to DIN IEC 68, section 2–17, tested in accordance with group Qc 2 (1 min. testing time)

Approvals: CSA File 45064, class 3211
UL Guide NRNT2, file E 48393

Miniature relay D1

V23040-A★★★ monostable, 1 winding
V23040-B★★★ bistable, 2 windings
V23040-C★★★ bistable, 1 winding

With 1 changeover, bifurcated contacts

Washable

For mounting into printed circuits,
pin arrangement for 2.54 mm grid in
accordance with DIN 40801 and DIN 40803, average

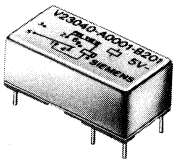
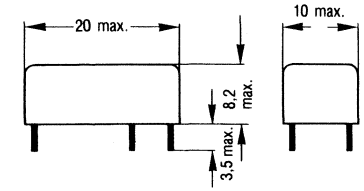
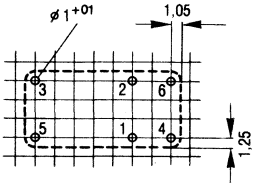


Illustration approx. original size
Weight approx. 6 g

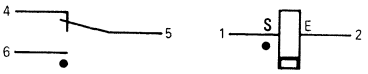




Tolerance between pc mounting holes ±0.2 mm.
Spacing between mounting of relays is not
necessary.

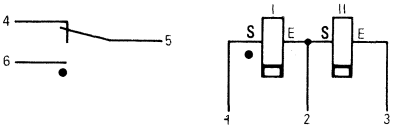
Mounting hole layout,
view from the wiring side

Base terminals
V23040-A... monostable and V23040-C... bistable



Circuit symbols drawn in "Off" position.
If a positive potential is applied to the coil start, the relay assumes the "On" position.

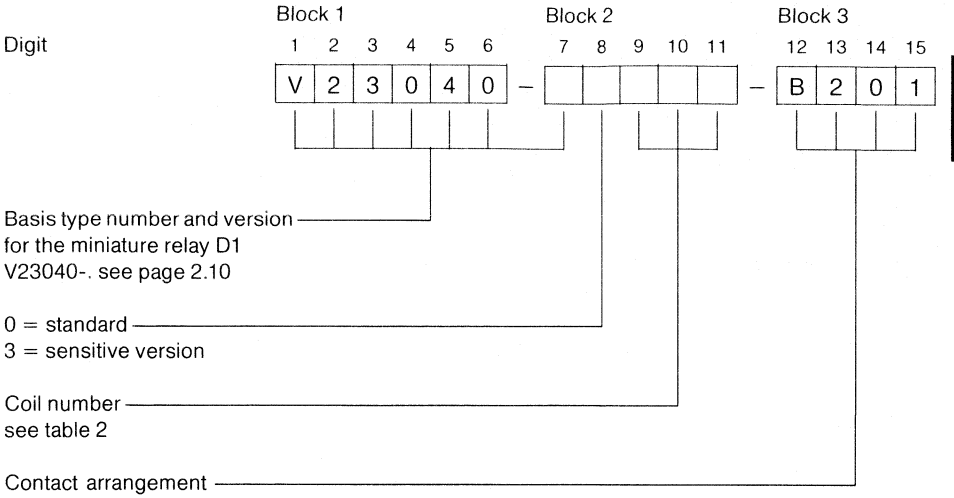
V23040-B... bistable



Circuit symbols drawn in "Off" position. If a minus potential is applied to terminal 1 and a plus potential on terminal 2 or a plus potential on 3 and a minus potential on 2 the relay assumes the "Off" position. If a plus potential is applied to terminal 1 and a minus potential on 2 or a minus potential on 3 and a plus potential on 2 the relay assumes the "On" position.

Miniature relay D1

Ordering code



Ordering example: V23040-C0052-B201
Miniature relay D1, bistable, 1 winding, standard version, 12 V nominal voltage

Preferred standard types

V23040-A0001-B201	V23040-B0101-B201	V23040-C0051-B201
-A0002-B201	-B0102-B201	-C0052-B201
-A0003-B201	-B0103-B201	
-A0004-B201	-B0104-B201	

Miniature relay D1

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 2
Nom. power consumption: monostable, 1 winding bistable, 2 windings bistable, 1 winding	mW mW mW	60 to 130[1]) 80 to 200[1]) 35 to 100[1])
Maximum temperature	°C	85
Continuous thermal load at 20 °C ambient temperature	mW	850
Thermal resistance	K/W	75

Contact side

Order No. block 3		B201
Contact material		Rhodium
Contact designation		21
Symbol (see also base terminals)		
Maximum switching voltage	Vdc Vac	150 125
Max. switching current	A	2
Max. power rating with dc voltage with ac voltage	 W VA	 35 to 60, see fig. 1 (voltage dependant) 60
Max. continuous current	A	2

General

Admissible ambient temperature	°C	−40 to +70
Operate time[2])	ms	approx. 2
Reverse operate time[2])	ms	approx. 2
Release time[2])	ms	approx. 0.6
Bounce time	ms	< 1
Maximum switching rate	ops./sec.	100
Test voltage contact/winding winding/cover open contact/closed contact contact/cover	 V_{rms} V_{rms} V_{rms} V_{rms}	 1500 1000 500 1000
Life with contacts loaded	operations	see page 2.15
Mechanical life	operations	approx. 10^8

[1]) According to relay version and coil.
[2]) Measured at nominal voltage without series resistor.

Table 2 List of coils

Nominal voltage Vdc	Winding	Operating voltage range at 20 °C Minimum voltage U_I Vdc	Operating voltage range at 20 °C Maximum voltage U_{II} Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
Standard version: monostable, 1 winding					
5		3.75	16.5	320 ± 32	001
12		9	30	1140 ± 170	002
15		11.25	38	1850 ± 275	003
24		18	60	4370 ± 650	004
Standard version: bistable, 2 windings					
5	I	3.75	16	315 ± 47	101
	II	3.75	16	315 ± 47	
12	I	9	30	1110 ± 165	102
	II	9	30	1110 ± 165	
15	I	11.25	37	1760 ± 265	103
	II	11.25	37	1760 ± 265	
24[1])	I	18	46	2800 ± 420	104
	II	18	46	2800 ± 420	
Standard version: bistable, 1 winding					
5		3.75	20	500 ± 75	051
12		9	38	1850 ± 275	052
15		11.25	48	2850 ± 425	053
24		18	67	5650 ± 845	054
Sensitive version: monostable, 1 winding					
5		3.8	18	400 ± 32	201
12		9	41	2000 ± 200	202
15		11.3	48	2850 ± 350	203
24		18	79	7700 ± 1000	204
Sensitive version: bistable, 2 windings					
5	I	3.8	16	315 ± 30	301
	II	3.8	16	315 ± 30	
12	I	9	38	1760 ± 200	302
	II	9	38	1760 ± 200	
15	I	11.3	48	2800 ± 350	303
	II	11.3	48	2800 ± 350	
24	I	18	61	4600 ± 550	304
	II	18	61	4600 ± 550	
Sensitive version: bistable, 1 winding					
5		3.8	23	650 ± 65	251
12		9	56	3900 ± 500	252
15		11.3	68	5650 ± 700	253
24		18	98	11700 ± 1500	254

Only one winding may be operated at any time within the specified voltage range.

[1]) Energising continuously at nominal voltage only permitted at an ambient temperature of up to 60 °C.

Miniature relay D1

The operating voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	–40 °C	–30 °C	–20 °C	–10 °C	0 °C	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1	1	1	1	1	1	1.02	1.04	1.06	1.08	1.1
k_{II}	1.39	1.33	1.27	1.21	1.14	1	0.92	0.83	0.73	0.62	0.48

The sum of ambient temperature and excess temperature in the coil must not exceed 85 °C.

The maximum operating voltage is calculated such, that with the factor k_{II} taken into account the maximum admissible temperature is not exceeded with the relay operated continuously.

Limiting curves for power load (12,5 ops./sec.)

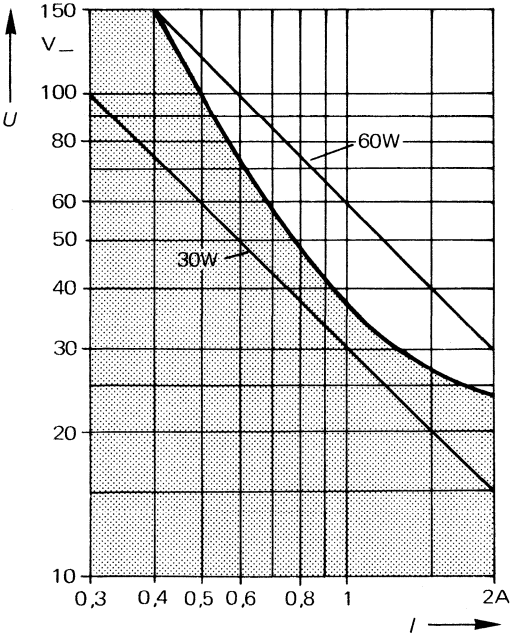


Fig. 1

I = Switching current

U = Switching voltage (dc)

Safe breaking, arc extinguished (limit curve II)

Electrical life

Switching voltage V	Switching current mA	Electrical life operations	Type of load	Life obtained at ops./sec.
6dc	2	approx. $8 \cdot 10^7$	resistive	10
6dc	100	approx. 10^8	resistive	10
24dc	50	approx. 10^6	resistive	10
24dc	1000	approx. 10^7	resistive	10
24dc	2000	approx. 10^5	resistive	1
48dc	10	approx. $2 \cdot 10^6$	resistive	10
48dc	40	approx. $5 \cdot 10^6$	complex	10
60dc	60	approx. 10^5	inductive, 3 H	10
62dc	10	approx. $7 \cdot 10^5$	inductive, 13.5 H	10
62dc	40	approx. $3 \cdot 10^6$	resistive	10
62dc	50	approx. $4 \cdot 10^6$	complex	10
110dc	500	approx. $5 \cdot 10^6$	resistive	10
125ac	400	approx. 10^5	resistive	0.1
125ac	500	approx. $4 \cdot 10^4$	resistive	0.1
125ac	600	approx. 10^4	resistive	0.1
125ac	800	approx. 10^3	resistive	0.1
250ac	100	approx. 10^5	resistive	0.1
250ac	200	approx. $5 \cdot 10^4$	resistive	0.1
250ac	300	approx. $1.5 \cdot 10^4$	resistive	0.1
250ac	500	approx. 10^3	resistive	0.1

Miniature relay D2

for dc operation, polarised, monostable or bistable

V23042 **2**

Outstanding features

- Best possible adaptation to various switching conditions
- Universal operational possibilities covering the complete range of electronics. Used in applications such as telephone exchanges and subscribers extension systems as well as cross-point element in micro-computer systems and storage element for in- and output equipment.
- Relay system encapsulated in epoxy resin
- High reliability and among other things the centre blade is operated without a moving actuator and has a getter protected atmosphere for the contact area

Versions

- Standard or with greater clearance from the printed circuit board
- Type of relay: monostable, 1 winding or
  bistable, 2 windings or
  bistable, 1 winding
- Contact arrangement: 2 changeovers
- Bifurcated contacts
- Termination: printed circuit
- Protected by plastic cover against damage
- Washable: protection class IP67 in accordance with DIN 40050 (IEC 529), sealing of the relay conforms to DIN IEC 68, section 2 – 17, tested to group Qc2 (1 min. testing time)

Note: If at all possible, ultrasonic cleaning methods should not be used unless the manufacturer has been consulted first

Approval: UL Guide NRNT 2, file E 48393

Miniature relay D2

V23042-A1★★★ monostable, 1 winding
V23042-B1★★★ bistable, 2 windings
V23042-C1★★★ bistable, 1 winding

With 2 changeovers, bifurcated contacts

Standard version (blue plastic cover)

Washable

For direct mounting into printed circuits,
pin arrangement for 2,54 mm grid in
accordance with DIN 40801 and DIN 40803, fine

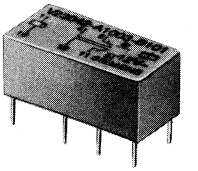
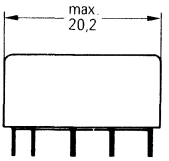
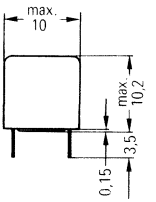
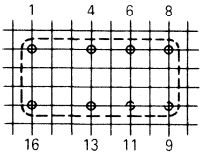


Illustration approx. original size
Approx. weight 8 g

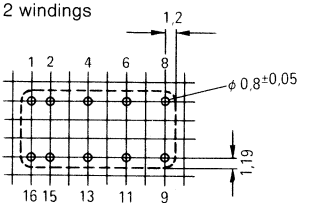




1 winding



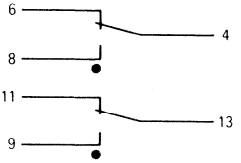
2 windings

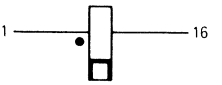


Mounting hole layout,
view from the wiring side

Base terminals

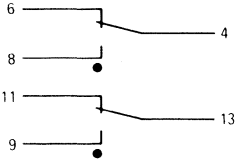
V23042-A1 ... monostable and V23042-C1 ... bistable (1 winding)

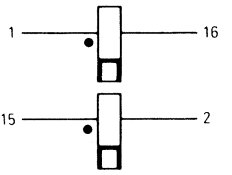




Circuit symbols drawn
in "Off" position.
If a plus potential is applied
to terminal 1 the relay assumes
the "On" position.

V23042-B1 ... bistable (2 windings)





Circuit symbols drawn
in "Off" position.
If a plus potential is applied
to terminal 1 or 15, the relay assumes
the "On" position.

Miniature relay D2

V23042-A2★★★ monostable, 1 winding
V23042-B2★★★ bistable, 2 windings
V23042-C2★★★ bistable, 1 winding

With 2 changeovers, bifurcated contacts

Version with greater clearance from the printed circuit board (light coloured plastic cover)

Washable

For direct mounting into printed circuits,
pin arrangement for 2.54 mm grid in
accordance with DIN 40801 and DIN 40803, fine

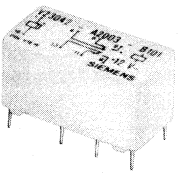
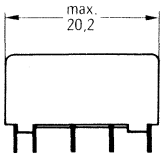
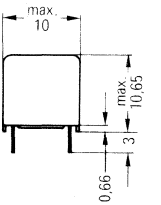
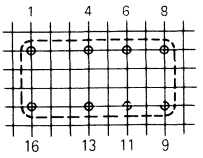


Illustration approx. original size
Approx. weight 8 g

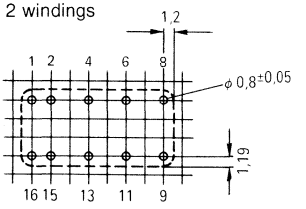




1 winding

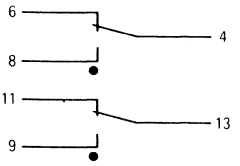


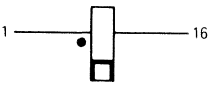
2 windings



Mounting hole layout
view from the wiring side

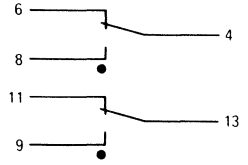
Base terminals
V23042-A2... monostable and V23042-C2... bistable (1 winding)

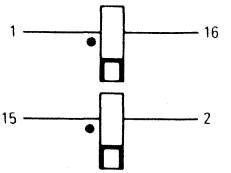




Circuit symbols drawn
in "Off" position.
If a plus potential is applied
to terminal 1 the relay assumes
the "On" position.

V23042-B2... bistable (2 windings)

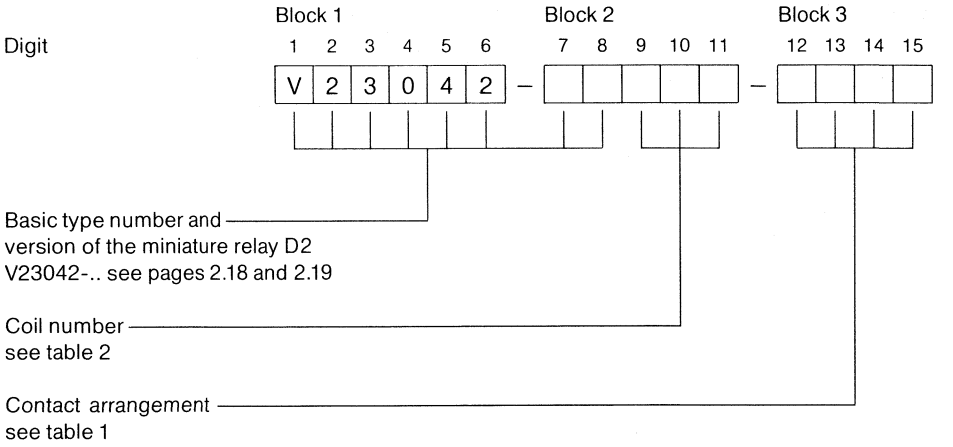




Circuit symbols drawn
in "Off" position.
If a plus potential is applied
to terminal 1 or 15, the relay assumes
the "On" position.

Miniature relay D2

Ordering code



Ordering example: V23042-C1103-B101
Miniature relay D2,coil with 1 winding, bistable, standard version,
12 V nominal voltage, contact material silver, gold plated.

Preferred standard types

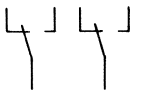
V23042-A1001-B101	V23042-B1201-B101	V23042-C1101-B101
-A1003-B101	-B1203-B101	-C1103-B101
-A1005-B101	-B1205-B101	

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 2
Nom. power consumpt.[1]): monostable, 1 winding bistable, 2 windings bistable, 1 winding	mW mW mW	200 to 250[2]) 200 to 280[2]) 100 to 150[2])
Maximum temperature	°C	95
Continuous thermal load at 20 °C ambient temperature	mW	700
Thermal resistance	K/W	105

Contact side

Order No. block 3		B101	B201
Contact material		Silver, gold plated	Palladium-silver, gold plated
Contact designation		21–21	
Symbols (see also base terminals)			
Maximum switching voltage	Vdc Vac	250 220	
Maximum switching voltage to VDE 0110, insulations group B	Vdc Vac	150 125	
Maximum switching current	A	5[3])	
Maximum power rating with dc voltage with ac voltage	W VA	50 to 150, see fig. 1 (voltage dependant) 250	
Maximum continuous current	A	2	

General

Admissible ambient temperature	°C	−40 to +70
Operate time[4])	ms	approx. 5
Reverse operate time[4])	ms	approx. 3
Release time[4])	ms	approx. 5
Bounce time	ms	approx. 1.5
Maximum switching rate	ops./sec	100
Test voltage contact/winding contact/contact	 V_{rms} V_{rms}	 1000 1000
Electrial life	operations	see page 2.24
Mechanical life	operations	2×10^7

[1]) Lower power consumption versions on request.
[2]) Depending on winding.
[3]) Admissible duty cycle at switching currents >2A on request.
[4]) Measured at nominal voltage without series resistor.

Table 2 List of coils

Nominal voltage Vdc	Winding	Operating voltage range at 20 °C Minimum voltage U_I Vdc	Operating voltage range at 20 °C Maximum voltage U_{II} Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
Monostable, 1 winding					
5		3.75	9	95 ± 9,5	001
12		9	22	600 ± 90	003
15		11.3	27	860 ± 130	004
24		18	43	2210 ± 330	005
Bistable, 2 windings					
5	I	3.75	10	125 ± 19	201
	II	3.75	10	125 ± 19	
12	I	9	24	720 ± 108	203
	II	9	24	720 ± 108	
15	I	11.3	29	1125 ± 170	204
	II	11.3	29	1125 ± 170	
24[1])	I	18	40	2040 ± 306	205
	II	18	40	2040 ± 306	
Bistable, 1 winding					
5		3.75	14	250 ± 37	101
12		9	33	1440 ± 216	103
15		11.3	41	2220 ± 335	104
24		18	56	4000 ± 600	105

Only one winding may be operated at any time within the specified voltage range.

The operating voltage limits U_I and U_{II} depend on temperature in accordance with following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

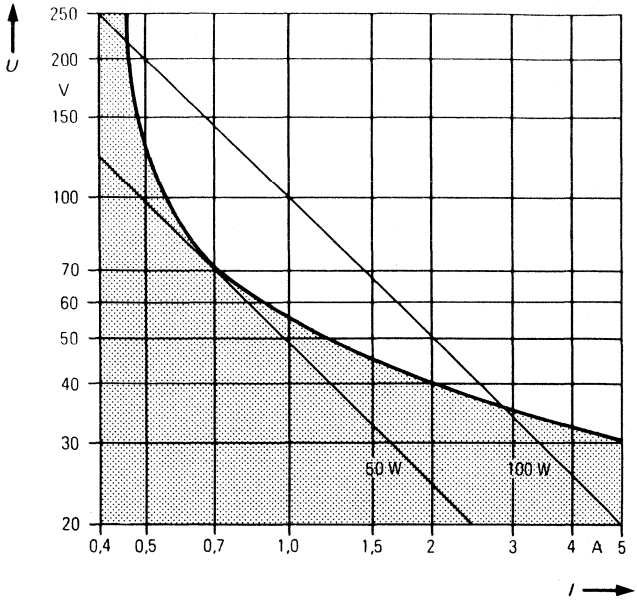
$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1.0	1.02	1.04	1.06	1.08	1.1
k_{II}	1.0	0.935	0.865	0.785	0.700	0.610

[1]) Energising continuously at 1,1 times nominal voltage only permitted at an ambient temperature of upto 60 °C.

Limiting curve for power load
Contact material silver, gold plated



I = Switching current
U = Switching voltage
Fig. 1

Curve: Safe breaking, arc extinguished (limit curve II)
Maximum 10 operations/sec.

Electrical life

Contact material silver, gold plated

Switching voltage V	Switching current mA	Electrical life operations	Type of load	Life obtained at ops./sec.
0	0	approx. $2 \cdot 10^7$	dry circuit	10
6dc	2	approx. $2 \cdot 10^7$	resistive	10
6dc	100	approx. $2 \cdot 10^7$	resistive	10
24dc	2	approx. $2 \cdot 10^7$	resistive	10
24dc	50	approx. $2 \cdot 10^7$	resistive	10
24dc	1000	approx. $2.5 \cdot 10^6$	resistive	1
24dc	2000	approx. $1 \cdot 10^5$	resistive	1
60dc	2	approx. 10^7	10 m cable	10
60dc	2	approx. 10^7	100 m cable	10
60dc	50	approx. 10^7	10 m cable	10
60dc	50	approx. 10^7	100 m cable	10
60dc	50	approx. $5 \cdot 10^5$	inductive, 3 H	1
125dc	250	approx. $7 \cdot 10^5$	resistive	1
250ac	600	approx. 10^6	resistive	0.3
250ac	1000	approx. 10^5	resistive	0.3
250ac	2000	approx. $1.5 \cdot 10^4$	resistive	0.3

Contact material palladium-silver, gold plated

Switching voltage V	Switching current mA	Electrical life operations	Type of load	Life obtained at ops./sec.
0	0	approx. $2 \cdot 10^7$	dry circuit	10
6dc	2	approx. $2 \cdot 10^7$	resistive	10
6dc	100	approx. $2 \cdot 10^7$	resistive	10
24dc	2	approx. $2 \cdot 10^7$	resistive	10
24dc	50	approx. $2 \cdot 10^7$	resistive	10
24dc	1000	approx. $4 \cdot 10^6$	resistive	1
24dc	2000	approx. $3 \cdot 10^5$	resistive	1
60dc	2	approx. 10^7	10 m cable	10
60dc	2	approx. 10^7	100 m cable	10
60dc	50	approx. 10^7	10 m cable	10
60dc	50	approx. 10^7	100 m cable	10
60dc	150	approx. 10^6	inductive, 6 H	1
125dc	250	approx. 10^7	resistive	1

Miniature relay W11 V23101, V23102

for dc operation, neutral, monostable

Outstanding features

- Suited for a multitude of applications.
- Small dimensions; whereby groupings of high density has been achieved.
- Can also be plugged into DIL sockets.
- Vibration resistance: 10 to 55 Hz (double amplitude 1.5 mm)
- Resistance to shock: standard version approx. 10 g (11ms)
  sensitive version approx. 6 g (11ms)

Versions

- Contact arrangement: 1 or 2 changeovers
- Arrangement with 1 changeover, standard or sensitive
- Single contacts;
  arrangement with 2 changeovers, choice of bifurcated contacts
- Termination: printed circuit
- Protected by transparent platic cover against damage.
- Dust protected or washable;
  washable: protection class IP67 in accordance with DIN 40050 (IEC 529),
  sealing conforms to DIN IEC 68, section 2–17,
  tested to group Qc2 (1 min. testing time).

Note: If at all possible, ultrasonic cleaning methods should not be used unless the manufacturer has been consulted first.

Miniature relay W11

V23101-A0★★★

Dust protected

With 1 changeover, single contacts

Standard or sensitive

Choice of terminal layouts A or B

For direct mounting into printed circuits, pin arrangement for 2.54 mm grid in accordance with DIN 40801

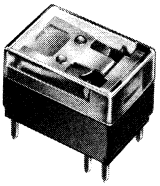
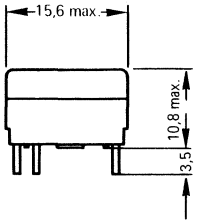
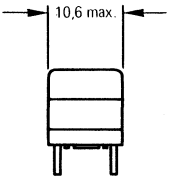
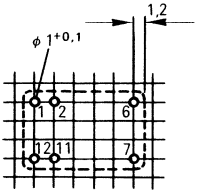


Illustration slightly larger than original. Approx. weight 4g

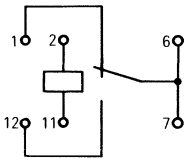




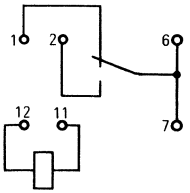


Mounting hole layout.
View from the wiring side

Base terminals A



Base terminals B



View from the wiring side

Miniature relay W11

V23101-B0★★★

Washable

With 1 changeover, single contacts

Standard or sensitive

Choice of terminal layouts A or B

For direct mounting into printed circuits, pin arrangement for 2.54 mm grid in accordance with DIN 40801

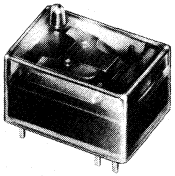
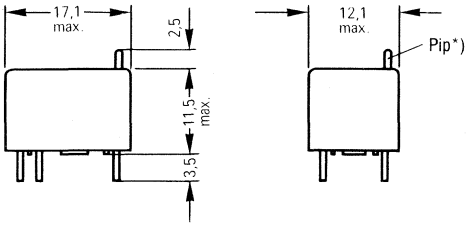
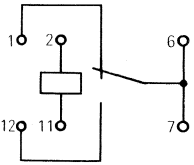
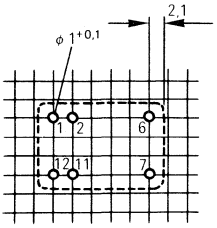


Illustration slightly larger than original. Approx. weight 4g



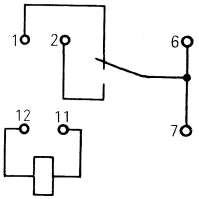
Base terminals A





Mounting hole layout.
View from the wiring side

Base terminals B



View from the wiring side

*) Pip can be removed after the soldering or cleaning process.

Miniature relay W11

V23102-A0★★★ dust protected
V23102-B0★★★ washable

With 2 changeovers, single or bifurcated contacts

For direct mounting into printed circuits, pin arrangement for 2.54 mm grid in accordance with DIN 40801

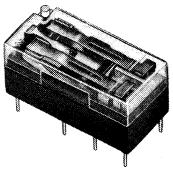
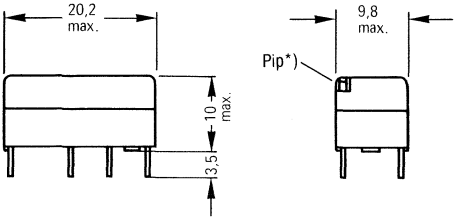
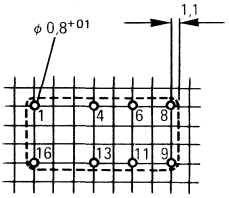


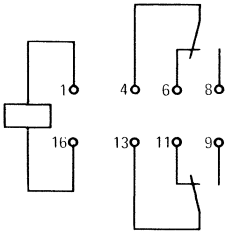
Illustration approx. original size
Approx. weight 5g





Mounting hole layout.
View from the wiring side

Base terminals

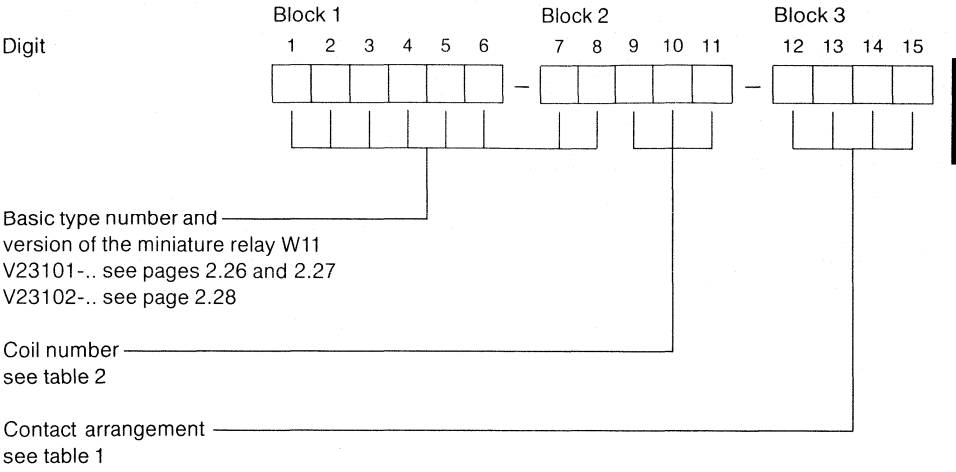


View from wiring side

*) Pip on the washable version can be removed after the soldering or cleaning process.

Miniature relay W11

Ordering code



Ordering example: V23101-B0104-B201

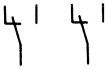
Miniature relay W11 washable, with 1 changeover (single contacts), terminal layout B, coil 6V nominal, sensitive version, contact material silver-palladium, gold plated.

Preferred standard types

V23101-A0003-A101	V23102-A0003-A101
-A0003-B101	-A0003-A111
-A0006-A101	-A0006-A101
-A0006-B101	-A0006-A111
-A0007-A101	-A0007-A101
-A0007-B101	-A0007-A111

Miniature relay W11

Table 1 Characteristics

Contact arrangement		1 changeover		2 changeovers	
Energising side					
Operating voltages	Vdc	see table 2		see table 3	
Nominal power: standard version sensitive version	W W	0.45 0.2		0.5 —	
Maximum temperature	°C	105		105	
Continuous thermal load at 20 °C ambient temperature	W	1.0		1.0	
Contact side					
Ordering code block 3 single contacts, base terminals A[1]) base terminals B[1])		A101 B101	A201 B201	A101 —	A201 —
Bifurcated contacts		—	—	A111	A211
Contact material		Silver, gold plated	Silver-palladium, gold plated	Silver, gold plated	Silver-palladium, gold plated
Contact designation		21		21–21	
Symbols (see also base terminals)					
Maximum switching voltage	Vdc Vac	60 125		125 125	
Switching current max. min.	A mA	1 approx. 100	1 [2])	1.25 approx. 100	1.25 [2])
Max. power rating dc voltage ac voltage	 W VA	 30 60		 30 60	
Continuous current	A	1		2	
General					
Admissible ambient temperature standard version sensitive version	 °C °C	 −25 to +55 −25 to +75		 −30 to +55 —	
Operate time standard version sensitive version	 ms ms	 approx. 3 approx. 5		 approx. 5 —	
Release time	ms	approx. 2		approx. 2	
Max. switching rate	ops./sec	20		20	
Test voltage contact/winding	 V_{rms}	 500		 500	
Electrical life dc voltage 28 V/1 A ac voltage 120 V/0.5 A	 operations operations	 approx. 3×10^5 approx. 1×10^5		 approx. 5×10^5 approx. 1×10^5	
Mechanical life	operations	approx. 5×10^6		approx. 2×10^7	

[1]) Base terminal connections A and B for version with 1 changeover only

[2]) Low level contact

Table 2 List of coils

Nominal voltage Vdc	Operating voltage range at 20 °C: Minimum voltage U_I Vdc	Operating voltage range at 20 °C: Maximum voltage U_{II} Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
Standard version: contact arrangement 1 changeover				
5	4	8	56 ± 6	003
6	4.8	9.5	80 ± 8	004
12	9.6	19.5	320 ± 32	006
24	19	39	1280 ± 130	007
Standard version: contact arrangement 2 changeovers				
5	4	7.5	50 ± 5	003
6	4.8	9	72 ± 7	004
12	9.6	18	290 ± 29	006
24	19.2	36	1150 ± 115	007
Sensitive version: contact arrangement 1 changeover only				
5	3.5	12	120 ± 12	103
6	4.2	14	180 ± 18	104
12	8.4	29	700 ± 70	106
24	16.8	58	2800 ± 280	107

The operating voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

Standard version

t_u		20 °C	30 °C	40 °C	50 °C	55 °C
k_I		1.0	1.04	1.08	1.11	1.13
k_{II}	1 changeover	1.0	0.95	0.88	0.79	0.74
	2 changeovers	1.0	0.94	0.87	0.78	0.74

Sensitive version

t_u	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C	75 °C
k_I	1.0	1.04	1.08	1.12	1.15	1.19	1.21
k_{II}	1.0	0.93	0.85	0.75	0.66	0.54	0.50

Miniature relay W12

V23100-W12

for dc operation, neutral, monostable

Outstanding features

- Suited for a multitude of applications
- Vibration resistance 10 to 55 Hz (double amplitude 1.5 mm)
- Resistance to shock approx. 100 ms^{-2} (11 ms)

Versions

- Contact arrangement: 1 or 2 changeovers
- Termination: printed circuit
- Protected by transparent plastic cover against damage and dust

Miniature relay W12

V23100-W12★ ★

With 1 changeover

Dust protected

For direct mounting into printed circuits
Pin arrangement for 2.54 mm grid
in accordance with DIN 40801

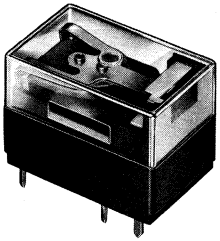
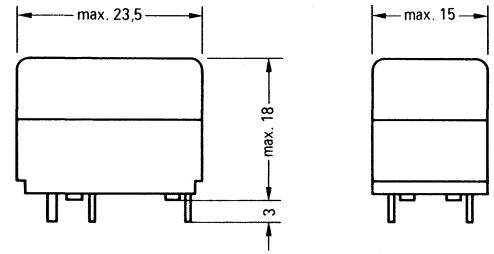
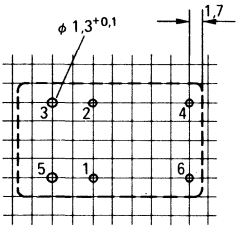


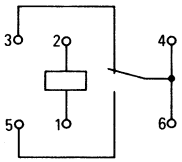
Illustration apprx. original size
Approx. weight 8g





Mounting hole layout.
View from the wiring side

Base terminals



Miniature relay W12

V23100-W12★★

With 2 changeovers

Dust protected

For direct mounting into printed circuits.
Pin arrangement for non – standard grid

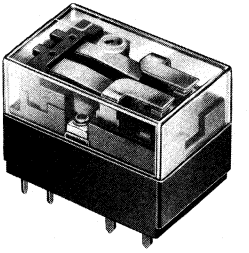
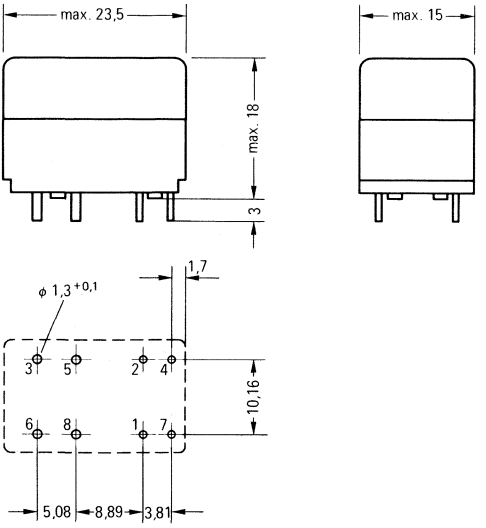
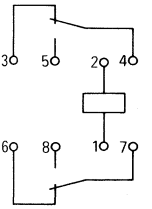


Illustration approx. original size
Approx. weight 8 g



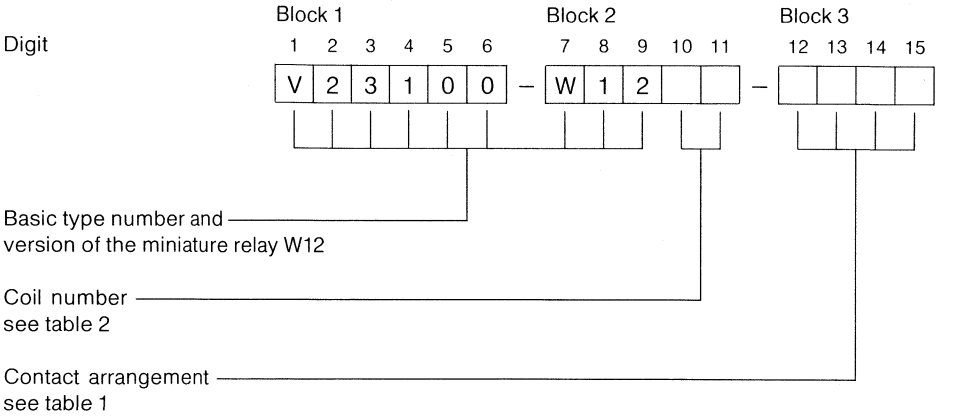
Mounting hole layout.
View from the wiring side

Base terminals



Miniature relay W12

Ordering code



Ordering example: V23100-W1206-A104

Miniature relay W12, coil 6V nominal, with 2 changeovers

Preferred standard types

V23100-W1205-A103
-W1205-A104

V23100-W1212-A103
-W1212-A104
-W1224-A103
-W1224-A104

Miniature relay W12

Table 1 Characteristics

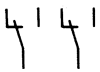
Contact arrangement		1 changeover	2 changeovers
Energising side			
Operating voltages	Vdc	see table 2	
Nominal power consumption	W	0.45	0.6
Maximum temperature	°C	90	
Continuous thermal load at 20 °C ambient temperature	W	1.15	1.1
Contact side			
Order No. block 3		A103	A104
Contact material		Silver, gold plated	
Contact designation		21	21–21
Symbols (see also base terminals)			
Max. switching voltage	Vdc Vac	60 250	
Max. switching current	A	3	
Max. power rating dc voltage ac voltage	 W VA	 85 360	
Max. continuous current	A	3	
General			
Admissible ambient temperature	°C	−30 to +50	−30 to +40
Operate time	ms	approx. 7	approx. 5
Release time	ms	approx. 3	approx. 2
Max. switching rate	ops./sec.	20	
Test voltage contact/winding	 V_{rms}	 500	
Electrical life dc voltage 24 V/3 A ac voltage 120 V/3 A	 operations operations	 approx. 10^5 approx. 10^5	
Mechanical life	operations	approx. 10^7	

Table 2 List of coils

Nominal voltage Vdc	Operating voltage range at 20 °C: Minimum voltage U_I Vdc	Operating voltage range at 20 °C: Maximum voltage U_{II} Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
Contact arrangement 1 changeover				
5	4	6.5	58 ± 6	05
6	4.8	8	85 ± 8.5	06
12	9.6	19	300 ± 30	12
24	19.2	38	1250 ± 125	24
Contact arrangement 2 changeovers				
5	4	7.5	42 ± 4.5	05
6	4.8	9	60 ± 6	06
12	9.6	18	230 ± 23	12
24	19.2	36	960 ± 96	24

The operating voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = facotrs

t_u	20 °C	25 °C	30 °C	35 °C	40 °C	45 °C	50 °C	55 °C
k_I	1	1.02	1.04	1.06	1.08	1.1	1.12	1.14
Contact arrangement 1 changeover								
k_{II}	1	0.95	0.91	0.85	0.81	0.76	0.71	0.65
Contact arrangement 2 changeovers								
k_{II}	1	0.94	0.87	0.81	0.75	0.70	—	—

Electromechanical relays

Cradle relay N V23154, V23162

for dc operation, neutral, monostable

Outstanding features

- PTB certificate for safe electrical separation between intrinsically safe and not intrinsically safe circuits

Versions

- Size I or II, depending on the height of the contact pile-up
- Various arrangement of contact pile-ups:
  max. 4 changeovers, 2 breaks or 6 makes
- Single or bifurcated contacts
- Termination: printed circuit or solderable and plug-in
- Protected by a cover against damage
- Dust protected or hermetically sealed;
  dust protected: transparent cover
  hermetically sealed: relay system inside metal enclosure

Note: If at all possible, ultrasonic cleaning methods should not be used unless the manufacturer has been consulted first.

See page 3.41 for information on sockets and mounting.

Approval: PTB Nr. III B/E-16134 U

Cradle relay N

V23154-C0★★★ Size I

V23154-D0★★★ Size II

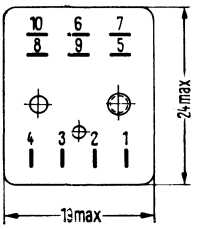
Contact pile-ups with single or bifurcated contacts

Dust protected

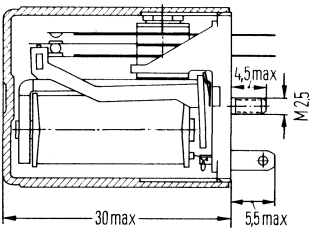
With individual solder connections, silver plated,

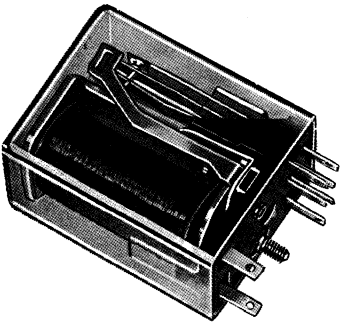
plug – in or mounting by fixing screw

Size I



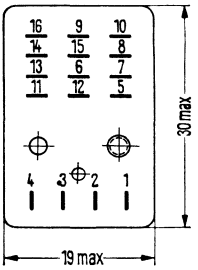
View from the wiring side

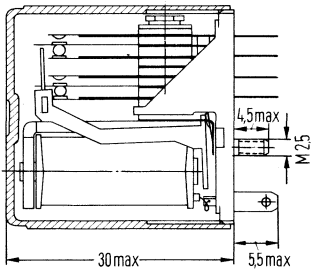


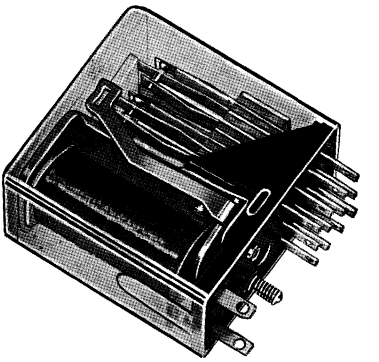


Approx. weight 20 g
Illustration approx. original size

Size II







Approx. weight 25 g

Mounting hole layout see page 3.45

Cradle relay N

V23154-M0★★★ Size I

V23154-N0★★★ Size II

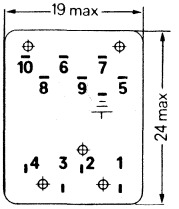
Contact pile-ups with single or bifurcated contacts

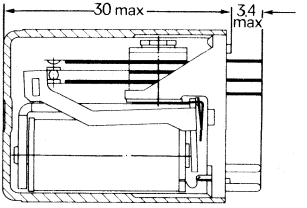
With earth connection

Dust protected

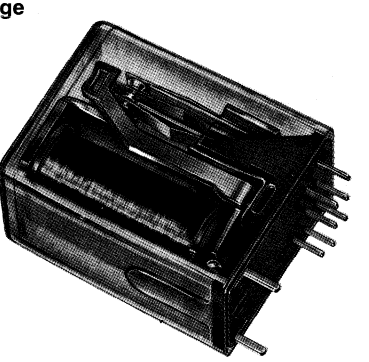
For direct mounting into printed circuits, pin arrangement for 2,5 mm grid also 2.54 mm grid in accordance with DIN 40801 and DIN 40803, average

Size I



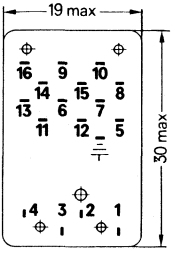


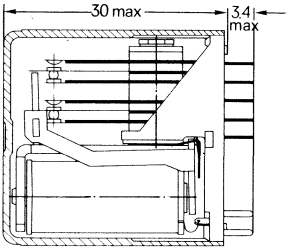
View from the wiring side

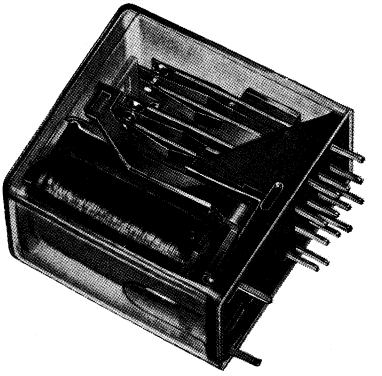


Approx. weight 20 g
Illustration approx. original size

Size II







Approx. weight 25 g

Mounting hole layout see page 3.46

Cradle relay N

V23162-A0★★★ Size I

V23162-B0★★★ Size II

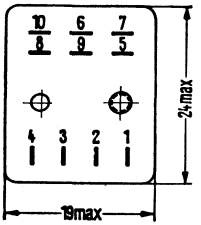
Contact pile-ups with single or bifurcated contacts

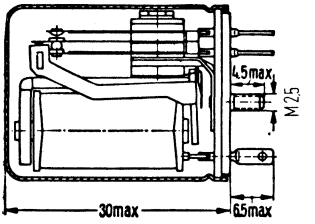
Hermetically sealed

With individual solder connections, tinned,

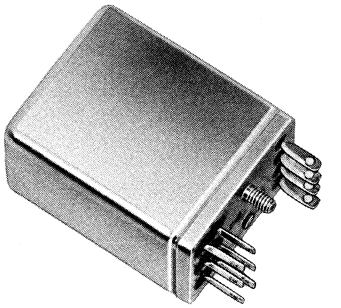
plug – in or mounting by fixing screw

Size I



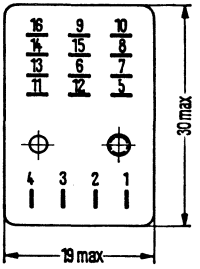


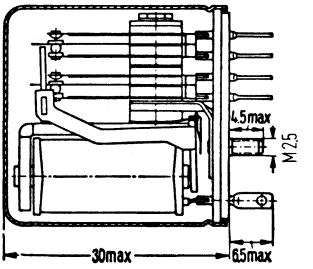
View from the wiring side

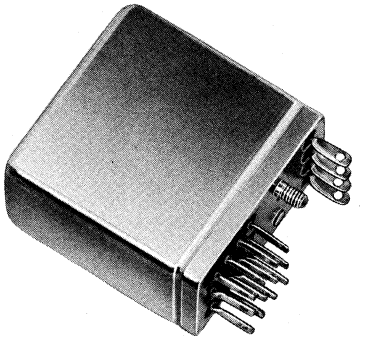


Approx. weight 30 g
Illustration approx. original size

Size II





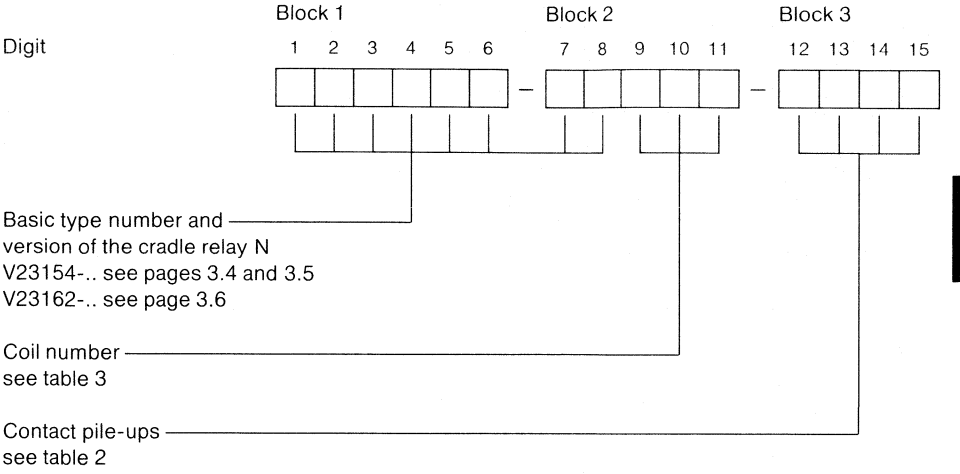


Approx. weight 35 g

Mounting hole layout see page 3.45

Cradle relay N

Ordering code



Ordering example: V23154-D0721-B110

Cradle relay N, size II, plug-in, dust protected, individual solder connections, silver plated, coil 24 V nominal, 4 changeover contact pile-up, single contacts, contact material silver, gold flashed.

Preferred standard types

V23154-C0704-B104	V23154-C0720-F 106
-C0712-B104	-C0721-B104
-C0715-B104	-C0721-B604
-C0716-B104	-C0721-C104
-C0717-B104	-C0721-F 106
-C0719-B104	-C0722-B104
-C0720-B104	-C0726-B104
-C0720-C104	-C0726-C104

Continued on next page

Cradle relay N

Preferred standard types(continuation)

V23154-D0703-B110
-D0703-F104
-D0704-B110
-D0704-B112
-D0704-F104
-D0712-B110
-D0712-F104
-D0715-B110
-D0715-F104
-D0716-B110
-D0716-F104
-D0717-B110

V23154-D0717-C110
-D0717-F104
-D0719-B110
-D0719-F104
-D0720-B110
-D0720-C110
-D0720-C410
-D0720-F104
-D0721-B110
-D0721-B112

V23154-D0721-B610
-D0721-C110
-D0721-F104
-D0722-B110
-D0722-C110
-D0722-F104
-D0726-B110
-D0726-B112
-D0726-C110
-D0726-F104

V23154-M0720-B104

V23154-M0721-B104
-M0722-B104

V23154-N0717-B110
-N0717-F104
-N0719-B110
-N0720-B110
-N0720-F104
-N0721-B110

V23154-N0721-F104
-N0726-B110

V23162-A0719-B104
-A0720-B104
-A0721-B104
-A0721-C104

V23162-A0721-C404
-A0721-F105
-A0722-B104
-A0722-B604
-A0726-B104
-A0726-C404

V23162-B0717-B110
-B0719-B110
-B0719-F104
-B0720-B110
-B0720-C110
-B0720-C410
-B0720-F104
-B0721-B110
-B0721-B610

V23162-B0721-F104
-B0722-B110
-B0722-B610
-B0722-F104
-B0726-B110
-B0726-C110
-B0726-F104

V23162-H0720-C410
-H0721-B110

Cradle relay N

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 3
Nominal power consumption	W	approx. 0.8
Maximum temperature	°C	100
Continuous thermal load at 20 °C ambient temperature	W	1.6
Thermal resistance	K/W	50

Contact side

Order No. block 3		B1..	B6..	C1..	C4..	F1..
Type of contact		Single contacts		Bifurcated contacts		Single contacts
Contact material		Silver gold flashed	Gold F	Silver gold flashed	Gold F	Silver gold flashed
Max. switching voltage	Vdc Vac	150 125	36 30	150 125	36 30	250 250
Max. switching current	A	2	0.2	2	0.2	5
Max. power rating dc voltage ac voltage	 W VA	 35 to 70 s. fig. 1 (volt. dep.) 50	 5 5	 35 to 70 s. fig. 1 (volt. dep.) 50	 5 5	 50 to 140 s. fig. 2 (voltage dependent) 500
Max. continuous current	A	2	2	2	2	5

General

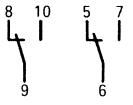
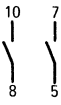
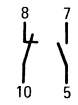
Admissible ambient temperature	°C	−40 to +70	−40 to +70
Operate time[1])	ms	approx. 7.5	approx. 7.5
Release time[1])	ms	approx. 3	approx. 3
Max. switching rate	ops./ sec.	50	10
Test voltage winding/frame contact/contact contact/frame	 V_{rms} V_{rms} V_{rms}	 500 500 500	 500 1000 1000
Mechanical life	ops.	approx. 10^8	approx. 10^7

[1]) Measured with contact pile-up B110 with fully wound coil without series resistor and nominal voltage. For other operating conditions these values can be considerably much lower or exceeded.

Cradle relay N

Table 2 Contact pile-ups

Size I

Type of contact	Single contacts	Bifurcated contacts	Single contacts		
Contact material silver, gold flashed order No. block 3	B104	C104	F105	F107	F106
Contact material gold F order No. block 3	B604	C404			
Contact designation	21–21		1–1	2–2	2–1
Symbols with base connections					

Size II

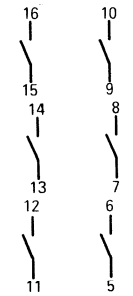
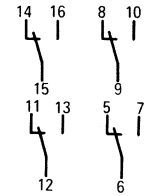
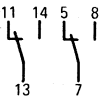
Type of contact	Single contacts	Bifurcated contacts	Single contacts	Bifurcated contacts	Single contacts
Contact material silver, gold flashed order No. block 3	B112	C112	B110	C110	F104
Contact material gold F order No. block 3	B612		B610	C410	
Contact designation	1-1-1–1-1-1		21-21–21-21		21–21
Symbols with base connections					

Table 3 List of coils

Nominal voltage	Operating voltage at 20 °C Minimum voltage U_I Vdc with contact pile-up (order No. block 3)				Maximum voltage U_{II}	Resistance at 20 °C	Coil No. Order No. block 2.
	-B104/-B604 -F105	-B110/-B610 -B112/-B612 -C104/-C404 -F104 -F106 -F107	-C112	-C110 -C410			
Vdc					Vdc	Ω	
5	1.8	2.5	3.0	3.7	7.2	28 ± 3	711
6	2.7	3.7	4.4	5.5	10.5	58 ± 6	712
12	5.3	7.1	8.7	10.5	20	220 ± 22	717
24	11	14.5	18	22	40	890 ± 89	721
48	23	30	37	45	75	3200 ± 480	726
60	27	36	43	53	92	4700 ± 705	734
110	49	65	79	98	164	15000 ± 2250	735
125	61	81	99	122	190	20900 ± 3140	703

Pin connections:

Coil with one winding
Start 4 End 1

Coil with two windings
(available on request)
Start 3 End 2 for winding I
Start 4 End 1 for winding II

The minimum voltage U_I is dependent on the contact pile-up and the ambient temperature, whereas the maximum voltage U_{II} depends on the ambient temperature alone.
Between minimum voltage $U_{I\,tu}$ and operating voltage U a safety margin of 20 % is recommended.

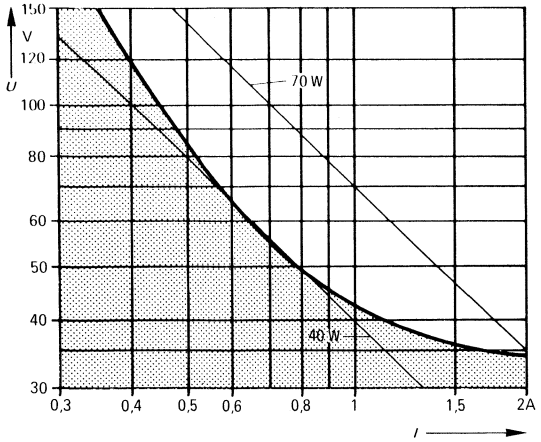
$U_{I\,tu}$ (1.2)< $U \leqslant U_{II\,tu}$
$U_{I\,tu} = U_{I\,20\,°C} \cdot k_{I\,tu}$
$U_{II\,tu} = U_{II\,20\,°C} \cdot k_{II\,tu}$

t_u = ambient temperature
U = operating voltage
$U_{I\,tu}$ = minimum voltage at ambient temperature t_u
$U_{II\,tu}$ = maximum voltage at ambient temperature t_U
k_I and k_{II} = factors

t_u	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1.0	1.05	1.09	1.13	1.17	1.215
k_{II}	1.0	0.93	0.86	0.79	0.705	0.615

Cradle relay N

Limiting curve for power load for contact pile-ups B1.. and C1..



I = Switching current
U = Switching voltage (dc)
Fig. 1

Safe breaking, arc extinguished (limit curve II)
contact material silver, gold flashed

Limiting curve for power load for contact pile-ups F1..

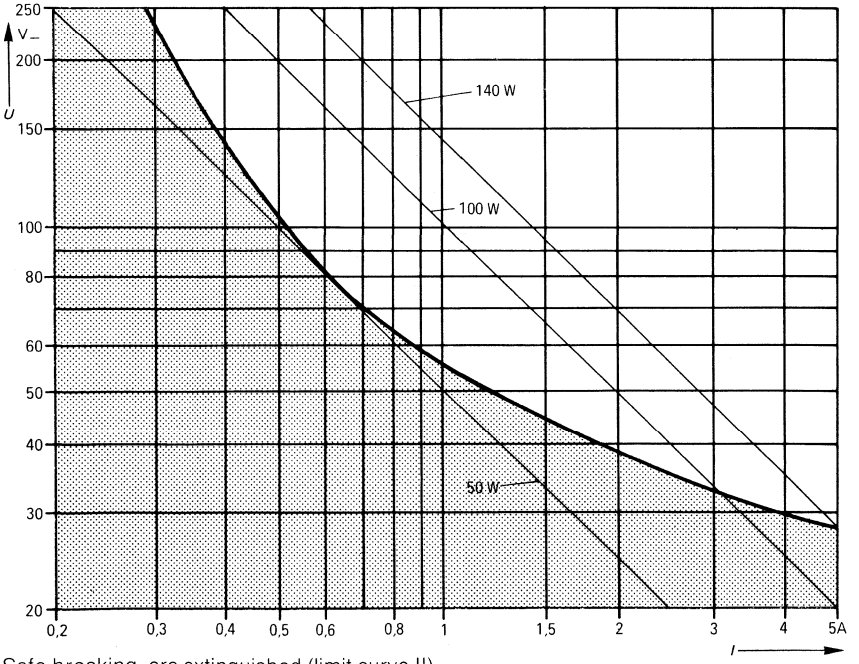


Fig. 2

Safe breaking, arc extinguished (limit curve II)
contact material silver, gold flashed

Instructions for impulse operation

The maximum voltage stated in table 3 can be increased for pulsed operations as follows:

$U_{II\ impulse} = U_{II\ tu} \cdot q$

$U_{II\ tu}$ = Max. continuous voltage at ambient temperature t_u

q = Factor

The pulse voltage must not exceed 80 % of the test voltage (winding/frame or winding/winding), or not to exceed the max. voltage as listed in table 3 by no more than 2.5 fold.

If $t_{ED} \leq 3$ s, then $q = \sqrt{\frac{t_Z}{t_{ED}}}$

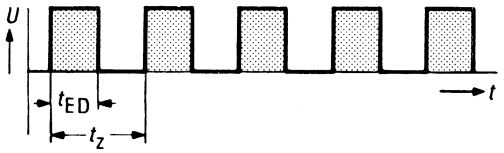
t_{ED} = pulse width

t_Z = cycle time

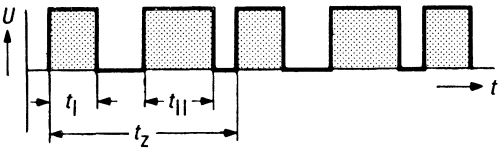
If $t_{ED} > 3$ sec. the value of q must be obtained from the nomograph on page 3.14.

Examples of various periodic pulse trains (energizing side)

1. Periodic recurrence of one energizing pulse



2. Periodic recurrence of two unequal energizing pulses

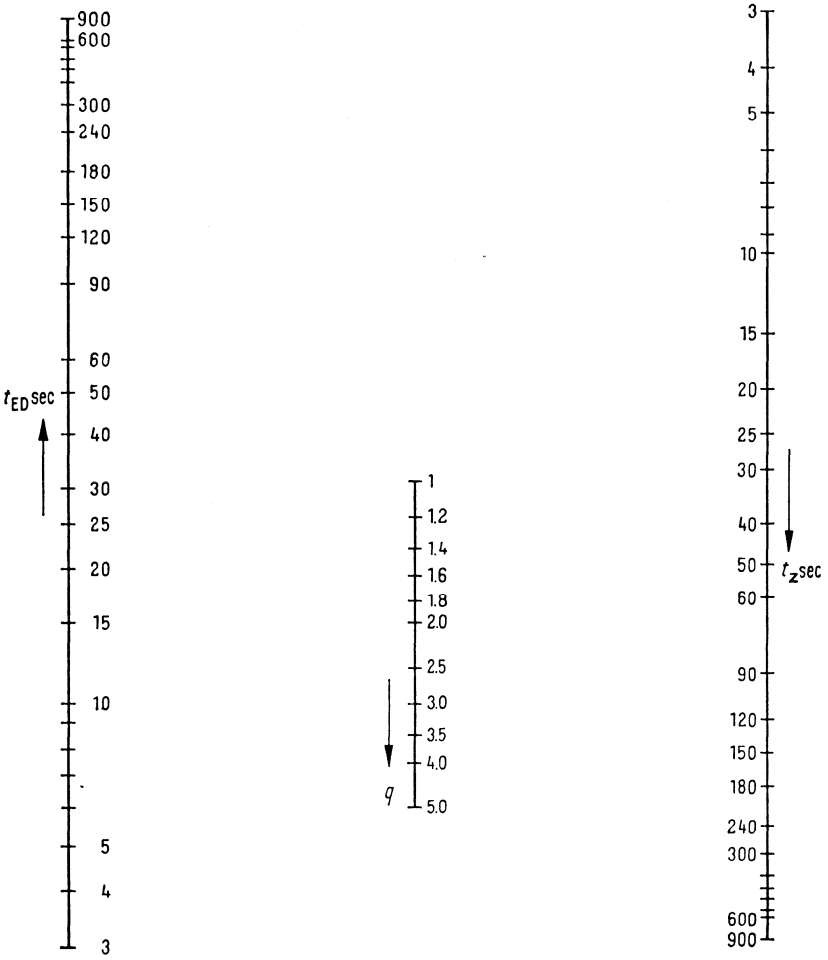


$t_{ED} = t_I + t_{II}$

t_I and t_{II} = are the pulse widths within one cycle

Cradle relay N

Nomograph for determining the factor q



Cradle relay P

V23003

for dc operation, polarised, bistable

Outstanding features

- Intended primarily for impulse operation.
- PTB certificate for safe electrical separation between intrinsically safe and not intrinsically safe circuits.

Versions

- Size I, II or III, depending on the height of the contact pile-up.
- Various arrangements of contact pile-ups:
  max. 6 changeovers, 2 breaks or 2 makes.
- Single or bifurcated contacts.
- Termination: solderable and plug-in.
- Transparent cover to give protection against damage and dust.

See page 3.41 for information on sockets and mounting.

Approval: PTB No. III B/E-16 134 U.

Cradle relay P

V23003-A0★★★ Size I

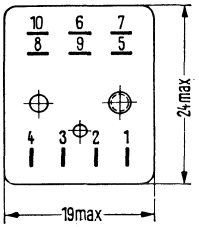
V23003-B0★★★ Size II

Contact pile-ups with single or bifurcated contacts

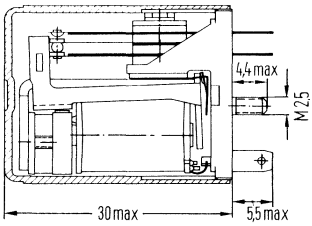
Dust protected

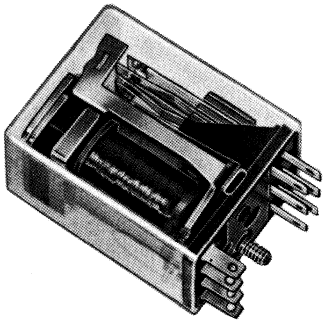
With individual solder connections, silver plated,
plug – in or mounting by fixing screw

Size I



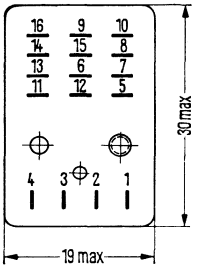
View from the
wiring side

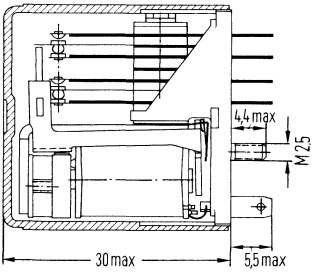


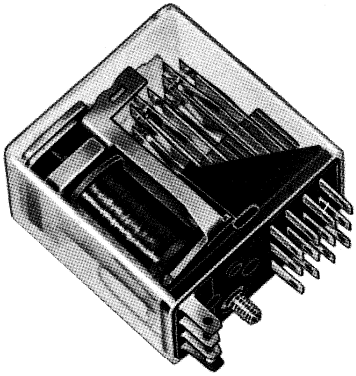


Approx. weight 25 g
Illustration approx. original size

Size II







Approx. weight 30 g

Mounting hole layout see page 3.45

Cradle relay P

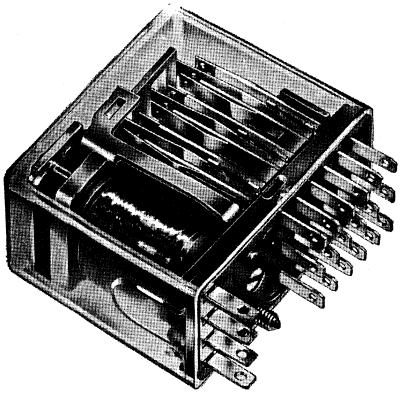
V23003-J0★★★ Size III

Contact pile-ups with single contacts

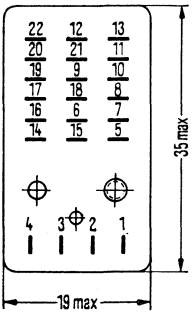
Dust protected

With individual solder connections, silver plated,

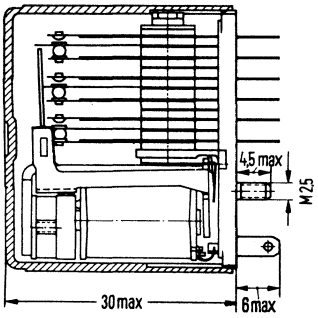
plug – in or mounting by fixing screw



Approx. weight 30 g
Illustration approx. original size



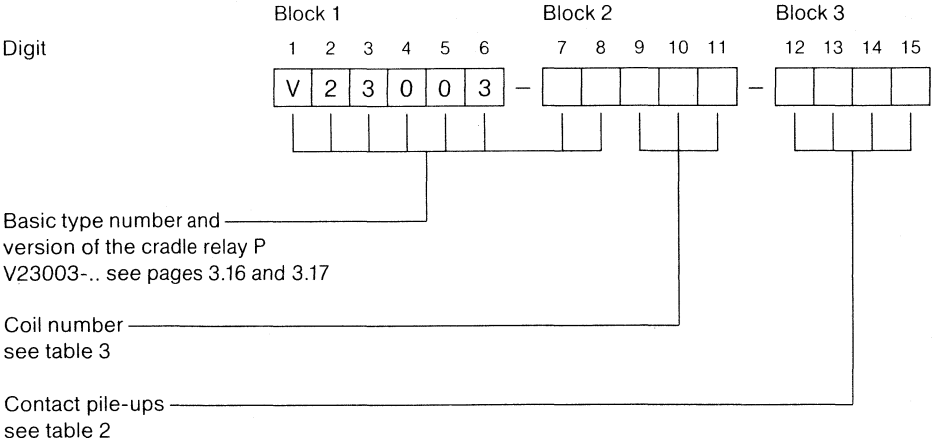
View from the
wiring side



Mounting hole layout see page 3.45

Cradle relay P

Ordering code



Ordering example: V23003-B0037-F104

Cradle relay P, size II, dust protected, coil 24 V nominal, 2 changeover contact pile-up, single contacts, contact material silver, gold flashed.

Preferred standard types

V23003-A0025-B104
-A0037-B104
-A0037-C104
-A0044-B104
-A0064-B104

V23003-B0025-B110
-B0025-F 104
-B0037-B110
-B0037-C110
-B0037-F 104
-B0044-B110
-B0064-B110

Cradle relay P

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 3
Nominal power consumption	W	approx. 1.5
Maximum temperature	°C	100
Continuous thermal load at 20 °C ambient temperature	W	1.6
Thermal resistance	K/W	50

Contact side

Order No. block 3		B1..	B6..	C1..	C4..	F1..
Type of contact		Single contacts		Bifurcated contacts		Single contacts
Contact material		Silver gold flashed	Gold F	Silver gold flashed	Gold F	Silver gold flashed
Max. switching voltage	Vdc Vac	150 125	36 30	150 125	36 30	250 250
Max. switching current	A	2	0.2	2	0.2	5
Max. power rating dc voltage ac voltage	 W VA	 35 to 70 s. fig. 1 (volt. dep.) 50	 5 5	 35 to 70 s. fig. 1 (volt. dep.) 50	 5 5	 50 to 140 see fig. 2 (voltage dependent) 500
Max. continuous current	A	2	2	2	2	5

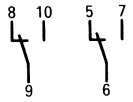
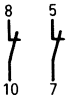
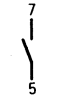
General

Admissible ambient temperature	°C	−40 to +70	−40 to +70
Operate time[1])	ms	approx. 4	approx. 4
Reverse operate time[1])	ms	approx. 4	approx. 4
Max. switching rate	ops./ sec.	20	20
Test voltage winding/frame contact/contact contact/frame	 V_{rms} V_{rms} V_{rms}	 500 500 500	 500 1000 1000
Mechanical life	ops.	approx. 10^7	approx. 10^7

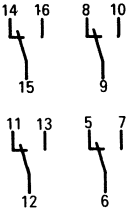
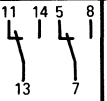
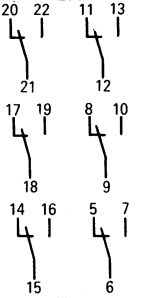
[1]) Measured with contact pile-up B110 with fully wound coil without series resistor and nominal voltage. For other operating conditions these values can be considerably much lower or exceeded.

Table 2 Contact pile-ups

Size I

Type of contact	Single contacts	Bifurcated contacts	Single contacts		
Contact material silver, gold flashed order No. block 3	B104	C104	F105	F107	F106
Contact material gold F order No. block 3	B604	C404			
Contact designation	21–21		1–1	2–2	2–1
Symbols with[1]) base connections					

Size II und Size III

	Size II			Size III
Type of contact	Single contacts	Bifurcated contacts	Single contacts	Single contacts
Contact material silver, gold flashed order No. block 3	B110	C110	F104	B133
Contact material gold F order No. block 3	B610	C410		B633
Contact designation	21 - 21 - 21 - 21		21 - 21	21-21-21-21-21-21
Symbols with[1]) base connections				

[1]) Circuit symbols drawn in "Off" position.
If a positive potential is applied to the coil start, the relay assumes the "Off" position.
Coil terminals see table 3.

Table 3 List of coils

Nominal voltage Vdc	Operating voltage range at 20 °C Minimum voltage U_I Vdc	Maximum voltage U_{II} Vdc	Coil data Winding	Resistance at 20 °C Ω	Connections Start	End	Test voltage winding/ winding V_{rms}	Coil No. Order No. block 2.
6	4.0	6.7	I	24.5 ± 2.5	3	2	150	026
	4.0	6.7	II	24.5 ± 2.5	4	1		
12	8.0	13.5	I	100 ± 10	3	2	150	025
	8.0	13.5	II	100 ± 10	4	1		
24	16.5	26.5	I	400 ± 60	3	2	500	037
	16.5	25	II	340 ± 34	4	1		
48	33.5	49	I	1400 ± 210	3	2	500	064
	33.5	49	II	1400 ± 210	4	1		
60	44	65	I	2400 ± 360	3	2	150	044
	44	65	II	2400 ± 360	4	1		

Only one winding may be energised at any time within the specified voltage range under continuous operation.

The minimum voltage U_I and the maximum voltage U_{II} are dependant on the ambient temperature.

$U_{I\,tu} = U_{I\,20\,°C} \cdot k_{I\,tu}$
$U_{II\,tu} = U_{II\,20\,°C} \cdot k_{II\,tu}$

t_u = ambient temperature
$U_{I\,tu}$ = minimum voltage at ambient temperature t_u
$U_{II\,tu}$ = maximum voltage at ambient temperature t_u
k_I and k_{II} = factors

Operate – minus at start of coil

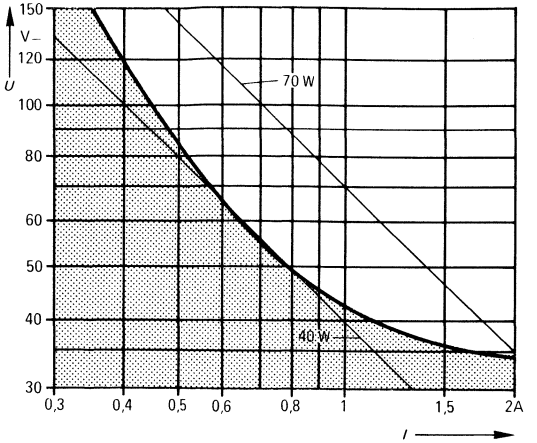
t_u	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1.0	1.02	1.04	1.06	1.08	1.10
k_{II}	1.0	0.93	0.86	0.79	0.705	0.615

Reverse operate – plus at start of coil

t_u	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1.0	1.01	1.02	1.03	1.04	1.05
k_{II}	1.0	0.93	0.86	0.79	0.705	0.615

Cradle relay P

Limiting curve for power load for contact pile-ups B1 .. and C1 ..



I = Switching current
U = Switching voltage (dc)
Fig. 1

Safe breaking, arc extinguished (limit curve II)
contact material silver, gold flashed

Limiting curve for power load for contact pile-ups F1..

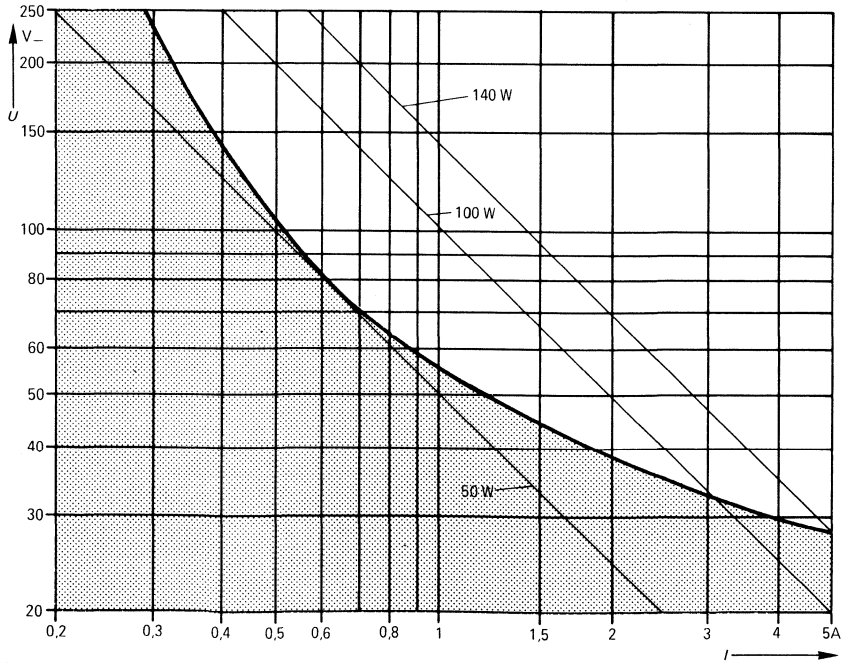


Fig. 2

Safe breaking, arc extinguished (limit curve II)
contact material silver, gold flashed

Cradle relay P

Instructions for impulse operation

The cradle relay P is intended primarily for impulse operation. The maximum voltage stated in table 3 can be increased for pulsed operation as follows:

$U_{\text{II impulse}} = U_{\text{II tu}} \cdot q$

$U_{\text{II tu}}$ = Maximum continuous voltage at ambient temperature t_u

q = Factor

The pulse voltage must not exceed 80 % of the test voltage (winding/frame or winding/winding) or not to exceed the max. voltage as listed in table 3 by no more than 3.3 fold at an ambient temperature of ≥ 20 °C and 2.3 fold at an ambient temperature of <20 °C.

If $t_{ED} \leq 3$ sec. then $q = \sqrt{\frac{t_Z}{t_{ED}}}$

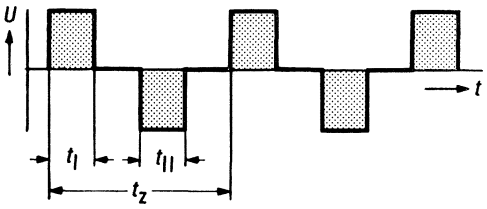
t_{ED} = pulse width

t_Z = cycle time

If $t_{ED} > 3$ sec. the value of q must be obtained from the nomograph on page 3.14.

Examples of various periodic pulse trains (energizing side).

1. Periodic recurrence of one energizing pulse



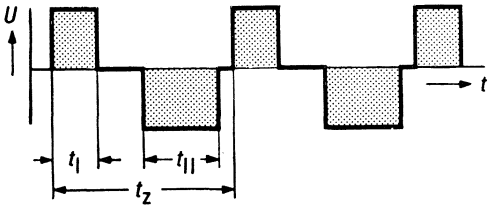
$t_{ED} = t_I + t_{II}$

t_I is the pulse width of the positive pulse on the start of the winding.

t_{II} is the pulse width of the negative pulse on the start of the winding.

t_I and t_{II} = are the pulse widths within one cycle.

2. Periodic recurrence of two unequal energizing pulses



Cradle relay S V23054

for operation, neutral, monostable

Outstanding features

- Stronger magnet system in comparison to that of the cradle relay N which results in a wider range of operating voltages.

Versions

- Size I, II or III, depending on the height of the contact pile-up.
- Various arrangements of contact pile-ups:
  max. 6 changeovers or 6 makes.
- Single or bifurcated contacts.
- Termination: solderable and plug-in.
- Transparent cover to give protection against damage and dust.

See page 3.41 for information on sockets and mounting.

Cradle relay S

V23054-C★★★ Size I

V23054-D★★★ Size II

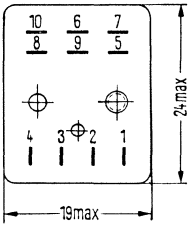
Contact pile-ups with single or bifurcated contacts

Dust protected

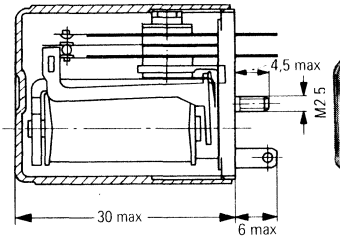
With individual solder connections, silver plated,

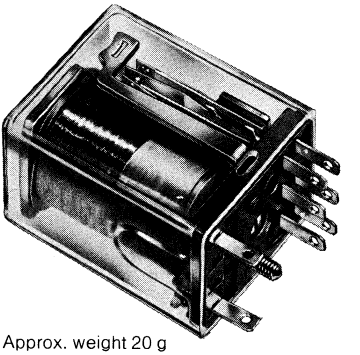
plug – in or mounting by fixing screw

Size I



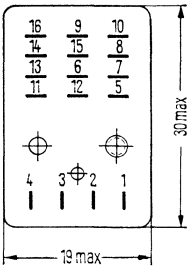
View from the wiring side

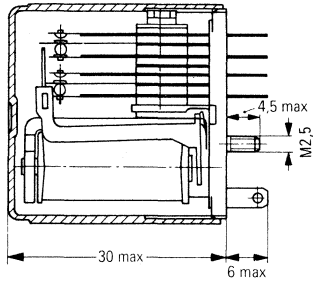


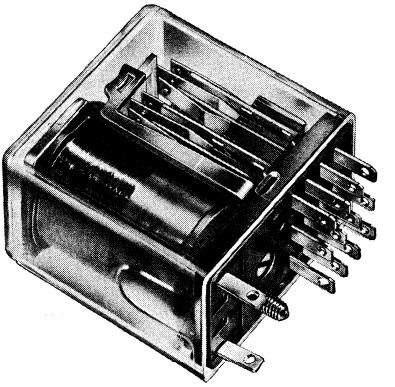


Approx. weight 20 g
Illustration approx. original size

Size II







Approx. weight 25 g

Mounting hole layout see page 3.45

Cradle relay S

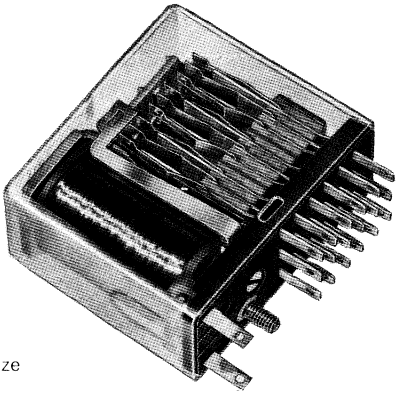
V23054-E★★★ Size III

Contact pile-ups with single or bifurcated contacts

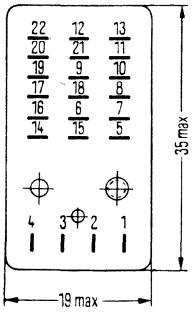
Dust protected

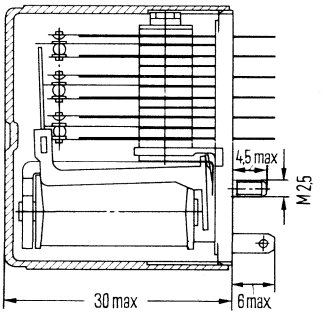
With individual solder connections, silver plated,

plug – in or mounting by fixing screw



Approx. weight 27 g
Illustration approx. original size



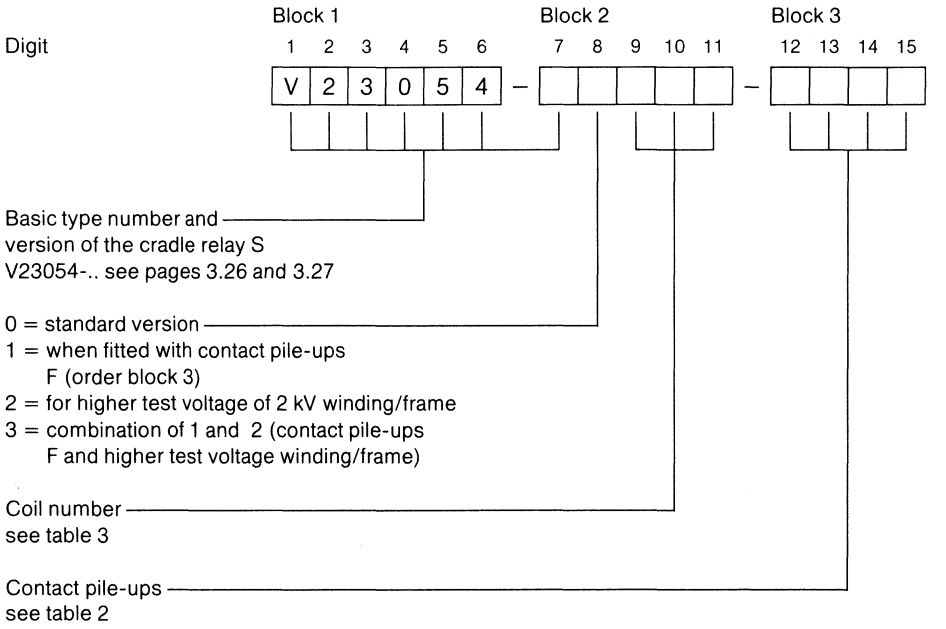


View from the
wiring side

Mounting hole layout see page 3.45

Cradle relay S

Ordering code



Ordering example: V23054-E0020-C133

Cradle relay S, size III, coil 24 V nominal, 6 changeover contact pile-up, bifurcated contacts, contact material silver, gold flashed.

Preferred standard types

V23054-D0020-B110
-D0020-C110
-D1020-F104

V23054-E1003-F110
-E1011-F110
-E1015-F110
-E0016-B133
-E1016-F110
-E0019-B133
-E0019-C133
-E1019-F110

V23054-E0020-B133
-E1020-F110
-E0021-B133
-E0022-B133
-E1022-F110
-E0026-B133

Cradle relay S

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 3
Nominal power consumption	W	approx. 1.0
Maximum temperature	°C	100
Continuous thermal load at 20 °C ambient temperature	W	2.1
Thermal resistance	K/W	40

Contact side

Order No. block 3		B1..	B6..	C1..	C4..	F1..
Type of contact		Single contacts		Bifurcated contacts		Single contacts
Contact material		Silver gold flashed	Gold F	Silver gold flashed	Gold F	Silver gold flashed
Max. switching voltage	Vdc Vac	150 125	36 30	150 125	36 30	250 250
Max. switching current	A	2	0.2	2	0.2	5
Max. power rating dc voltage ac voltage	 W VA	 35 to 70 s. fig. 1 (volt. dep.) 50	 5 5	 35 to 70 s. fig. 1 (volt. dep.) 50	 5 5	 50 to 140 see fig. 2 (voltage dependent) 500
Max. continuous current	A	2	2	2	2	5

General

Admissible ambient temperature	°C	−40 to +70	−40 to +70
Operate time[1])	ms	approx. 16	approx. 16
Release time[1])	ms	approx. 2	approx. 2
Max. switching rate	ops./ sec.	50	10
Test voltage winding/frame contact/contact contact/frame	 V_{rms} V_{rms} V_{rms}	 500[2]) 500 500	 500[2]) 1000 1000
Mechanical life	ops.	approx. 10^8	approx. 10^7

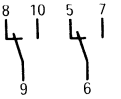
[1]) Measured with contact pile-up C133 with fully wound coil without series resistor and nominal voltage. For other operating conditions these values can be considerably much lower or exceeded.

[2]) 2000 V_{rms} with special coils.

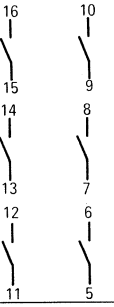
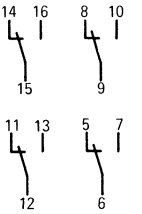
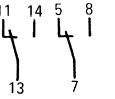
Cradle relay S

Table 2 Contact pile-ups

Size I

Type of contact	Single contacts	Bifurcated contacts	Single contacts
Contact material silver, gold flashed order No. block 3	B104	C104	F105
Contact material gold F, order No. block 3	B604	C404	
Contact designation	21-21		1-1
Symbols with base connections			

Size II

Type of contact	Single	Bifurcated	Single	Bifurcated	Single
Contact material silver, gold flashed order No. block 3	B112	C112	B110	C110	F104
Contact material gold F, order No. block 3	B612	C412	B610	C410	
Contact designation	1-1-1–1-1-1		21-21–21-21		21-21
Symbols with base connections					

Size III

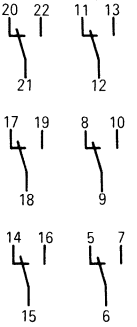
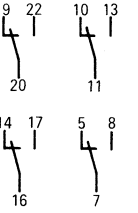
Type of contact	Single contacts	Bifurcated contacts	Single contacts
Contact material silver, gold flashed order No. block 3	B133	C133	F110
Contact material gold F, order No. block 3	B633	C433	
Contact designation	21-21-21–21-21-21		21-21–21-21
Symbols with base connections			

Table 3 List of coils

Nominal voltage	Operating voltage range at 20 °C Minimum voltage U_I Vdc with contact pile-up (order No. block 3)				Maximum voltage U_{II}	Resistance at 20 °C	Coil No. Order No. block 2.
	-B104/-B604 -B110/-B610 -B112/-B612	-C104/-C404 -C112/-C412 -B113/-B633	-C110 -C410 -F110	-C133 -C433			
Vdc	-F105	-F104			Vdc	Ω	
6	2.4	2.9	3.5	4.5	9	33± 3.3	011
12	4.7	5.8	7.0	8.8	18	130± 13	015
24	10.5	13	15.5	20	39	630± 63	020
60	29	36	43	55	94	3800± 570	026
110	44	53.5	66	85	145	9200±1380	004
125	59	73	88	112	190	15500±2320	013
220	79	98	118	151	240	25000±3750	003

Pin connections:

Coil with one winding
Start 4 End 1

Coil with two windings
(available on request)
Start 3 End 2 for winding I
Start 4 End 1 for winding II

The minimum voltage U_I is dependent on the contact pile-up and the ambient temperature, whereas the maximum voltage U_{II} depends on the ambient temperature alone.
Between minimum voltage $U_{I\,tu}$ and operating voltage U a safety margin of 20% is recommended.

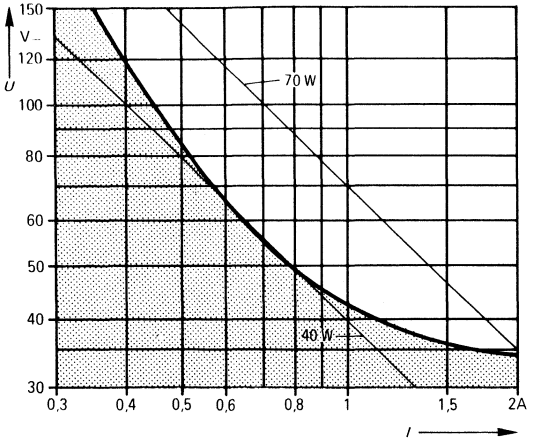
$U_{I\,tu}$ (1.2)< $U \leqslant U_{II\,tu}$
$U_{I\,tu} = U_{I\,20\,°C} \cdot k_{I\,tu}$
$U_{II\,tu} = U_{II\,20\,°C} \cdot k_{II\,tu}$

t_u = ambient temperature
U = operating voltage
$U_{I\,tu}$ = minimum voltage at ambient temperature t_u
$U_{II\,tu}$ = maximum voltage at ambient temperature t_u
k_I and k_{II} = factors

t_u	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1.0	1.05	1.09	1.13	1.17	1.215
k_{II}	1.0	0.93	0.86	0.79	0.705	0.615

Cradle relay S

Limiting curve for power load for contact pile-ups B1.. and C1..



I = Switching current
U = Switching voltage (dc)
Fig. 1

Safe breaking, arc extinguished (limit curve II)
contact material silver, gold flashed

Limiting curve for power load for contact pile-ups F1..

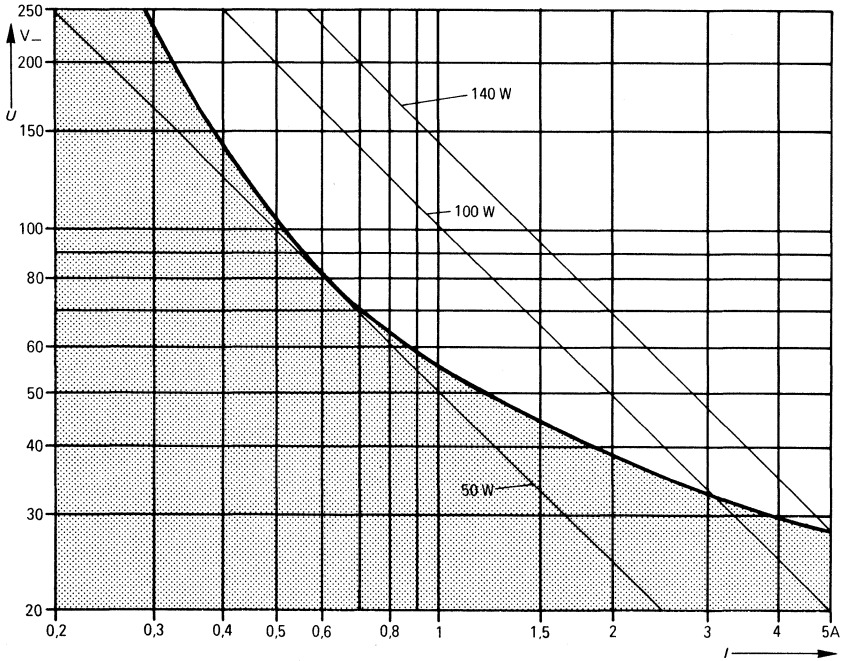


Fig. 2

Safe breaking, arc extinguished (limit curve II)
contact material silver, gold flashed

Instructions for impulse operation

The maximum voltage stated in table 3 can be increased for pulsed operation as follows:

$U_{II\ impulse} = U_{II\ tu} \cdot q$

$U_{II\ tu}$ = Maximum continuous voltage at ambient temperature t_u

q = Factor

The pulse voltage must not exceed 80 % of the test voltage (winding/frame or winding/winding) or not to exceed the max. voltage as listed in table 3 by no more than 2.3 fold.

If $t_{ED} \leq 3$ sec. then $q = \sqrt{\frac{t_z}{t_{ED}}}$

t_{ED} = pulse width

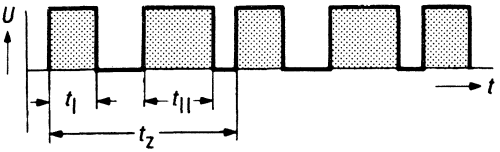
t_z = cycle time

If $t_{ED} > 3$ sec. the value of q must be obtained from the nomograph on page 3.14.

Examples of various periodic pulse trains (energizing side)

1. Periodic recurrence of one energizing pulse

2. Periodic recurrence of two unequal energizing pulses



$t_{ED} = t_I + t_{II}$

t_I and t_{II} = are the pulse widths within one cycle

Cradle relay W V23005

for ac operation, neutral, monostable

Outstanding features

- PTB certificate for safe electrical separation between intrinsically safe and not intrinsically safe circuits.

Versions

- Size I or II, depending on the height of the contact pile-up.
- Various arrangements of contact pile-ups:
  max. 4 changeovers, 2 breaks or 2 makes.
- Single or bifurcated contacts.
- Termination: solderable and plug-in.
- Transparent cover to give protection against damage and dust.

See page 3.41 for information on sockets and mounting.

Approval: PTB No. III B/E-16 134 U

Cradle relay W

V23005-A0★★★ Size I

V23005-B0★★★ Size II

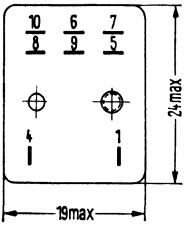
Contact pile-ups with single or bifurcated contacts

Dust protected

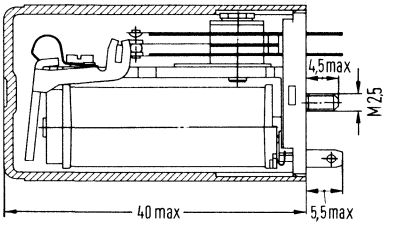
With individual solder connections, silver plated,

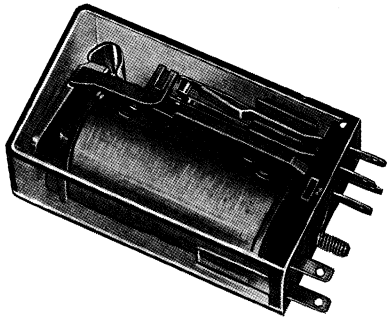
plug – in or mounting by fixing screw

Size I



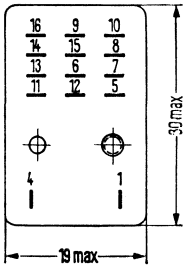
View from the wiring side

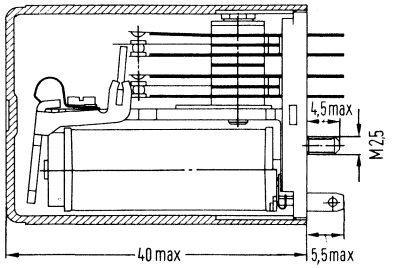


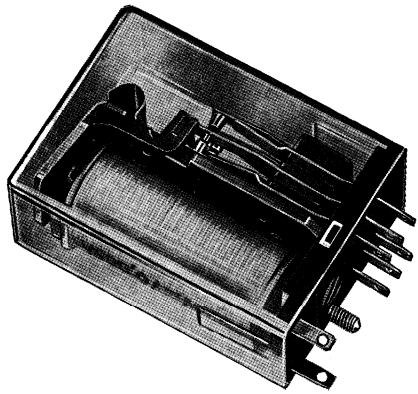


Approx. weight 35 g
Illustration approx. original size

Size II





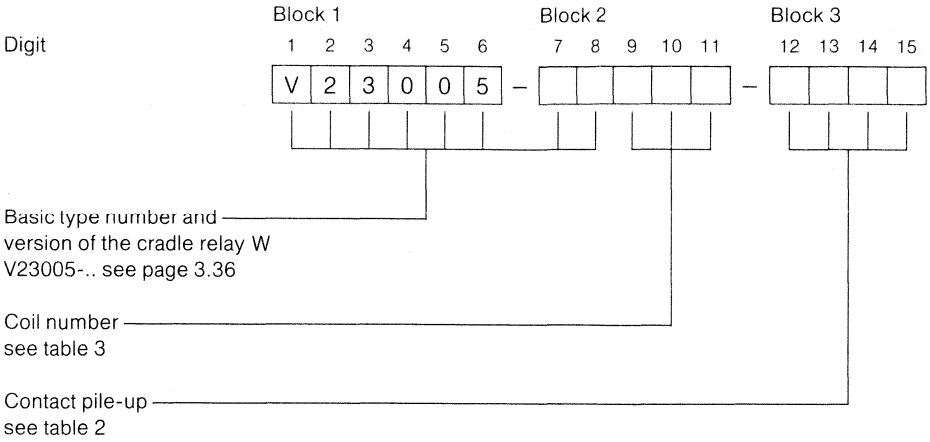


Approx. weight 40 g

Mounting hole layout see page 3.45

Cradle relay W

Ordering code



Ordering example: V23005-B0004-F104

Cradle relay W, size II, coil 220 V ac nominal, 2 changeover contact pile-up, single contacts, contact material silver, gold flashed.

Preferred standard types

V23005-A0004-B104
-A0004-B604
-A0004-F106
-A0010-B104

V23005-B0004-B110
-B0004-B610
-B0004-F104
-B0007-B110
-B0007-F104
-B0010-B110
-B0010-F104

Cradle relay W

Table 1 Characteristics

Energising side

Operating voltages	Vac	see table 3
Nominal power consumption	VA	1.15
Maximum temperature	°C	100
Continuous thermal load at 20 °C ambient temperature	VA	2.2
Thermal resistance	K/VA	35

Contact side

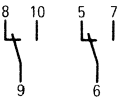
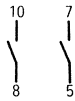
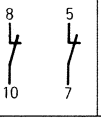
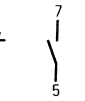
Order No. block 3		B1..	B6..	C1..	C4..	F1..
Type of contact		Single contacts		Bifurcated contacts		Single contacts
Contact material		Silver gold flashed	Gold F	Silver gold flashed	Gold F	Silver gold flashed
Max. switching voltage	Vdc Vac	150 125	36 30	150 125	36 30	250 250
Max. switching current	A	2	0.2	2	0.2	5
Max. power rating dc voltage ac voltage	 W VA	 35 to 70 s. fig. 1 (volt. dep.) 50	 5 5	 35 to 70 s. fig. 1 (volt. dep.) 50	 5 5	 50 to 140 see fig. 2 (voltage dependent) 500
Max. continuous current	A	2	2	2	2	5

General

Admissible ambient temperature	°C	−40 to +70	−40 to +70
Max. switching rate	ops. /sec.	20	20
Test voltage winding/frame contact/contact contact/frame	 V_{rms} V_{rms} V_{rms}	 500 at nominal voltage ≤ 60 V 2000 at nominal voltage > 60 V 500 500	 1000 1000
Mechanical life	ops.	approx. 10^7	approx. 10^6

Table 2 Contact pile-ups

Size I

Type of contact	Single	Bifurcated	Single contacts		
Contact material silver, gold flashed order No. block 3	B104	C104	F105	F107	F106
Contact material gold F order No. block 3	B604	C404			
Contact designation	21–21		1–1	2–2	2–1
Symbols with base connections					

Size II

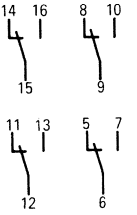
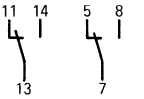
Type of contact	Single contacts	Bifurcated contacts	Single contacts
Contact material silver, gold flashed order No. block 3	B110	C110	F104
Contact material gold F order No. block 3	B610	C410	
Contact designation	21-21 – 21-21		21-21
Symbols with base connections			

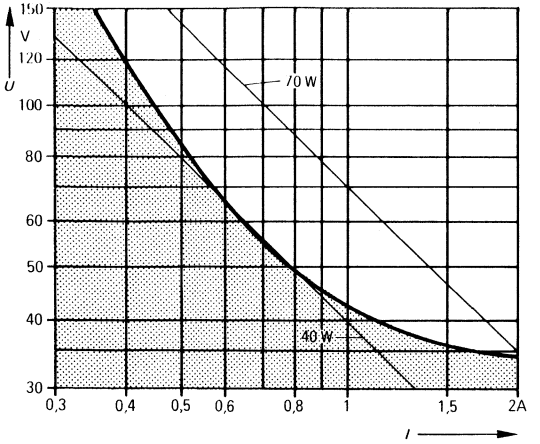
Table 3 List of coils

Nominal voltage (50 Hz/60 Hz) Vac	dc resistance at 20 °C Ω	Coil terminals S	E	Coil No. Order No. block 2.
6	8 ± 0.8	4	1	015
12	40 ± 4.0	4	1	017
24	170 ± 17	4	1	010
48	620 ± 62	4	1	019
60	1000 ± 100	4	1	008
110	3200 ± 480	4	1	007
220	14000 ± 2100	4	1	004

There are tolerances on the operating voltage of +10 % and −20 % of nominal when working in an ambient temperature of + 70 °C.

Cradle relay W

Limiting curve for power load for contact pile-ups B1.. and C1..



I = Switching current
U = Switching voltage (dc)

Fig. 1

Safe breaking, arc extinguished (limit curve II)
contact material silver, gold flashed

Limiting curve for power load for contact pile-ups F1..

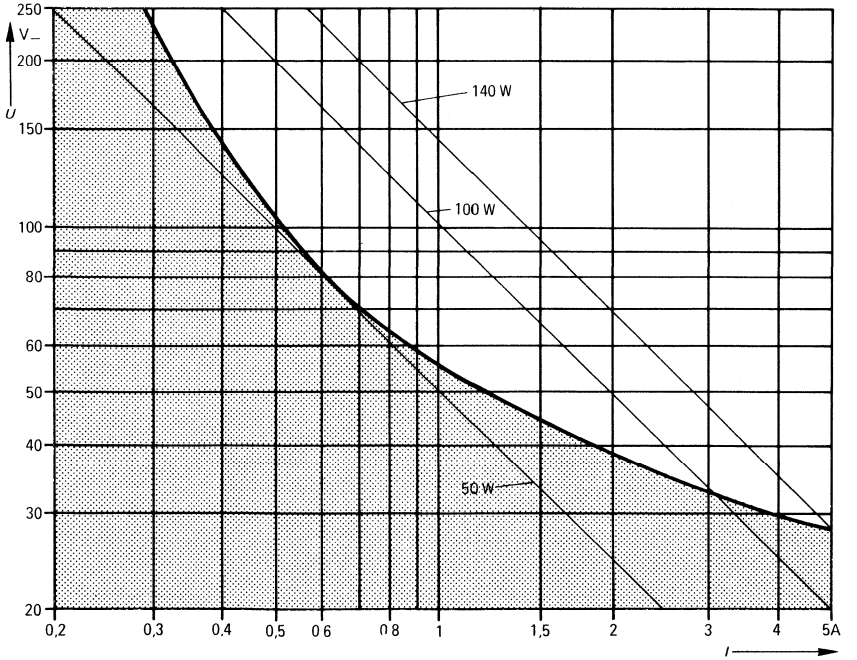


Fig. 2

Safe breaking, arc extinguished (limit curve II)
contact material silver, gold flashed

Cradle relays – accessories and mounting

Accessories

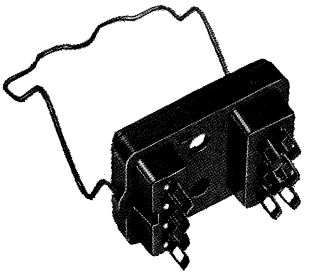
- Sockets for mounting relays upright
- Angle sockets for mounting relays horizontal
- Termination: printed circuit or solderable
- Retaining clips

Cradle relays – accessories and mounting

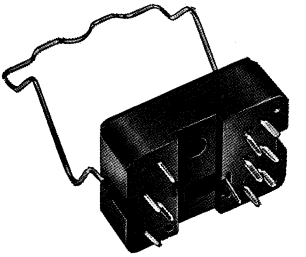
Sockets for solder connections

Sockets for printed circuits

Size I

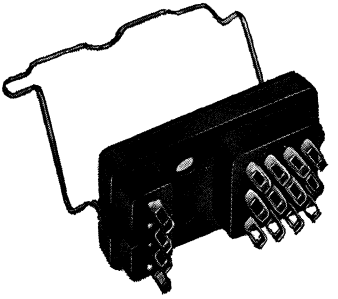


Approx. weight 3.5 g

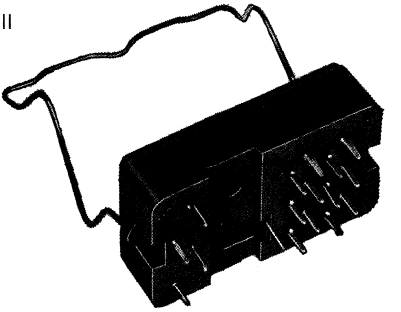


Approx. weight 4.5 g

Size II

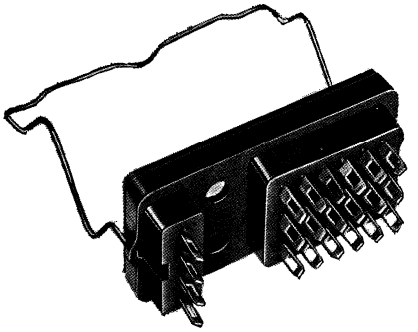


Approx. weight 4.5 g

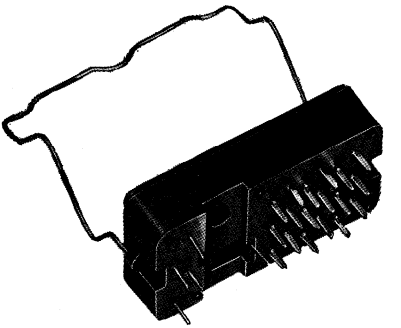


Approx. weight 5.5 g

Size III



Approx. weight 5.5 g



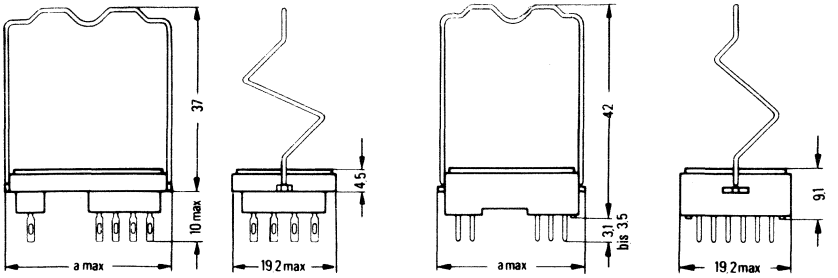
Approx. weight 6.5 g

Cradle relays – accessories and mounting

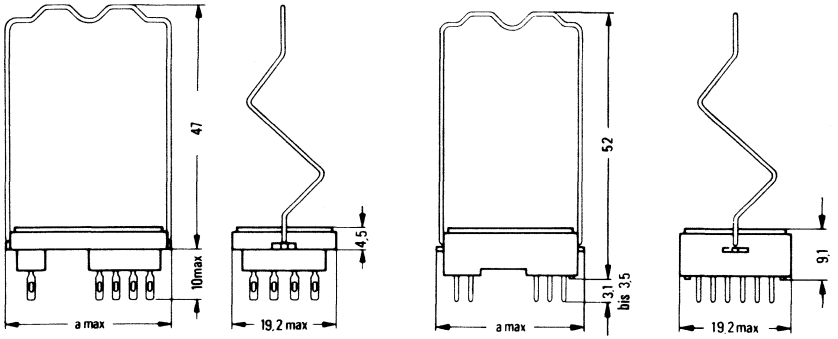
Sockets for solder connections

Sockets for printed circuits

with retainer for cradle relays N, S and P



with retainer for cradle relay W



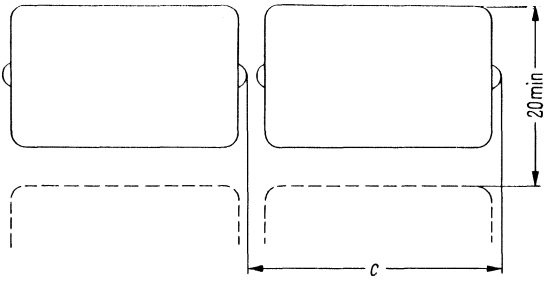
Socket	Size I	Size II	Size III
Dim. a	26.6	32.5	38

Ordering numbers

Type	Size	Order number
Sockets		
for printed circuits with silver – plated terminals	I	V23154-Z1001
	II	V23154-Z1002
	III	V23154-Z1028
for solder connections with silver – plated terminals	I	V23154-Z1005
	II	V23154-Z1006
	III	V23154-Z1015
Retainers		
for cradle relays N, P, S	I	V23154-Z1021
	II	V23154-Z1022
	III	V23154-Z1034
for cradle relay W	I	V23154-Z1023
	II	V23154-Z1024

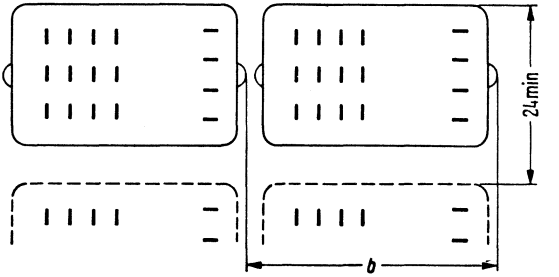
Cradle relays – accessories and mounting

Minimum spacing between sockets for cradle relays N, S and W



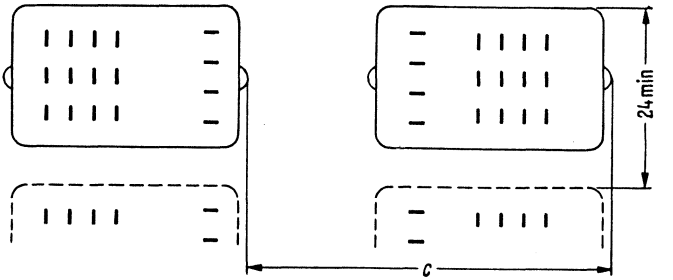
Socket	Dim. c
Size I	27
Size II	33
Size III	39

Minimum spacing between sockets for cradle relay P
with symmetrical relay arrangement



Socket	Dim. b	Dim. c
Size I	27	42
Size II	33	48
Size III	39	54

with asymmetrical relay arrangement

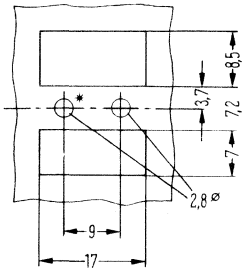


When mounting the cradle relay P, consideration should be given to magnetic fields. Strong dc magnetic fields, possibly caused by adjacent relays, and large iron masses, are the most common causes of interference. Experience indicates, that the specified minimum spacing for the cradle relay P is sufficient, under normal operating conditions, to prevent cross interference.

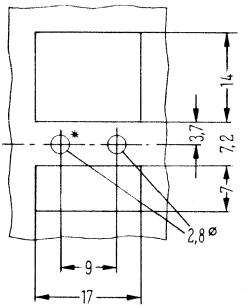
Cradle relays – accessories and mounting

Mounting hole layout for cradle relays or sockets with individual solder connection.

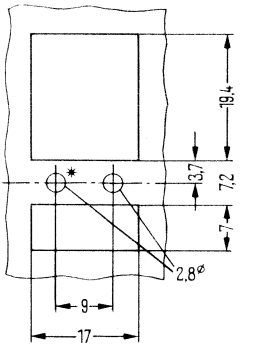
Size I



Size II

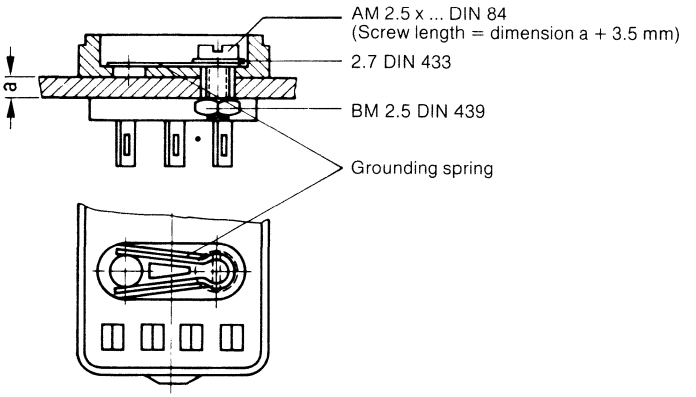


Size III



*) This hole is omitted when the mounting hole layout is intended for the socket.

Fixing the socket

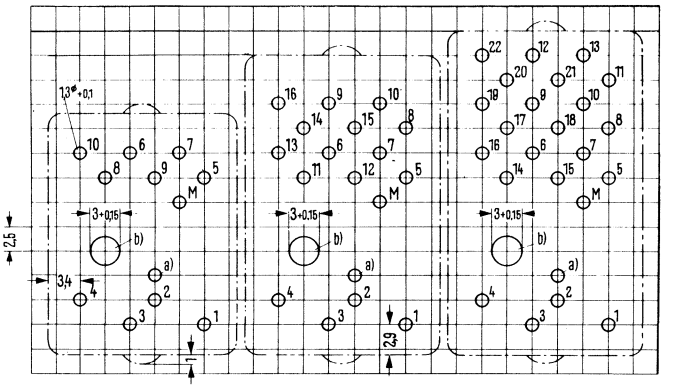


Direct mounting of relays without a socket requires a fixing nut M2.5 DIN 934-m6AU.
Ordering number from Siemens: D00934-A0025-S001

Cradle relays – accessories and mounting

Mounting hole layout for cradle relays or sockets for direct mounting into printed circuits
Pin arrangement for 2.5 mm grid in accordance with DIN 40801.

Size I Size II Size III



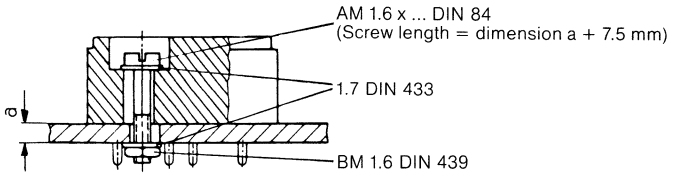
Base terminals as viewed from the wiring side

M = Ground connection ⏚

a) Holes for mechanical armature actuation if required

b) Holes for fixing socket with M 1.6 screw if required

Fixing the socket

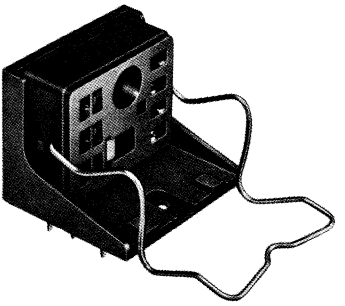


Cradle relays – accessories and mounting

Angle sockets for direct mounting into printed circuits.

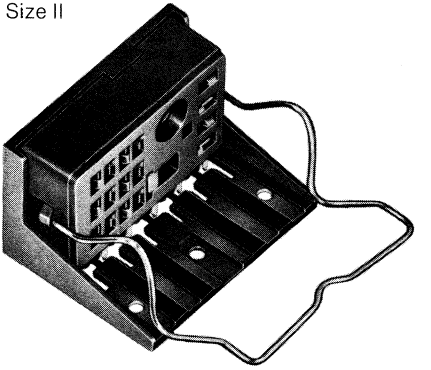
For reason of space saving, it is often necessary to mount cradle relays in a horizontal position on printed circuit boards. This is made possible by using angle sockets which are available in size I and II.

Size I



Approx. weight 10 g

Size II



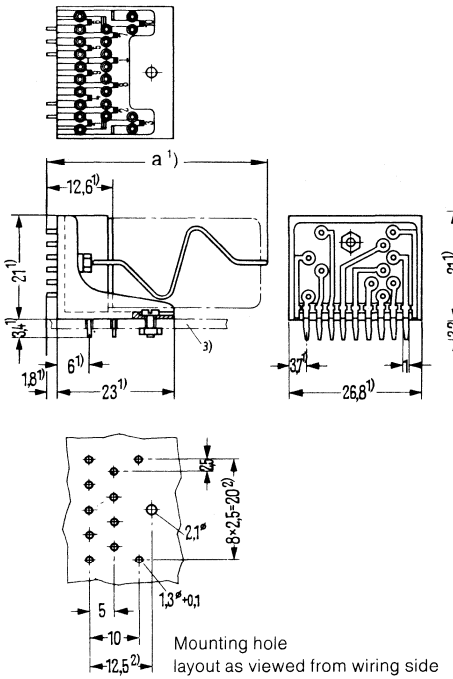
Approx. weight 15 g

Angle socket size I is mounted by a single screw whereas the size II socket is provided with more than one fixing hole so that either one or two screws can be used. (Two screws should be used under conditions of increased shock or vibration).

1 or 2 cheese-head screws AM 1.6 x 4 DIN 84-...
1 or 2 washers 1.8 DIN 433-...
1 or 2 hexagon nuts M1.6 DIN 934-m...

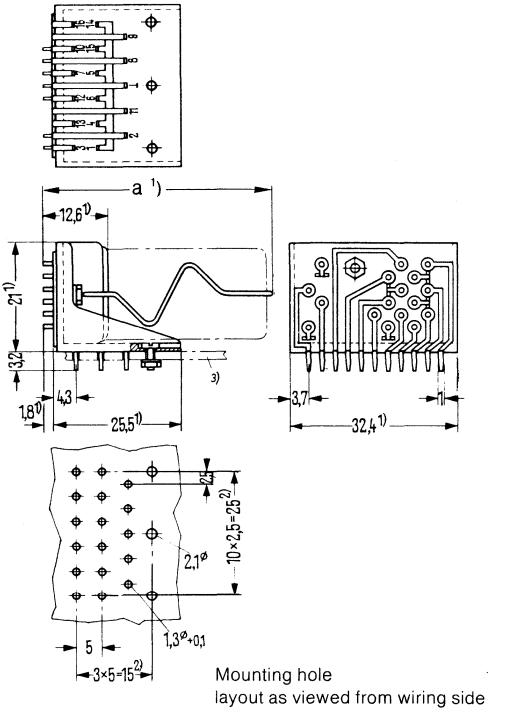
Cradle relays – accessories and mounting

Size I



Mounting hole
layout as viewed from wiring side

Size II



Mounting hole
layout as viewed from wiring side

1) Max. dimensions; dim. a see below, under retainers
2) Tolerance between any 2 holes: ± 0.2 mm
3) Printed circuit board

Ordering numbers

Angle sockets

Type	Size	Order number
for p.c. mounting with silver – plated terminals	I	C42334-A0272-A001
	II	C42334-A0272-A003

Retainers (see also page 3.43)

Type	Dim. a	Size	Order number
for cradle relays N, P, S	45.5	I	V23154-Z1021
		II	V23154-Z1022
for cradle relay W	55.5	I	V23154-Z1023
		II	V23154-Z1024

Electromechanical relays

Card relay N V23012

for dc operation, neutral, monostable

Outstanding features

- Low profile, therefore particularly suited for flat pack components grouping.

Versions

- Contact arrangement: 2 changeovers
- Single or bifurcated contacts
- Termination: printed circuit
- Protected by a cover against damage
- Dust protected or washable;
  dust protected: transparent cover,
  washable: blue non-transparent cover;
  protection class IP 67 in accordance with
  DIN 40050 (IEC 529),sealing of the relay conforms
  to DIN ICE 68, section 2 - 17, tested to group Qc 2
  (1 min. testing time).

Note: If at all possible, ultrasonic cleaning methods should not be used unless the manufacturer has been consulted first.

Card relay N

V23012-A0★★★
With 2 changeovers
Single or bifurcated contacts

Dust protected

For direct mounting into printed
circuits, pin arrangement for 2.5 mm
grid also 2.54 mm grid in accordance with DIN 40801
and DIN 40803, **average**

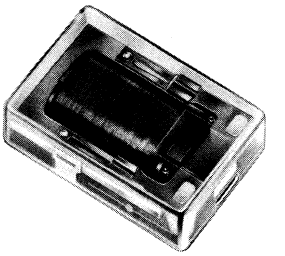
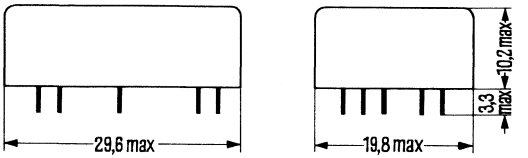
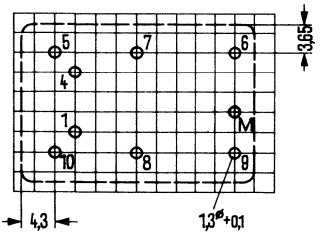


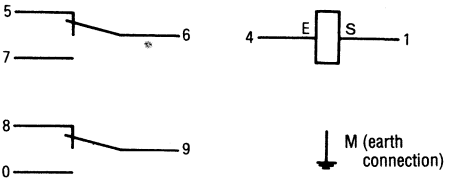
Illustration approx. original size
Approx. weight 12 g





Mounting hole layout
View from the wiring side.

Base terminals



Card relay N

V23012-B0★★★
With 2 changeovers
Single or bifurcated contacts

Washable

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid also 2.54 mm grid in accordance with DIN 40801 and DIN 40803, **fine**

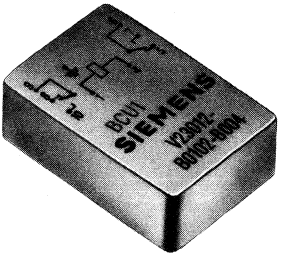
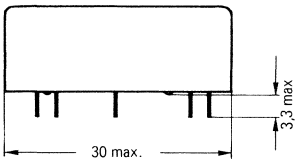
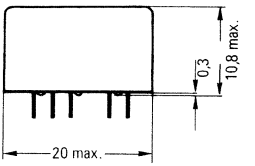
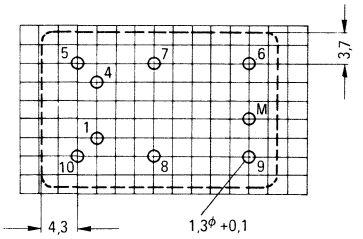


Illustration approx. original size
Approx. weight 12 g



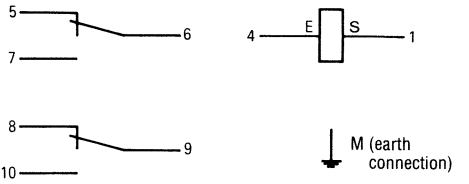




Tolerances between mounting holes ± 0.2 mm

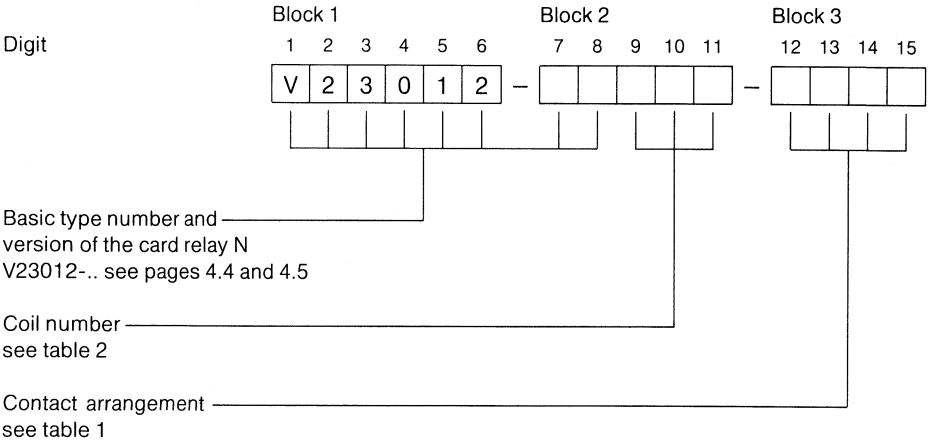
Mounting hole layout
View from the wiring side

Base terminals



Card relay N

Ordering code



Ordering example: V23012-A0105-B001

Card relay N, dust protected, coil 24 V nominal, 2 changeovers, bifurcated contacts, contact material silver, gold flashed.

Preferred standard types

V23012-A0101-A001
-A0101-B001
-A0102-A001
-A0102-B001
-A0102-B004
-A0105-A001
-A0105-A004

V23012-A0105-B001
-A0105-B004
-A0114-A001
-A0114-B001
-A0123-B001
-A0133-A001
-A0133-B001
-A0133-B004

V23012-B0102-B001
-B0105-B001

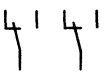
Card relay N

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 2
Nominal power concumption	W	approx. 0.45
Maximum temperature	°C	105[1])
Continuous thermal load at 20 °C ambient temperature	W	1.7
Thermal resistance	K/W	50

Contact side

Order No. block 3	Single contacts		A001	A004
	Bifurcated cont.		B001	B004
Contact material			Silver, gold flashed	Gold F
Contact designation			21 – 21	
Symbols (see also base terminals)				
Max. switching voltage		Vdc Vac	150 125	36 30
Max. switching current		A	2	0.2
Max. power rating dc voltage ac voltage		 W VA	 30 60	 5 5
Max. continuous current		A	2[2])	
General				
Admissible ambient temperature		°C	−40 to +70	
Operate time[3])		ms	approx. 8	
Release time[3])		ms	approx. 6	
Max. switching rate		ops./sec	50	
Test voltage winding/frame contact/contact contact/frame		 V_{rms} V_{rms} V_{rms}	 500 500 500	
Electrical life[4]) dc voltage 12 V, 0.1 A dc voltage 12 V, 1 A dc voltage 24 V, 0.5 A dc voltage 24 V, 1 A dc voltage 24 V, 2 A		 operations operations operations operations operations	 approx. 8×10^7 approx. 2×10^7 approx. 3×10^7 approx. 6×10^6 approx. 0.6×10^6	 — — — — —
Mechanical life		operations	approx. 2×10^8	

[1]) Up to the stage of cleaning the board, the only time the temperature of 70 °C can be exceeded for the card relay N V23012-B... is during the soldering process.
[2]) 1 A up to an ambient temperature of 70 °C; 2 A up to an ambient temperature of 50 °C.
[3]) Measured at nominal voltage without series resistor.
[4]) These values apply for resistive loads or inductive loads with suitable spark suppression.
Obtained at 10 ops/sec.

Table 2 List of coils

Nominal voltage Vdc	Operating voltage range at 20 °C Minimum voltage U_I Vdc	Maximum voltage U_{II} Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
5	3.5	9.2	55 ± 5.5	106
6	4.2	11	81 ± 8	101
12	8.3	22	322 ± 32	102
24	16.8	44	1045 ± 155	105
36	25.2	66	2320 ± 350	114
48	33.5	88	5350 ± 805	133
60	42.0	110	7750 ± 1160	123

The operating voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1.0	1.04	1.085	1.13	1.17	1.21
k_{II}	1.0	0.95	0.88	0.79	0.7	0.6

Card relay P V23015

for dc operation, polarised, bistable

Outstanding features

- Intended primarily for impulse operation
- Low profile, therefore particularly suited for flat pack components grouping
- It corresponds to that of the card relay N in design and size
- Vibration resistance approx. 150 ms^{-2}
- Resistance to shock approx. 150 ms^{-2}

Versions

- Contact arrangement : 2 changeovers
- Single or bifurcated contacts
- Termination: printed circuit
- Protected by a cover against damage
- Dust protected or washable;
  dust protected: transparent cover,
  washable: blue non-transparent cover;
  protection class IP 67 in accordance with DIN
  40050 (IEC 529), sealing of the relay conforms to
  DIN IEC 68, section 2 - 17, tested to group Qc 2 (1 min. testing time).

Note: If at all possible, ultrasonic cleaning methods should not be used unless the manufacturer has been consulted first.

Card relay P

V23015-A0★★★
With 2 changeovers
Single or bifurcated contacts

Dust protected

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid also 2.54 mm grid in accordance with DIN 40801 and DIN 40803, **average**

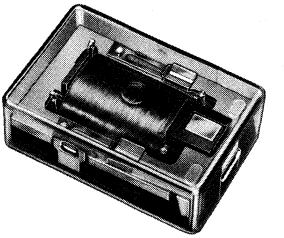
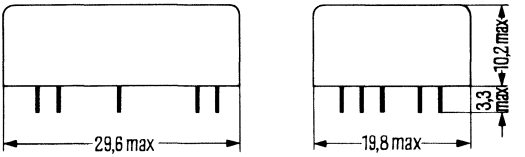
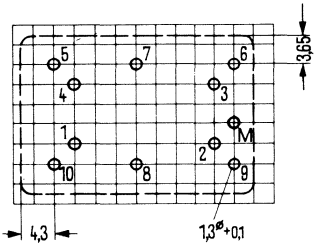


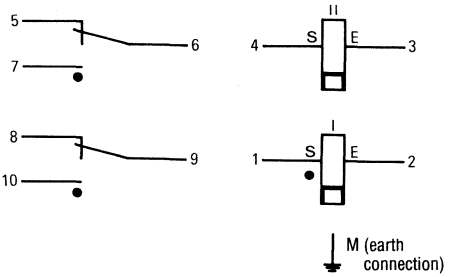
Illustration approx. original size
Approx. weight 12 g





Mounting hole layout
View from the wiring side

Base terminals[1])



Circuit symbols drawn in "Off" position.
If a minus potential is applied to the coil start of winding II, the relay assumes the "Off" position.
If a plus potential is applied to the coil start of winding I, the relay assumes the "On" position.

[1]) Winding I should only be used as the operate winding, winding II as the reverse operate winding, as the assymetric settings are compensated by a different number of turns. In terms of voltage the relay is therefore balanced.

Card relay P

V23015-B0★★★
With 2 changeovers
Single or bifurcated contacts

Washable

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid also 2.54 mm grid in accordance with DIN 40801 and DIN 40803, **fine**

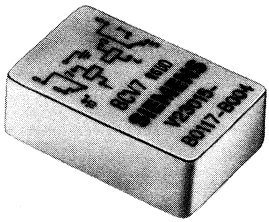
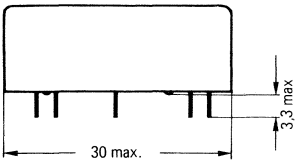
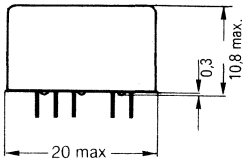
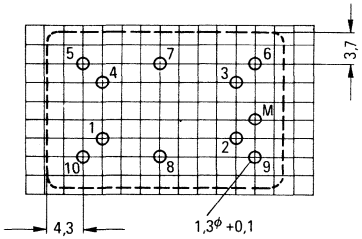


Illustration approx. original size
Approx. weight 12 g



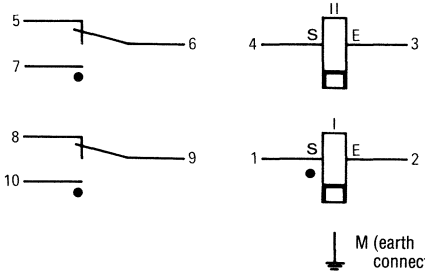




Tolerances between
mounting holes ± 0.2 mm

Mounting hole layout
View from the wiring side

Base terminals[1])

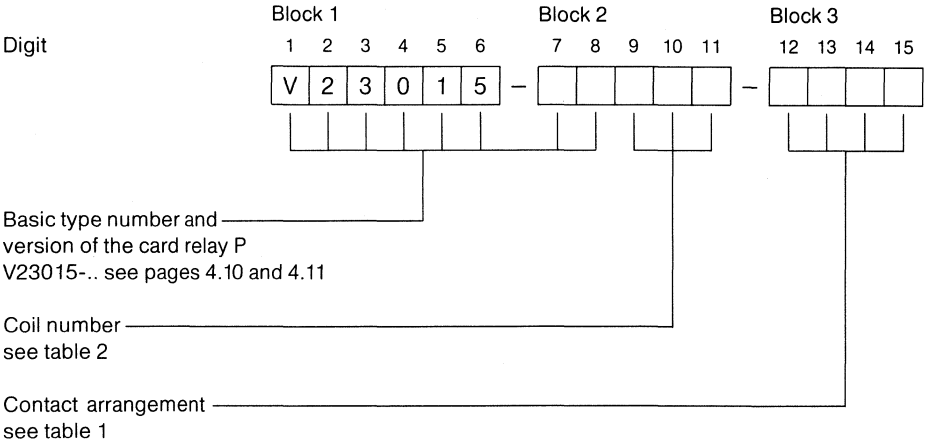


Circuit symbols drawn in "Off" position.
If a minus potential is applied to the coil start of winding II, the relay assumes the "Off" position.
If a plus potential is applied to the coil start of winding I, the relay assumes the "On" position.

[1]) Winding I should only be used as the operate winding, winding II as the reverse operate winding, as the assymetric settings are compensated by a different number of turns. In terms of voltage the relay is therefore balanced.

Card relay P

Ordering code



Ordering example: V23015-A0118-B001

Card relay P ,dust protected, coil 24 V nominal, 2 changeovers, bifurcated contacts, contact material silver, gold flashed.

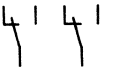
Card relay P

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 2
Nominal power consumpt. per winding	W	approx. 0.6
Maximum temperature	°C	105[1])
Continuous thermal load at 20 °C ambient temperature	W	1.7
Thermal resistance	K/W	50

Contact side

Order No. block 3	Single contacts		A001	A004
	Bifurcated cont.		B001	B004
Contact material			Silver gold flashed	Gold F
Contact designation			21 – 21	
Symbols (see also base terminals)				
Max. switching voltage	Vdc Vac		110 110	36 30
Max. switching current	A		2	0.2
Max. power rating dc voltage ac voltage	 W VA		 30 60	 5 5
Max. continuous current	A		2[2])	

General

Admissible ambient temperature	°C	−25 to +70
Operate time[3])	ms	approx. 8
Reverse operate time[3])	ms	approx. 7
Max. switching rate	ops./sec.	40
Test voltage winding/frame winding/winding contact/contact contact/frame	 V_{rms} V_{rms} V_{rms} V_{rms}	 500 150 500 500
Electrical life[4]) dc voltage 12 V, 1 A dc voltage 24 V, 1 A	 operations operations	 approx. 10^7 approx. 3×10^6
Mechanical life	operations	approx. 10^8

[1]) Up to the stage of cleaning the board, the only time the temperature of 70 °C can be exceeded for the card relay P V 23015–B . . . is during the soldering process.
[2]) 1 A up to an ambient temperature of 70 °C; 2 A up to an ambient temperature of 50 °C.
[3]) Measured at nominal voltage without series resistor.
[4]) These values apply for resistive loads or inductive loads with suitable spark suppression. Obtained at 10 ops./sec.

Table 2 List of coils

Nominal voltage Vdc	Winding	Operating voltage range at 20 °C Minimum voltage U_I Vdc	Operating voltage range at 20 °C Maximum voltage U_{II} Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
6	I	4.5	9.9	62 ± 6	119
	II	4.5	9.9	62 ± 6	
12	I	9	19.8	255 ± 38	117
	II	9	19.8	255 ± 38	
24	I	18	39.6	800 ± 120	118
	II	18	39.6	800 ± 120	
48	I	36	79.5	3950 ± 590	193
	II	36	79.5	3950 ± 590	

Even in pulsed operation, the above value of U_{II} stated in the table must not be exceeded. Only one winding may be operated at any time within the specified voltage range.

The operating voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

Operate (plus at start of coil) – winding I

t_u	–25 °C	–10 °C	0 °C	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1	1	1	1	1.025	1.05	1.075	1.1	1.125
k_{II}	1	1	1	1	0.95	0.88	0.79	0.7	0.59

Reverse operate (minus at start of coil) – winding II

t_u	–25 °C	–10 °C	0 °C	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1.1	1.08	1.06	1	1	1	1	1	1
k_{II}	0.7	0.85	1	1	0.95	0.88	0.79	0.7	0.59

Card relay SN V23030

for dc operation, neutral, monostable

Outstanding features

- Low profile, therefore particularly suited for flat pack components grouping
- Applicable to relays with 1 or 2 changeovers:
  creepage distances and air gaps between contacts and frame > 5 mm or > 10 mm (depending on the size of relay);
  breakdown voltage between contacts and frame 4 kVrms or 6 kVrms.
  Further information on request.
- PTB certificate for safe electrical separation between intrinsically safe and not intrinsically safe circuits.

Versions

- 2 sizes, according to the contact arrangement
- Contact arrangement: 4 or 6 changeovers
- Bifurcated contacts
- Termination: printed circuit
- Cover to give protection against damage
- Dust protected or washable;
  dust protected: transparent cover,
  washable: blue non-transparent cover,
  protection class IP 67 in accordance with DIN 40050 (IEC 529), sealing conforms to DIN IEC 68, section 2 - 17, tested to group Qc 2 (1 min. testing time).

Note: If at all possible, ultrasonic cleaning methods should not be used unless the manufacturer has been consulted first.

Approvals: PTB No. III B/E-28520 U
UL Guide NRNT 2, file No. E48393

Card relay SN

V23030-A1★★★ without earth connection

V23030-A2★★★ with earth connection

With 4 changeovers
Bifurcated contacts

Dust protected

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid also 2.54 mm grid in accordance with DIN 40801 and DIN 40803, **average**

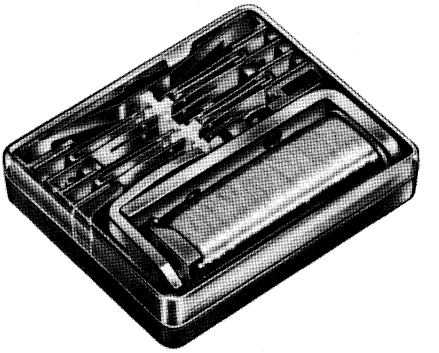
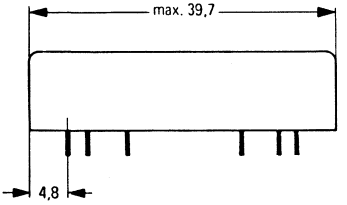
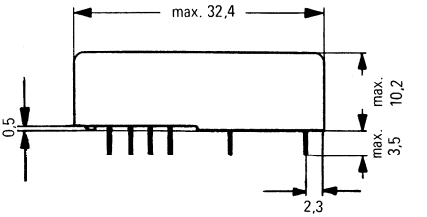
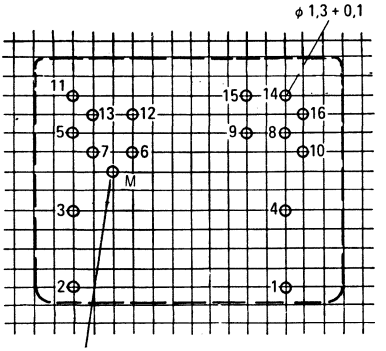


Illustration approx. original size
Approx. weight 12 g



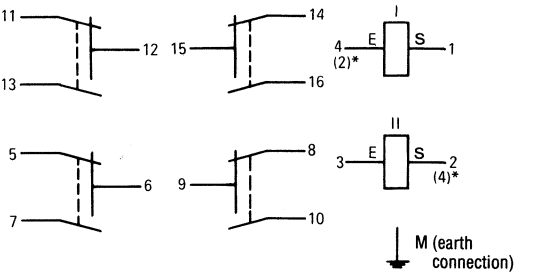




Hole M only required for relays with earth connection

Mounting hole layout
View from the wiring side

Base terminals
(coil with 2 windings on request)



*) Pin numbers in brackets correspond to coils with two windings wound in parallel

Card relay SN

V23030-C1★★★ without earth connection

V23030-C2★★★ with earth connection

With 6 changeovers
Bifurcated contacts

Dust protected

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid also 2.54 mm grid in accordance with DIN 40801 and DIN 40803, **average**

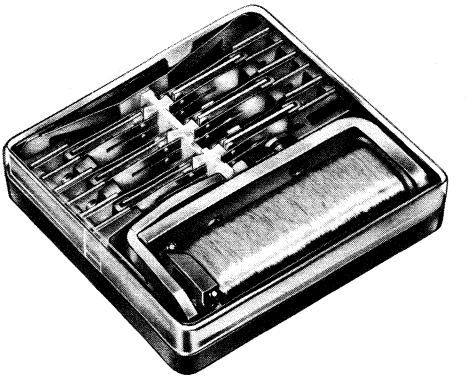
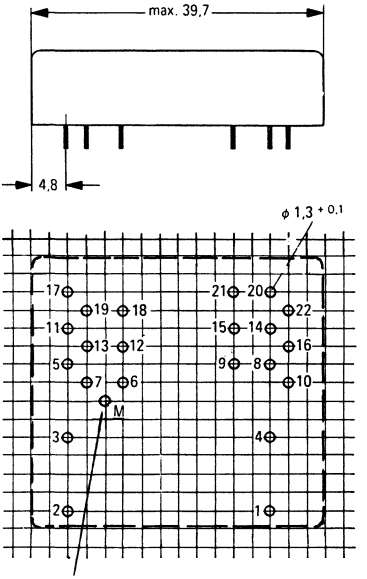
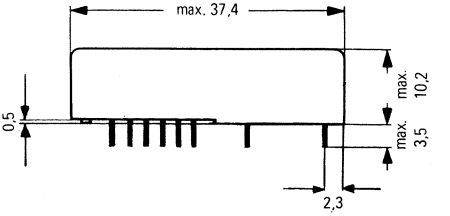


Illustration approx. original size
Approx. weight 30 g

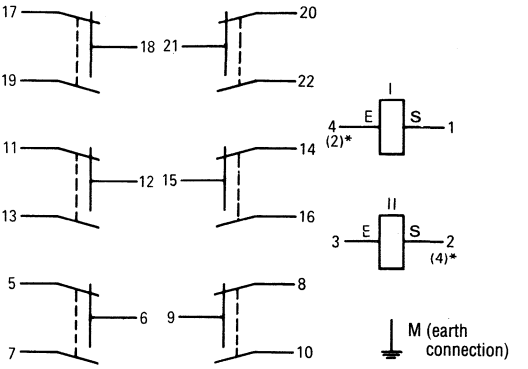


Hole M only required for relays with earth connection

Mounting hole layout
View from the wiring side



Base terminals
(coil with 2 windings on request)



*) Pin numbers in brackets correspond to coils with two windings wound in parallel

Card relay SN

V23030-H1★★★ without earth connection

V23030-H2★★★ with earth connection

With 4 changeovers
Bifurcated contacts

Washable

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid also 2.54 mm grid in accordance with DIN 40801 and DIN 40803, **fine**

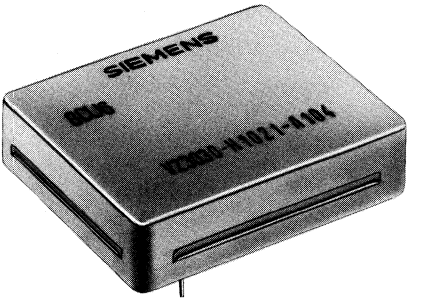
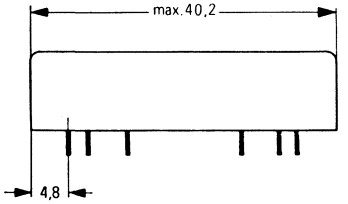
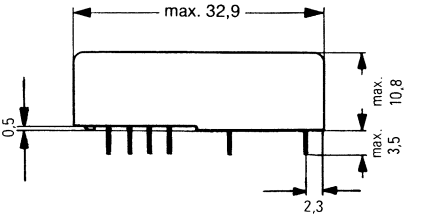
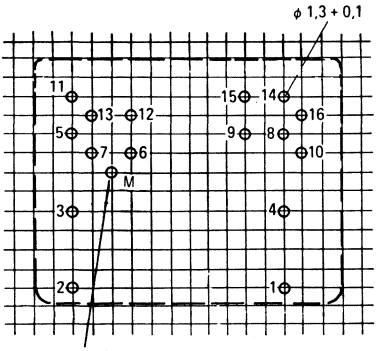


Illustration approx. original size
Approx. weight 25 g



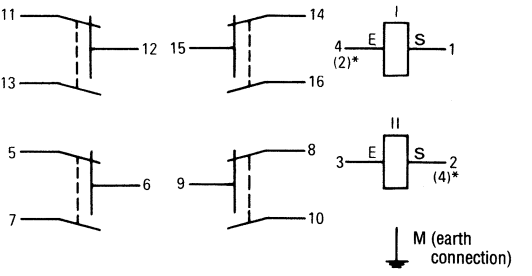




Hole M only required for relays with earth connection

Mounting hole layout
View from the wiring side

Base terminals
(coil with 2 windings on request)



*) Pin numbers in brackets correspond to coils with two windings wound in parallel

Card relay SN

V23030-J1★★★ without earth connection

V23030-J2★★★ with earth connection

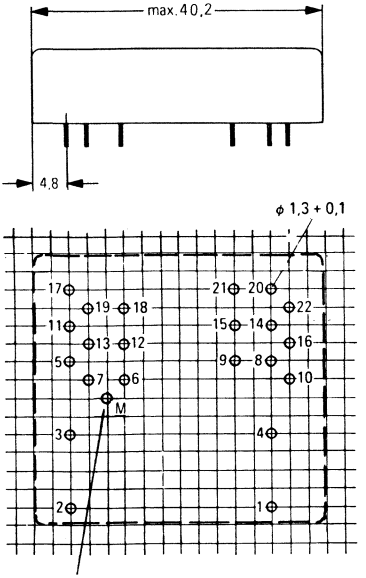
With 6 changeovers
Bifurcated contacts

Washable

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid also 2.54 mm grid in accordance with DIN 40801 and DIN 40803, **fine**

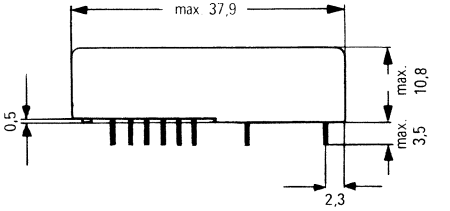
Illustration approx. original size
Approx. weight 30 g

4

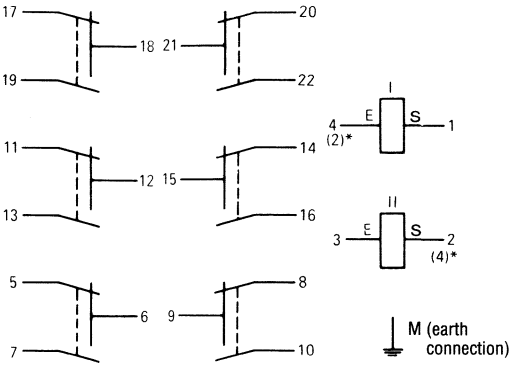


Hole M only required for relays with earth connection

Mounting hole layout
View from the wiring side



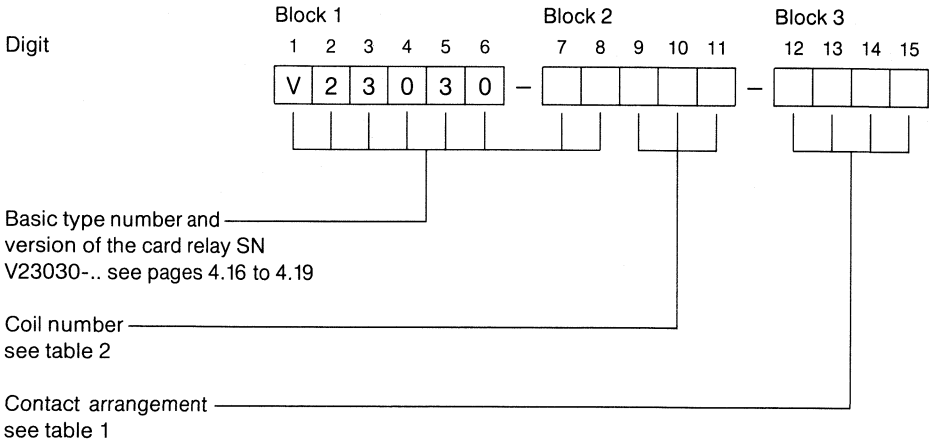
Base terminals
(coil with 2 windings on request)



*) Pin numbers in brackets correspond to coils with two windings wound in parallel

Card relay SN

Ordering code



Ordering example: V23030-H1014-A104

Card relay SN washable, 4 changeovers, without earth connection, coil 60 V nominal, contact material silver, gold flashed.

Preferred standard types

V23030-A1017-A104
-A1021-A104
-A1026-A104

V23030-A2012-A104
-A2014-A104
-A2017-A104
-A2017-A204
-A2021-A104
-A2026-A104

V23030-C1017-A106
-C1021-A106
-C1021-A206
-C1026-A106

V23030-C2012-A106
-C2014-A106
-C2017-A106
-C2017-A206
-C2021-A106

Card relay SN

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 2
Nominal power consumption	W	approx. 0.7
Maximum temperature	°C	110
Continuous thermal load at 20 °C ambient temperature	W	2.5
Thermal resistance	K/W	35

Contact side

Order No. block 3		A104	A106	A204	A206
Contact designation		12-12-12-12	12-12-12 12-12-12	12-12-12-12	12-12-12 12-12-12
Symbols (see also base terminals)					
Contact material		Silver, gold flashed		Gold F	
Max. switching voltage	Vdc Vac	250 250		36 30	
Max. switching current	A	3[1])		0.2	
Max. power rating dc voltage ac voltage	W VA	40 to 75; see fig. 1 (voltage dependent) 100		5 5	
Max. continuous current	A	2[2])			

General

Admissible ambient temperature	°C	−40 to +70
Operate time[3])	ms	approx. 8
Release time[3])	ms	approx. 2
Max. switching rate	ops./sec	30
Test voltage winding/frame contact/contact contact/frame contact/winding	 V_{rms} V_{rms} V_{rms} V_{rms}	 500 1000 1000 1000
Electrical life	operations	see page 4.23 —
Mechanical life	operations	approx. 10^8

[1]) The current of 3 A may flow a maximum of 4 sec. up to 10 % on-time.
[2]) 1 A up to an ambient temperature of 70 °C; 2 A up to an ambient temperature of 50 °C.
[3]) Measured at nominal voltage without series resistor.

Table 2 List of coils

Nominal voltage Vdc	Winding	Operating voltage range at 20 °C: Minimum voltage U_I Version with 4 changeovers Vdc	Minimum voltage U_I Version with 6 changeovers Vdc	Maximum voltage U_{II} Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2.
5	I	3.3	4.0	10.8	38 ± 3.8	032
6	I	3.9	4.6	12.4	50 ± 5	012
12	I	7.8	9.5	24	185 ± 19	017
24	I	15.5	18.5	47	730 ± 73	021
48	I	32	37	88	2700 ± 405	026
60	I	38	45	109	4100 ± 615	014

Coils with two windings on request.

The operating voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

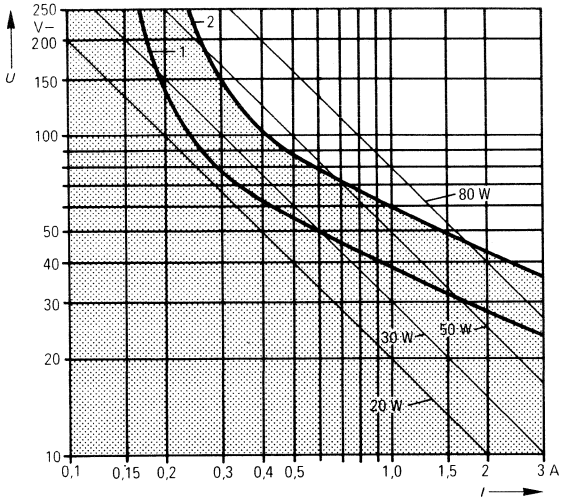
$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1.0	1.04	1.085	1.13	1.17	1.21
k_{II}	1.0	0.93	0.86	0.79	0.7	0.6

Limiing curves for power-load
contact material silver, gold flashed



I = Switching current
U = Switching voltage (dc)
Fig. 1

Curve 1: Arc extinguished within contact transit period (limit curve I).
Maximum 12.5 ops./sec.

Curve 2: Safe breaking, arc extinguished (limit curve II).
Maximum 12.5 ops./sec.

Electrical life
contact material silver, gold flashed

Switching voltage Vdc	Switching current A	Electrical life Operations	Type of load	Life optained at ops./sec.
24	2.4	appr. 1×10^6	resistive	12.5
24	3	appr. 0.3×10^6	resistive	6
30	1.35	appr. 6×10^6	resistive	12.5
40	0.85	appr. 2×10^7	resistive	12.5
60	0.36	appr. 8×10^7	resistive	12.5
110	0.21	appr. 10×10^7	resistive	12.5
24	2.4	appr. 1×10^6	resistive + 100 μH self-inductance*)	12.5
60	0.6	appr. 10×10^6	resistive + 100 μH self-inductance*)	12.5
110	0.24	appr. 40×10^6	resistive + 100 μH self-inductance*)	12.5

*) Self-inductance in accordance with IEC 255-0-20

Card relay SP V23031

for dc operation, polarised, bistable

Outstanding features

- Intended primarily for impulse operation
- Low profile, therefore particularly suited for flat pack components grouping
- PTB certificate for safe electrical separation between intrinsically safe and not intrinsically safe circuits.

Versions

- 2 sizes, according to the contact arrangement
- Contact arrangement: 4 or 6 changeovers
- Bifurcated contacts
- Termination: printed circuits
- Transparent cover to give protection against damage and dust

Approval: PTB No. III B/E-28520 U

Card relay SP

V23031-A1★★★ without earth connection

V23031-A2★★★ with earth connection

With 4 changeovers
Bifurcated contacts

Dust protected

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid also 2.54 mm grid in accordance with DIN 40801 and DIN 40803, average

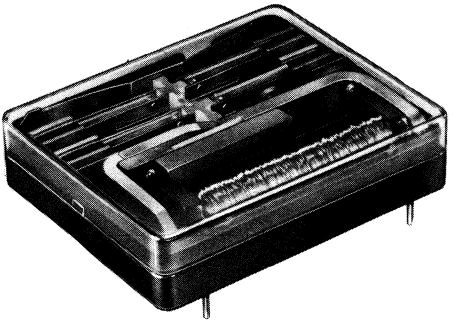
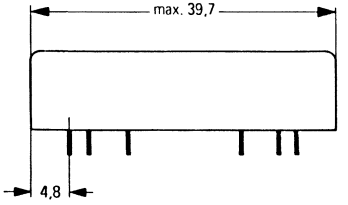
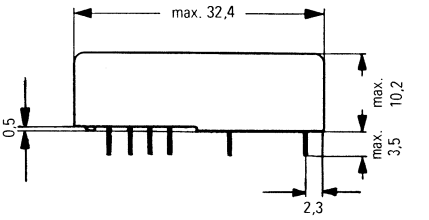
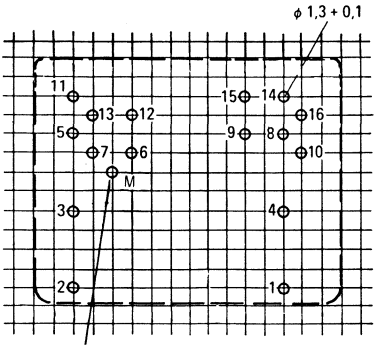


Illustration approx. original size
Approx. weight 25 g



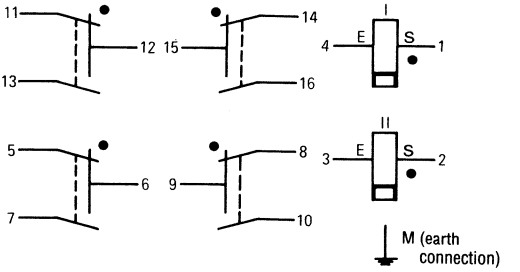




Hole M only required for relays with earth connection

Mounting hole layout.
View from the wiring side

Base terminals



Circuit symbols drawn in "Off" position.
If a plus potential is applied to the coil start, the relay assumes the "Off" position.

Card relay SP

V23031-C1★★★ without earth connection

V23031-C2★★★ with earth connection

With 6 changeovers
Bifurcated contacts

Dust protected

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid also 2.54 mm grid in accordance with DIN 40801 and DIN 40803, average

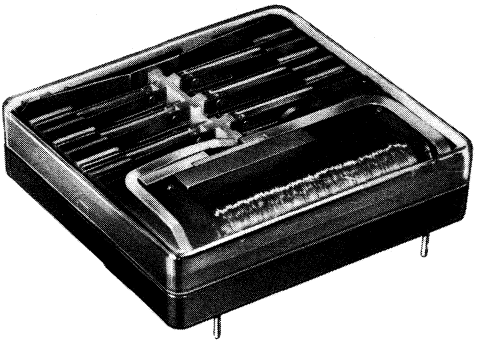
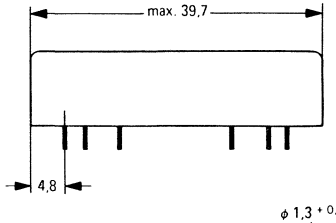
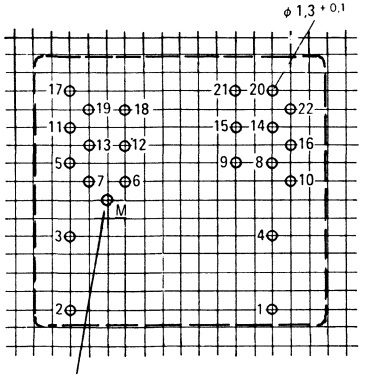


Illustration approx. original size
Approx. weight 30 g

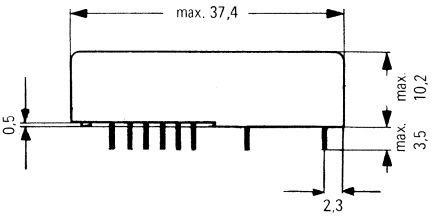
4



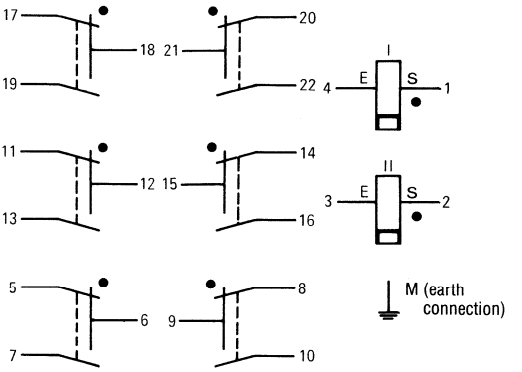


Hole M only required for relays with earth connection

Mounting hole layout
View from the wiring side



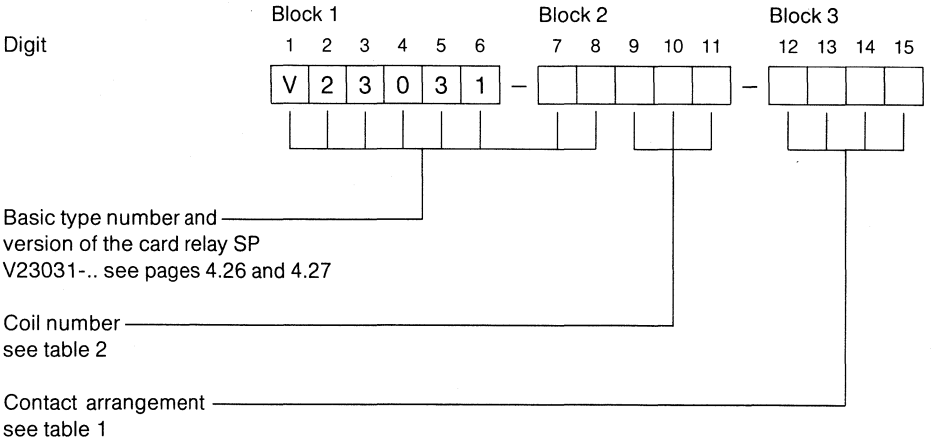
Base terminals



Circuit symbols drawn in "Off" position.
If a plus potential is applied to the coil start, the relay assumes the "Off" position.

Card relay SP

Ordering code



Ordering example: V23031-A1014-A104

Card relay SP with 4 changeovers, without earth connection, coil 60 V nominal, contact material silver, gold flashed.

Card relay SP

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 2
Nom. power consumpt. per wind.	W	approx. 1.5
Maximum temperature	°C	110
Continuous thermal load at 20 °C ambient temperature	W	2.2
Thermal resistance	K/W	40

Contact side

Order No. block 3		A104	A106	A204	A206
Contact designation		12-12-12-12	12-12-12 12-12-12	12-12-12-12	12-12-12 12-12-12
Symbols (see also base terminals)					
Contact material		Silver, gold flashed		Gold F	
Max. switching voltage	Vdc Vac	250 250		36 30	
Max. switching current	A	3[1])		0.2	
Max. power rating dc voltage ac voltage	 W VA	 40 to 75, see fig. 1 (voltage dependent) 100		 5 5	
Maximum continuous current	A	2[2])			

General

Admissible ambient temperature	°C	−40 to +70
Operate time[3])	ms	approx. 7
Reverse operate time[3])	ms	approx. 6
Maximum switching rate	ops./sec	40
Test voltage winding/frame winding/winding contact/contact contact/frame contact/winding	 V_{rms} V_{rms} V_{rms} V_{rms} V_{rms}	 500 500 1000 1000 1000
Mechanical life	operations	approx. 10^7

[1]) The current of 3 A may flow for a maximum of 4 sec. up to 10 % on-time.
[2]) 1 A up to an ambient temperature of 70 °C; 2 A up to an ambient temperature of 50 °C.
[3]) Measured at nominal voltage without series resistor.

Table 2 List of coils

Nominal voltage Vdc	Winding	Operating voltage range at 20 °C Minimum voltage U_I Vdc	Maximum voltage U_{II} Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
6	I	4.3	8.3	26 ± 3.0	011
	II	4.3	8.3	26 ± 3.0	
12	I	8.2	16	93 ± 9.5	012
	II	8.2	16	93 ± 9.5	
24	I	17	32	380 ± 38	015
	II	17	32	380 ± 38	
48	I	35	61	1450 ± 220	034
	II	35	61	1450 ± 220	
60	I	44.3	76	2300 ± 345	014
	II	44.3	76	2300 ± 345	

Only one winding may be operated at any time within the specified voltage range.

The operating voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

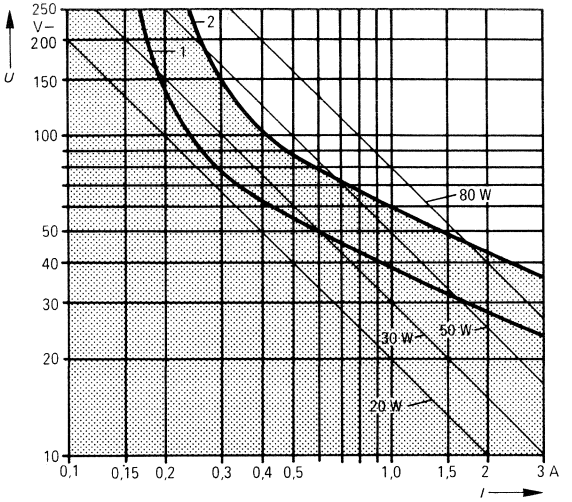
$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1.0	1.04	1.085	1.13	1.17	1.21
k_{II}	1.0	0.93	0.86	0.79	0.7	0.6

Limiting curves for power load
contact material silver, gold flashed



I = Switching current
U = Switching voltage (dc)
Fig. 1

Curve 1: Arc extinguished within contact transit period (limit curve I).
Maximum 12.5 ops./sec.

Curve 2: Safe breaking, arc extinguished, (limit curve II).
Maximum 12.5 ops./sec.

Card relay SP

Instructions for impulse operations

The card relay SP is intended primarily for impulse operation.
The maximum voltage stated in table 2 can be increased for impulsed operation as follows:

$U_{II\ impulse} = U_{II\ tu} \cdot q$

$U_{II\ tu}$ = Max. continuous voltage at ambient temperature t_u
q = Factor

The pulse voltage must not exceed 80 % of the test voltage (winding/frame or winding/winding) or not to exceed the max. voltage as listed in table 2 by no more than 1.5 fold.

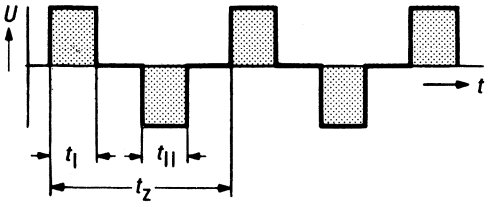
If $t_{ED} \leq 3$ sec. then $q = \sqrt{\frac{t_Z}{t_{ED}}}$

t_{ED} = pulse width
t_Z = cycle time

If $t_{ED} > 3$ sec. the value of q must be obtained from the nomograph on page 3.14.

Examples of various periodic pulse trains (energizing side).

1. Periodic recurrence of one energizing pulse

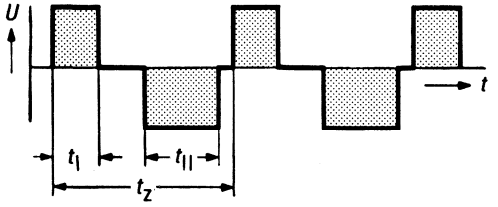


$t_{ED} = t_I + t_{II}$

t_I is the pulse width of the positive pulse on the start of the winding.

t_{II} is the pulse width of the negative pulse on the start of the winding.

2. Periodic recurrence of two unequal energizing pulses



t_I and t_{II} = are the pulse widths within one cycle.

Card relay E V23127, V23057

for dc operation, neutral, monostable

Outstanding features

- Used as switching element for electrical separation of low voltage control circuits from heavy current load circuits
- High switching capabilities for its small size
- The mechanical and electrical characteristics conform to the »Regulations for electrical relays in heavy current circuits« (VDE 0435/9.72) and the »Safe electrical separation of telecommunication and heavy current circuits« (VDE 0804)
- Specifications for thermostatic regulators and temperature limiting controllers in accordance with VDE 0631 and the »Safety regulations for mains operated electronic domestic appliances and related equipment« VDE 0860 (DIN IEC 65) are met
- Conforming to the relevant regulations for use in domestic appliances (VDE 0700 or VDE 0730) e. g. leakage current stability of the housing in accordance with CTI 175 (DIN IEC 112)
- Air gaps and creepage distances of $\geqslant$ 4 mm (make and changeover) or $\geqslant$ 8 mm (make and break)

Versions

- Flat or vertical mounting
- Contact arrangement: 1 make, 1 break or 1 changeover
- Single or bifurcated contacts with 1 changeover
- Termination: printed circuits
- Covered to give protection against damage
- Dust protected or washable;
  dust protected: transparent cover,
  washable: non-transparent cover,
  protection class IP 67 in accordance with DIN 40050 (IEC 529),
  sealing conforms to DIN IEC 68, section 2 - 17, tested to group Qc 2 (1 min. testing time)

Note: If at all possible, ultrasonic cleaning methods should not be used unless the manufacturer has been consulted first.

Approvals:

VDE	0435/09.72 – Certificate for monitoring of manufacturing – monogram	204 and 1573
PTB	Ex-86/2049 U	
SEMKO	8419106, ...107, ...109 and ...110 8513171 and ...172 8403028 and ...029 8401096	
SEV	D7.91/496 and D7.91/450	
CSA	File 50227, class 3211	
UL	Guide NRNT 2, file E 48393	

Card relay E

V23127-A0★★★ with air gaps and creepage distances > 4 mm*)
With 1 changeover,
with single or bifurcated contacts
or
with 1 make,
with single contacts

V23127-C0★★★ with air gaps and creepage distances > 8 mm*)
With 1 make or 1 break,
with single contacts

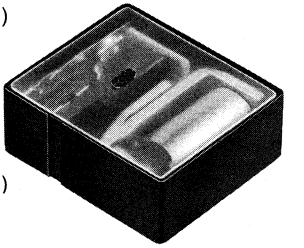
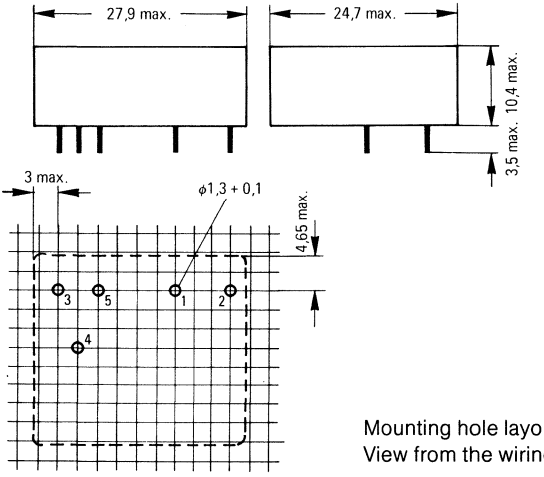


Illustration approx. original size
Approx. weight 12 g

Flat mounting

Dust protected

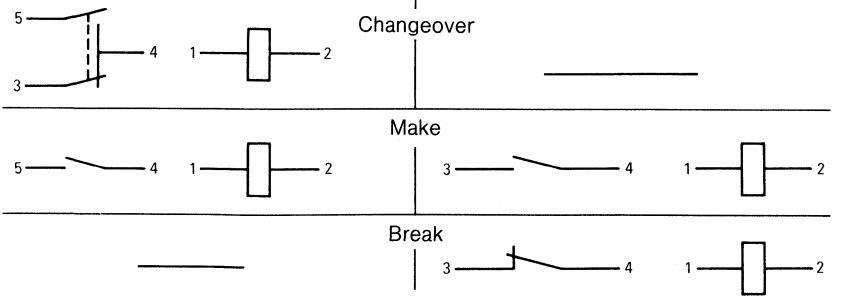
For direct mounting into printed circuits,
pin arrangement for 2.5 mm grid also 2.54 mm
grid in accordance with DIN 40801 and DIN 40803, **average**



Mounting hole layout
View from the wiring side

Base terminals
for V23127-A0...

for V23127-C0...



*) Between winding and contacts

Card relay E

V23127-B0★★★ with air gaps and creepage distances > 4 mm*)
With 1 changeover,
with single or bifurcated contacts
or
with 1 make,
with single contacts

V23127-D0★★★ with air gaps and creepage distances > 8 mm*)
With 1 make or 1 break,
with single contacts

Vertical mounting

Dust protected

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid also 2.54 mm grid in accordance with DIN 40801 and DIN 40803, **average**

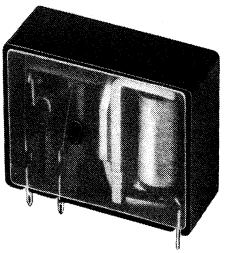
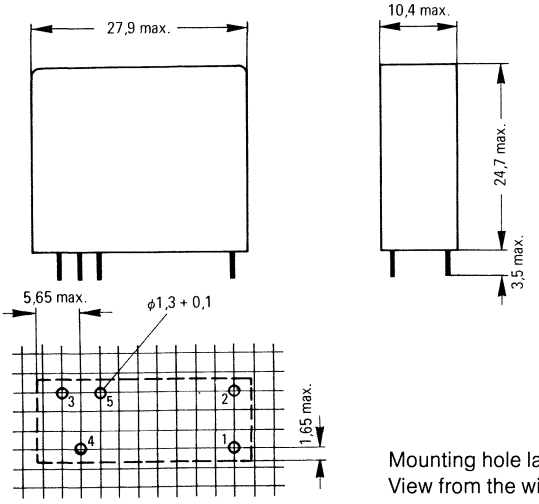


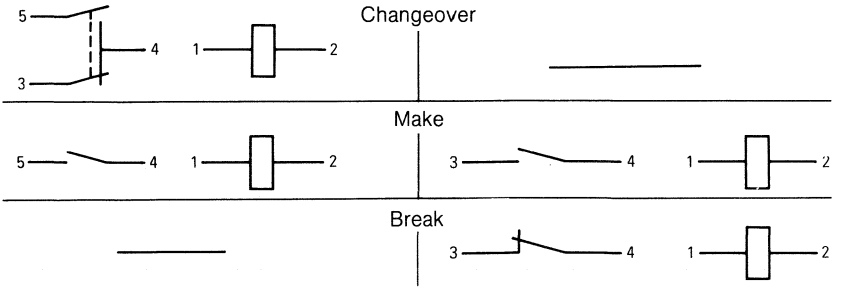
Illustration approx. original size
Approx. weight 12 g

4



Mounting hole layout
View from the wiring side

Base terminals
for V23127-B0...



*) Between winding and contacts

Card relay E

V23057-A0★★★ with air gaps and creepage distances > 4 mm*)
With 1 changeover,
with single or bifurcated contacts
or
with 1 make,
with single contacts

V23057-C0★★★ with air gaps and creepage distances > 8 mm*)
With 1 make or 1 break,
with single contacts

Flat mounting
Washable
For direct mounting into printed circuits, pin arrangement for 2.5 mm grid also 2.54 mm grid in accordance with DIN 40801 and DIN 40803, **fine**

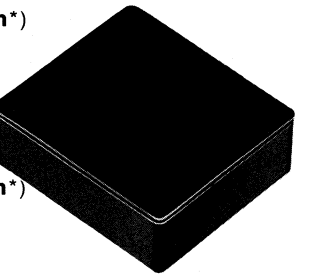
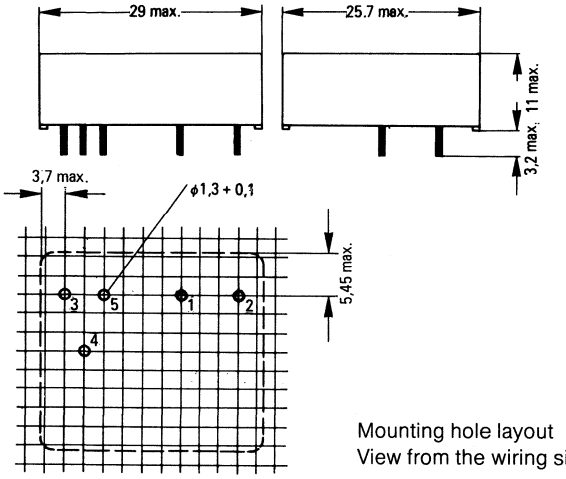
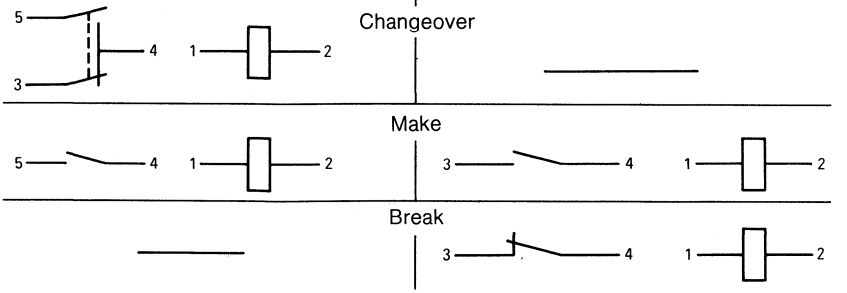


Illustration approx. original size
Approx. weight 20 g



Mounting hole layout
View from the wiring side

Base terminals
for V23057-A0...



*) Between winding and contacts

Card relay E

V23057-B0★★★ with air gaps and creepage distances > 4 mm*)
With 1 changeover,
with single or bifurcated contacts
or
with 1 make,
with single contacts

V23057-D0★★★ with air gaps and creepage distances > 8 mm *)
With 1 make or 1 break,
with single contacts

Vertical mounting
Washable
For direct mounting into printed circuits, pin arrangement for 2.5 mm grid also 2.54 mm grid in accordance with DIN 40801 and DIN 40803, **fine**

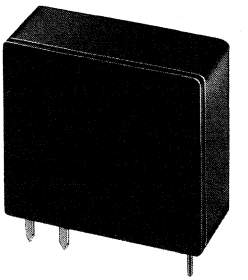
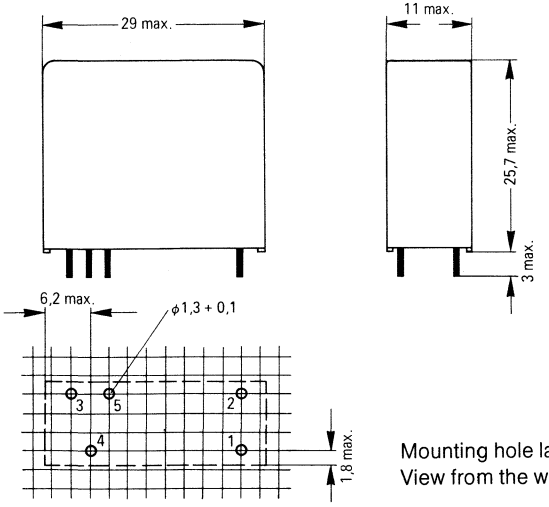


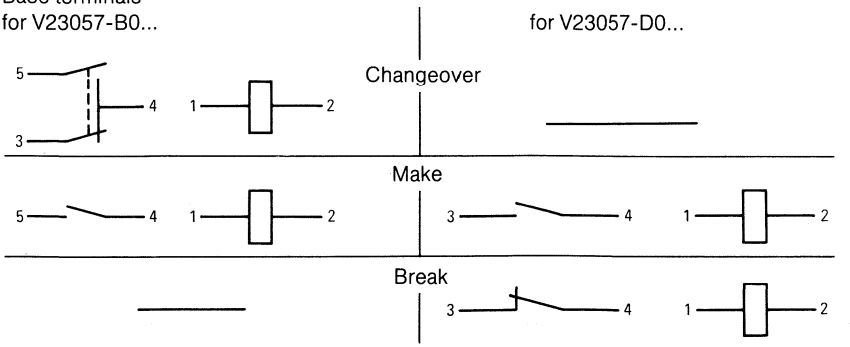
Illustration approx. original size
Approx. weight 20 g



Mounting hole layout
View from the wiring side

Base terminals
for V23057-B0...

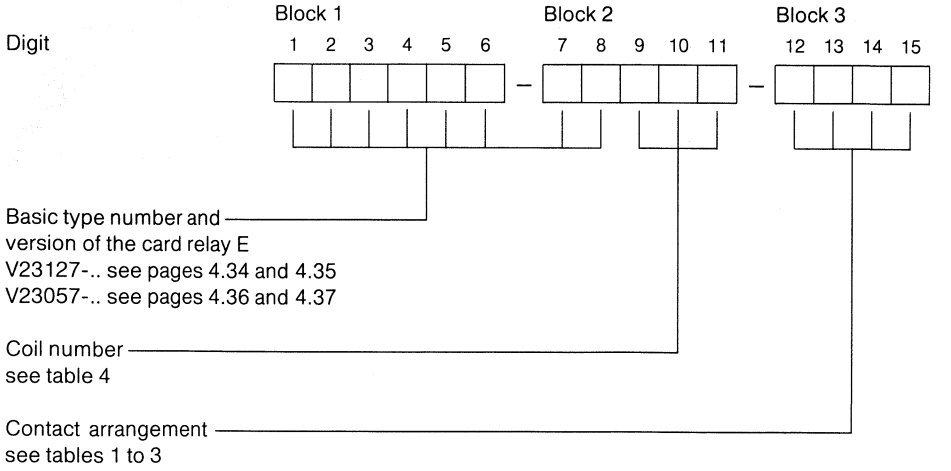
for V23057-D0...



*) Between winding and contacts

Card relay E

Ordering code



Ordering example: V23127-D0002-A102

Card relay E for vertical mounting, dust protected, with air gaps and creepage distances of ⩾ 8 mm between winding and contacts, coil 12 V nominal, 1 make, single contacts, contact material silver, gold flashed.

Preferred standard types

V23057-A0001-A101
-A0002-A101
-A0006-A101

V23057-B0002-A101
-B0006-A101

V23127-A0001-A101
-A0001-A201
-A0002-A101
-A0002-A102
-A0002-A201
-A0002-A401
-A0002-B101

V23127-A0006-A101
-A0006-A102
-A0006-A201
-A0006-A401
-A0006-B101
-A0013-A101
-A0023-A101

V23127-B0001-A101
-B0001-A102
-B0002-A101
-B0002-A201
-B0002-A202
-B0002-A401
-B0002-B101

V23127-B0006-A101
-B0006-A102
-B0006-A201
-B0006-A401
-B0006-B101
-B0013-A101
-B0023-A101

V23127-D0006-A402

Table 1 Characteristics for V23127-A0.../-B0... and V23057-A0.../-B0... with single contacts

Energising side

Operating voltages	Vdc	see table 4
Nominal power consumption	W	approx. 0.45
Maximum temperature	°C	115
Continuous thermal load at 20 °C ambient temperature	W	1.2
Thermal resistance	K/W	75

Contact side

Order No. block 3		A101	A201	A401	A102	A202	A402
Contact material		Silver, gold flashed	Silver, nickel	Silver-cadmium oxide	Silver, gold flashed	Silver, nickel	Silver, cadmium oxide
Contact designation		12			1		
Symbols (see also base terminals)							
Maximum switching voltage to VDE 0110 group C	Vdc Vac	300 250					
Max. switching current	A	5/15[1])	8/15[1])		5/15[1])	8/15[1])	
Max. power rating[2]) dc voltage	W W W W	50 to 330 see fig. 1 (voltage dependent)	up to 24 V : 100 30 V : 80 200 V : 30 250 V : 50	35 to 330 see fig. 1 (voltage dependent)	50 to 330 see fig. 1 (voltage dependent)	up to 24 V : 100 30 V : 80 200 V : 30 250 V : 50	35 to 330 see fig. 1 (voltage dependent)
ac voltage	VA	1250	2000		1250	2000	
Max. continuous current	A	8					

General

Admissible ambient temperature	°C	−40 to +70
Operate time[3])	ms	approx. 6
Release time[3])	ms	approx. 4
Maximum switching rate	ops./sec	20
Test voltage contact/winding	V_{rms}	4000
Electrical life	operations	see pages 4.44 and 4.45
Mechanical life	operations	approx. 2×10^7

[1]) The current of 15 A may flow for a maximum of 4 sec. up to 10 % on time.
[2]) These values apply for resistive loads or inductive loads with suitable spark suppression.
[3]) Measured at nominal voltage without series resistor.

Card relay E

Table 2 Characteristics for V23127-A0.../-B0... and V23057-A0.../-B0... with bifurcated contacts

Energising side

Operating voltages	Vdc	see table 4
Nominal power consumption	W	approx. 0.45
Maximum temperature	°C	115
Continuous thermal load at 20 °C ambient temperature	W	1.2
Thermal resistance	K/W	75

Contact side

Order No. block 3		B101	B601
Contact material		Silver, gold flashed	Gold F
Contact designation		12	
Symbols (see also base terminals)			
Maximum switching voltage to VDE 0110 group C	Vdc Vac	300 250	36 30
Max. switching current	A	4/10[1])	0.2
Max. power rating with dc voltage	W	see fig. 2[2]) (voltage dependant)	5
with ac voltage	VA	500	—
Max. continuous current	A	6	2

General

Admissible ambient temperature	°C	−40 to +70
Operate time[3])	ms	approx. 6
Release time[3])	ms	approx. 4
Maximum switching rate	ops./sec.	20
Test voltage contact/winding	V_{rms}	4000
Electrical life[2])	operations	s. pages 4.44 and 4.45 —
Mechanical life	operations	approx. 2×10^7

[1]) The current of 10 A may flow for a maximum of 4 sec. up to 10 % on time.
[2]) These values apply for resistive loads or inductive loads with suitable spark suppression, obtained at 1 ops./sec.
[3]) Measured at nominal voltage without series resistor.

Table 3 Characteristics for V23127-C0.../-D0... and V23057-C0.../-D0...

Energising side

Operating voltages	Vdc	see table 4
Nominal power consumption	W	approx. 0.45
Maximum temperature	°C	115
Continuous thermal load at 20 °C ambient temperature	W	1.2
Thermal resistance	K/W	75

Contact side

Order No. block 3		A102	A202	A402	A103	A203	A403
Contact material		Silver, gold flashed	Silver, nickel	Silver-cadmium oxide	Silver, gold flashed	Silver, nickel	Silver-cadmium oxide
Contact designation		1			2		
Symbols (see also base terminals)							
Maximum switching voltage to VDE 0110 group C	Vdc Vac	300 250					
Max. switching current	A	5/15[1])	8/15[1])		5/15[1])	8/15[1])	
Max. power rating[2]) dc voltage	W W W W	50 to 330 see fig. 1 (voltage dependent)	up to 24 V : 100 30 V : 80 200 V : 30 250 V : 50	35 to 330 see fig. 1 (voltage dependent)	50 to 330 see fig. 1 (voltage dependent)	up to 24 V : 100 30 V : 80 200 V : 30 250 V : 50	35 to 330 see fig. 1 (voltage dependent)
ac voltage	VA	1250	2000		1250	2000	
Max. continuous current	A	8					

General

Admissible ambient temperature	°C	−40 to +70	
Operate time[3])	ms	approx. 7	approx. 6
Release time[3])	ms	approx. 3	approx. 4
Maximum switching rate	ops./sec	20	
Test voltage contact/winding	V_{rms}	4000	
Electrical life	operations	see page 4.44	
Mechanical life	operations	approx. 2×10^7	

[1]) The current of 15 A may flow for a maximum of 4 sec. up to 10 % one time.
[2]) These values apply for resistive loads or inductive loads with suitable spark suppression.
[3]) Measured at nominal voltage without series resistor.

Table 4 List of coils

Nominal voltage Vdc	Operating voltage range at 20 °C Minimum voltage U_I Vdc	Maximum voltage U_{II} Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
5	3.5	9	57 ± 5.7	017
6	4.2	10.6	80 ± 8	001
12	8.3	21.5	330 ± 33	002
24	16.8	40	1200 ± 180	006
48	33.6	79	4700 ± 700	013
60	42	98	7200 ± 1080	023

The operating voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1.0	1.04	1.085	1.13	1.17	1.21.
k_{II}	1.0	0.94	0.88	0.82	0.75	0.68

Card relay E

Limiting curves for power load
for relays with single contacts

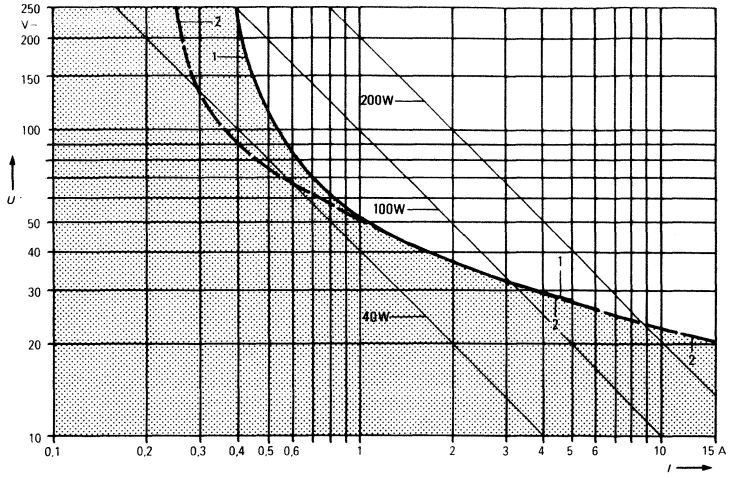


Fig. 1

for relays with bifurcated contacts

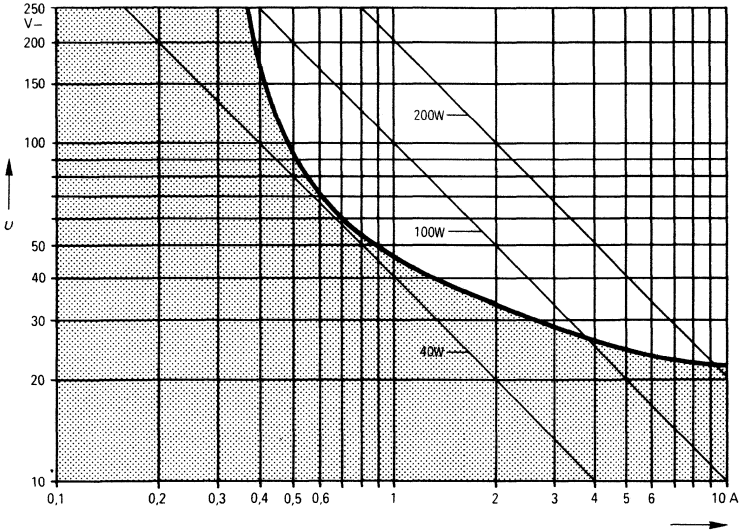


Fig. 2

I = Switching current
U = Switching voltage (dc)

Curves: Safe breaking, arc extinguished (limit curve II).
Maximum 12.5 ops./sec.

Curve 1 ————Contact material
silver, gold flashed

Curve 2 — — — —Contact material
silver-cadmium-oxide

Card relay E

Electrical life

Switching voltage 220 Vac

Type of load: resistive
Life obtained at 1 ops./sec.

for V23127-A0.../-B0... and
V23057-A0.../-B0... with
single contacts

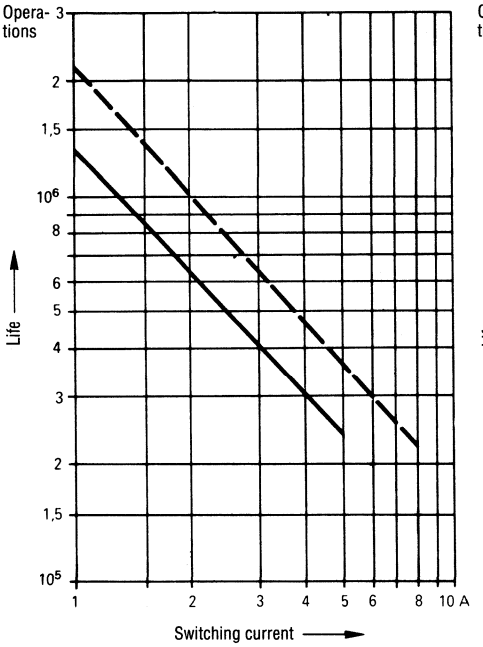


Fig. 3

for V23127-C0.../-D0... and
V23057-C0.../-D0...

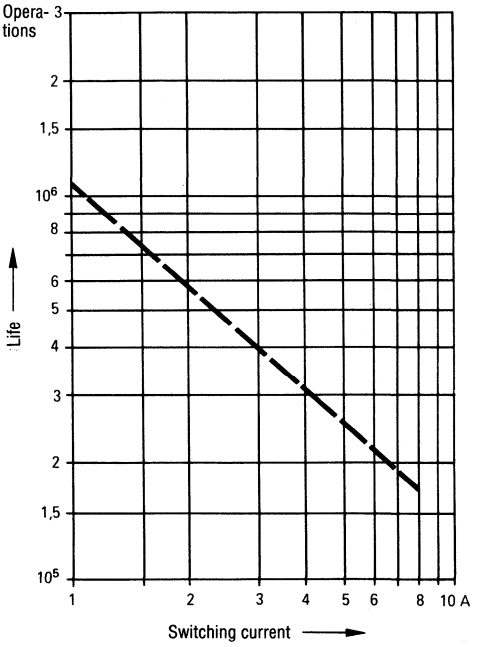


Fig. 4

—— Contact material
silver, gold flashed

– – – Contact material
silver-cadmium-oxide

Card relay E

Electrical life

Individual values

for V23127-A0.../-B0... and V23057-A0.../-B0...,
contact material silver, gold flashed

Switching voltage V	Switching current A	Electrical life (standard values) operations	Type of load	Life obtained at ops./sec.
24dc	8	0.5×10^6	resistive	1
30dc	4	2×10^6	resistive	1
60dc	0.8	4×10^6	resistive	1
250dc	0.4	6×10^6	resistive	1
24dc	0.5	10^6	inductive τ = 40 ms	0.1
24dc	1.0	2×10^5	inductive τ = 40 ms	0.1
48dc	0.5	2×10^5	inductive τ = 40 ms	0.1
48dc	0.2	10^6	inductive τ = 40 ms	0.1
220ac	1	5×10^5	inductive cos φ = 0.4	0.1
220ac	0.5	2×10^6	inductive cos φ = 0.4	0.1
220ac	0.4	4×10^6	inductive cos φ = 0.4	0.1
220ac	0.1	8×10^6	inductive cos φ = 0.4	0.1

Card relay R

V23039

Remanent relay, bistable

Outstanding features

- For impulse operation
- High switching capabilities for its small size
- It corresponds to that of the card relay E in size, contact arrangement and switching capabilities
- Practical design meets the »Safe electrical separation of telecommunication and heavy current circuits« (VDE 0804)
- Mechanical and electrical characteristics conform to the »Regulations for electrical relays in heavy current circuits« (VDE 0435/9.72)
- Air gaps and creepage distances $\geqslant$ 4 mm
- Vibration resistance 200 ms^{-2}
- Resistance to shock 500 ms^{-2}

Versions

- Flat or vertical mounting
- Contact arrangement: 1 make or 1 changeover
- Termination: printed circuit
- Transparent cover to give protection against damage and dust

Card relay R

V23039-A0★★★

Flat mounting

With 1 make or 1 changeover

Dust protected

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid also 2.54 mm grid in accordance with DIN 40801 and DIN 40803, average

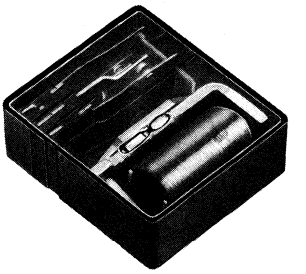
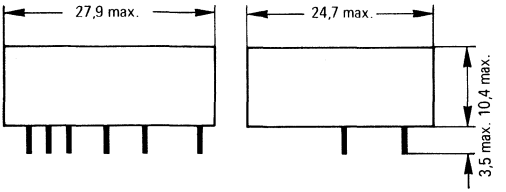
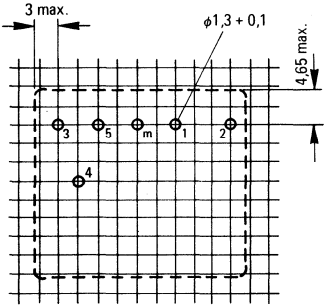


Illustration approx. original size
Approx. weight 12 g

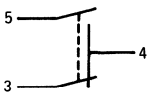




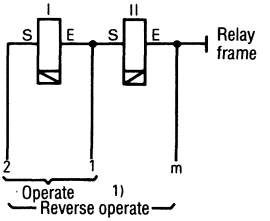
Mounting hole layout
View from the wiring side

Base terminals

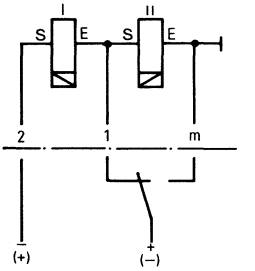
Changeover



or
make



Wiring example



Circuit symbols drawn in "Off" position (armature released).

[1]) see also footnote under table 2

Card relay R

V23039-B2★★★

Vertical mounting

With 1 make or 1 changeover

Dust protected

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid also 2.54 mm grid in accordance with DIN 40801 and DIN 40803, average

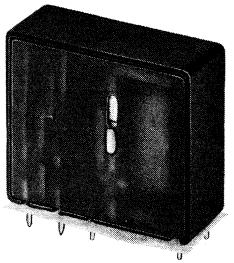
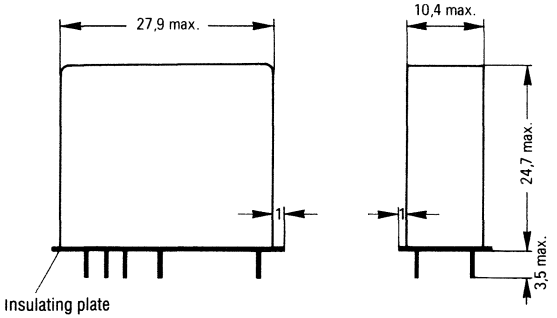
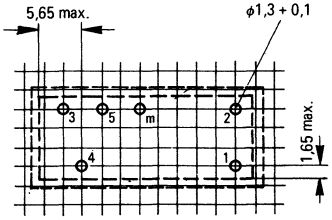


Illustration approx. original size
Approx. weight 12 g

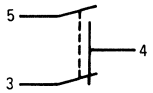




Mounting hole layout
View from the wiring side

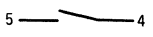
Base terminals

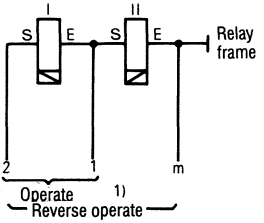
Changeover



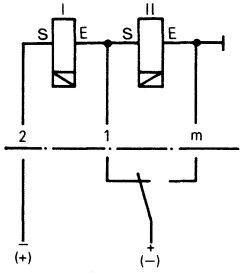
or

make





Wiring example

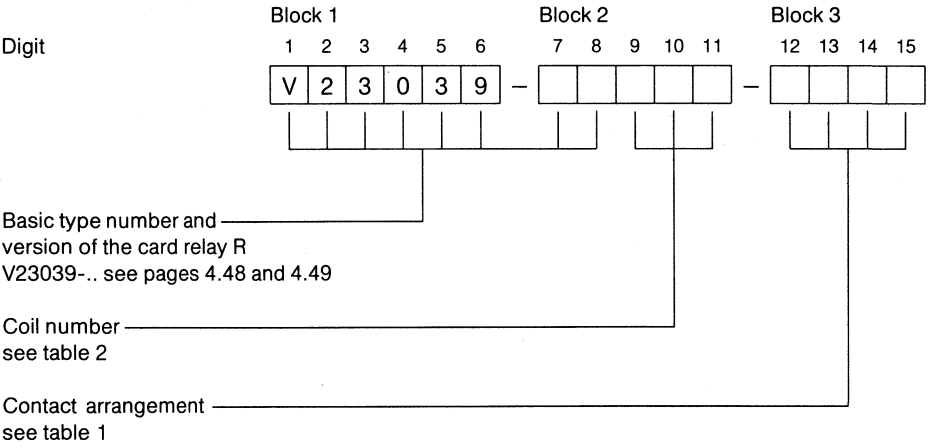


Circuit symbols drawn in "Off" position (armature released)

[1]) see also footnote under table 2

Card relay R

Ordering code



Ordering example: V23039-B2002-A101

Card relay R for vertical mounting, coil 12 V nominal, 1 changeover, contact material silver, gold flashed

Card relay R

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 2
Nominal power consumption at: operate reverse operate	 W W	 approx. 3 approx. 0.9
Maximum temperature	°C	115
Continuous thermal load at 20 °C ambient temperature	W	1.2
Thermal resistance	K/W	70

Contact side

Order No. block 3		A101	A401	A102	A402
Contact material		Silver, gold flashed	Silver-cadmium oxide	Silver, gold flashed	Silver-cadmium oxide
Contact designation		12		1	
Symbols (see also base terminals)					
Maximum switching voltage to VDE 0110 group C	Vdc Vac	300 250			
Max. switching current	A	5/15[1])	8/15[1])	5/15[1])	8/15[1])
Max. power rating[2]) dc voltage	W	50 to 330 see fig. 2 (voltage dependent)	35 to 330 see fig. 2 (voltage dependent)	50 to 330 see fig. 2 (voltage dependent)	35 to 330 see fig. 2 (voltage dependent)
ac voltage	VA	1250	2000	1250	2000
Max. continuous current	A	8			

General

Admissible ambient temperature	°C	−40 to +70
Pulse duration	Sec.	0.01 to 20
Relative pulse width (max.)	%	20
Test voltage contact/winding	V_{rms}	2500
Electrical life	operations	see page 4.54
Mechanical life	operations	approx. 2 x 10^7

see also pages 4.52 and 4.53

[1]) The current of 15 A may flow for a maximum of 4 sec. up to 10 % on time.
[2]) These values apply for resistive loads or inductive loads with suitable spark suppression.

Table 2 List of coils

Nominal voltage Vdc	Winding	Operating voltage range at 20 °C Minimum voltage U_I Vdc	Maximum voltage U_{II} Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
6	I	4.2	11.8	12 ± 1.5	001
	II	4.2	11.8	23 ± 2.5	
12	I	8.5	24.9	53 ± 5.5	002
	II	8.5	24.9	104 ± 10	
24	I	17.1	48.8	204 ± 20	006
	II	17.1	48.8	400 ± 40	
48	I	33.6	85.4	660 ± 100	014
	II	33.6	85.4	1250 ± 190	
60	I	42.4	107.2	1040 ± 160	024
	II	42.4	107.2	1980 ± 300	

Winding I should be used as the operate winding. As the reverse operation requires the same energising voltage as operating, but less ampere turns, the winding I and II is connected in series and wound in the opposite direction to generate counter-energisation.

The operating voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	≤ 20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1.0	1.04	1.07	1.12	1.16	1.19
k_{II}	1.0	0.94	0.88	0.81	0.75	0.66

The voltage range stated applies for pulse durations up to 3 sec. (Explanation see next page).

Card relay R

Instructions for impulse operation

The card relay R is intended primarily for impulse operation.

The operating voltages U_I, U_{II} and the factors k_I, k_{II} are based on a symmetrical impulse operation in accordance with fig. 1 and the following applies:

$t_1 = t_2$ and $t_3 = t_4$, also applicable:

$t_1 = t_2 \leq 3$ s and $100 \cdot \frac{t_1 + t_2}{t_z} \leq 20\,\%$ relative pulse width

For pulse width above 3 sec., the maximum voltage must not exceed 1.1 times the nominal voltage (up to 70 °C_{tu}).

Periodic recurrence of one energising pulse

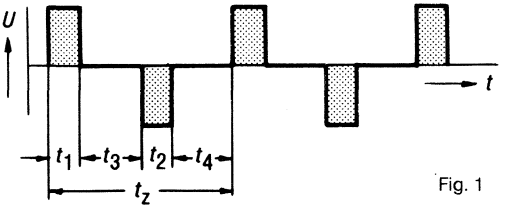


Fig. 1

t_1 = Operate time
t_2 = Reverse operate time
t_3 = Pause between operating and reverse operating
t_4 = Pause between reverse operating and operating
t_z = Cycle time = $t_1 + t_2 + t_3 + t_4$

Limiting curves for power load

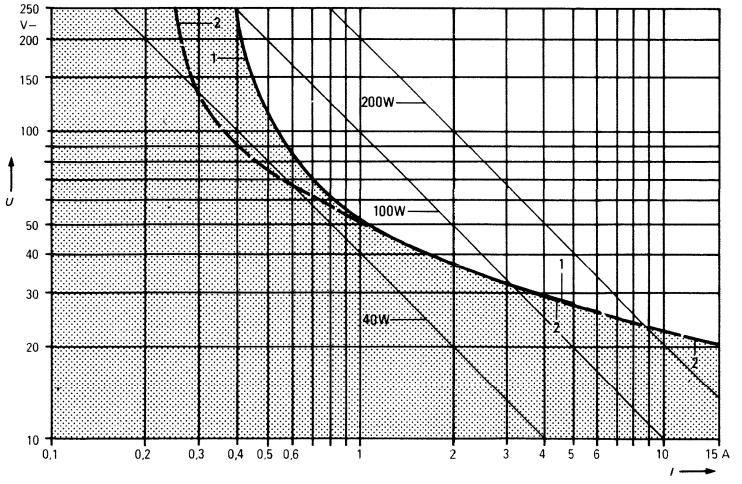


Fig. 2

I = Switching current

U = Switching voltage (dc)

Curves: Safe breaking, arc extinguished (limit curve II).
Maximum 12.5 ops./sec.

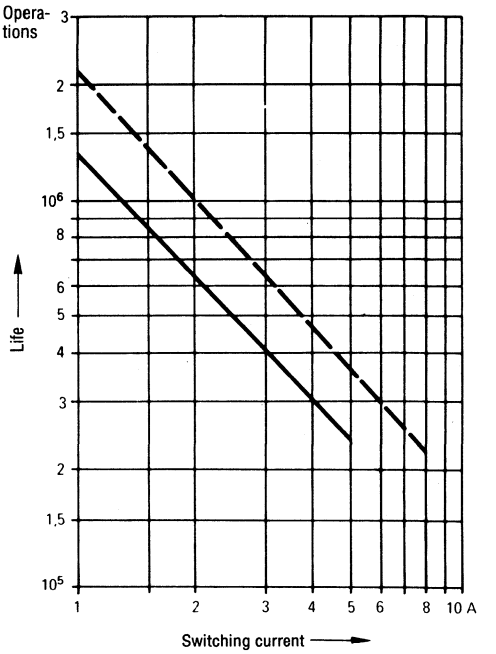
Curve 1 ——— Contact material silver, gold flashed

Curve 2 ----- Contact material silver-cadmium-oxide

Card relay R

Electrical life

Switching voltage 220 Vac
Type of load: resistive
Life obtained at 1 ops./sec.



—— Contact material silver, gold flashed

– – – Contact material silver-cadmium-oxide

Fig. 3

Individual values
contact material silver, gold flashed

Switching voltage V	Switching current A	Electrical life (standard values) operations	Type of load	Life obtained at ops./sec.
24dc	8	0.5×10^6	resistive	1
30dc	4	2×10^6	resistive	1
60dc	0.8	4×10^6	resistive	1
250dc	0.4	6×10^6	resistive	1
24dc	0.5	10^6	inductive $\tau = 40$ ms	0.1
24dc	1.0	2×10^5	inductive $\tau = 40$ ms	0.1
48dc	0.5	2×10^5	inductive $\tau = 40$ ms	0.1
48dc	0.2	10^6	inductive $\tau = 40$ ms	0.1
220ac	1	5×10^5	inductive $\cos\varphi = 0.4$	0.1
220ac	0.5	2×10^6	inductive $\cos\varphi = 0.4$	0.1
220ac	0.4	4×10^6	inductive $\cos\varphi = 0.4$	0.1
220ac	0.1	8×10^6	inductive $\cos\varphi = 0.4$	0.1

Electromechanical relays

Miniature power relay N V23016

for dc operation, neutral, monostable

Outstanding features

- Used as switching element for electrical separation of low voltage control circuits from heavy current load circuits
- High switching capabilities for its small size
- Low power consumption, therefore particularly suited to be controlled by circuits employing semiconductors
- Typical applications: control circuits for heating installations and temperature regulating systems, machine tool control, automotive electronics and operating contactors
- PTB certificate for safe electrical separation between intrinsically safe and not intrinsically safe circuits

Versions

- Contact arrangement: 1 changeover or 1 twin make
- Termination: printed circuit and/or plug-in
- Transparent cover to give protection against damage and dust

Approvals

PTB	Nr. III B/E-21 904 U
DEMKO	64157 HK
NEMKO	M48600
SEMKO	43-39512
SEV	D 7.91/251
CSA	File 26128, class 3211
UL	Guide NRNT 2, file E 48393

Miniature power relay N

V23016-A0★★★

With 1 changeover or twin make

Dust protected

With flat terminals, suitable for 2.8 mm push-on connectors in accordance with DIN 46245 or DIN 46247

For screw mounting

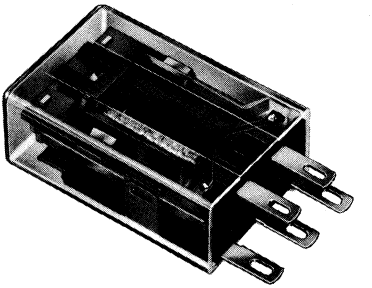
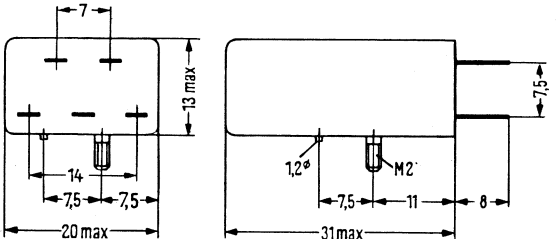
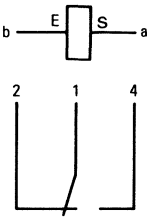


Illustration approx. original size
Approx. weight 15 g

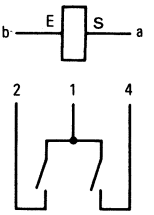


Base terminals
View from the wiring side

Changeover



Twin make



The relay is fixed by means of a screw M2, DIN 933. These screws are available to order either 4 mm or 6 mm in length.

SIEMENS ordering number for screw M2 x 4: D00933-G0040-S001
screw M2 x 6: D00933-G0060-S001
Respective hexagon nuts M2, DIN 439, SIEMENS ordering number D00439-B0020-S001

Special accessories: Sockets complete with retainer for printed circuit mounting of V23016-A0... (max. load 5 A), are obtainable from: Maußner Steuereungstechnik GmbH, Hunnenstr. 24a, 8901 Königsbrunn/Augsb., Tel. 08231/2096. WEST-GERMANY

Miniature power relay N

V23016-B0★★★

With 1 changeover or 1 twin make

Dust protected

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid in accordance with DIN 40801 and DIN 40803, fine

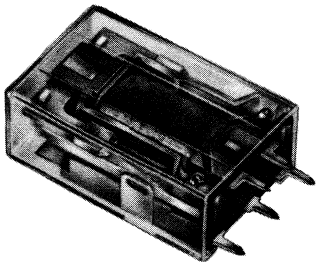
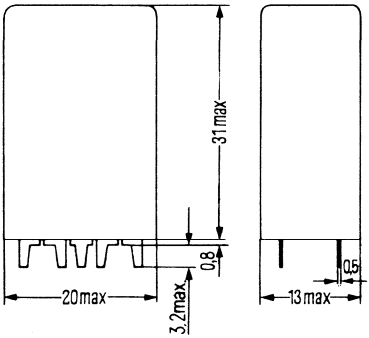
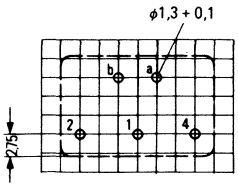


Illustration approx. original size
Approx. weight 15 g

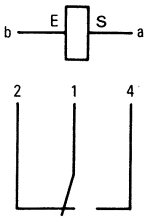




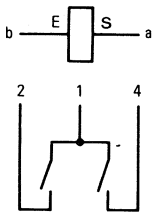
Mounting hole layout
View from the wiring side

Base terminals

Changeover



Twin make



5

Miniature power relay N

V23016-C0★★★

With 1 changeover or 1 twin make

Dust protected

Mounting bracket and coil terminals: For direct mounting into printed circuits, pin arrangement for 2.5 mm grid in accordance with DIN 40801

Contact connections: flat terminals, suitable for 2.8 mm push-on connectors in accordance with DIN 46245 and DIN 46247

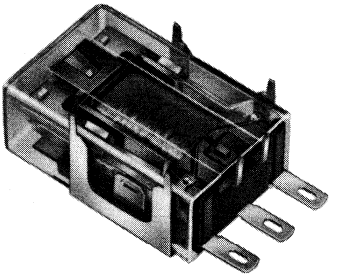
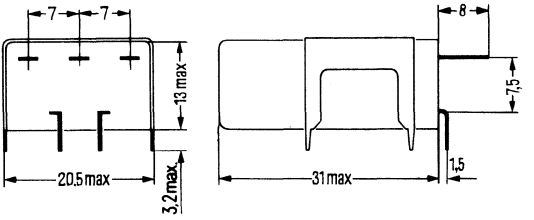
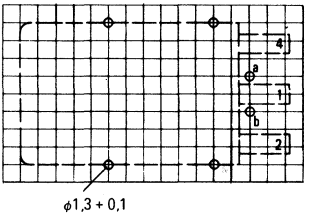


Illustration approx. original size
Approx. weight 16 g

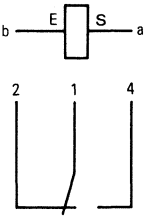




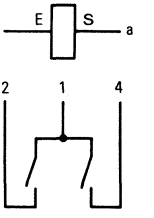
Mounting hole layout
View from the wiring side

Base terminals

Changeover



Twin make



Miniature power relay N

V23016-D0★★★-A★9★

With 1 changeover or 1 twin make

Dust protected

With additional solder pin for fixing

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid in accordance with DIN 40801 and DIN 40803, fine

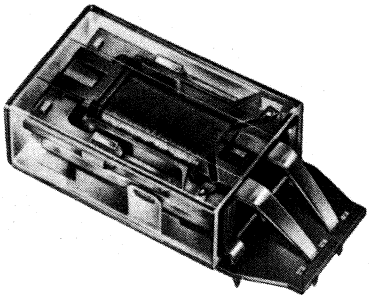
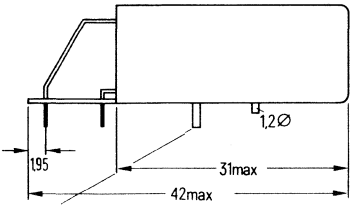
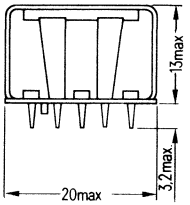
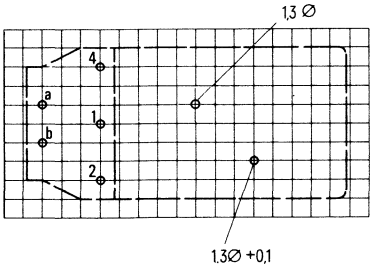


Illustration approx. original size
Approx. weight 18 g



Solder pin

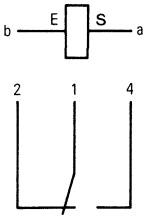




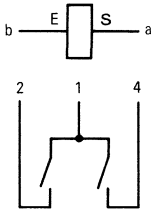
Mounting hole layout
View from the wiring side

Base terminals

Changeover



Twin make



5

Miniature power relay N

V23016-D0★★★-A★0★

With 1 changeover or 1 twin make

Dust protected

With additional screw for fixing

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid in accordance with DIN 40801 and DIN 40803, fine

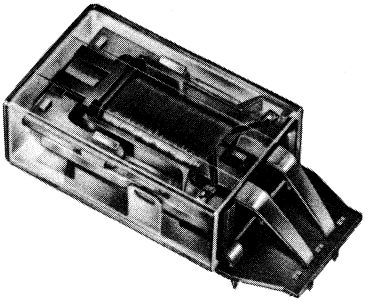
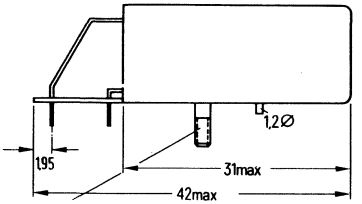
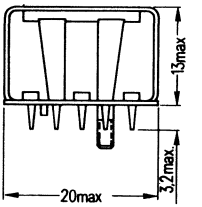
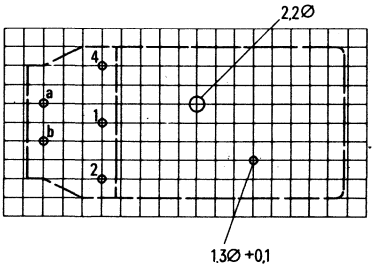


Illustration approx. original size
Approx. weight 18 g



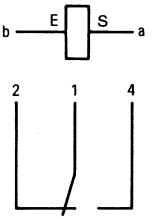




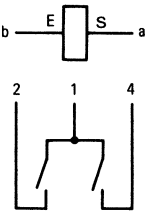
Mounting hole layout
View from the wiring side

Base terminals

Changeover



Twin make

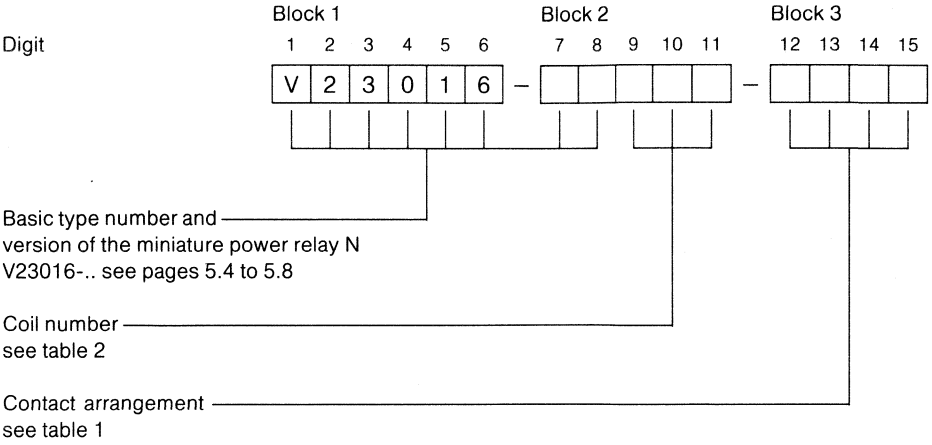


The relay is fixed by means of a screw M2, DIN 933. These screws are available to order either 4 mm or 6 mm in lenght.

SIEMENS ordering number for screw M2 x 4: D00933-G0040-S001
screw M2 x 6: D00933-G0060-S001
Respective hexagon nuts M2 DIN 439, SIEMENS ordering number D00439-B0020-S001

Miniature power relay N

Ordering code



5

Ordering example: V23016-B0006-A101

Miniature power relay N, for printed circuits (vertical mounting), coil 24 V nominal, 1 changeover, contact material silver, gold flashed.

Preferred standard types

Relays V23016-A0002-A101
-A0004-A101
-A0005-A101

V23016-A0006-A101
-A0006-A201
-A0013-A101

V23016-B0002-A101
-B0004-A101
-B0005-A101
-B0005-A201

V23016-B0006-A101
-B0006-A102
-B0006-A201
-B0013-A101

V23016-C0002-A101
-C0005-A101
-C0005-A201

V23016-C0006-A101
-C0006-A201
-C0013-A101

V23016-D0002-A101
-D0004-A101
-D0005-A101
-D0005-A191
-D0005-A201

V23016-D0006-A101
-D0006-A191
-D0006-A192
-D0006-A201

Screws D00933-G0040-S001
-G0060-S001

Miniature power relay N

Table 1 Characteristics

Energising side Continuation →

Operating voltages	Vdc	see table 2		
Nominal power consumption	W	approx. 0.6		
Maximum temperature	°C	110		
Continuous thermal load at 20 °C ambient temperature	W	2.1		
Thermal resistance	K/W	45		

Contact side

Order No. block 3	Versions A0, B0 and C0	A101	A201	A401
	Version D0[1])	A101, A191	A201, A291	A401, A491
Contact material		Silver, gold flashed	Silver/Nickel	Silver-cadmium oxide
Contact designation		21		
Symbols (see also base terminals)				
Maximum switching voltage to VDE 0110 group C	Vdc Vac	300 250		
Max. switching current	A	15[3])		
Max. power rating[4]) dc voltage	W W W W	55 to 420 see fig. 1 (voltage dependent)	up to 24 V:150 30 V:100 200 V: 30 250 V: 50	35 to 400 see fig. 1 (voltage dependent)
ac voltage	VA	3750		
Max. continuous current	A	7.5		

General

Admissible ambient temperature	°C	−40 to +70
Operate time[5])	ms	approx. 7
Release time[5])	ms	approx. 5
Maximum switching rate	ops./sec	40
Test voltage winding/frame contact/frame contact/winding	V_{rms} V_{rms} V_{rms}	1500 2500 2500
Electrical life[6])		
ac voltage	operations	see page 5.14
dc voltage 6 V, 15 A	operations	approx. 10^6
dc voltage 15 V, 7.5 A	operations	approx. 4×10^6
dc voltage 24 V, 4 A	operations	approx. 6×10^6
Mechanical life	operations	approx. 2×10^8

[1]) For type V23016-D0... digit 14 of ordering block 3 insert:
0 = version for screw mounting (see page 5.8)
9 = version with soldering pin (see page 5.7)

[2]) The power ratings listed are only valid when the contacts are bridge connected. When used as a twin make, the values for the changeover contact applies.

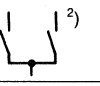
[3]) The current of 15 A may flow for a maximum of 4 sec. up to 10 % on-time.

[4]) These values apply for resistive loads or inductive loads with suitable spark suppression.

[5]) Measured at nominal voltage without series resistor.

[6]) These values refer to silver contacts and are applicable for resistive loads or inductive loads with suitable spark suppression. Values obtained at 2 ops./sec.

Table 1 Characteristics (continued)
Energising side

Operating voltages	Vdc	see table 2		
Nominal power consumption	W	approx. 0.6		
Maximum temperature	°C	110		
Continuous thermal load at 20 °C ambient temperature	W	2.1		
Thermal resitance	K/W	45		
Contact side				
Order No. block 3 — Versions A0, B0 and C0		A102	A202	A402
Order No. block 3 — Version D0[1])		A102, A192	A202, A292	A402, A492
Contact material		Silver, gold flashed	Silver/Nickel	Silver-cadmium oxide
Contact designation		(11)		
Symbols (see also base terminals)		Twin make  [2])		
Maximum switching voltage to VDE 0110 group C	Vdc Vac	300 250		
Max. switching current	A	15[3])		
Max. power rating[4]) dc voltage	W W W W	55 to 420 see fig. 1 (voltage dependent)	up to 30 V:250 60 V:150 250 V: 70	35 to 400 see fig. 1 (voltage dependent)
ac voltage	VA	3750		
Max. continuous current	A	7.5		
General				
Admissible ambient temperature	°C	−40 to +70		
Operate time[5])	ms	approx. 7		
Release time[5])	ms	approx. 5		
Maximum switching rate	ops./sec	40		
Test voltage winding/frame contact/frame contact/winding	V_{rms} V_{rms} V_{rms}	1500 2500 2500		
Electrical life[6])				
ac voltage	operations	see page 5.14		
dc voltage 6 V, 15 A	operations	approx. 10^6		
dc voltage 15 V, 7.5 A	operations	approx. 4×10^6		
dc voltage 24 V, 4 A	operations	approx. 6×10^6		
Mechanical life	operations	approx. 2×10^8		

[1]) For type V23016-D0... digit 14 of ordering block 3 insert:
0 = version for screw mounting (see page 5.8)
9 = version with soldering pin (see page 5.7)
[2]) The power ratings listed are only valid when the contacts are bridge connected. When used as a twin make, the values for the changeover contact applies.
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[4]) These values apply for resistive loads or inductive loads with suitable spark suppression.
[5]) Measured at nominal voltage without series resistor.
[6]) These values refer to silver contacts and are applicable for resistive loads or inductive loads with suitable spark suppression. Values obtained at 2 ops./sec.

Table 2 List of coils

Nominal voltage	Operating voltage range at 20 °C		Resistance at 20 °C	Coil No. Order No. block 2
	Minimum voltage U_I	Maximum voltage U_{II}		
Vdc	Vdc	Vdc	Ω	
6	4.2	11	65 ± 6.5	002
12	8.3	22	230 ± 23	005
24	16.8	44	970 ± 144	006
48	33.5	88	3150 ± 472	004
60	42.0	110	5000 ± 750	013

The operating voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1.0	1.04	1.085	1.13	1.17	1.21
k_{II}	1.0	0.95	0.88	0.79	0.70	0.60

Miniature power relay N

Limiting curves for power load

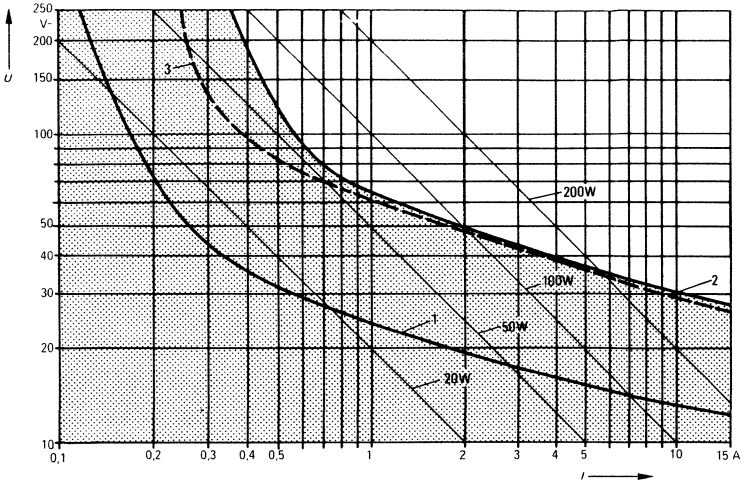


Fig. 1

5

I = Switching current
U = Switching voltage (dc)

Curve 1: Arc extinguished within contact transit period (limit curve I).
Maximum 12.5 ops./sec.

———— Contact material
silver, gold flashed

Curve 2: Safe breaking, arc extinguished (limit curve II).
Maximum 12.5 ops./sec.

———— Contact material
silver, gold flashed

Curve 3: Safe breaking, arc extinguished (limit curve II).
Maximum 12.5 ops./sec.

– – – – – – Contact material
silver-cadmium-oxide

Miniature power relay N

Electrical life

Switching voltage 220 Vac
Type of load: resistive
Life obtained at 1 ops./sec.

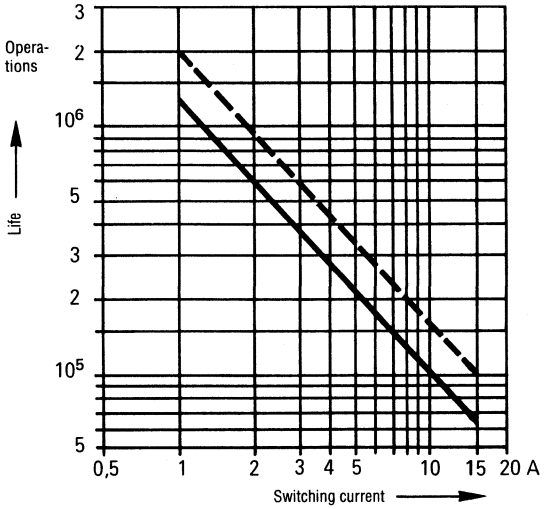


Fig. 2

——— Contact material
silver, gold flashed

– – – – – Contact material
silver-cadmium-oxide

Miniature power relay P

V23017

for dc operation, polarised, bistable

Outstanding features

- Intended primarily for impulse operation
- Used as switching element for electrical separation of low voltage control circuits from heavy current load circuits
- Low power consumption, therefore particularly suited to be controlled by circuits employing semiconductors
- It corresponds to that of the miniature power relay N in design and size
- Vibration resistance approx. 150 ms^{-2}, up to 100Hz
- Resistance to shock approx. 150 ms^{-2}

5

Versions

- Contact arrangement: 1 changeover
- Termination: printed circuit or plug-in
- Transparent cover to give protection against damage and dust

Approval: SEV D7.91/251

Miniature power relay P

V23017-F0★★★

With 1 changeover;
Winding with centre tap

Dust protected

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid in accordance with DIN 40801 and DIN 40803, fine

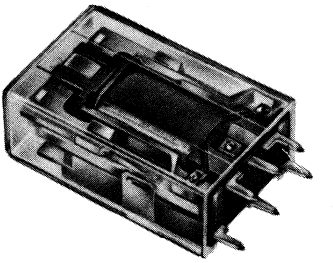
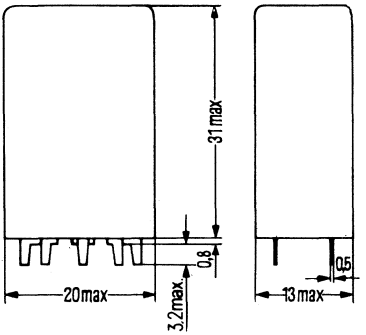
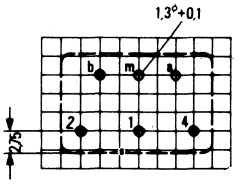


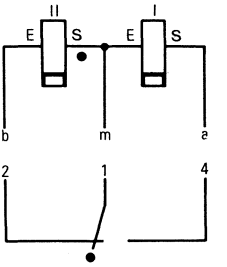
Illustration approx. original size
Approx. weight 15 g





Mounting hole layout
View from the wiring side

Base terminals[1])



Circuit symbols drawn in "Off" position.
If a plus potential is applied to the coil start (m) of winding II and a minus potential to the coil end (b) of winding II, the relay assumes the "Off"position.
If a minus potential is applied to the coil start (a) of winding I and a plus potential to the coil end (m) of winding I, the relay assumes the "On" position.

[1]) Winding I should only be used as the operate winding, winding II only as the reverse operate winding as the assymetric settings are compensated by a different number of turns. In terms of voltage the relay is therefore balanced.

Miniature power relay P

V23017-G0★★★

With 1 changeover;
Winding with centre tap

Dust protected

Mounting bracket and coil terminals:
For direct mounting into printed circuits, pin arrangement for 2.5 mm grid in accordance with DIN 40801

Contact connections: flat terminals, suitable for 2.8 mm push-on connectors in accordance with DIN 46245 and DIN 46247

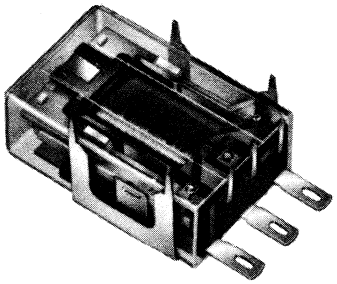
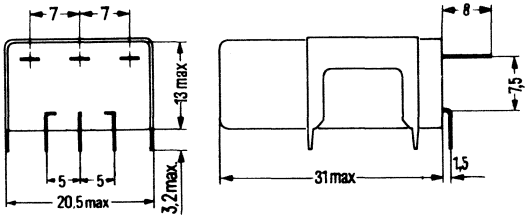
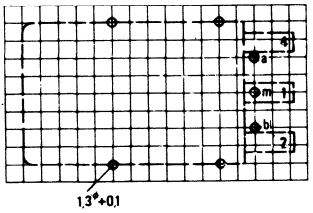


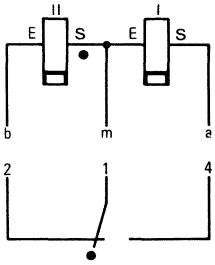
Illustration approx. original size
Approx. weight 16 g





Mounting hole layout
View from the wiring side

Base terminals[1])



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If a minus potential is applied to the coil start (a) of winding I and a plus potential to the coil end (m) of winding I, the relay assumes the "On" position.

[1]) Winding I should only be used as the operate winding, winding II only as the reverse operate winding as the assymetric settings are compensated by a different number of turns. In terms of voltage the relay is therefore balanced.

Miniature power relay P

V23017-H0★★★-A★9★

With 1 changeover;
Winding with centre tap

Dust protected

With additional solder pin for fixing

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid in accordance with DIN 40801 and 40803, fine

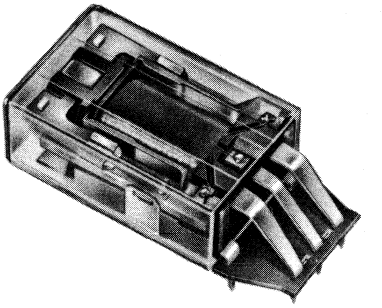
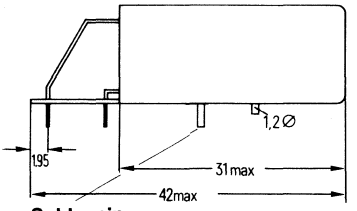
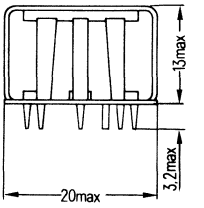
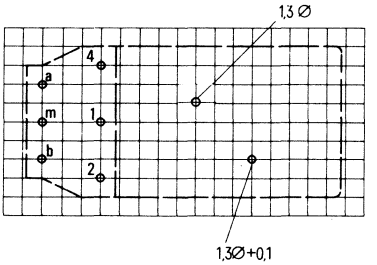


Illustration approx. original size
Approx. weight 18 g



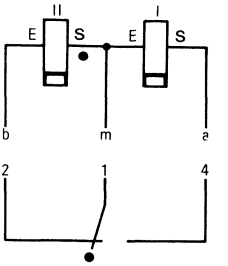
Solder pin





Mounting hole layout
View from the wiring side

Base terminals[1])



Circuit symbol drawn in "Off" position.
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Miniature power relay P

V23017-H0★★★-A★0★

With 1 changeover;
Winding with centre tap

Dust protected

With additional screw for fixing

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid in accordance with DIN 40801 and DIN 40803, fine

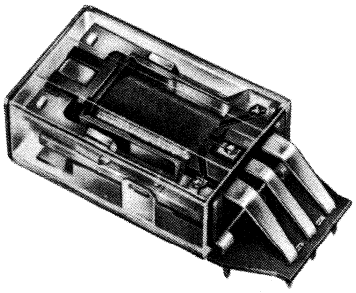
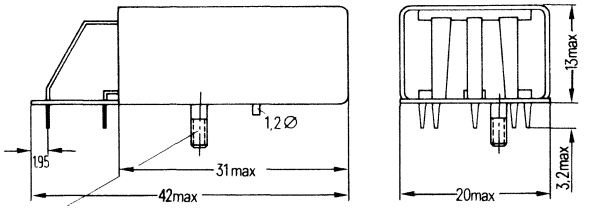
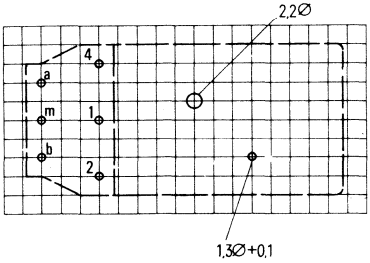


Illustration approx. original size
Approx. weight 18 g

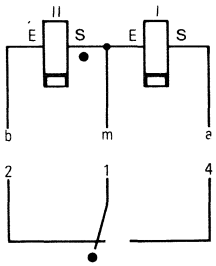


Screw M2



Mounting hole layout
View from the wiring side

Base terminals[1])



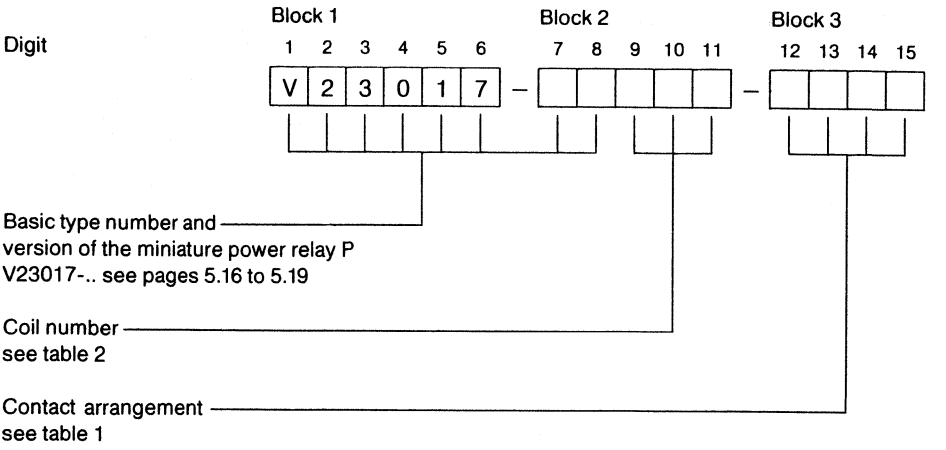
Circuit symbol drawn in "Off" position.
If a plus potential is applied to the coil start (m) of winding II and a minus potential to the coil end (b) of winding II, the relay assumes the "Off" position.
If a minus potential is applied to the coil start (a) of winding I and a plus potential to the coil and (m) of winding I, the relay assumes the "On" position.

The relay is fixed by means of a screw M2, DIN 933. These screws are available to order either 4 mm or 6 mm in length.
SIEMENS ordering number for screw M2 x 4: D00933-G0040-S001
screw M2 x 6: D00933-G0060-S001
Respective hexagon nuts M2, DIN 439, SIEMENS ordering number D00439-B0020-S001

[1]) Winding I should only be used as the operate winding, winding II only as the reverse operate winding as the assymetric settings are compensated by a different number of turns. In terms of voltage the relay is therefore balanced.

Miniature power relay P

Ordering code



Ordering example: V23017-F0017-A101

Miniature power relay P, for printed circuits, vertical mounting, coil 24 V nominal, contact material silver, gold flashed.

Miniature power relay P

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 2
Nom. power consumpt. per wind.:		
coil with 1 winding	W	approx. 0.45
coil with centre tap	W	approx. 0.7
Maximum temperature	°C	105
Continuous thermal load at 20 °C ambient temperature	W	1.8
Thermal resistance	K/W	45

Contact side

Order No. block 3	Versions F0 and G0	A101
	Version H0[1])	A101, A191
Contact material		Silver, gold flashed
Contact designation		21
Symbols (see also base terminals)		
Maximum switching voltage to VDE 0110 group C	Vdc Vac	300 250
Max. switching current	A	15[2])
Maximum power rating		
dc voltage	W	up to 30 V: 100; up to 250 V: 50
ac voltage	VA	3750
Max. continuous current	A	7.5

General

Admissible ambient temperature	°C	−25 to +70
Operate time[3])	ms	approx. 8
Reverse operate time[3])	ms	approx. 7
Maximum switching rate	ops./sec	40
Test voltage		
winding/frame	V_{rms}	1500
contact/frame	V_{rms}	2500
contact/winding	V_{rms}	2500
Mechanical life	operations	approx. 10^8

[1]) For type V23017-H0... digit 14 of ordering block 3 insert:
0 = version for screw mounting (see page 5.19)
9 = version with soldering pin (see page 5.18)

[2]) The current of 15 A may flow for a maximum of 4 sec. up to 10 % on-time.

[3]) Measured at nominal voltage without series resistor.

5

Table 2 List of coils

Nominal voltage Vdc	Winding	Operating voltage range at 20 °C Minimum voltage U_I Vdc	Operating voltage range at 20 °C Maximum voltage U_{II} Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
6	I	4.5	9.9	49 ± 5	020
	II	4.5	9.9	49 ± 5	
12	I	9	19.8	180 ± 18	012
	II	9	19.8	180 ± 18	
24	I	18	39.6	850 ± 128	017
	II	18	39.6	850 ± 128	
48	I	36	79.5	3000 ± 450	023
	II	36	79.5	3000 ± 450	

Even in pulsed operation the value of U_{II} stated in the table must not be exceeded. Only one winding may be operated at any time within the specified voltage range.

The operating voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

Operate (minus at start of coil) – winding I

t_u	–25 °C	–10 °C	0 °C	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1	1	1	1	1.025	1.05	1.075	1.1	1.125
k_{II}	1	1	1	1	0.95	0.88	0.79	0.7	0.59

Reverse operate (plus at start of coil) – winding II

t_u	–25 °C	–10 °C	0 °C	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1.1	1.08	1.06	1	1	1	1	1	1
k_{II}	0.7	0.85	1	1	0.95	0.88	0.79	0.7	0.59

Miniature power relay E1 V23056

for dc operation, neutral, monostable

Outstanding features

- Used as switching element for electrical separation of low voltage control circuits from heavy current load circuits.
- High switching capabilities for its small size
- The mechanical and electrical characteristics conform to the »Regulations for electrical relays in heavy current circuits« (VDE 0435/9.72) and the »Safe electrical separation of telecommunication and heavy current circuits« (VDE 0804)
- Its meets the requirements regarding air gaps, creepage distances and test voltages for potection class II in accordance with VDE 0720 part 1/2.72 § 22 n and VDE 0730 part 1/3.72 § 22n
- Complies to CEE-publication 10 and 11
- Comforming to the relevant regulations for use in domestic appliances (VDE 0700 or VDE 0730) e. g. leakage current stability for the housing of KB ≥ 250.
  Example for washing machines: VDE 0730 part 2J/8.77 § 30c; in addition, the flammability test to VDE 0730 part 2J/8.77 § 221 is maintained.
- It conforms to the "Safety regulations for mains operated electronic domestic appliances and related equipment" VDE 0860 (DIN IEC 65) as well as to the specifications for thermostatic regulators and temperature limiting controllers in accordance with VDE 0631
- Air gaps and creepage distances ≥ 8 mm

Versions

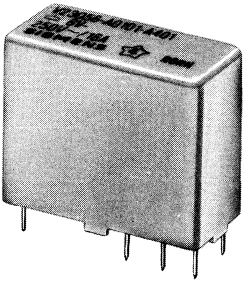
- Standard or heat resistant (materials resistance to high temperature) heat resistant: useable in ambient temperature of up to 110 °C,
  155 °C upper temperature limit at continuous operation
- Contact arrangement: 1 make, 1 break or 1 changeover
- Single- or twin base terminals
- Termination: printed circuit
- Cover to give protection against damage and dust

Approvals:

VDE	0435/9.72 – Certificate for monitoring of manufacturing – monogram	914
DEMKO	63385 HK and 78889 HK	
SEMKO	8403030 and ...031 also 8401092	
SEV	D 3.31/65	
CSA	File 50227, class 3211	
UL	Guide NRNT 2, file E 48393	

Miniature power relay E1

V23056-A0★★★ standard



V23056-B0★★★ heat resistant

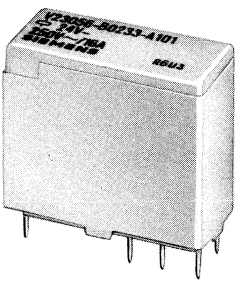
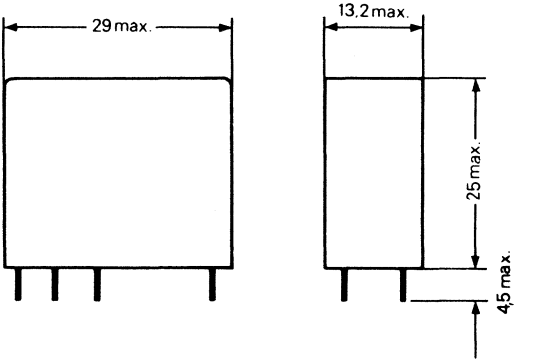


Illustration approx. original size
Approx. weight 20 g

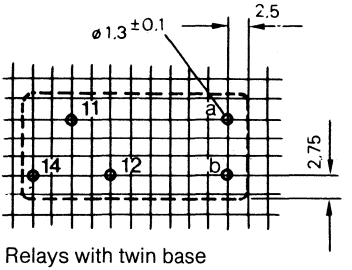
With 1 make, 1 break or 1 changeover

Dust protected

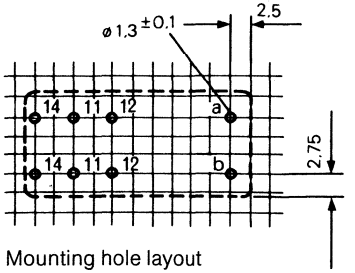
For direct mounting into printed circuits, pin arrangement for 2.5 mm grid also 2.54 mm grid in accordance with DIN 40801



Relays with single base terminals for a continuous current of 10 A max.

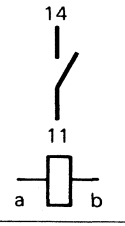
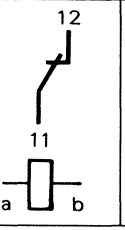
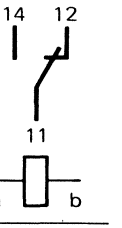


Relays with twin base terminals for a continuous current of 16 A max.



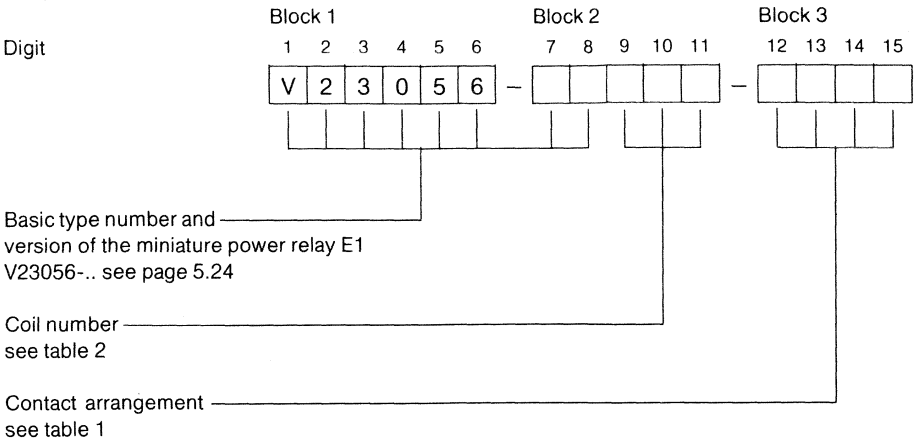
Mounting hole layout
View from the wiring side

Base terminal connections for contact arrangement with:

1 make (1)	1 break (2)	1 changeover (21)
		

Miniature power relay E1

Ordering code



5

Ordering example: V23056-A0102-A101

Miniature power relay E1, standard version, coil 12 V nominal, 1 changeover with twin base terminals, contact material silver, gold flashed.

Preferred standard types

V23056-A0101-A401
-A0102-A101
-A0102-A401
V23056-A0105-A101
-A0105-A401

Miniature power relay E1

Table 1 Characteristics

Energising side

Operating voltages		Vdc	see table 2
Nominal power consumption	Standard version	W	approx. 0.65
	Heat resistant version	W	approx. 0.8
Maximum temperature	Standard version	°C	115
	Heat resistant version	°C	155
Continuous thermal load at 20 °C ambient temperature	Standard version	W	1.3
	Heat resistant version	W	2
Thermal resistance		K/W	65

Contact side

Contact arrangement	Twin base terminals	A101	A102	A103	A401	A402	A403
Order No. block 3	Single base terminals	A104	A105	A106	A404	A405	A406
Contact material		Silver			Silver-cadmium-oxide		
Contact designation		21	1	2	21	1	2
Symbols (see also base terminals)							

Maximum switching voltage to VDE 0110 group C	Vdc	300	
	Vac	250	
Max. switching current	A	16	25[1])
Max. power rating[2]) dc voltage	W	50 to 330 see fig. 2 (voltage dependent)	35 to 500 see fig. 2 (voltage dependent)
ac voltage	VA	2000	4000
Max. continuous current			
Twin base terminals	A	16	
Single base terminals	A	10	

General

Admissible ambient temperature			
Standard version	°C	−40 to + 60	
Heat resistant version	°C	−40 to +110	
Operate time[3])	ms	approx. 8	
Release time[3])	ms	approx. 3	
Max. switching rate	ops./sec	20	
Test voltage: contact/winding	V_{rms}	4000	
Electrical life[2])			
ac voltage 220 V, 10 A	operations	approx. 10^5	approx. 2×10^5
ac voltage 220 V, 16 A	operations		approx. 10^5
Mechanical life			
Standard version	operations	approx. 10^7	
Heat resistant version	operations	approx. 3×10^5	

[1]) The current of 25 A may flow for a max. of 4 sec. up to 10 % on-time.
[2]) These values apply for resistive load or inductive load with suitable spark suppression. Values obtained at 1 ops./sec.
[3]) Measured at nominal voltage without series resistor.

Table 2 List of coils

Nominal voltage Vdc	Operating voltage range at 20 °C: Minimum voltage U_I Vdc	Operating voltage range at 20 °C: Maximum voltage U_{II} Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
Standard version				
5	3.5	8.6	42 ± 4.2	112
6	4.4	9.5	60 ± 6	101
12	8.8	18.5	215 ± 22	102
24	17.5	36.5	875 ± 130	105
48	35	72	3300 ± 495	104
60	44	90	5200 ± 780	103
Heat resistant version				
6	3.8	11.5	46 ± 5	231
12	7.6	23.6	195 ± 20	232
24	15.1	47.5	790 ± 80	233
48	30.0	91.0	3050 ± 460	234
60	37.8	114.0	4830 ± 725	235

The operating voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C	80 °C	90 °C	100 °C	110 °C
Standard version										
k_I	1.0	1.04	1.08	1.12	1.16	—	—	—	—	—
k_{II}	1.0	0.94	0.88	0.81	0.75	—	—	—	—	—
Heat resistant version										
k_I	1.0	1.04	1.08	1.12	1.16	1.2	1.24	1.28	1.31	1.35
k_{II}	1.0	0.96	0.92	0.88	0.84	0.79	0.75	0.69	0.64	0.58

Miniature power relay E1

Heat resistant version

Temerature rise of the coil ($\Delta\,\vartheta$), as a function of the continuous contact current (I_D)

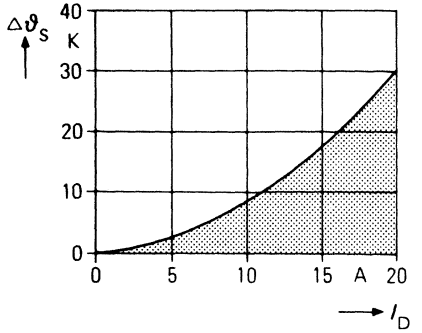


Fig. 1

Limiting curves for power load

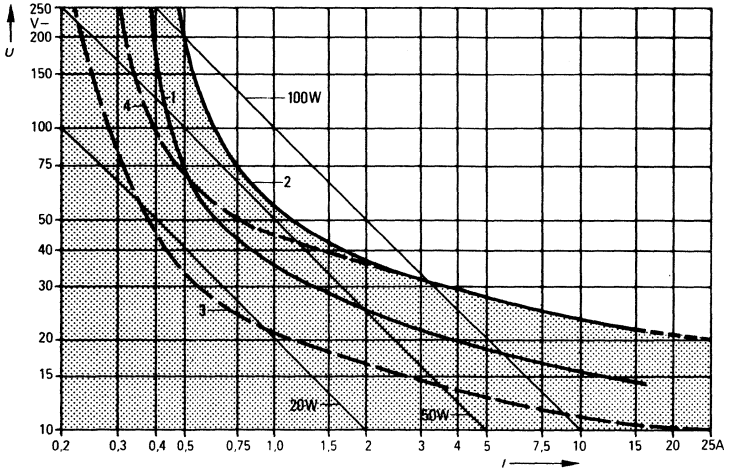


Fig. 2

I = Switching current
U = Switching voltage (dc)

Curve 1 and 3: Arc extinguished within contact transit period (limit curve I)
Maximum 12.5 ops./sec.

Curve 2 and 4: Safe breaking, arc extinguished (limit curve II)
Maximum 1 ops./sec.

——— Contact material
silver, gold flashed

– – – – – Contact material
silver-cadmium-oxide

Miniature power relay E2

V23037

for dc operation, neutral, monostable

Outstanding features

- Used as switching element for electrical separation of low voltage control circuits from heavy current load circuits
- High switching capabilities for its small size
- The mechanical and electrical characteristics conform to the »Regulations for electrical relays in heavy current circuits« (VDE 0435/9.72) and the »Safe electrical separation of telecommunication and heavy current circuits« (VDE 0804)
- Air gaps and creepage distances ≥ 6 mm with 2 makes (standard) or ≥ 8 mm (version – B0. . .)

Versions

- Contact arrangement: max. 2 makes, 2 breaks or 2 changeovers
- Termination: printed circuit
- Heavy duty contacts
- Transparent cover to give protection against damage and dust

Approvals:	VDE	0435/9.72 – Certificate for monitoring of manufacturing – monogram	8233
	SEMKO	43-62640 and 43-57014	
	SEV	D 3.31/108	
	CSA	File 45064, class 3211	
	UL	Guide NRNT 2, file E 48393	

Miniature power relay E2

V23037-A0★★★ standard

V23037-B0★★★ with 2 makes only:
air gaps and creepage distances ⩾ 8 mm
in accordance with VDE 0110

With 2 changeovers, 2 makes or 2 breaks

Dust protected

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid also 2.54 mm grid in accordance with DIN 40801 and DIN 40803, average

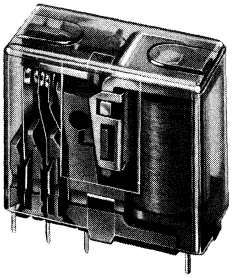
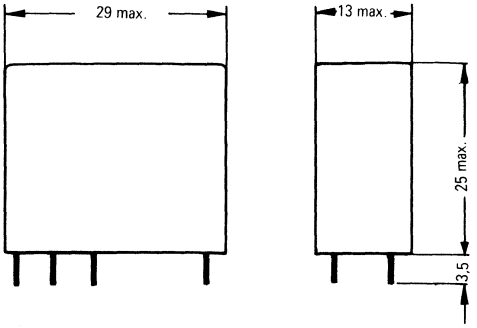
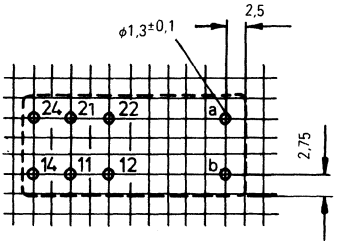


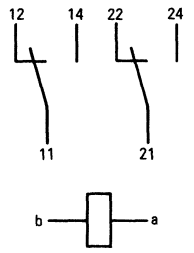
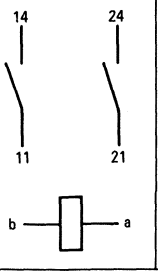
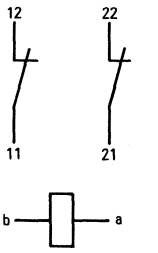
Illustration approx. original size
Approx. weight 20 g





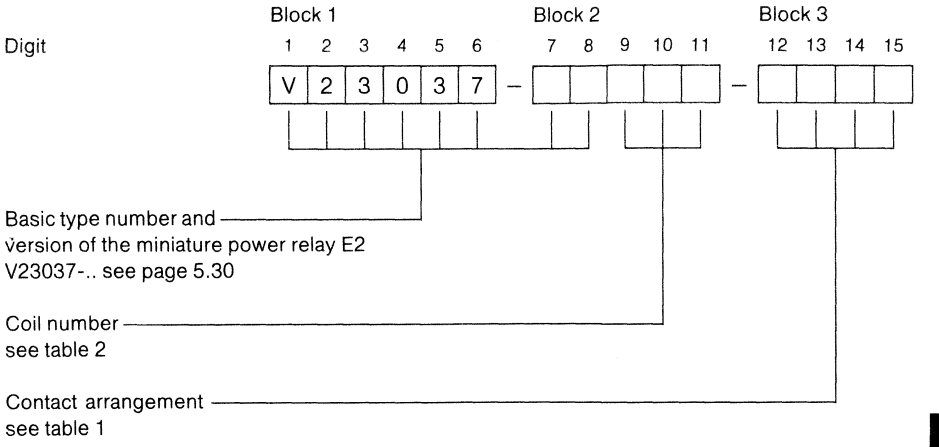
Mounting hole layout
View from the wiring side

Base terminals connections
for contact arrangement with:

2 changeovers	2 makes	2 breaks
		

Miniature power relay E2

Ordering code



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Ordering example: V23037-A0002-A101

Miniature power relay E2, standard version, coil 12 V nominal, 2 changeovers, contact material silver, gold flashed.

Preferred standard types

V23037-A0001-A101
-A0002-A101
-A0002-A102
-A0002-A401
-A0004-A101

V23037-A0005-A101
-A0005-A102
-A0005-A401
-A0005-A402

Miniature power relay E2

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 2
Nominal power consumption	W	approx. 0.5
Maximum temperature	°C	110
Continuous thermal load at 20 °C ambient temperature	W	1.3
Thermal resistance	K/W	65

Contact side

Order No. block 3		A101	A102	A103	A401	A402	A403
Contact material		Silver, gold flashed			Silver-cadmium-oxide		
Contact designation		21-21	1-1	2-2	21-21	1-1	2-2
Symbols (see also base terminals)							
Maximum switching voltage to VDE 0110 group C	Vdc Vac	300 250					
Max. switching current	A	10[1])					
Max. power rating[2]) dc voltage	W	50 to 250			35 to 250		
		see fig. 1 (voltage dependent)					
ac voltage	VA	1250					
Max. continuous current	A	5					

General

Admissible ambient temperature	°C	−40 to +60
Operate time[3])	ms	approx. 8
Release time[3])	ms	approx. 3
Maximum switching rate	ops./sec.	20
Test voltage: contact/winding contact/contact	V_{rms} V_{rms}	4000 2500
Electrical life[4]) ac voltage 220 V, 5 A	operations	approx. 8×10^4
Mechanical life	operations	approx. 2×10^7

[1]) The current of 10 A may flow for a maximum of 4 sec. up to 10 % on-time.
[2]) These values apply for resistive load or inductive load with suitable spark suppression.
[3]) Measured at nominal voltage without series resistor
[4]) These values refer to silver contacts and apply for resistive load or inductive load with suitable spark suppression. Obtained at 1 ops./sec.

Table 2 List of coils

Nominal voltage Vdc	Operating voltage range at 20 °C		Resistance at 20 °C Ω	Coil No. Order No. block 2
	Minimum voltage U_I Vdc	Maximum voltage U_{II} Vdc		
5	3.5	8.6	47 ± 4.7	012
6	4.4	10.4	70 ± 7	001
12	8.8	20.8	270 ± 27	002
24	17.5	41.5	1100 ± 165	005
48	35	83	4400 ± 660	004
60	44	103	6850 ± 1030	003

The operating voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	20 °C	30 °C	40 °C	50 °C	60 °C
k_I	1.0	1.04	1.08	1.12	1.16
k_{II}	1.0	0.94	0.88	0.81	0.75

Miniature power relay E2

Limiting curves for power load

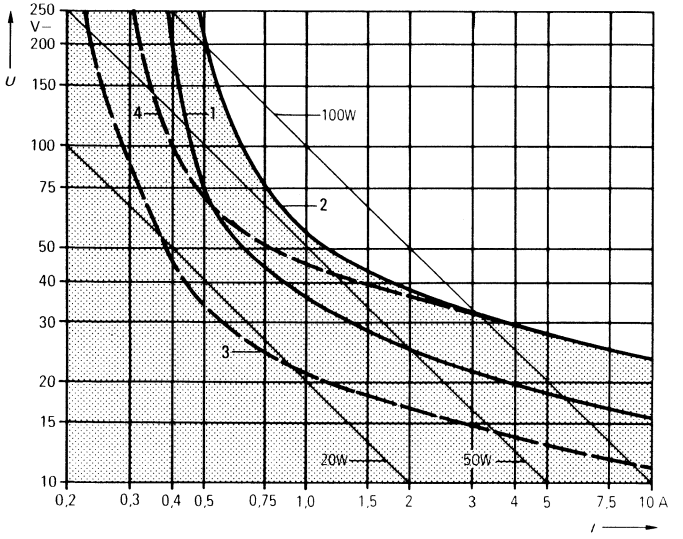


Fig. 1

I = Switching current
U = Switching voltage (dc)

Curve 1 and 3: Arc extinguished within contact transit period (limit curve I)
Maximum 12.5 ops./sec.

Curve 2 and 4: Safe breaking, arc extinguished (limit curve II)
Maximum 1 ops./sec.

——— Contact material
silver, gold flashed

– – – – – Contact material
silver-cadmium-oxide

Electromechanical relays

Industrial relay 1 V23100-V7

for dc or ac operation, neutral, monostable

Outstanding features

- Well established usage in the professional electronics, such as data processing, vending machines, machine tool control, in switchgear for electric motors as well as in the entertainment industry

Versions

- Contact arrangement: 2 or 4 changeovers
- Termination: printed circuit or solderable and plug-in
- Transparent cover to give protection against damage and dust
- Accessories: sockets, printed circuit or solder connections

Industrial relay 1

V23100-V71★★

With 2 or 4 changeovers

Dust protected

For direct mounting into printed circuits. Pin arrangement for non – standard grid

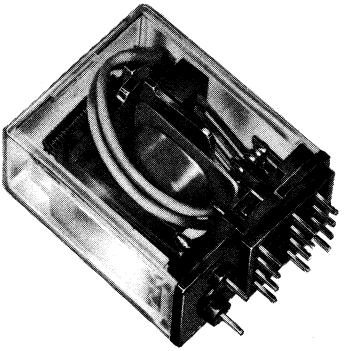
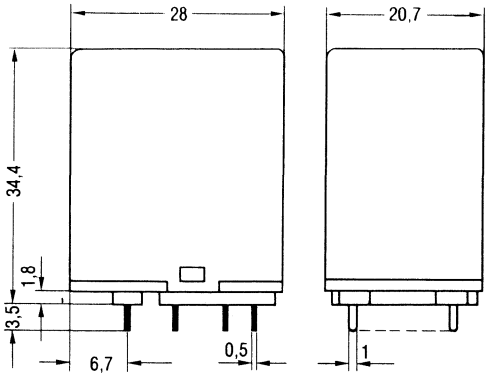
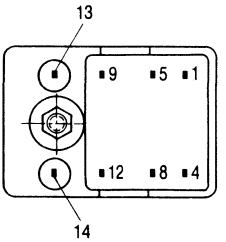


Illustration with 4 changeovers, approx. original size
Approx. weight 35 g



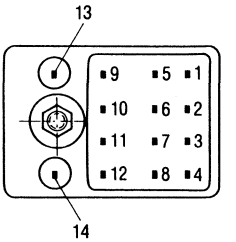
Mounting hole layout
see page 6.10

Version with 2 changeovers

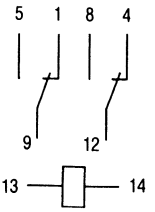


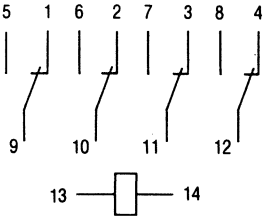
View from the wiring side

Version with 4 changeovers



Base terminals





Industrial relay 1

V23100-V72★★

With 2 or 4 changeovers

Dust protected

With individual solder connections

Plug – in

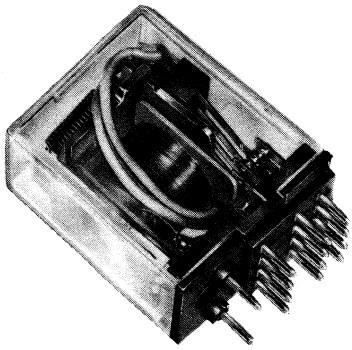
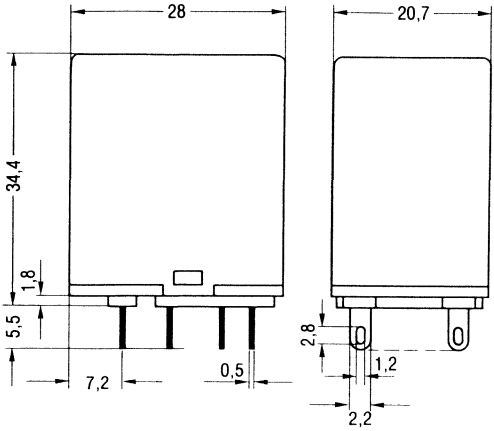
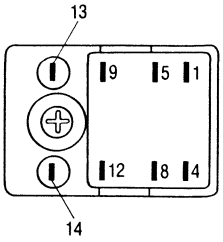


Illustration with 4 changeovers,
approx. original size
Approx. weight 35 g



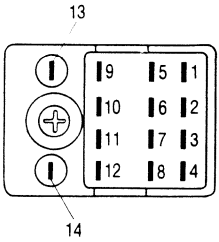
Mounting hole layout
see page 6.10

Version with 2 changeovers

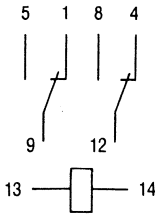


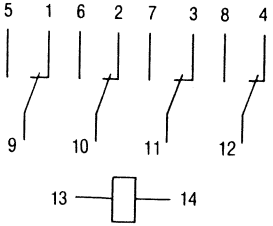
View from the wiring side

Version with 4 changeovers



Base terminals

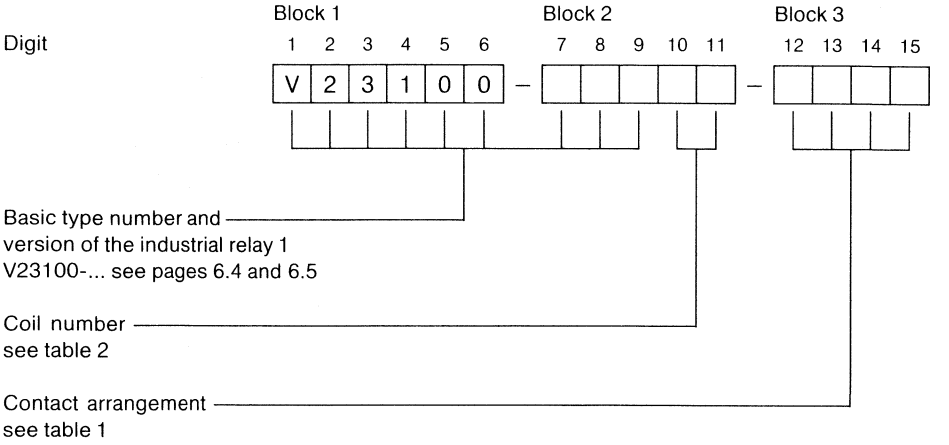




6

Industrial relay 1

Ordering code



Ordering example: V23100-V7112-F104

Industrial relay 1 for direct mounting into printed circuits, for dc operation, coil for 12 V nominal, contact arrangement 2 changeovers.

Preferred standard types

Relays	V23100-V7112-F104	V23100-V7213-F104
	-V7112-F110	-V7213-F110
	-V7113-F104	-V7223-F110
	-V7113-F110	-V7227-F110
	-V7128-F104	-V7228-F104
	-V7128-F110	-V7228-F110

Sockets	V23100-Z7001
(see page 6.9)	-Z7002
	-Z7003
	-Z7004

Industrial relay 1

Table 1 Characteristics

Energising side

Operating voltages	Vdc/Vac	see table 2
Nominal power consumption		
dc voltage	W	0.8
ac voltage 50 Hz	VA	1.4
ac voltage 60 Hz	VA	1.1

Contact side

Order No. block 3		F104	F110
Contact material		Silver	
Contact designation		21-21	21-21-21-21
Symbols (see also base terminals)		2 x 	4 x 
Max. switching voltage	Vdc Vac	110 250	
Max. switching current	A	5	3
Max. power rating			
dc voltage	W	up to 30 V: 150 W up to 110 V: 36 W	up to 30 V: 90 W up to 110 V: 36 W
ac voltage	VA	1250	
Max. continuous current	A	5	3

General

Admissible ambient temperature	°C	−20 to +50	
Operate time	ms	⩽ 20	
Release time	ms	⩽ 20	
Max. switching rate	ops./sec.	0.5	
Test voltage			
contact/contact	V_{rms}	1500	
contact/winding	V_{rms}	2500	
Electrical life[1])			
ac voltage 220 V, 5 A/3 A	operations	approx. 3.5×10^5	approx. 1.5×10^5
ac voltage 220 V, 1 A	operations	approx. 2×10^6	approx. 5×10^5
dc voltage 24 V, 5 A/3 A	operations	approx. 2×10^5	approx. 10^5
dc voltage 24 V, 1 A	operations	approx. 1.6×10^6	approx. 8×10^5
Mechanical life	operations	approx. 5×10^7	

[1]) These values apply for resistive load or inductive load with suitable spark suppression, obtained at 0.5 ops./sec.

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Table 2 List of coils

for dc operation

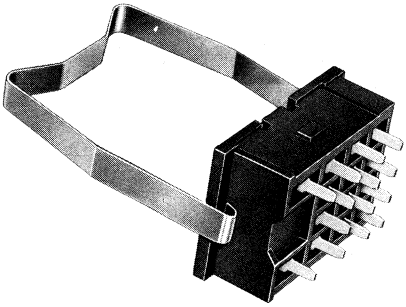
Nominal voltage Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
12	160 ± 16	12
24	650 ± 65	13
60	4000 ± 600	16

for ac operation

Nominal voltage Vac, 50/60 Hz	dc resistance at 20 °C Ω	Coil No. Order No. block 2
12	41 ± 4.5	22
24	160 ± 16	23
115	3800 ± 540	27
220	14600 ± 2000	28

There are tolerances on the operating voltage of+10 % or −15 % of nominal when working in an ambient temperature of + 40 °C.

Sockets with retainer
for direct mounting into printed circuits



for solder connections

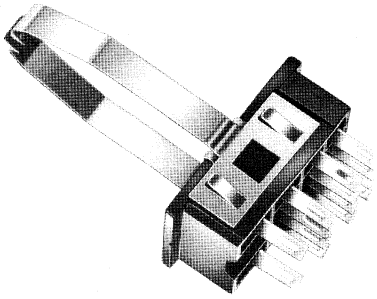
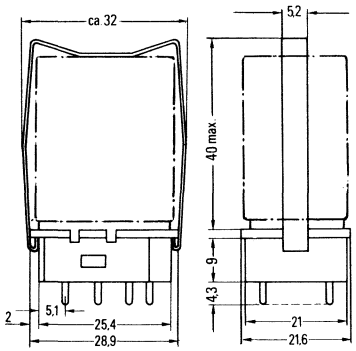
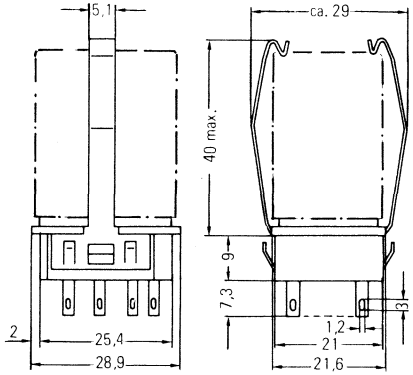


Illustration approx.
original size
Weight approx. 8 g





Ordering code

Sockets for direct mounting into printed circuits

for relay with 2 changeovers	V23100-Z7003
for relay with 4 changeovers	V23100-Z7001

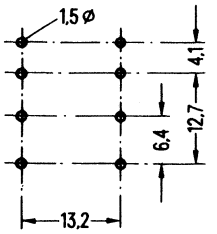
Sockets for solder connections

for relay with 2 changeovers	V23100-Z7004
for relay with 4 changeovers	V23100-Z7002

Industrial relay 1

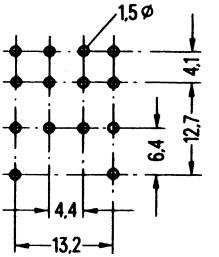
Mounting hole layout for relays and sockets for direct mounting into printed circuits

Relays
with 2 changeovers

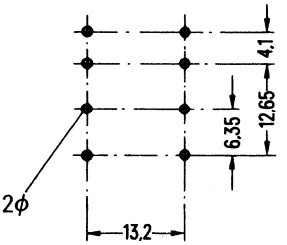


View from the wiring side

Relays
with 4 changeovers

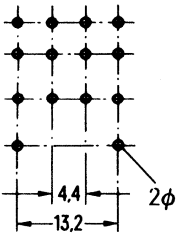


Sockets for relay
with 2 changeovers

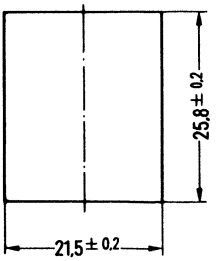


View from the wiring side

Sockets for relay
with 4 changeovers



Mounting hole layout for sockets for solder connections for fixing into mounting plates



Thickness of mounting plate 1 mm to 2.3 mm

Industrial relay 10 V23100-V9

for dc or ac operation, neutral, monostable

Outstanding features

- Robust and simple design
- Well established usage in casting technics and mechanical conveying and handling systems, chemical industry, transport accessory equipment as well as in switchgear for electric motors

Versions

- Contact arrangement: 2 or 3 changeovers
- Heavy duty contacts
- Termination: plug-in
- Transparent cover to give protection against damage and dust
- Relay base suitable for 8 or 11 pin international standard sockets
- Accessories: sockets, solder connection or quick mounting to DIN rails

Industrial relay 10

V23100-V91★★

With 2 changeovers

Dust protected

Plug-in

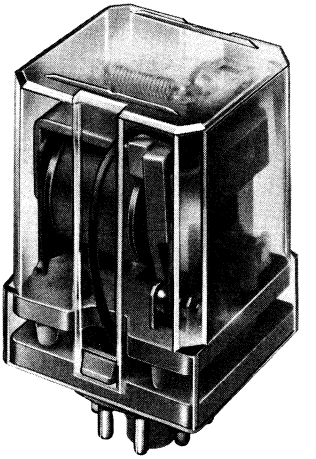
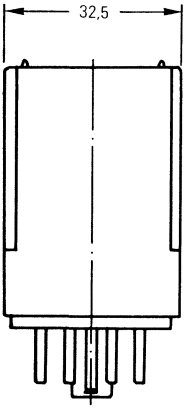
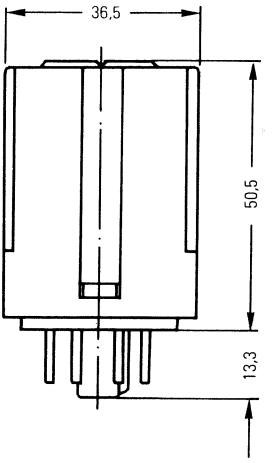
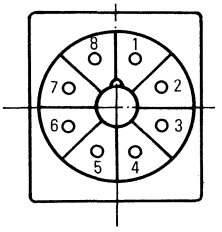


Illustration approx.
2/3 of original size
Approx. weight 75 g

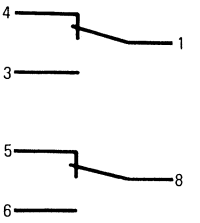


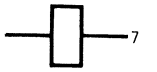


View from the
wiring side



Base terminals





Industrial relay 10

V23100-V91★★

With 3 changeovers

Dust protected

Plug-in

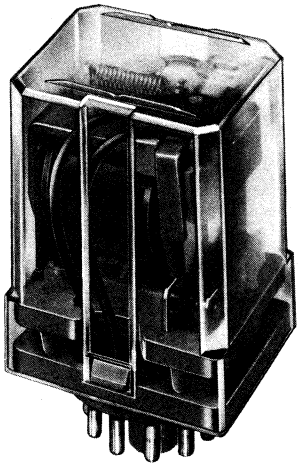
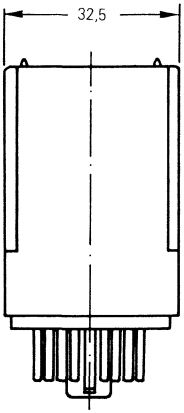
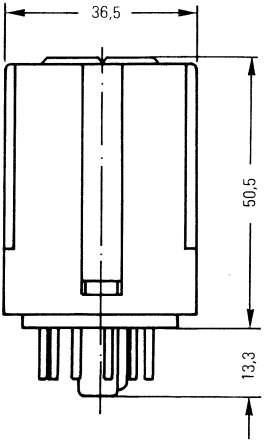
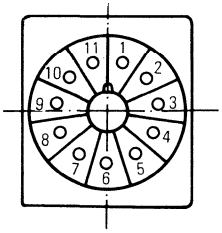


Illustration approx.
2/3 of original size
Approx. weight 80 g

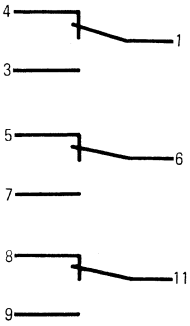


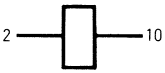


View from the
wiring side



Base terminals





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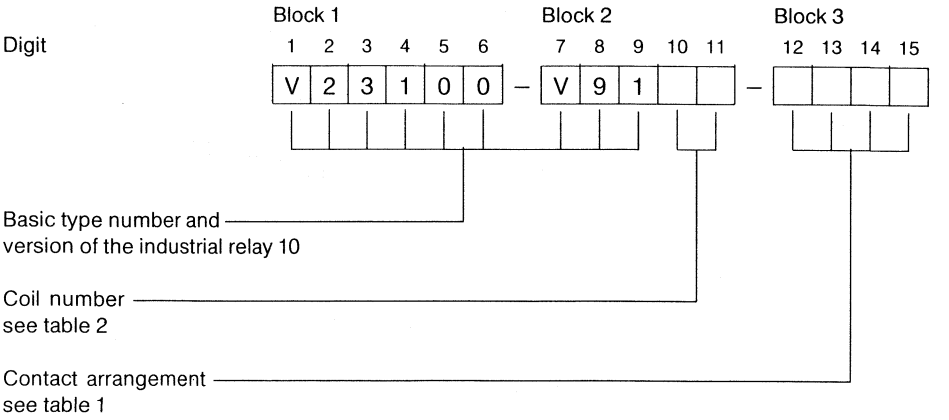
Industrial relay 10

Ordering code



Ordering example: V23100-V9112-F204

Industrial relay 10, for dc operation, coil 12 V nominal, contact arrangement 2 changeovers.

Preferred standard types

Relays	V23100-V9112-F204	V23100-V9123-F204
	-V9112-F206	-V9123-F206
	-V9113-F204	-V9127-F204
	-V9113-F206	-V9127-F206
		-V9128-F204
		-V9128-F206
Sockets	V23100-Z9001	V23100-Z9005
(see page 6.17)	-Z9002	-Z9006

Table 1 Characteristics

Energising side

Nominal voltage	Vdc/Vac	see table 2
Nominal power consumption		
dc voltage	W	approx. 1.3
ac voltage	VA	approx. 3.8 during switching-on
ac voltage	VA	approx. 2.4 after switched-on
Maximum temperature	°C	100

Contact side

Order No. block 3		F204	F206
Contact material		Silver-nickel	
Contact designation		21-21	21-21-21
Symbols (see also base terminals)		2 x 	3 x 
Max. switching voltage	Vdc Vac	250 250	
Max. switching current	A	10	
Max. power rating			
dc voltage	W	up to 24 V: 240	
	W	up to 250 V: 100	
ac voltage	VA	1500	
Max. continuous current	A	10	

General

Admissible ambient temperature	°C	−40 to +50
Maximum switching rate		
dc voltage	ops./sec	10
ac voltage	ops./sec	5
Test voltage		
winding/frame	V_{rms}	2000
contact/contact	V_{rms}	2000
contact/frame	V_{rms}	2000
Mechanical life		
dc voltage	operations	approx. 2×10^6
ac voltage	operations	approx. 10^6

6

Table 2 List of coils

for dc operation

Nominal voltage*) Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
12	110 ± 10	12
24	445 ± 45	13

for ac operation

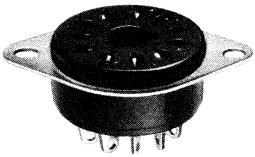
Nominal voltage*) Vac, 50 Hz	dc resistance at 20 °C Ω	Coil No. Order No. block 2
24	75 ± 8	23
110	1800 ± 180	27
220	7000 ± 700	28

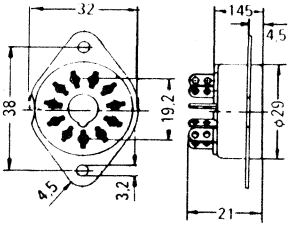
*) There are tolerances on the operating voltage of + 10 % and – 15 % of nominal at ac operation or + 15 % and – 20 % of nominal at dc operating.

Socket with metal flange

8- or 11 pin

For solder connections



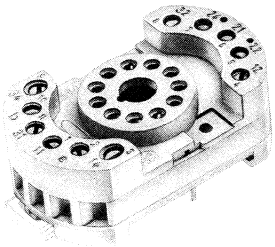


Socket with fixture

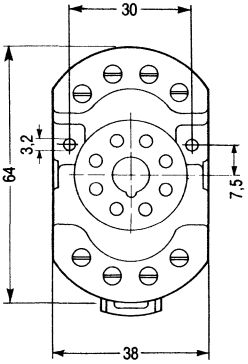
8- or 11 pin

For quick mounting
onto DIN-rails 46277

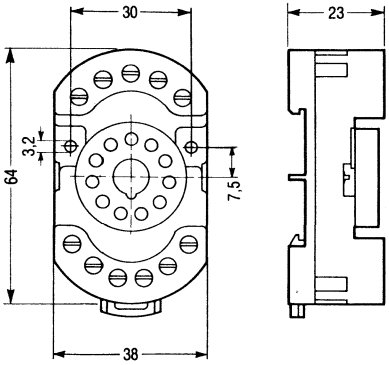
For screw connections



8 pin



11 pin



6

Ordering code

Sockets		Order No.
with metal flange	8 pin (for relay with 2 changeovers)	V23100-Z9001
	11 pin (for relay with 3 changeovers)	V23100-Z9002
with fixture	8 pin	V23100-Z9005
	11 pin	V23100-Z9006

Power relay 15 V23008, V23009

for dc or ac operation, neutral, monostable

Outstanding features

- High switching capability
- The mechanical and electrical characteristics conform to the »Regulations for electrical relays in heavy current circuits« (VDE 0435/9.72) and the »Safe electrical separation of telecommunication and heavy current circuits« (VDE 0804)
- Air gaps ≥ 3 mm, creepage distances ≥ 4 mm

Versions

- Contact arrangement: 2 makes or 2 or 3 changeovers
- Termination: push-on connectors
- Transparent cover to give protection against damage

Approval: SEV No. D 7.91/254

Power relay 15

V23008-A0★★★ for ac operation

V23009-A0★★★ for dc operation

With 2 makes or
2 changeovers

Dust protected

With flat terminals, suitable for 6.3 mm push-on connectors in accordance with DIN 46245 or DIN 46247

For screw mounting

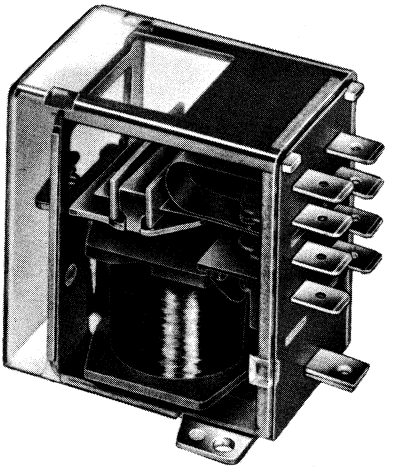
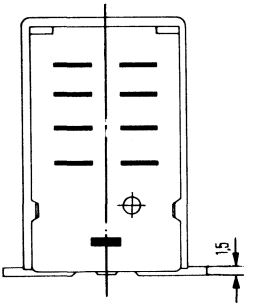
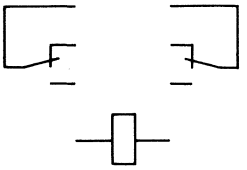


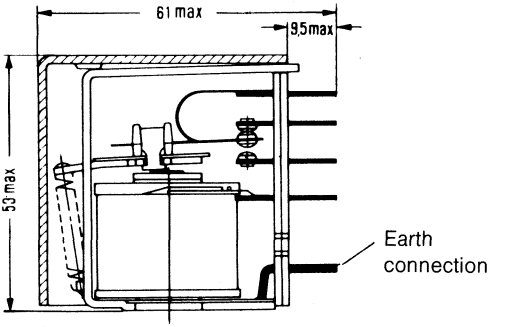
Illustration approx. 2/3 of original size
Approx. weight 125 g

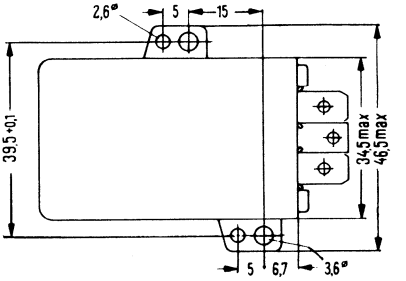


Base terminals



View from the wiring side





Power relay 15

V23008-A0★★★ for ac operation

V23009-A0★★★ for dc operation

With 3 changeovers

Dust protected

With flat terminals, suitable for 4.8 mm push-on connectors in accordance with DIN 46245 or DIN 46247

For screw mounting

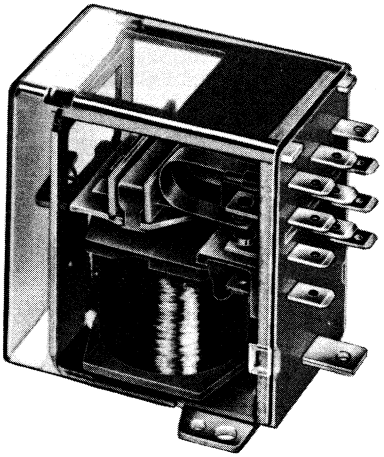
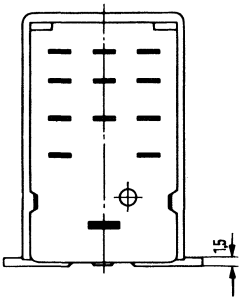
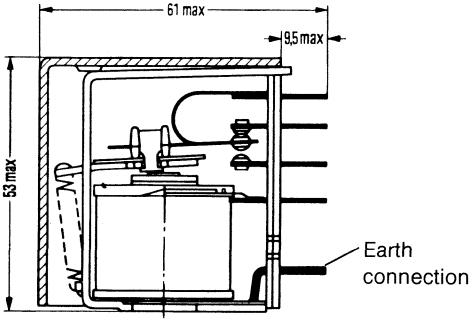
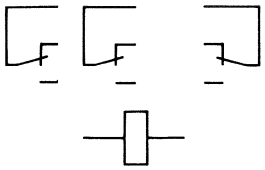


Illustration approx. 2/3 of original size
Approx. weight 140 g

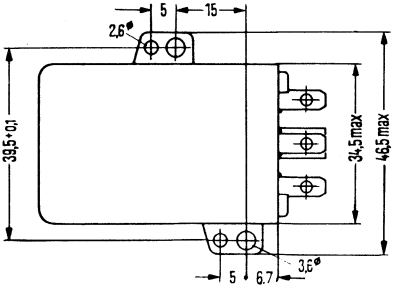




Base terminals

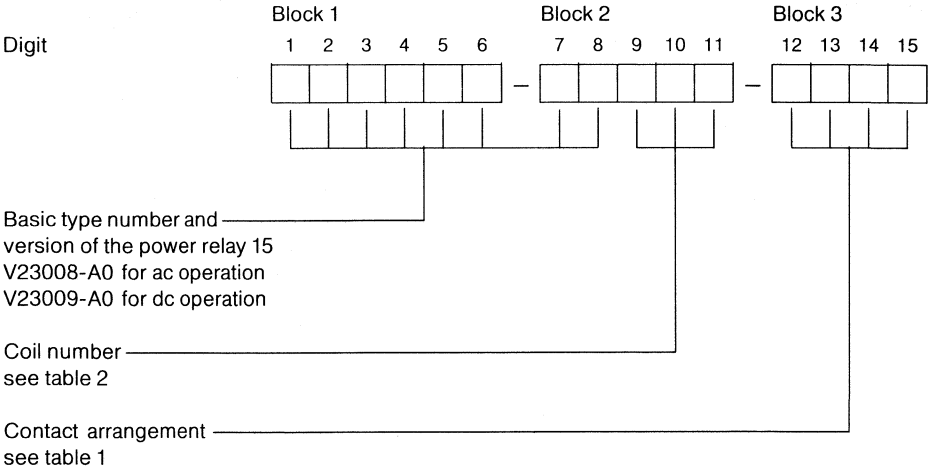


View from the wiring side



Power relay 15

Ordering code



Ordering example: V23008-A0002-A052

Power relay 15, for 220 V ac operation, with 2 changeovers, contact material silver-nickel

Preferred standard types

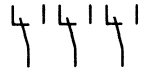
V23008-A0002-A052	V23009-A0001-A052
-A0002-A101	-A0001-A101
-A0005-A052	-A0005-A052
-A0005-A101	-A0006-A052
-A0015-A101	-A0006-A101
-A0022-A052	-A0007-A052
	-A0007-A101
	-A0008-A052
	-A0008-A101
	-A0010-A101

Table 1 Characteristics

Energising side

Relay version		for dc operation	for ac operation
Operating voltages	Vdc/Vac	see table 2	
Nominal power consumption	W or VA VA	approx. 2	approx. 5.3 during switching-on approx. 3.4 after switched-on
Maximum temperature	°C	100	
Continuous thermal load at 20 °C ambient temperature	W or VA	4	7.5
Thermal resistance	K/W or K/VA	20	10

Contact side

Contact material silver order No. block 3		A031	A051	A100
Contact material silver-nickel order No. block 3		A032	A052	A101
Contact designation		1-1	21-21	21-21-21
Symbols (see also base terminals)				
Max. switching voltage to VDE 0110 group C	Vdc Vac	300 250		
Max. switching current[1])	A	40	40	20
Max. power rating[2]) dc voltage	 W W W W	 up to 24 V: 360 up to 40 V: 140 up to 60 V: 80 up to 250 V: 100		
ac voltage	kVA	10	10	5
Max. continuous current	A	15	15	8

General

Admissible ambient temperature	°C	−40 to +65		
Max. switching rate dc voltage ac voltage	 ops./sec ops./sec	 10 5		
Test voltage winding/frame contact/contact contact/frame	 V_{rms} V_{rms} V_{rms}	 2500 2500 2500		
Electrical life[2]) ac voltage 220 V, 15 A ac voltage 220 V, 6 A	 operations operations	 approx. 10^5	approx. 10^5	 approx. 10^5
Mechanical life	operations	approx. 10^7		

[1]) The current of 40 A/20 A may flow for a maximum of 4 sec. up to 10 % on time.

[2]) These values apply for resistive load or inductive load with suitable spark suppression. Obtained at 2 ops/sec.

6

Table 2 List of coils

for dc operation

Nominal voltage Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
6	22 ± 2.2	005
12	85 ± 8.5	006
24	300 ± 30	007
48	1000 ± 100	001
60	2100 ± 210	008
110	5300 ± 530	009
220	20400 ± 3060	010

for ac operation

Nominal voltage Vac, 50 Hz	dc resistance at 20 °C Ω	Coil No. Order No. block 2
6	1.6 ± 0.2	011
12	6.1 ± 0.6	012
24	22 ± 2.2	005
42	76 ± 7.6	022
110	620 ± 62	015
220	2900 ± 290	002
380	8600 ± 1290	027

There are tolerances on the operating voltage of + 10 % and – 15 % of nominal when working in an ambient temperature of + 65 °C.

Power relay ZW V23048

with forcible guided contacts,
for dc operation, neutral, monostable

General

Trade unions demand relays fitted with forcible guided contacts for applications which specify the protection of human life and to ensure safety and health.

This is achieved by design features, whereby break and make contacts within the same contact pile-up are arranged in such a way, that no normally open contact shall close if a break contact is welded together, and no normally closed contact will open if a make contact is welded in the closed position.

This also applies for a changeover arrangement which has to be considered as 1 make and 1 break contact. This well defined state is guaranteed by interlocking the pair of contact sets by means of a rigid, statically arrangement between the member of the link and the blades.

Outstanding features

- It meets the requirements for forcible guidance to be used in control systems, mainly in the metal working industries.
  Regulations for self-monitoring in accordance with ZH1/457, paragraph 3.4.1f
- Individual contact sets are self contained in chambers and the operating system is shielded from the contact pile-ups
- Air gaps and creepage distances in accordance with VDE 0110, insulation group C, 250 Vac, winding-contact 8 mm

Versions

- Vertical; mounting position optional
- Contact arrangement: 4 makes and 2 breaks
- Termination: printed circuit
- Transparent cover to give protection against damage and dust

Approvals:	TÜV-RHINELAND	No. 945/EL 1001
	SEV	86.1/10931/02
	Swiss Accident Insurance	Certificate No. 2798
	Institute UL	Guide NRNT 2, file E 48393

Power relay ZW

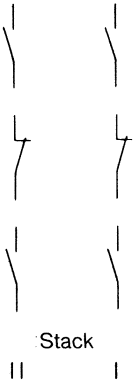
V23048-A1★★★

With 4 makes and 2 breaks

Dust protected

For direct mounting into printed circuits. Pin arrangement for 1.25 mm grid

Base terminals



Stack

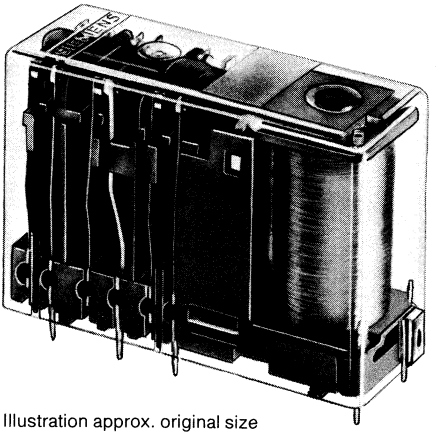
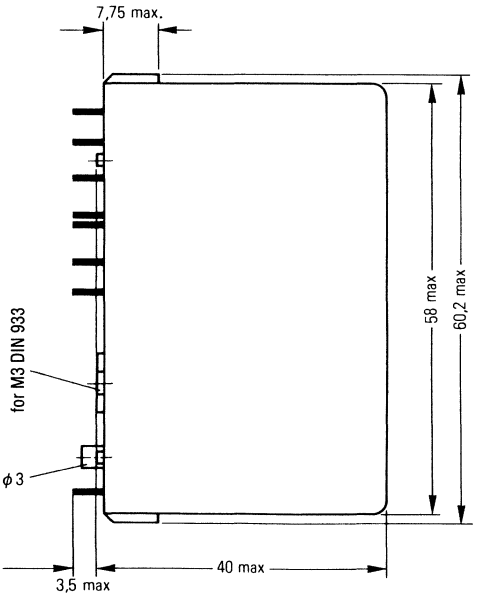
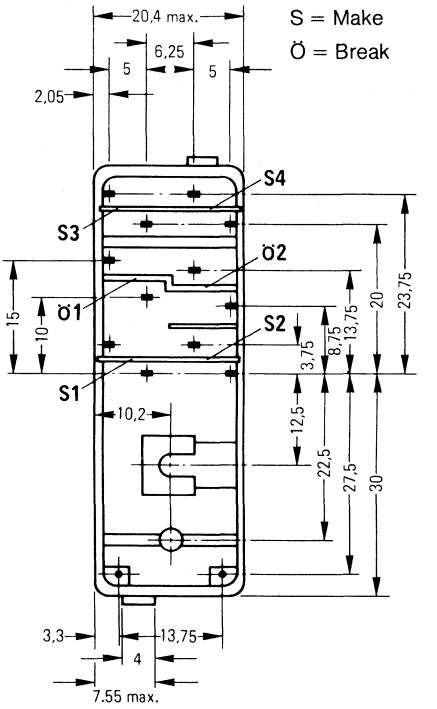


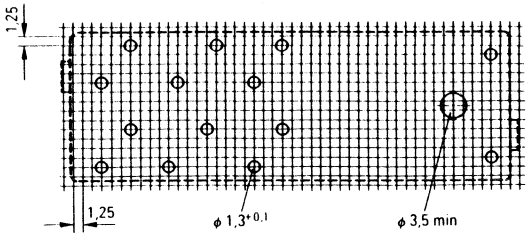
Illustration approx. original size
Approx. weight 80 g





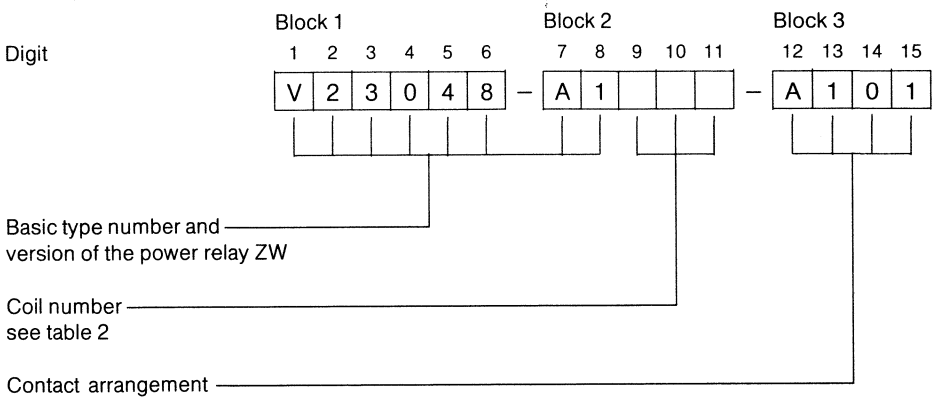
Base terminals ultrasonic tinned

Power relay ZW



Mounting hole layout
View from the wiring side

Ordering code



Ordering example: V23048-A1001-A101
Power relay ZW, coil 12 V nominal

6

Power relay ZW

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 2
Nominal power consumption	W	1.25
Maximum temperature	°C	115
Thermal resistance	K/W	36

Contact side

Order No. block 3		A101
Contact material		Silver, gold flashed
Contact designation		1-2-1–1-2-1
Symbols (see also base terminals)		
Max. switching voltage	Vdc Vac	300 250
Max. switching current	A	4
Max. power rating dc voltage ac voltage	 W VA	 50 to 120; see fig. 1 (voltage dependent) 1000
Max. continuous current	A	4

General

Admissible ambient temperature	°C	−25 to +70
Operate time	ms	approx. 25
Release time	ms	approx. 8
Bounce time	ms	approx. 10
Max. switching rate	ops./sec	20
Test voltage contact/winding contact/contact support pieces/conduct. parts	 V_{rms} V_{rms} V_{rms}	 4000 2000 4000
Electrical life	operations	$\geq 6 \cdot 10^5$
Mechanical life	operations	approx. 10^7

Table 2 List of coils

Nominal voltage Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
12	115 ± 12	001
24	460 ± 46	003
110	9700 ± 1460	002
220	37217 ± 5585	004

There are tolerances on the operating voltage of +10 % and −15 % of nominal when working in an ambient temperature of 70 °C.

Limiting curve for power load

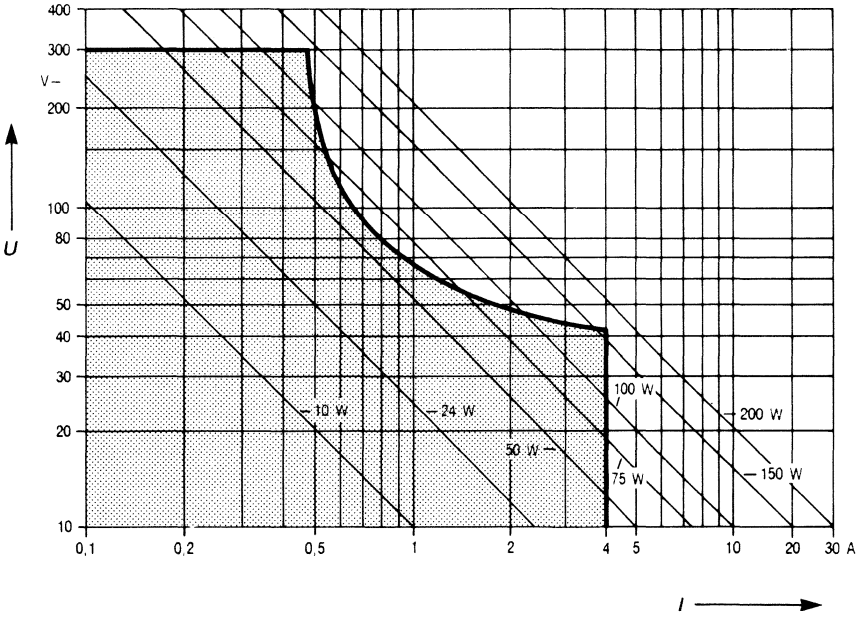


Fig. 1

I = Switching current
U = Switching voltage (dc)

Safe breaking, arc extinguished (limit curve II).

Power relay ZW

Electrical life

Switching voltage Vdc	Switching current A	Electrical life operations	Type of load	Life obtained at ops./sec.
12	4	5×10^6	resistive	1
12	1	1×10^7	resistive	1
24	4	6×10^5	resistive	1
24	1	1×10^6	resistive	1
48	0.5	8×10^6	resistive	1
48	1	3×10^5	resistive	1

Small general purpose relay V23006

for dc operation, neutral, monostable

Outstanding features

- Versatile for many applications due to the large number of contact pile-ups

Versions

- Contact arrangement: V23006-A0... max. 6 makes or 6 changeovers
  V23006-G1... max. 4 changeovers
  V23006-H1... max. 8 changeovers
- Contact pile-ups with single or bifurcated contacts
- Termination: solderable and/or plug-in
- Transparent cover (type V23006-G1... and -H1...) to give protection against damage and dust
- Accessories: sockets, solder connections, and retainers

Small general purpose relay

V23006-A0★★★

Contact pile-ups with single or bifurcated contacts,
with max. 6 makes or 6 changeovers

With individual solder connections

For screw mounting

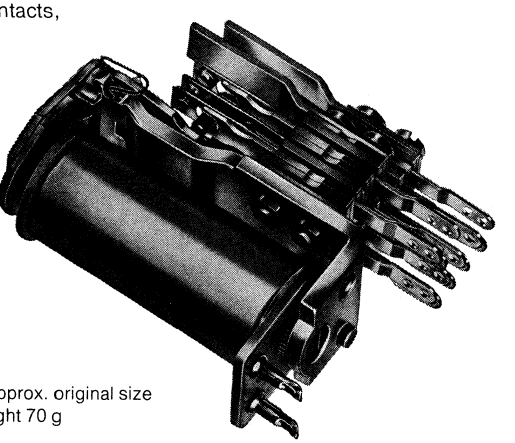
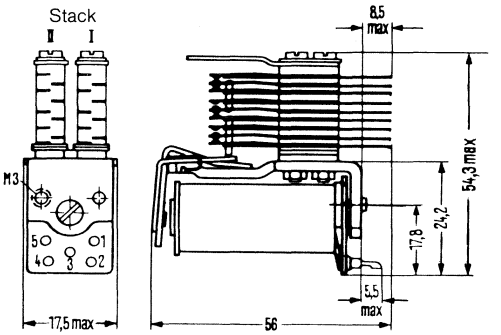
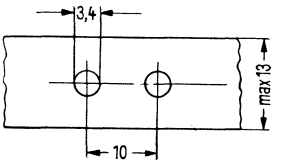


Illustration approx. original size
Approx. weight 70 g

Stack



Mounting hole layout



Insertion depth of fixing screw M3: max. 4 mm

Small general purpose relay

V23006-G1★★★

Contact pile-ups with single or bifurcated contacts,
with max. 4 changeovers

Dust protected

With individual solder connections

Plug-in and for screw mounting

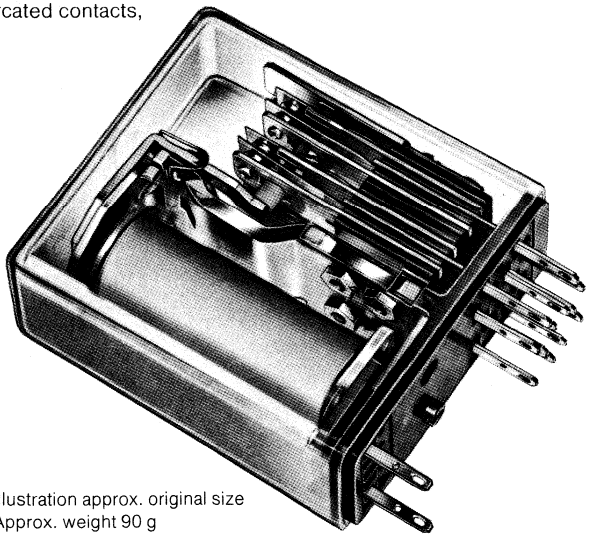
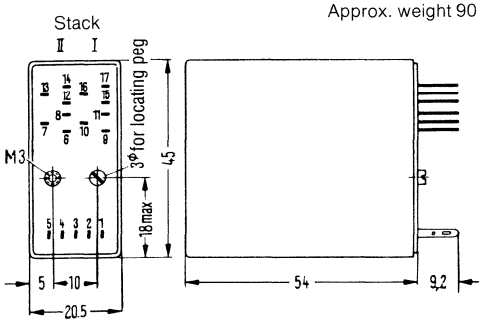
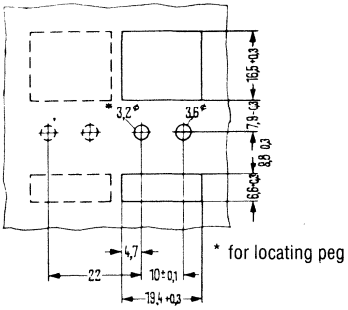


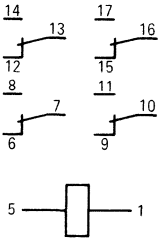
Illustration approx. original size
Approx. weight 90 g



Mounting hole layout



Base terminals



View from the wiring side

Socket see page 6.40

Small general purpose relay

V23006-H1★★★

Contact pile-ups with single or bifurcated contacts,
with max. 8 changeovers

Dust protected

With individual solder connections

Plug-in and for screw mounting

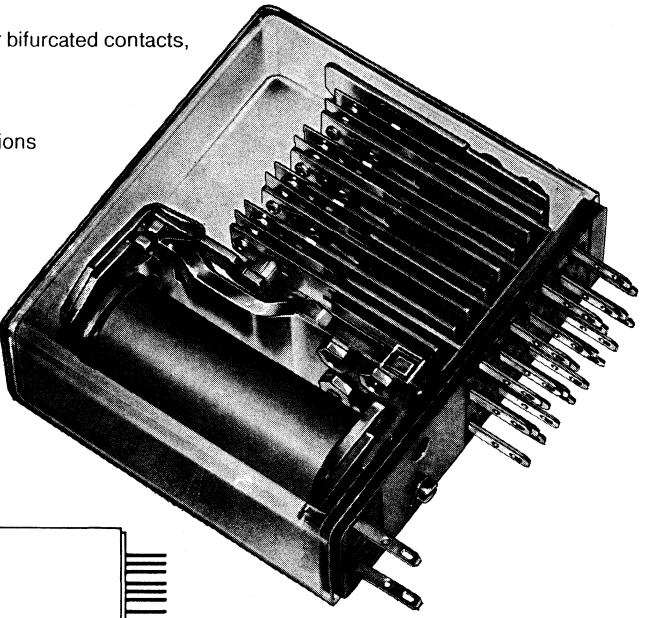
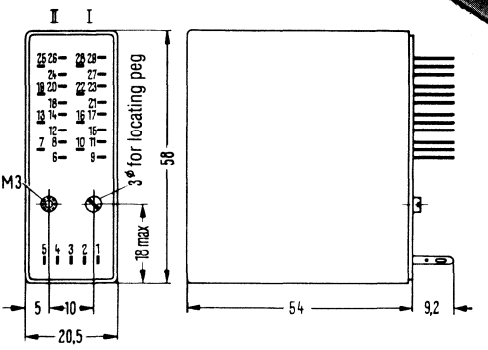
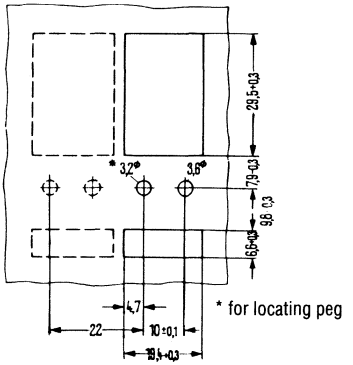


Illustration approx. original size
Approx. weight 105 g

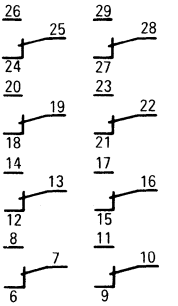
Stack



Mounting hole layout



Base terminals

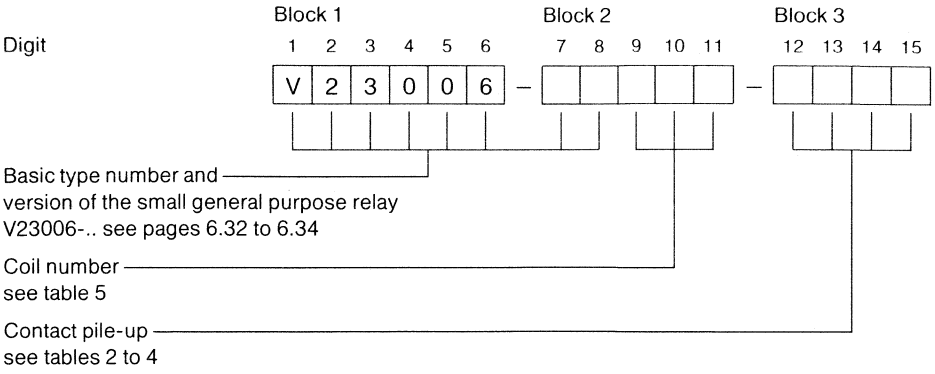


View from the wiring side

Socket see page 6.41

Small general purpose relay

Ordering code for complete relays



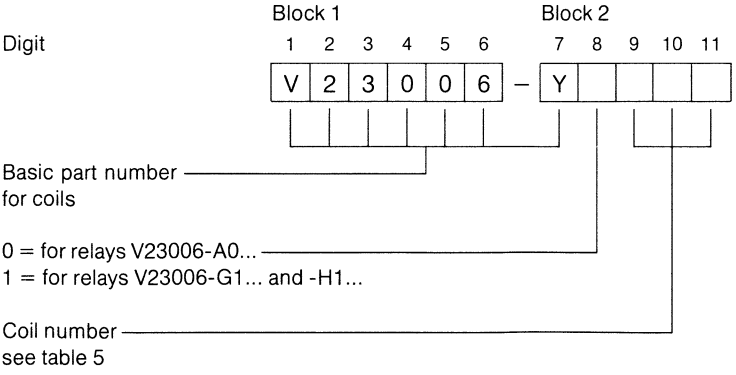
Ordering example: V23006-G0012-A004

Small general purpose relay, plug-in, coil 24 V nominal (coil resistance 220 Ω), 4 change-overs, bifurcated contacts (switching current 2 A max.).

Preferred standard types

V23006-G1016-A004	V23006-G1017-A032	V23006-H1012-A008
-G1016-A034	-G1020-A034	-H1012-A036
-G1017-A002		-H1012-A038

Ordering code for coils only



Ordering example: V23006-Y0012

Coil for V23006-A0..., 24 V nominal

Small general purpose relay

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 5
Nominal power consumption	W	1.8...3.8
Maximum temperature	°C	100
Continuous thermal load at 20 °C ambient temperature	W	3.8
Thermal resistance	K/W	21

Contact side

Type of contact		Bifurcated	Single	Single
Contact arrangement max. changeovers makes		 8 —	 8 6	 2 2
Max. switching voltage	Vdc Vac	450 380	450 380	450 380
Max. switching current	A	2	4	20
Max. power rating	W/VA	30	10 to 160[1])	100 to 400[1])

General

Admissible ambient temperature	°C	−40 to +70		
Operate time[2])	ms	approx. 5 to 20		
Release time[2])	ms	approx. 1.5 to 6		
Max. switching rate	ops./sec.	20		
Test voltage winding/frame contact/contact contact/frame	 V_{rms} V_{rms} V_{rms}	 1500 1500 1500	 1500 1500 1500	 1500 — 1500
Mechanical life[2])	operations	approx. 10^8		

[1]) These values are voltage dependent.
[2]) Depending on the contact pile-up.

Table 2 Contact pile-ups for V23006-A0...

Bifurcated contacts, contact material silver, gold flashed,
max. power rating 30 W, max. switching voltage 380 Vac/450 Vdc
max. switching current 2 A

Contact designation		Order No.
stack II	stack I	block 3
21	21	A002
21-21	21-21	A004
21-21-21	21-21-21	A006

Single contacts, contact material silver, gold flashed,
max. power rating 160 W up to switching voltage 380 Vac/40 Vdc
100 W up to switching voltage 380 Vac/60 Vdc
60 W up to switching voltage 380 Vac/450 Vdc
max. switching current 4 A

Contact designation		Order No.
stack II	stack I	block 3
1-1	1-1	A094
1-1-1	1-1-1	A096
21	21	A032
21-21	21-21	A034

Single contacts, contact material silver, gold flashed
max. power rating 400 W up to switching voltage 380 Vac/40 Vdc
200 W up to switching voltage 380 Vac/60 Vdc
100 W up to switching voltage 380 Vac/450 Vdc
max. switching current 20 A

Contact designation		Order No.
stack II	stack I	block 3
—	1	A241
1	1	A242
—	21	A191
21	21	A192

Table 3 Contact pile-ups for V23006-G1...

Bifurcated contacts, contact material silver, gold flashed
max. power rating 30 W,max. switching voltage 380 Vac/450 Vdc
max. switching current 2 A

Contact designation		Order No.
stack II	stack I	block 3
21	21	A002
21-21	21-21	A004

Single contacts, contact material silver, gold flashed,
max. power rating 160 W up to switching voltage 380 Vac/40 Vdc
100 W up to switching voltage 380 Vac/60 Vdc
60 W up to switching voltage 380 Vac/450 Vdc
max. switching current 4 A

Contact designation		Order No.
stack II	stack I	block 3
21	21	A032
21-21	21-21	A034

Table 4 Contact pile-ups for V23006-H1...

Bifurcated contacts, contact material silver, gold flashed,
max. power rating 30 W, max. switching voltage 380 Vac/450 Vdc
max. switching current 2 A

Contact designation		Order No.
stack II	stack I	block 3
21-21-21	21-21-21	A006
21-21-21-21	21-21-21-21	A008

Single contacts, contact material silver, gold flashed,
max. power rating 160 W up to switching voltage 380 Vac/40 Vdc
100 W up to switching voltage 380 Vac/60 Vdc
60 W up to switching voltage 380 Vac/450 Vdc
max. switching current 4 A

Contact designation		Order No.
stack II	stack I	block 3
21-21-21	21-21-21	A036
21-21-21-21	21-21-21-21	A038

Table 5 List of coils

Nominal voltage	Operating voltage range at 20 °C					Resistance at 20 °C	Coil No. Order No. block 2
	Minimum voltage U_I Vdc with contact pile-up (order No. block 3)				Maximum voltage U_{II}		
	-A002 -A004 -A032	-A094 -A191 -A241	-A006 -A008 -A034 -A036	-A038 -A096 -A192 -A242			
Vdc					Vdc	Ω	
6	3.0 3.9	3.9 5.0	4.6 —	5.6 —	9.5 12.0	20 ± 2 32 ± 3.2	006 007
12	5.6 7.9	7.3 10.3	8.7 —	10.5 —	17.0 23.0	65 ± 6.5 120 ± 12	008 010
24	10.8 14.8	14.0 19.3	16.7 —	20.2 —	31.5 42.5	220 ± 22 400 ± 40	012 016
48	18.1 22.4	23.6 29.2	28.3 34.9	34.3 42.3	52.0 64.0	600 ± 60 900 ± 90	017 018
60	28.0 35.3	36.5 46.2	43.8 55.4	53.1 —	79.0 95.0	1380 ± 140 2000 ± 200	019 020
110	52.0 59.0	68.0 77.0	82.0 93.0	100.0 —	130.0 143.0	4000 ± 600 4800 ± 720	022 025
125	75.0	98.0	117.0	—	187.0	8200 ± 1230	026
220	119.0	157.0	189.0	—	284.0	19000 ± 2850	014

The operating voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1.0	1.04	1.08	1.12	1.16	1.20
k_{II}	1.0	0.94	0.87	0.79	0.71	0.6

Small general purpose relay

Socket for V23006-G1...

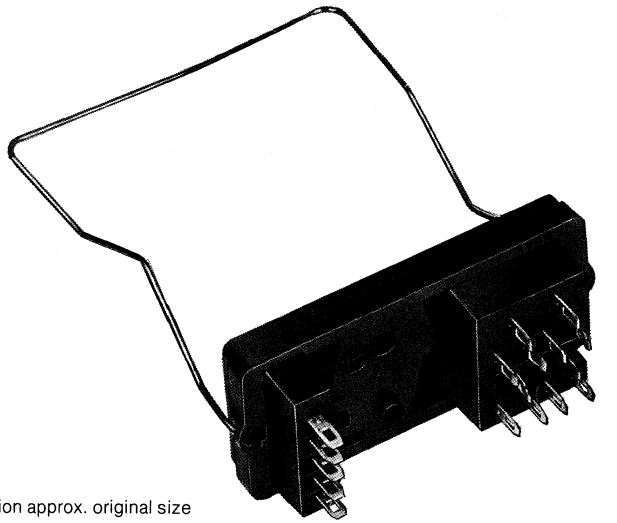
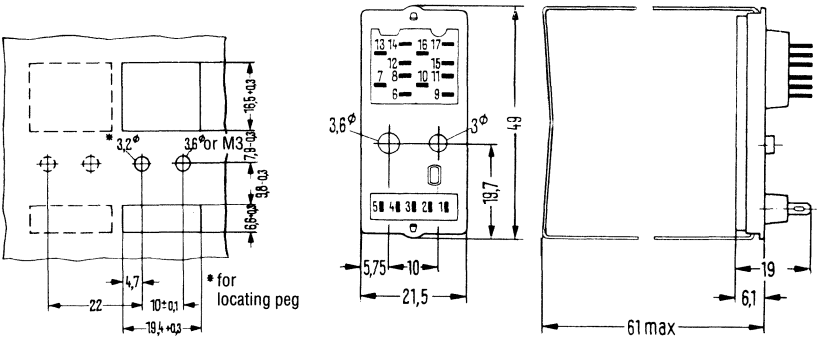


Illustration approx. original size

Mounting hole layout



Item	Order No.	Weight g (approx.)
Socket	V23006-Z1001	9
Retainer	V23006-Z1003	2

Small general purpose relay

Socket for V23006-H1...

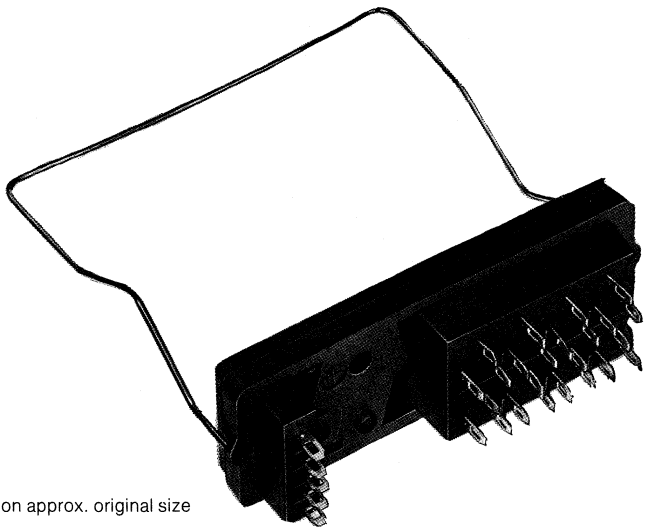
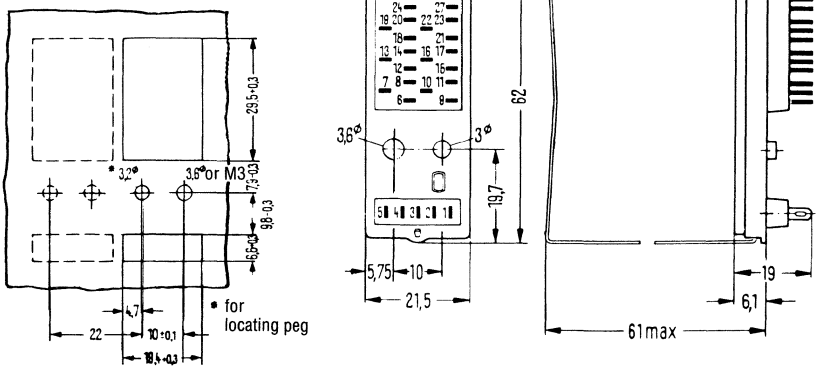


Illustration approx. original size

Mounting hole layout



Item	Order No.	Weight g (approx.)
Socket	V23006-Z1002	9
Retainer	V23006-Z1004	2

Electromechanical relays

Power relay K V23133
Power relay K-B V23033
Power relay K-D V23033
Power relay K-S V23071

for dc operation, neutral, monostable

Outstanding features

- Used in automotive applications (cars, lorries and buses) as well as in gambling machines, toy industry and control systems

Versions

- Contact arrangement:
  power relay K: 1 make, 1 break or 1 changeover
  power relay K-B: 1 bridging make
  power relay K-D: 1 twin make
  power relay K-S: 1 make
- Power relay K: contact arrangement for higher continuous current (max. 45 A)
- Power relay K-S: heavy duty version, conforms to special requirements in the automotive industry
- Termination: printed circuit or US-footprint (power relay K only)

Power relay K

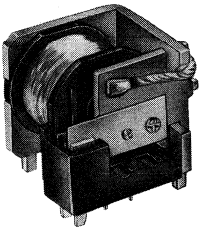
V23133-A1★★★

With 1 make, 1 break or 1 changeover

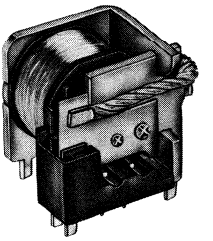
PCB terminals (standard)

For direct mounting into printed circuits

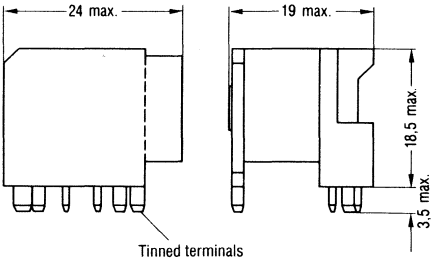
Standard version

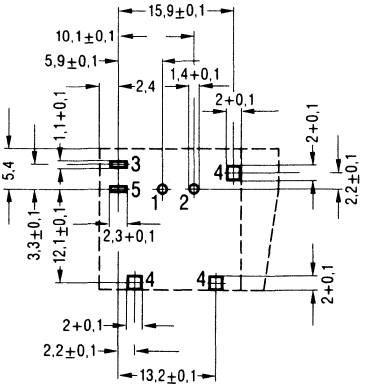


For higher continuous current (max. 45 A)



Approx. weight 20 g
Illustration approx. original size

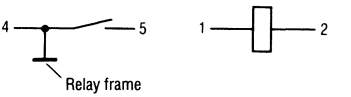




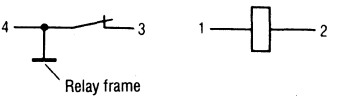
Mounting hole layout
View from the wiring side

Base terminals

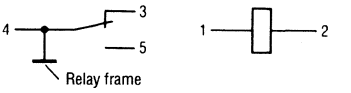
Make



Break



Changeover



Power relay K

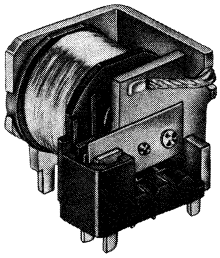
V23133-F1★★★

With 1 make, 1 break or 1 changeover

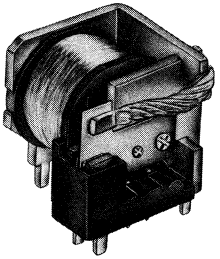
US-footprint terminals

For direct mounting into printed circuits

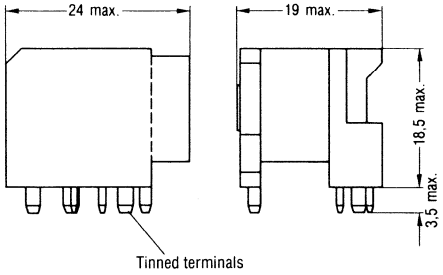
Standard version

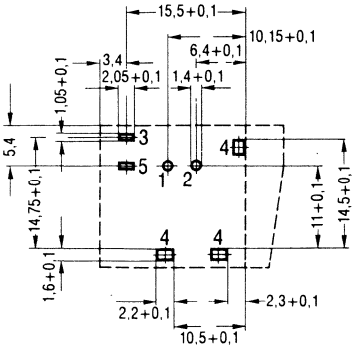


For higher continuous current (max. 45 A)



Approx. weight 20 g
Illustration approx. original size

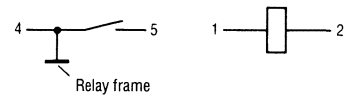




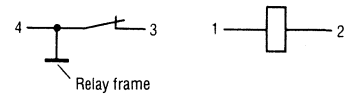
Mounting hole layout
View from the wiring side

Base terminals

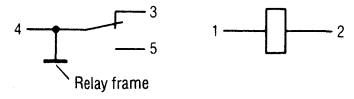
Make



Break



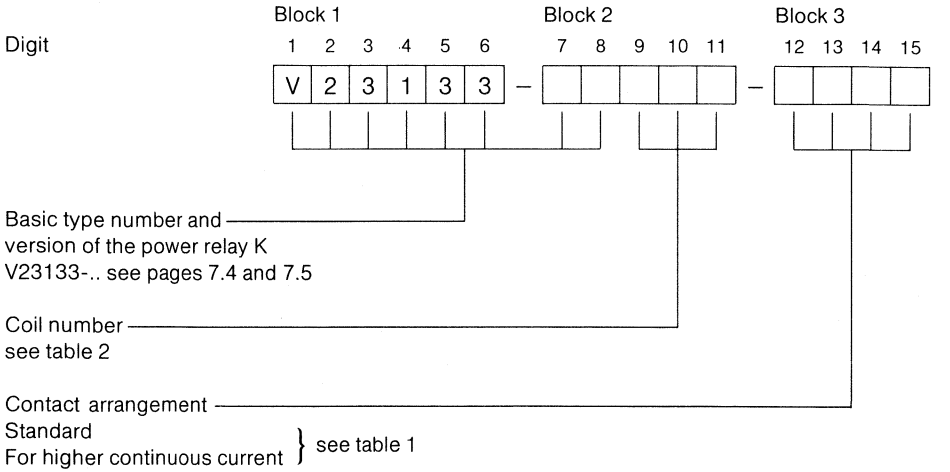
Changeover



7

Power relay K

Ordering code



Ordering example: V23133-A1001-A133

Power relay K, standard version, coil 12 V nominal, 1 changeover.

Power relay K

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 2
Nominal power consumption	W	approx. 1.6
Maximum temperature	°C	155
Continuous thermal load at 20 °C ambient temperature	W	3
Thermal resistance	K/W	45

Contact side

Order No. block 3	Standard version	A132		A131		A133		
	For higher continuous current		C132		C131		C133	
Contact material		Silver						
Contact designation		1		2		21		
Symbols (see also base terminals)								
Max. switching voltage	Vdc Vac	see fig. 1 60						
Max. switching current[1]) on[2]) off	A A	60 30	100 60	30 15	30 30	break/make 30/100 15/ 30	break/make 30/100 30/ 60	
Maximum power rating dc voltage ac voltage	 W VA	 see fig. 1 (voltage dependent) 1000						
Max. continuous current at 20 °C at 85 °C	A A	16 10	45 30	10 6	30 25	10/16 6/10	30/45 25/30	

General

Admissible ambient temperature	°C	−40 to +85					
Operate time[3])	ms	approx. 5					
Release time[3])	ms	approx. 3					
Maximum switching rate (without contact load)	ops./sec.	20					
Test voltage winding/contact	V_{rms}	500					
Electrical life[1]) ac voltage 60 V, 12 A dc voltage 15 V, 16 A dc voltage 15 V, 40 A	 operations operations operations	 approx. 1.5×10^5 $\sim 5 \times 10^5$ — — $\sim 2 \times 10^5$		 $\sim 5 \times 10^5$ — — $\sim 2 \times 10^5$		 $\sim 5 \times 10^5$ — — $\sim 2 \times 10^5$	
Mechanical life	operations	approx. 10^7					

[1]) These values apply for resistive load or inductive load with suitable spark suppression; switching voltage 15 V
Values obtained at 1 ops./sec.

[2]) This current can flow for a maximum of 3 sec, at 1 : 10 duty cycle.

[3]) Measured at nominal voltage without series resistor.

7

Table 2 List of coils

Nominal voltage Vdc	Operating voltage range at 20 °C: Minimum voltage U_{min}*) Vdc	Operating voltage range at 20 °C: Maximum voltage U_{max} Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
6	3.3	8.9	19 ± 2	021
12	6.8	19.3	90 ± 9	001
24	13.9	38.7	362 ± 40	022

Further coils for motor vehicle applications on request.

The operating voltage limits U_{min} and U_{max} depend on temperature in accordance with the following fomulae:

$U_{min\ tu} = k_I \cdot U_{min\ 20\,°C}$ and $U_{max\ tu} = k_{II} \cdot U_{max\ 20\,°C}$

t_u = ambient temperature

$U_{min\ tu}$ = minimum voltage at ambient temperature t_u

$U_{max\ tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	-40°C	-30°C	-20°C	-10°C	0°C	10°C	20°C	30°C	40°C	50°C	60°C	70°C	80°C	85°C
k_I	0.764	0.804	0.843	0.882	0.921	0.961	1.0	1.039	1.079	1.118	1.157	1.197	1.236	1.255
k_{II}	1.174	1.147	1.120	1.091	1.062	1.031	1.0	0.967	0.934	0.898	0.861	0.822	0.780	0.759

*) Pick-up voltage at 20 °C coil temperature

Limiting curve for power load

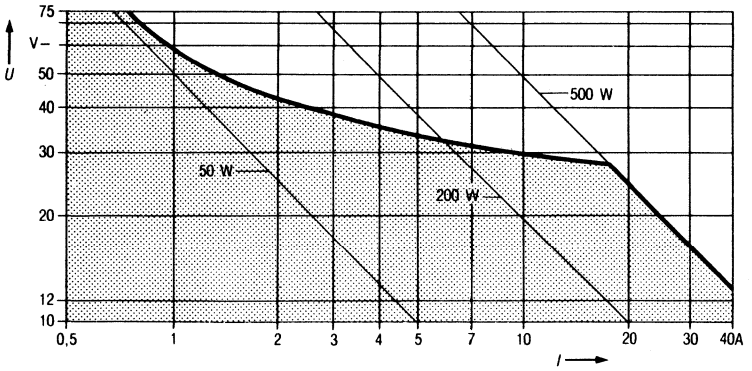


Fig. 1

Safe breaking, arc extinguished (limit curve II).

I = Switching current

U = Switching voltage (dc)

Power relay K-B and K-D

Power relay K-B

V23033-C1★★★

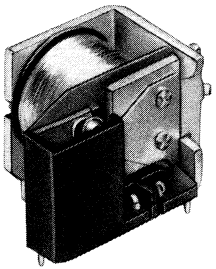
With 1 bridging make

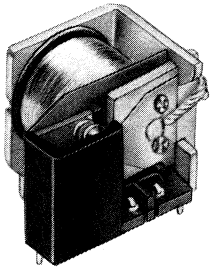
Power relay K-D

V23033-D1★★★

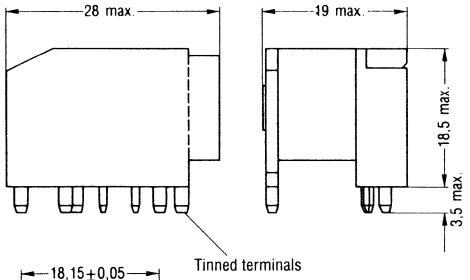
With 1 twin make

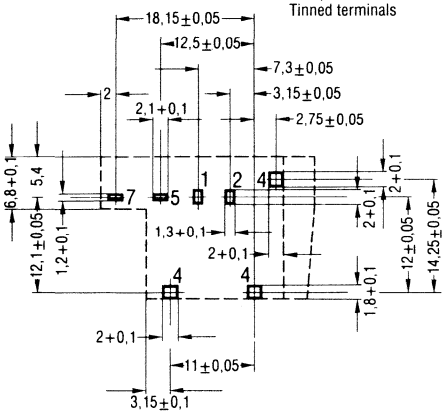
For direct mounting into printed circuits





Approx. weight 20 g
Illustration approx. original size

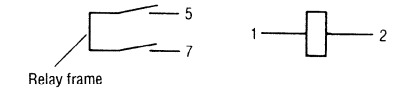




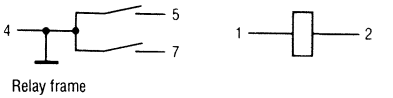
Mounting hole layout
View from the wiring side

Base terminals

Bridging make



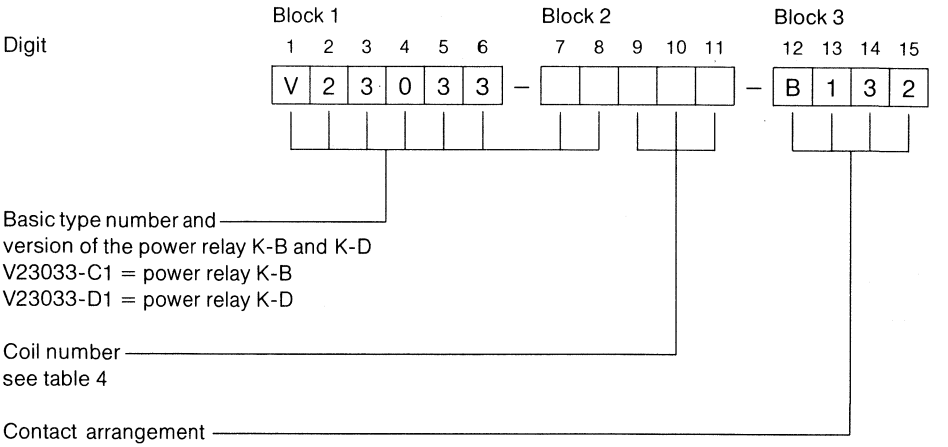
Twin make



7

Power relay K-B and K-D

Ordering code



Ordering example: V23033-C1055-B132

Power relay K-B with 1 bridging make, coil 24 V nominal

Power relay K-B and K-D

Table 3 Characteristics

Energising side

Power relay		K-B	K-D
Operating voltages	Vdc	see table 4	
Nominal power consumption	W	2.5	2.25
Maximum temperature	°C	155	
Continuous thermal load at 20 °C ambient temperature	W	3.2	
Thermal resistance	K/W	approx. 42	

Contact side

Order No. block 3		B132	
Contact material		Silver	
Contact designation		1	(11)
Symbols (see also base terminals)			
Maximum switching voltage	Vdc Vac	see fig. 2 160	see fig. 3 60
Max. switching current[1]) on[2]) off	A A	80 35	2 x 80 2 x 20
Maximum power rating dc voltage ac voltage	W VA	see fig. 2 (voltage dependent) 1600	see fig. 3 800
Max. continuous current at 20 °C at 85 °C	A A	35 20	2 x 20 2 x 15

General

Admissible ambient temperature	°C	−40 to +85	
Operate time[3])	ms	approx. 4	
Release time[3])	ms	approx. 3	
Maximum switching rate (without contact load)	ops./sec	20	
Test voltage winding/contact	V_{rms}	500	
Electrical life[1]) dc voltage 15 V, 50 A	operations	approx. 2×10^4	approx. 2×10^5
Mechanical life	operations	approx. 10^6	

[1]) These values apply for resistive load or inductive load with suitable spark suppression; switching voltage 15 V. Values obtained at 1 ops. sec.
[2]) This current can flow for a maximum of 3 sec, at 1 : 10 duty cycle.
[3]) Measured at nominal voltage without series resistor.

7

Table 4 List of coils

Nominal voltage	Operating voltage range at 20 °C		Resistance at 20 °C	Coil No. Order No. block 2
	Minimum voltage U_{min}*)	Maximum voltage U_{max}		
Vdc	Vdc	Vdc	Ω	
6	3.3	8.3	15.4 ± 1.5	056
12	6.8	16.8	64 ± 6.4	054
24	13.9	32.2	234 ± 23.4	055

Further coils for motor vehicle applications on request.

The operating voltage limits U_{min} and U_{max} depend on temperature in accordance with the following formulae:

$U_{min\ tu} = k_I \cdot U_{min\ 20\ °C}$ and $U_{max\ tu} = k_{II} \cdot U_{max\ 20\ °C}$

t_u = ambient temperature

$U_{min\ tu}$ = minimum voltage at ambient temperature t_u

$U_{max\ tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	-40°C	-30°C	-20°C	-10°C	0°C	10°C	20°C	30°C	40°C	50°C	60°C	70°C	80°C	85°C
k_I	0.764	0.804	0.843	0.882	0.921	0.961	1.0	1.039	1.079	1.118	1.157	1.197	1.236	1.255
k_{II}	1.103	1.087	1.071	1.054	1.037	1.018	1.0	0.981	0.961	0.940	0.918	0.894	0.870	0.857

*) Pick-up voltage at 20 °C coil temperature

Power relay K-B

Limiting curve for power load

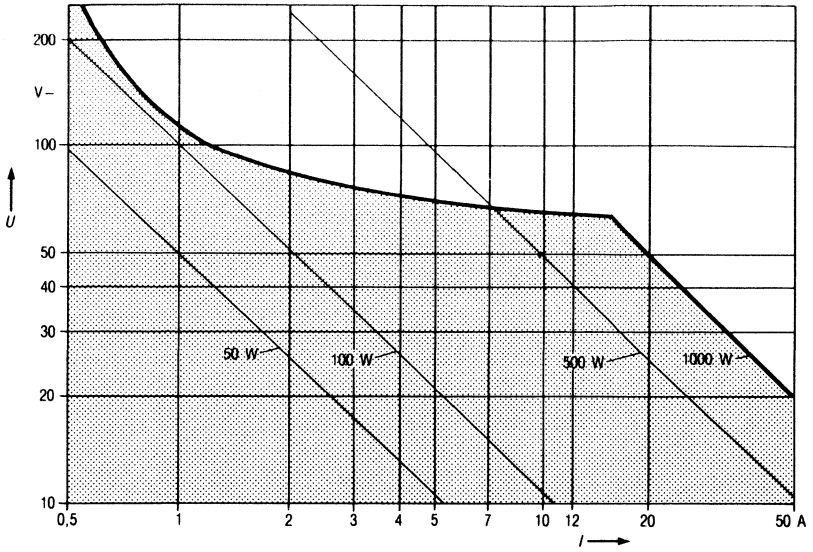


Fig. 2

Power relay K-D

Limiting curve for power load

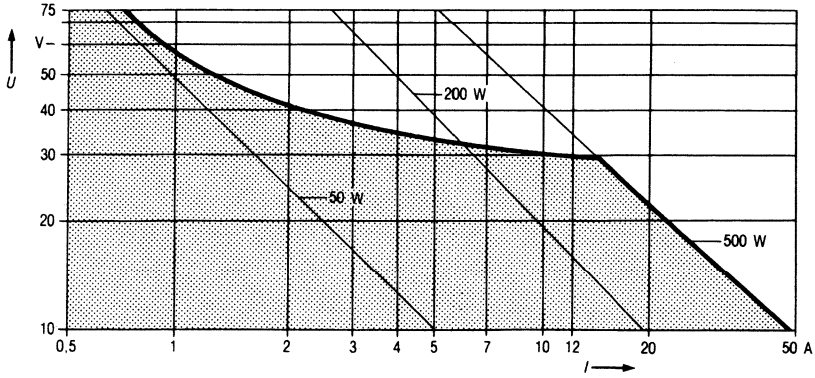


Fig. 3

Safe breaking, arc extinguished (limit curve II).

I = Switching current
U = Switching voltage (dc)

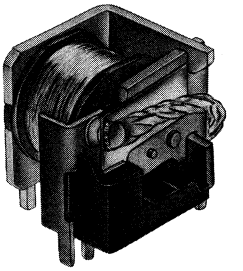
Power relay K-S

V23071-A1★★★

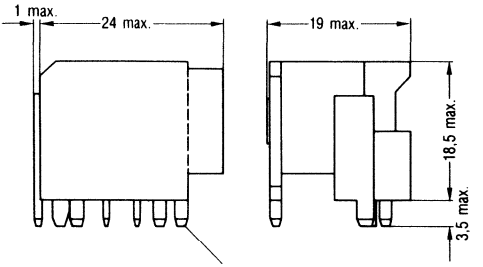
– heavy duty version –

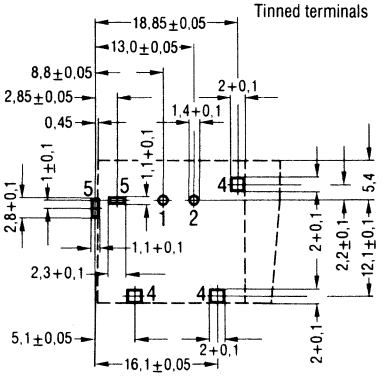
With 1 make

For direct mounting into printed circuits



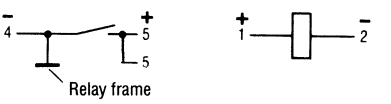
Approx. weight 30 g
Illustration approx. original size





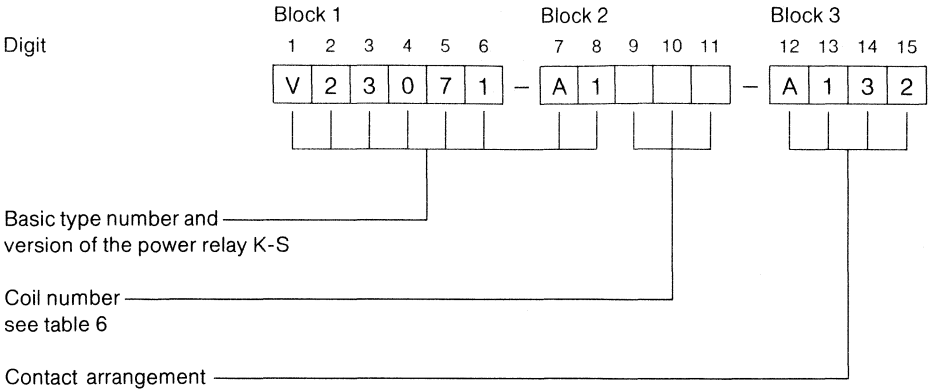
Mounting hole layout
View from wiring side

Base terminals



Power relay K-S

Ordering code



Ordering example: V23071-A1009-A132

Power relay K-S, coil 12 V nominal, with 1 make

7

Power relay K-S

Table 5 Characterisctics

Energising side

Operating voltages	Vdc	see table 6
Nominal power consumption	W	approx. 2.25
Maximum temperature	°C	155
Continuous thermal load at 20 °C ambient temperature	W	3
Thermal resistance	K/W	approx. 45

Contact side

Order No. block 3		A132
Contact material		Silver
Contact designation		1
Symbols (see also base terminals)		
Max. switching voltage	Vdc Vac	see fig. 4 60
Max. switching current[1]) on[2]) off	A A	300 70
Maximum power rating dc voltage ac voltage	W VA	see fig. 4 (voltage dependent) 1200
Max. continuous current at 20 °C at 85 °C	A A	70 50

General

Admissible ambient temperature	°C	−40 to +85
Operate time[3])	ms	approx. 4
Release time[3])	ms	approx. 3
Maximum switching rate (without contact load)	ops./ sec.	20
Test voltage winding/contact	V_{rms}	500
Electrical life[1]) dc voltage 12 V, 50 A	operations	approx. 5×10^4
Mechanical life	operations	approx. 10^6

[1]) These values apply for resistive load or inductive load with suitable spark suppression; switching voltage 15 V. Values obtained at 1 ops./sec.

[2]) This current can flow for a maximum of 1 sec, at 1 : 10 duty cycle.

[3]) Measured at nominal voltage without series resistor.

Table 6 List of coils

Nominal voltage Vdc	Operating voltage range at 20 °C: Minimum voltage U_{min} *) Vdc	Operating voltage range at 20 °C: Maximum voltage U_{max} Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
6	3.3	8.0	15.4 ± 1.5	008
12	6.8	16.3	64 ± 6.4	009
24	13.9	31.1	234 ± 23.4	010

Further coils for motor vehicle applications on request.

The operating voltage limits U_{min} and U_{max} depend on temperature in accordance with the following formulae:

$U_{min\ tu} = k_I \cdot U_{min\ 20\,°C}$ and $U_{max\ tu} = k_{II} \cdot U_{max\ 20\,°C}$

t_u = ambient temperature

$U_{min\ tu}$ = minimum voltage at ambient temperature t_u

$U_{max\ tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	-40°C	-30°C	-20°C	-10°C	0°C	10°C	20°C	30°C	40°C	50°C	60°C	70°C	80°C	85°C
k_I	0.764	0.804	0.843	0.882	0.921	0.961	1.0	1.039	1.079	1.118	1.157	1.197	1.236	1.255
k_{II}	1.081	1.069	1.056	1.043	1.029	1.014	1.0	0.985	0.969	0.953	0.935	0.917	0.897	0.887

*) Pick-up voltage at 20 °C coil temperature

7

Limiting curve for power load

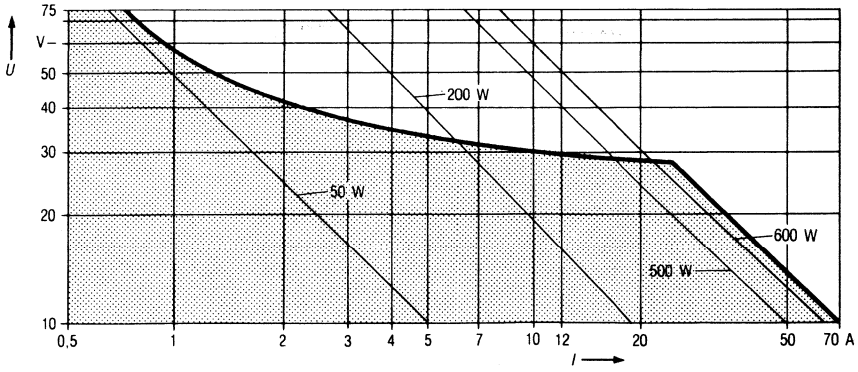


Fig. 4

Safe breaking, arc extinguished (limit curve II).

I = Switching current

U = Switching voltage (dc)

Buzzer version V23133

Outstanding features

- Formulated on the design of the power relay K
- Small dimensions
- Used predominantly in gambling machines, toys as well as in automotive applications

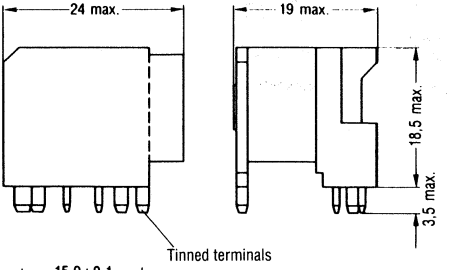
Version

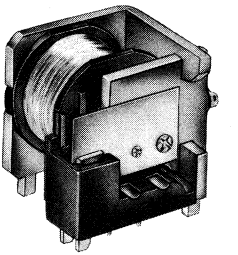
- Termination: printed circuit

Buzzer version

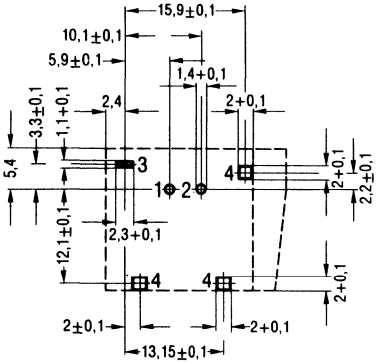
V23133-A1★★★

For direct mounting into printed circuits



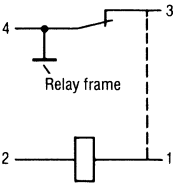


Approx. weight 20 g
Illustration approx. original size



Mounting hole layout
View from the wiring side

Base terminals



Link 3-1 to be made
on printed circuit board

Characteristics

Mounting position	optional
Nominal power consumption	approx. 0.3 W
Sound level at 1 m distance	up to 60 dB (A) in suspension frequency range 200 ± 50 Hz

Ordering information

Nominal voltage Vdc	Order number
6	V23133-A1021-E501
12	V23133-A1001-E501
24	V23133-A1022-E501

There are tolerances on the operating voltage ± 25 % of nominal when working in an ambient temperature of 20 °C.

Mini-power relay K

V23072

for dc operation, neutral, monostable

Outstanding features

- Used in automotive applications (cars, lorries and buses) as well as in gambling machines, toy industry and control systems
- 60 % less in volume to that of the power relay K
- At the washable version the relay system is protected by a plastic cover and sealed with epoxy resin

Versions

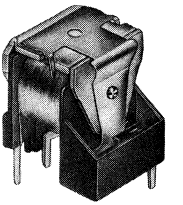
- Contact arrangement: 1 make, 1 bridging/twin make, 1 break, 1 bridging/twin break or 1 changeover
- Termination: printed circuit
- Open or washable;
  washable: protection class IP 67 in accordance with DIN 40050 (IEC 529)

Mini-power relay K

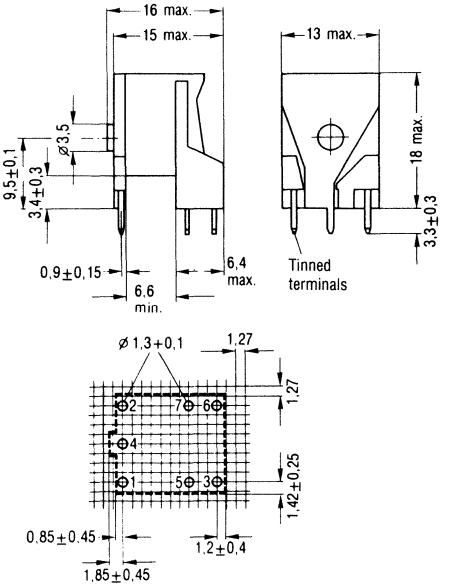
V23072-A1★★★

With 1 make, 1 bridging/twin make, 1 break,
1 bridging/twin break or 1 changeover

For direct mounting into printed circuits
Pin arrangement for 1.27 mm grid



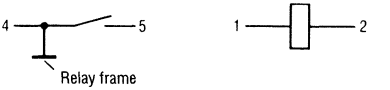
Approx. weight 8 g
Illustration approx. original size



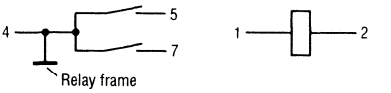
Mounting hole layout
View from the wiring side

Base terminals

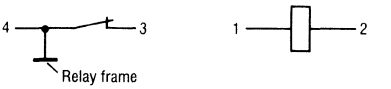
Make



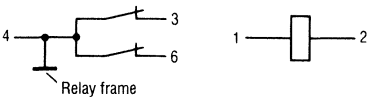
Bridging/twin make



Break



Bridging/twin break



Changeover

Mini-power relay K

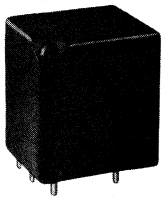
V23072-C1★★★

washable

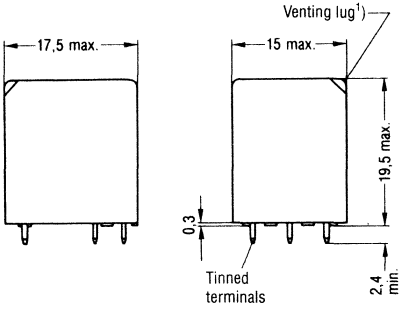
With 1 make, 1 bridging/twin make, 1 break, 1 bridging/twin break or 1 changeover

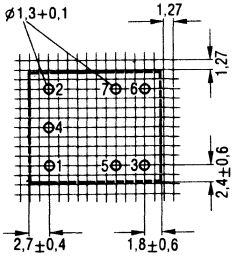
For direct mounting into printed circuits
Pin arrangement for 1.27 mm grid

Fitted with a plastic cover to give protection against damage



Approx. weight 12 g
Illustration approx. original size

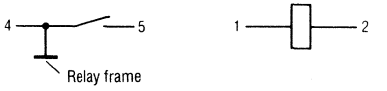




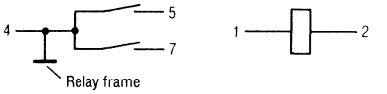
Mounting hole layout
View from the wiring side

Base terminals

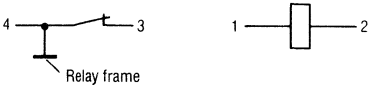
Make



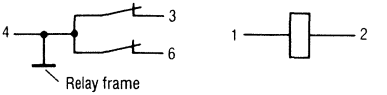
Bridging/twin make



Break



Bridging/twin break

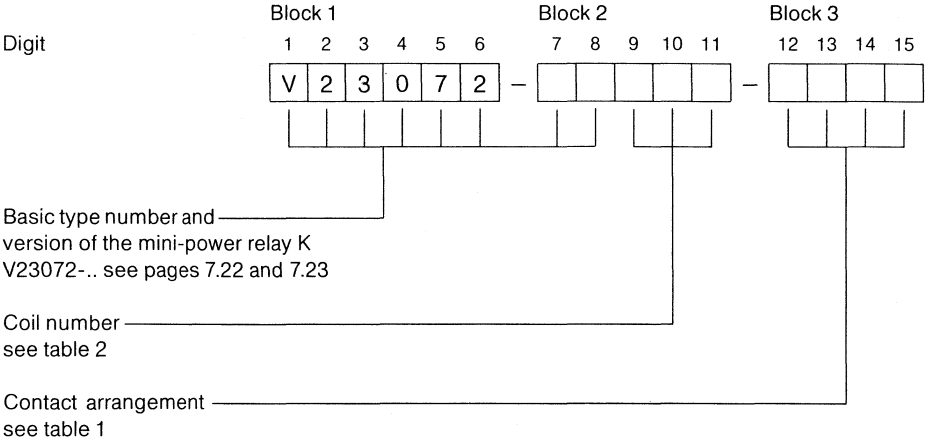


Changeover

[1]) The venting lug can be cut-off after the soldering and cleaning process.

Mini-power relay K

Ordering code



Ordering example: V23072-A1061-A303

Mini-power relay K, coil 12 V nominal, 1 changeover.

Preferred standard types

V23072-C1061-A303
-C1062-A303

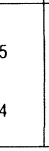
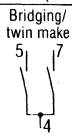
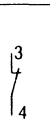
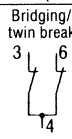
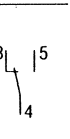
V23072-C1061-A308
-C1062-A308

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 2
Nominal power consumption	W	approx. 1.1
Maximum temperature	°C	155
Continuous thermal load at 20 °C ambient temperature	W	1.8
Thermal resistance	K/W	75

Contact side

Order No. block 3		A302	A308	A301	A307	A303
Contact material		Silver				
Contact designation		1	1 or (11)	2	2or (22)	21
Symbols (see also base terminals)						
Max. switching voltage	Vdc Vac	see fig. 1 60				
Max. switching current[1]) on[2]) off	A A	60 20	2 x 40 2 x 20	12 10	2 x 8 2 x 7	break/make 12/60 10/20
Maximum power rating dc voltage ac voltage	 W VA	see fig. 1 (voltage dependent) 500				
Max. continuous current at 20 °C at 85 °C	A A	15 10	2 x 10 2 x 6	10 5	2 x 7 2 x 4	10/15 5/10

General

Admissible ambient temperature	°C	−40 to +85
Operate time[3])	ms	approx. 3
Release time[3])	ms	approx. 1.5
Maximum switching rate (without contact load)	ops./ sec.	20
Test voltage winding/contact	V_{rms}	500
Electrical life[1]) dc voltage 15 V, 10 A	 operations	 approx. 2×10^5
Mechanical life	operations	approx. 10^7

[1]) These values apply for resistive load or inductive load with suitable spark suppression; switching voltage 15 V. Values obtained at 1 ops./sec.

[2]) This current can flow for a maximum of 3 sec, at 1 : 10 duty cycle.

[3]) Measured at nominal voltage without series resistor.

Table 2 List of coils

Nominal voltage Vdc	Operating voltage range at 20 °C: Minimum voltage U_{min}*) Vdc	Operating voltage range at 20 °C: Maximum voltage U_{max} Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
6	3.3	8.3	28 ± 3	060
12	6.8	18.0	130 ± 13	061
24	13.9	35.9	520 ± 52	062

Further coils for motor vehicle applications on request.

The operating voltage limits U_{min} and U_{max} depend on temperature in accordance with the following formulae:

$U_{min\ tu} = k_I \cdot U_{min\ 20\,°C}$ and $U_{max\ tu} = k_{II} \cdot U_{max\ 20\,°C}$

t_u = ambient temperature

$U_{min\ tu}$ = minimum voltage at ambient temperature t_u

$U_{max\ tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	-40°C	-30°C	-20°C	-10°C	0°C	10°C	20°C	30°C	40°C	50°C	60°C	70°C	80°C	85°C
k_I	0.764	0.804	0.843	0.882	0.921	0.961	1.0	1.039	1.079	1.118	1.157	1.197	1.236	1.255
k_{II}	1.132	1.112	1.091	1.069	1.047	1.023	1.0	0.975	0.950	0.923	0.895	0.865	0.834	0.817

*) Pick-up voltage at 20 °C coil temperature

Limiting curve for power load

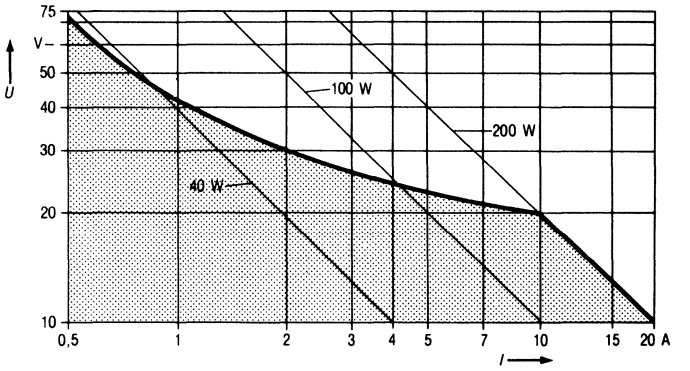


Fig. 1

Safe breaking, arc extinguished (limit curve II).

I = Switching current

U = Switching voltage (dc)

Electromechanical relays

Power relay F2 V23134
Power relay F4 V23134
Power relay F7 V23134

for dc operation, neutral, monostable

Outstanding features

- Used in automotive applications (cars, lorries and buses) as well as in the toy industry, gambling machines and control systems

Versions

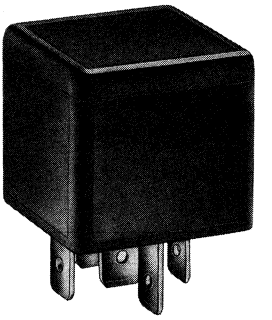
- Contact arrangement:
  power relay F2 and F4: 1 make, 1 twin make or 1 changeover,
  power relay F7: 1 make
- Power relay F7: heavy duty version conforms to special requirements in the automotive industry
- Termination: plug-in or solderable or printed circuit
- Plastic cover to give protection against damage and dust

Power relay F

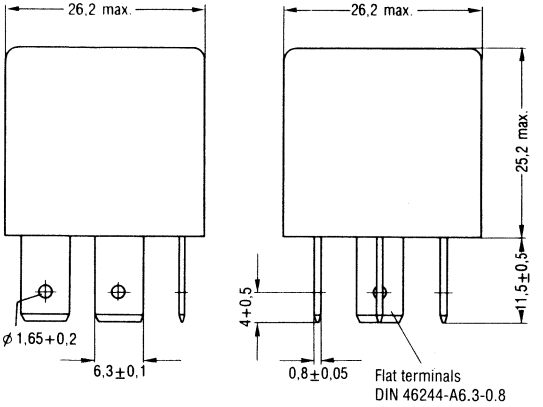
Power relay F2 and F4
V23134-A0★★★ with 1 changeover
V23134-B0★★★ with 1 make
V23134-C0★★★ with 1 make (2 terminals 87)
V23134-M0★★★ with 1 twin make

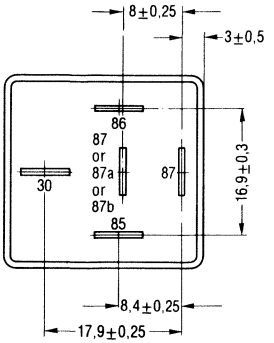
Dust protected

With flat terminals, suitable for push-on connectors 6.3 mm in accordance with DIN 46245 and DIN 46247



Approx. weight 30 g
Illustration approx. original size

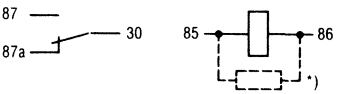




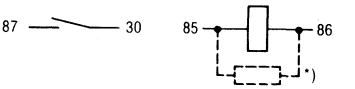
Terminal layout
View from the wiring side
(special connections
on request)

Base terminals

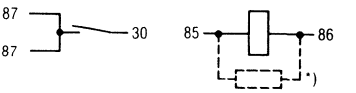
Changeover



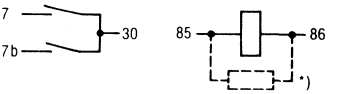
Make



Make (2 terminals 87)



Twin make



*) Can also be supplied with a resistor or diode fitted in parallel to the coil

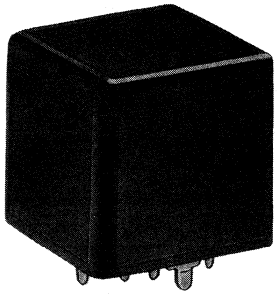
Power relay F

Power relay F2 and F4

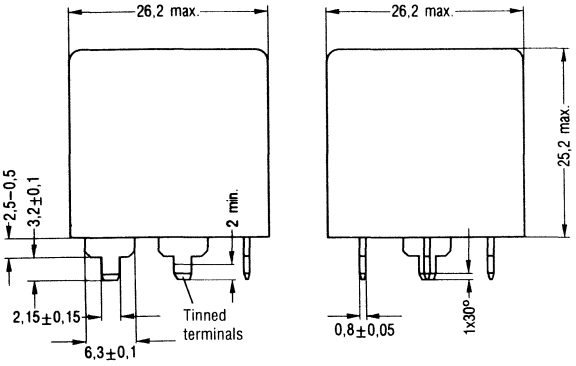
V23134-A0★★★ with 1 changeover
V23134-B0★★★ with 1 make
V23134-C0★★★ with 1 make (2 terminals 87)
V23134-M0★★★ with 1 twin make

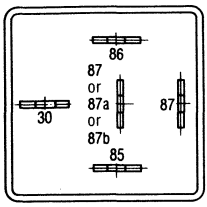
Dust protected

For direct mounting into printed circuits or solder connections

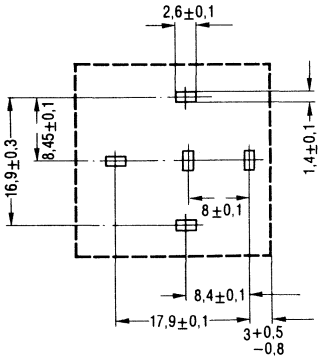


Approx. weight 30 g
Illustration approx. original size





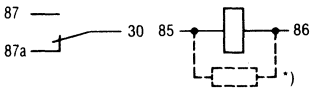
Terminal layout
View from the wiring side
(Special connections on request)



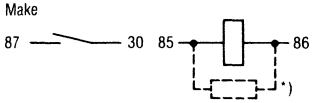
Mounting hole layout
View from the wiring side

Base terminals

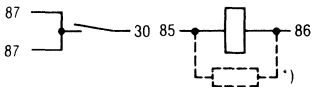
Changeover



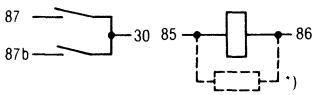
Make



Make (2 terminals 87)



Twin make



*) Can also be supplied with a resistor or diode fitted in parallel to the coil

8

Power relay F

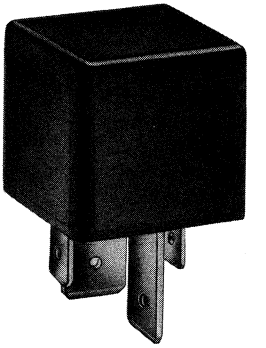
Power relay F7

V23134-J0★★★
– heavy duty version –

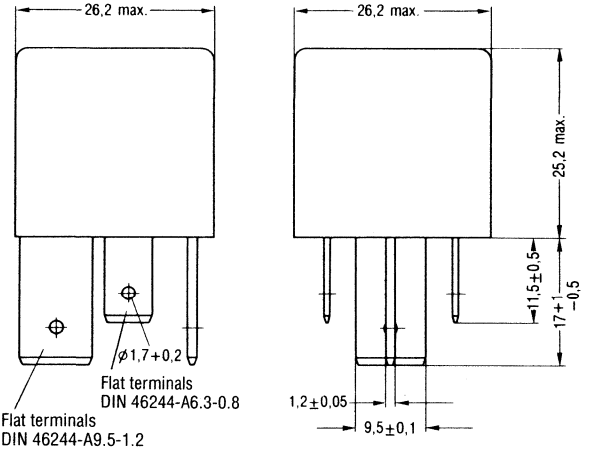
With 1 make

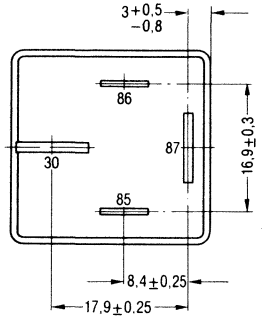
Dust protected

With flat terminals, suitable for push-on connectors 6.3 mm and 9.5 mm in accordance with DIN 46245 and DIN 46247



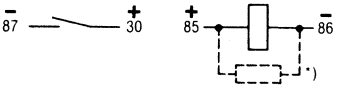
Approx. weight 32 g
Illustration approx. original size





Terminal layout
View from the wiring side

Base terminals



*) Can also be supplied with a resistor or diode fitted in parallel to the coil

Power relay F

Power relay F2, F4 and F7

V23134-★★★ (on request)

Dust protected

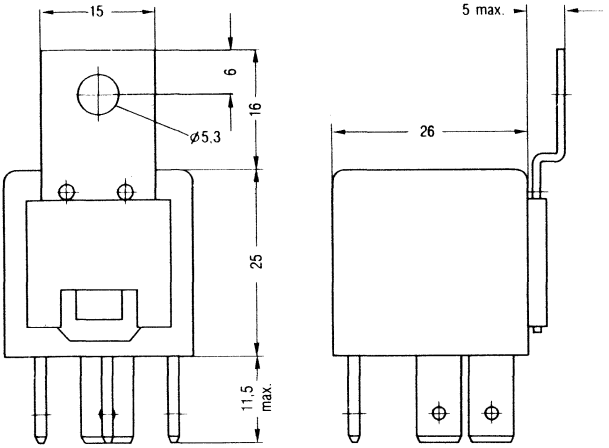
With mounting bracket or clip

With flat terminals

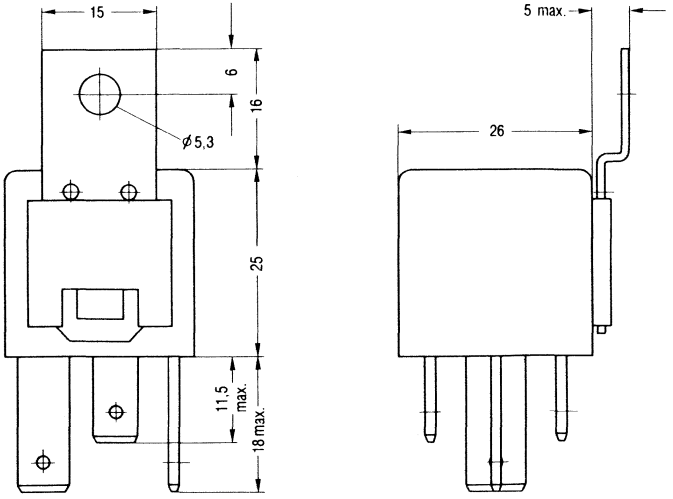
Power relay F2 and F4: suitable for push-on connectors 6.3 mm in accordance with DIN 46245 and DIN 46247. Power relay F7: suitable for push-on connectors 6.3 mm and 9.5 mm in accordance with DIN 46245 and DIN 46247.

Note: see standard version for technical details, contact arrangement and base terminal connections.

Power relay F2/F4



Power relay F7

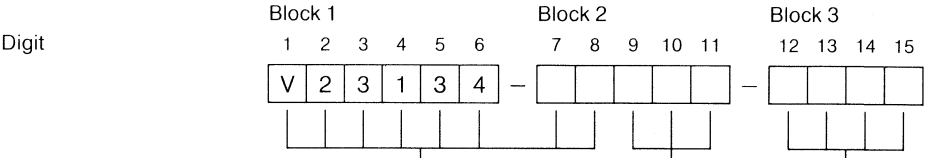


8

Power relay F

Power relay F2, F4 and F7

Ordering code



Basic type number and
version of the power relay
V23134-..
Power relay F2 and F4 see pages 8.4, 8.5 and 8.7
Power relay F7 see pages 8.6 and 8.7

Coil number
see table 4

Contact arrangement
Power relay F2 see table 1
Power relay F4 see table 2
Power relay F7 see table 3

Ordering examples:

V23134-A0052-A103
Power relay F2 plug-in with 1 changeover, coil 12 V nominal

V23134-B0052-G242
Power relay F4 solderable with 1 make, coil 12 V nominal

V23134-J0052-D242
Power relay F7 with 1 make, coil 12 V nominal

Power relay F

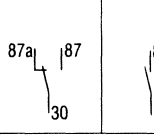
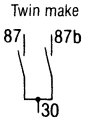
Power relay F2

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 4
Nominal power consumption	W	approx. 1.6
Maximum temperature	°C	155
Continuous thermal load at 20 °C ambient temperature	W	3.4
Thermal resistance	K/W	40

Contact side

Order No. block 3	plug-in	-A103	-A102	-A102	-A102
	solderable (pcb)	-E103	-E102	-E102	-E102
Contact material		Silver-nickel			
Contact designation		21	1	1	(11)
Symbols (see also base terminals)					
Maximum switching voltage	Vdc Vac	see fig. 1 60			
Max. switching current[1]) on[2])	A	break/make 45/120	120	120	2 x 100
off	A	30/ 40	40	40	2 x 40
Maximum power rating dc voltage ac voltage	 W VA	 see fig. 1 (voltage dependent) 900			
Max. continuous current at 20 °C	A	30/30	30	30	2 x 15
at 85 °C	A	20/20	20	20	2 x 10

General

Admissible ambient temperature	°C	−40 to +85
Operate time[3])	ms	approx. 5
Release time[3])	ms	approx. 3
Maximum switching rate (without contact load)	ops./sec	20
Test voltage winding/contact	V_{rms}	500
Electrical life[1]) dc voltage 15 V, 20 A	operations	approx. 2×10^5
Mechanical life	operations	approx. 10^7

[1]) These values apply for resistive load or inductive load with suitable spark suppression; switching voltage 15 V. Values obtained at 1 ops./sec.

[2]) This current can flow for a maximum of 3 sec, at 1 : 10 duty cycle.

[3]) Measured at nominal voltage without series resistor.

8

Power relay F

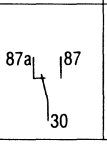
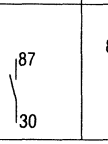
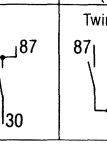
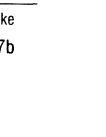
Power relay F4

Table 2 Characteristics

Energising side

Operating voltages	Vdc	see table 4
Nominal power consumption	W	approx. 1.6
Maximum temperature	°C	155
Continuous thermal load at 20 °C ambient temperature	W	3.4
Thermal resistance	K/W	40

Contact side

Order No. block 3	plug-in	-C243	-C242	-C242	-C242
	solderable (pcb)	-G243	-G242	-G242	-G242
Contact material		Silver			
Contact designation		21	1	1	(11)
Symbols (see also base terminals)					
Max. switching voltage	Vdc Vac	see fig. 1 60			
Max. switching current[1])	on[2]) off	break/make A 45/120 A 40/ 60	120 60	120 60	2 x 100 2 x 40
Maximum power rating dc voltage ac voltage	 W VA	see fig. 1 (voltage dependent) 900			
Max. continuous current at 20 °C at 85 °C	A A	40/60 30/40	60 40	60 40	2 x 30 2 x 25

General

Admissible ambient temperature	°C	−40 to +85
Operate time[3])	ms	approx. 5
Release time[3])	ms	approx. 3
Maximum switching rate (without contact load)	ops./sec.	20
Test voltage winding/contact	V_{rms}	500
Electrical life[1]) dc voltage 15 V, 20 A	 operations	 approx. 2×10^5
Mechanical life	operations	approx. 10^7

[1]) These values apply for resistive load or inductive load with suitable spark suppression; switching voltage 15 V. Values obtained at 1 ops./sec.

[2]) This current can flow for a maximum of 3 sec, at 1 : 10 duty cycle.

[3]) Measured at nominal voltage without series resistor.

Power relay F

Power relay F7

Table 3 Characteristics

Energising side

Operating voltages	Vdc	see table 4
Nominal power consumption	W	approx. 1.6
Maximum temperature	°C	155
Continuous thermal load at 20 °C ambient temperature	W	3.4
Thermal resistance	K/W	40

Contact side

Order No. block 3		D242
Contact material		Silver
Contact designation		1
Symbol (see also base terminals)		
Max. switching voltage	Vdc Vac	see fig. 2 60
Max. switching current[1]) on[2]) off	A A	240 70
Maximum power rating dc voltage ac voltage	 W VA	 see fig. 2 (voltage dependent) 1400
Max. continuous current at 20 °C at 85 °C	A A	70 50

General

Admissible ambient temperature	°C	−40 to +85
Operate time[3])	ms	approx. 5
Release time[3])	ms	approx. 3
Maximum switching rate (without contact load)	ops./sec.	20
Test voltage winding/contact	V_{rms}	500
Mechanical life	operations	approx. 10^7

[1]) These values apply for resistive load or inductive load with suitable spark suppression; switching voltage 15 V. Values obtained at 1 ops./sec.

[2]) This current can flow for a maximum of 3 sec, at 1 : 10 duty cycle.

[3]) Measured at nominal voltage without series resistor.

Power relay F2, F4 and F7

Table 4 List of coils

Nominal voltage	Operating voltage range at 20 °C		Resistance at 20 °C	Coil No. Order No. block 2
	Minimum voltage U_{min} *)	Maximum voltage U_{max}		
Vdc	Vdc	Vdc	Ω	
6	3.6	10.1	22 ± 2.2	051
12	7.2	20.5	90 ± 9	052
24	14.3	39.1	330 ± 33	053

Further coils for motor vehicle applications on request.

The operating voltage limits U_{min} and U_{max} depend on temperature in accordance with the following formulae:

$U_{min\ tu} = k_I \cdot U_{min\ 20\ °C}$ and $U_{max\ tu} = k_{II} \cdot U_{max\ 20\ °C}$

t_u = ambient temperature

$U_{min\ tu}$ = minimum voltage at ambient temperature t_u

$U_{max\ tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	-40°C	-30°C	-20°C	-10°C	0°C	10°C	20°C	30°C	40°C	50°C	60°C	70°C	80°C	85°C
k_I	0.764	0.804	0.843	0.882	0.921	0.961	1.0	1.039	1.079	1.118	1.157	1.197	1.236	1.255
k_{II}	1.189	1.160	1.130	1.099	1.067	1.034	1.0	0.944	0.928	0.890	0.849	0.806	0.762	0.738

*) Pick-up voltage at 20 °C coil temperature

Power relay F

Power relays F2 and F4

Limiting curve for power load

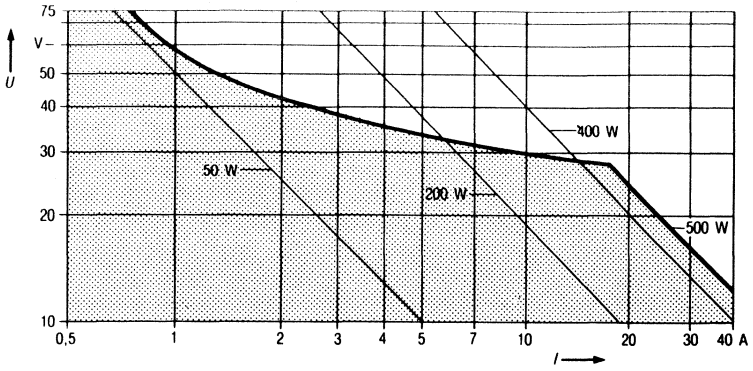


Fig. 1

Safe breaking, arc extinguished (limit curve II).

Power relay 7

Limiting curve for power load

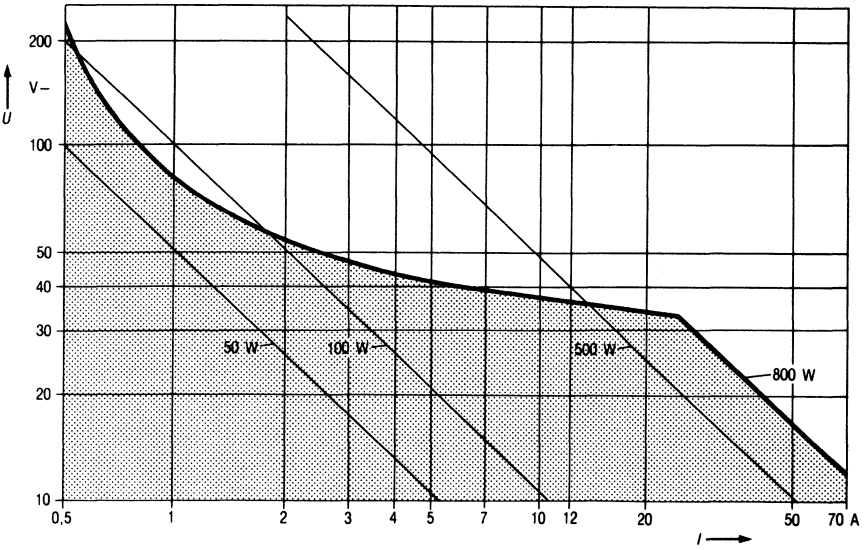


Fig. 2

Safe breaking, arc extinguished (limit curve II).

I = Switching current
U = Switching voltage (dc)

8

Mini-power relay F V23073

for dc operation, neutral, monostable

Outstanding features

- Used in automotive applications (cars, lorries, buses) as well as in the toy industry, gambling machines and control systems
- 55 % less in volume to that of the power relay F

Versions

- Contact arrangement: 1 make, 1 break or 1 changeover
- Termination: plug-in or solderable or printed circuit
- Plastic cover to give protection against damage and dust

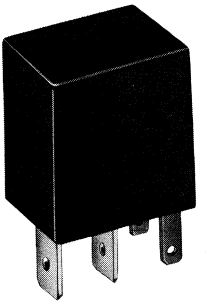
Mini-power relay F

V23073-A1★★★

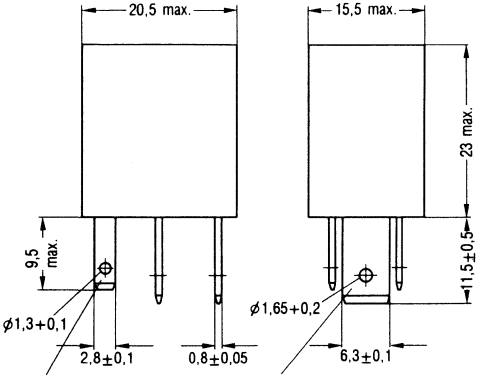
With 1 make or 1 break

Dust protected

With flat terminals, suitable for push-on connectors 2.8 mm and 6.3 mm in accordance with DIN 46245 and DIN 46247

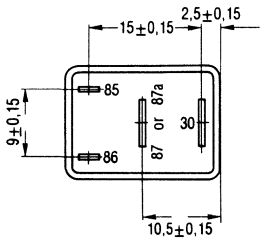


Approx. weight 12 g
Illustration approx. original size



Flat terminals
DIN 46244-A2.8-0.8

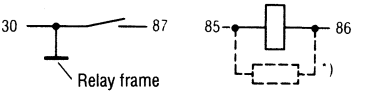
Flat terminals
DIN 46244-A6.3-0.8



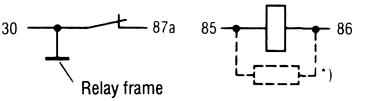
Terminal layout
View from the wiring side

Base terminals

Make



Break



*) Can also be supplied with a resistor or diode fitted in parallel to the coil

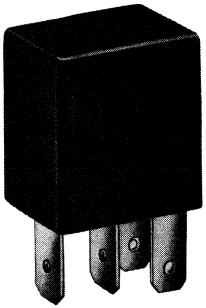
Mini-power relay F

V23073-B1★★★

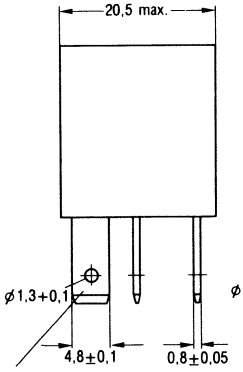
With 1 make, 1 break or 1 changeover

Dust protected

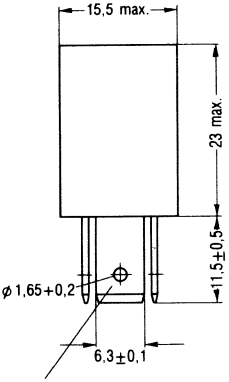
With flat terminals, suitable for push-on connectors 4.8 mm and 6.3 mm in accordance with DIN 46245 and DIN 46247



Approx. weight 14 g
Illustration approx. original size



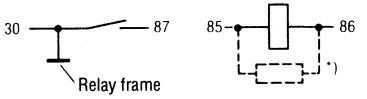
Flat terminals
DIN 46244-A4.8-0.8



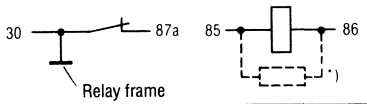
Flat terminals
DIN 46244-A6.3-0.8

Base terminals

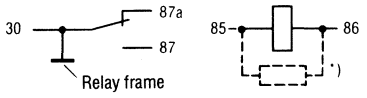
Make



Break

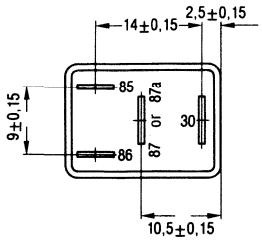


Changeover

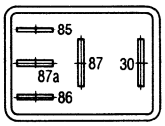


*) Can also be supplied with a resistor or diode fitted in parallel to the coil

Contacts:
make or break



changeover



Terminal layout
View from the wiring side

8

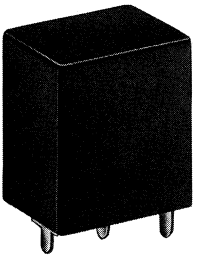
Mini-power relay F

V23073-C1★★★

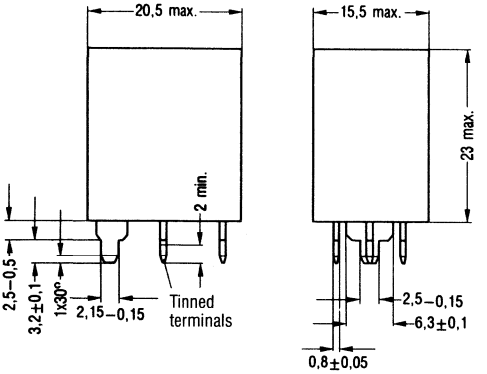
With 1 make, 1 break or 1 changeover

Dust protected

For solder connections or direct mounting into printed circuits

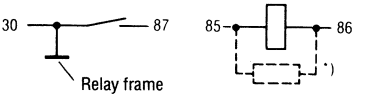


Approx. weight 12 g
Illustration approx. original size

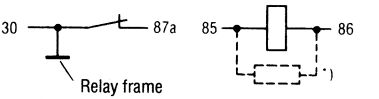


Base terminals

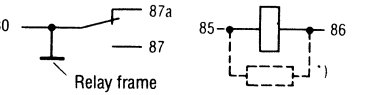
Make



Break

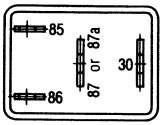


Changeover

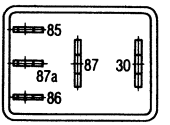


*) Can also be supplied with a resistor or diode fitted in parallel to the coil

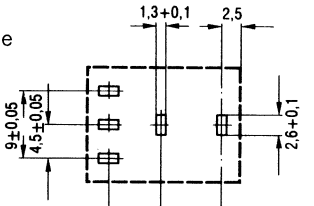
Contacts:
make or break



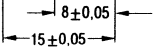
changeover



Terminal layout
View from the wiring side

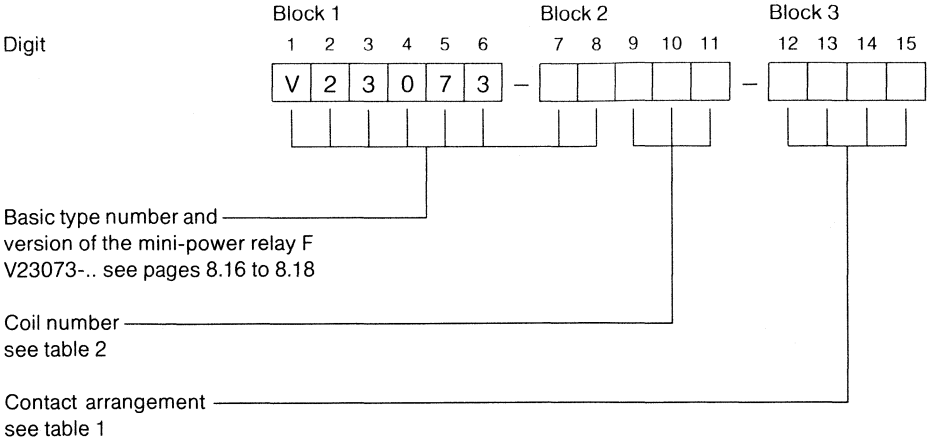


Mounting hole layout
View from the wiring side



Mini-power relay F

Ordering code



Ordering example: V23073-A1005-A302

Mini-power relay F, with flat terminals for push-on connectors 2.8 mm and 6.3 mm, coil 12 V nominal, with 1 make.

8

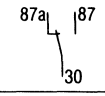
Mini-power relay F

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 2
Nominal power consumption break or make changeover	 W W	 approx. 1.2 approx. 1.5
Maximum temperature	°C	155
Continuous thermal load at 20 °C ambient temperature	W	2.5
Thermal resistance	K/W	55

Contact side

Order No. block 3		A302	A301	A303
Contact material		Silver		
Contact designation		1	2	21
Symbols (see also base terminals)				
Max. switching voltage	Vdc Vac	see fig. 1 60		
Max. switching current[1]) on[2]) off	A A	90 30	20 15	break/make 20/90 15/30
Maximum power rating dc voltage ac voltage	 W VA	 see fig. 1 (voltage dependent) 500		
Max. continuous current at 20 °C at 85 °C	A A	20 15	15 10	10/20 6/15

General

Admissible ambient temperature	°C	−40 to +85		
Operate time[3])	ms	approx. 3		
Release time[3])	ms	approx. 1.5		
Maximum switching rate (without contact load)	ops./sec.	20		
Test voltage winding/contact	V_{rms}	500		
Electrical life[1]) dc voltage 15 V, 10 A	 operations	approx. 5×10^5	approx. 2×10^5	approx. 2×10^5
Mechanical life	operations	approx. 10^7		

[1]) These values apply for resistive load or inductive load with suitable spark suppression; switching voltage 15 V. Values obtained at 1 ops./sec.

[2]) This current can flow for a maximum of 3 sec, at 1 : 10 duty cycle.

[3]) Measured at nominal voltage without series resistor.

Table 2 List of coils

Nominal voltage Vdc	Operating voltage range at 20 °C: Minimum voltage U_{min}*) Vdc	Operating voltage range at 20 °C: Maximum voltage U_{max} Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
Make or break contact				
6	3.6	10.4	32 ± 3.2	004
12	7.2	20.4	123 ± 12.3	005
24	14.3	40.4	483 ± 48.3	006
Changeover contact				
6	3.6	9.2	25 ± 2.5	007
12	7.2	18.1	97 ± 9.7	008
24	14.3	36.0	384 ± 38.4	009

Further coils for motor vehicle applications on request.

The operating voltage limits U_{min} and U_{max} depend on temperature in accordance with the following formulae:

$U_{min\,tu} = k_I \cdot U_{min\,20\,°C}$ and $U_{max\,tu} = k_{II} \cdot U_{max\,20\,°C}$

t_u = ambient temperature

$U_{min\,tu}$ = minimum voltage at ambient temperature t_u

$U_{max\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	-40°C	-30°C	-20°C	-10°C	0°C	10°C	20°C	30°C	40°C	50°C	60°C	70°C	80°C	85°C
k_I	0.764	0.804	0.843	0.882	0.921	0.961	1.0	1.039	1.079	1.118	1.157	1.197	1.236	1.255
Make or break contact														
k_{II}	1.194	1.164	1.133	1.102	1.069	1.034	1.0	0.964	0.926	0.887	0.846	0.802	0.756	0.732
Changeover contact														
k_{II}	1.127	1.107	1.087	1.067	1.045	1.023	1.0	0.976	0.952	0.926	0.899	0.870	0.840	0.824

*) Pick-up voltage at 20 °C coil temperature

Mini-power relay F

Limiting curve for power load

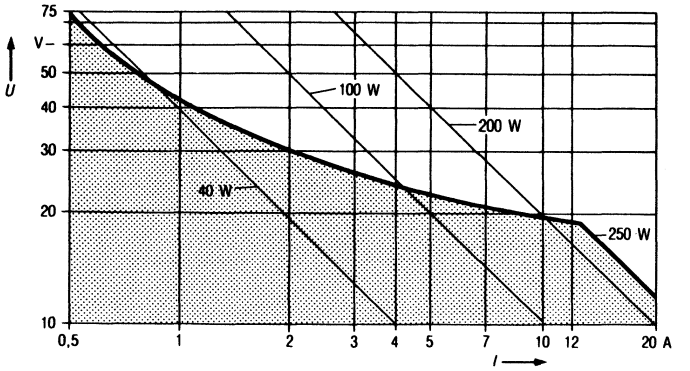


Fig. 1

Safe breaking, arc extinguished (limit curve II).

I = Switching current

U = Switching voltage (dc)

Electromechanical relays

DIL-reed relay V23100-V4

(Reed relay in dual-in-line housing) for dc operation, neutral, monostable

Outstanding features

- For use in control – and regulating systems
- Constructive design to meet the electrical requirements for modern integrated circuit parctice
- Minimum contact noise and low thermo e.m.f. ensure the suitability for electronic circuits
- Relay system encapsulated in epoxy resin; standard dual-in-line terminations are used
- Vibration resistance 200 ms^{-2}, 10 to 5000 Hz
- Resistance to shock 1000 ms^{-2}, 11 ms

Versions

- Choice of:
  - standard version
  - with electrostatic shield by means of a screening foil between coil and contact
  - with clamp diode (spark suppression)
  - with electrostatic shield and clamp diode
- Contact arrangement: 1 make, 2 makes or 1 changeover
- Reed switches
- Termination: printed circuit

DIL-reed relay

V23100-V40★★

With 1 make
(Reed switch)

For direct mounting into printed circuits, pin arrangement for 2.54 mm grid in accordance with DIN 40803, fine

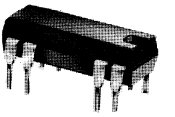
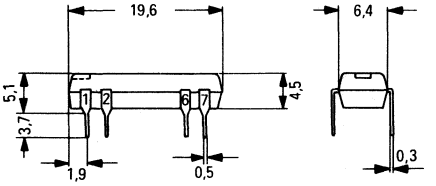
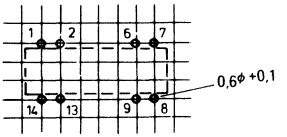


Illustration approx. original size
Approx. weight 1.5 g





Mounting hole layout
View from the wiring side

Terminal connections see page 9.9

DIL reed relay

V23100-V43★★

With 2 makes or 1 changeover
(Reed switches)

For direct mounting into printed circuits, pin arrangement for 2.54 mm grid in accordance with DIN 40803, fine

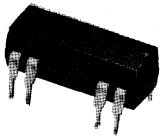
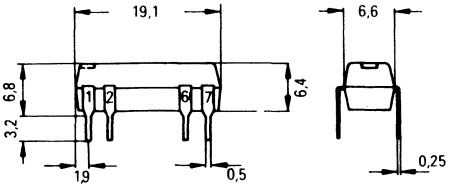
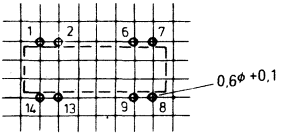


Illustration approx. original size
Approx. weight 2 g



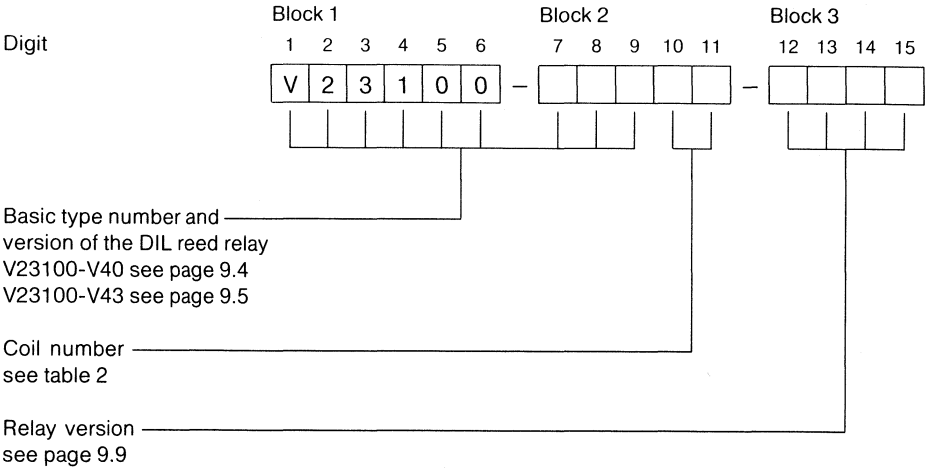


Mounting hole layout
View from the wiring side

Terminal connections see page 9.9

DIL reed relay

Ordering code



Ordering example: V23100-V4005-A010

DIL reed relay with 1 make, 5 V nominal, with clamp diode (spark suppression).

Preferred standard types

V23100-V4005-A000
-V4005-A001
-V4005-A010
-V4005-A011

V23100-V4012-A000
-V4012-A001
-V4012-A010
-V4012-A011

V23100-V4015-A000
-V4015-A001
-V4015-A011

V23100-V4024-A000
-V4024-A001
-V4024-A010
-V4024-A011

V23100-V4305-B000
-V4305-B010
-V4305-C000
-V4305-C010
-V4305-C011

V23100-V4312-C000

V23100-V4324-B000
-V4324-B010
-V4324-C000
-V4324-C010
-V4324-C011

DIL reed relay

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 2
Maximum temperature	°C	105

Contact side

Contact designation		1	1-1	21
Symbols (see also base terminals)				
Max. switching voltage	Vdc Vac	100 100	100 100	28 28
Max. switching current	A	0.5	0.25	0.25
Max. power rating dc voltage ac voltage	 W VA	 10 10	 10 10	 3 3
Max. continuous current	A	1	0.7	0.5

General

Admissible ambient temperature	°C	−40 to +85		
Operate time[1])	μs	approx. 200	approx. 300	approx. 400
Release time[1]) without diode with diode	μs μs	approx. 50 approx. 100	approx. 25 approx. 100	approx. 700 approx. 800
Bounce time[1])	μs	100 to 150	approx. 150	approx. 250
Maximum switching rate at nominal voltage at maximum voltage	 ops./sec. ops./sec.	 650 1000	 500	 150
Test voltage contact blade/blade winding/contact contact/contact screen/contact screen/winding	 V_{rms} Vdc V_{rms} Vdc V_{rms} V_{rms} V_{rms}	 175 250 350 500 — 130 130	 175 250 300 — 750 — —	 125 170 300 — — 130 130
Electrical life[2]) at low level (mA/mV) at 28 Vdc/360 mA	 operations operations	 approx. 10^8 approx. 5×10^6	 approx. 3×10^8 approx. 6×10^6	 approx. 5×10^7 approx. 4×10^6

[1]) Measured at nominal voltage without series resistor.
[2]) These values apply for resistive loads or inductive loads with suitable spark suppression.

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Table 2 List of coils

Nominal voltage	Voltage range at 20 °C			Resistance at 20 °C	Coil No. Order No. block 2
	Minimum voltage U_I	Maximum voltage U_{II}	Release voltage		
Vdc	Vdc	Vdc	Vdc	Ω	
Contact arrangement 1 make (V23100-V40)					
5	≤ 3.5	16	≥ 1	380 ± 38	05
12	≤ 8	19	≥ 2	530 ± 53	12
15	≤ 11.5	36.5	≥ 3	2000 ± 200	15
24	≤ 16	36.5	≥ 4	2000 ± 200	24
Contact arrangement 2 makes (V23100-V43)					
5	≤ 4.2	12	≥ 1	200 ± 20	05
12	≤ 9.6	19	≥ 2	500 ± 50	12
15	≤ 11.5	25	≥ 3	850 ± 85	15
24	≤ 16	40	≥ 4	2150 ± 215	24
Contact arrangement 1 changeover (V23100-V43)					
5	≤ 3.7	12	≥ 1	200 ± 20	05
12	≤ 8	19	≥ 2	500 ± 50	12
15	≤ 11.5	25	≥ 3	850 ± 85	15
24	≤ 16	40	≥ 4	2150 ± 215	24

The operating voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1.0	1.04	1.085	1.13	1.17	1.21
k_{II}	1.0	0.93	0.86	0.79	0.7	0.6

Relay versions and base terminal connection

Relay versions	Contact arrangement 1 make		Contact arrangement 2 makes		Contact arrangement 1 changeover	
	Order No. Block 3	Terminal connections	Order No. Block 3	Terminal connections	Order No. Block 3	Terminal connections
Relay (standard type)	A000		B000		C000	
Relay with electrostatic shield	A001				C001	
Relay with clamp diode	A010		B010		C010	
Relay with clamp diode and electrostatic shield	A011				C011	

Electrical life

Contact arrangement 1 make (V23100-V40)

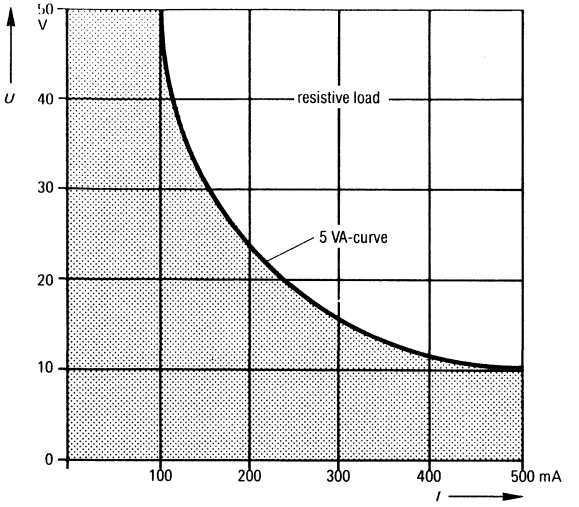


Fig. 1

Contact loads within the hatched area
obtains a life $\geq 10^7$ operations

Reed relay V6 V23100-V6

for dc operation, neutral or polarised, monostable

Outstanding features

- Small dimensions
- Vibration resistance: 250 ms^{-2}, 50 to 2000 Hz
- Resistance to shock: 500 ms^{-2}, 11 ms

Versions

- Contact arrangement: 1 make, 2 makes or 1 make and 1 break
- Termination: printed circuit
- Cover to give protection against damage and dust

Reed relay V6

V23100-V6★★★

With 1 or 2 makes,
neutral, monostable
or
with 1 make and 1 break,
polarised, monostable

Dust protected

For direct mounting into printed circuits,
pin arrangement for 2.5 mm grid in
accordance with DIN 40801 and DIN 40803, fine

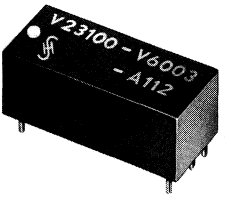
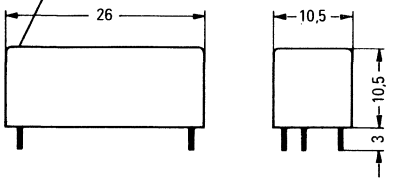
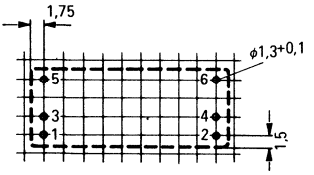


Illustration approx. original size
Approx. weight 15 g

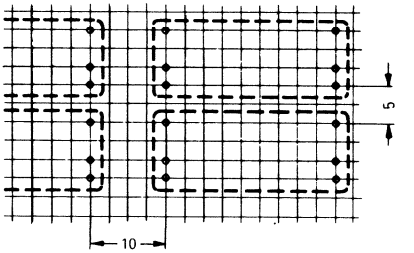
Dot (see photo) indicates row of terminal pins 1, 3, 5





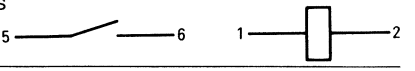
Mounting hole layout
View from the wiring side

Minimum spacing for version with
1 make + 1 break contact

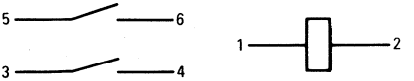


Base terminals

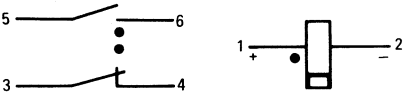
1 make



2 makes



1 make
and
1 break[1])

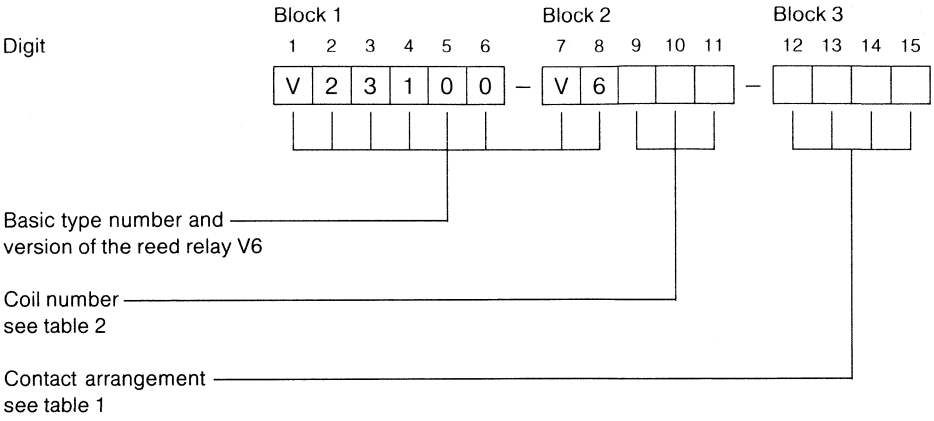


[1]) The contact arrangement 1 make + 1 break can be connected externally via the printed circuit board as a single changeover contact.

Circuit symbols drawn in "Off" position.
If a plus potential is applied to the coil terminal point 1
the relay assumes the "On" position.

Reed relay V6

Ordering code



Ordering example: V23100-V6002-A201

Reed relay V6 for 12 V nominal with 2 make contacts

Preferred standard types

V23100-V6002-A101
-V6003-A101

V23100-V6002-A112
-V6003-A112

V23100-V6001-A201
-V6002-A201
-V6003-A201

9

Reed relay V6

Table 1 Characteristics

Energising side

Operating voltages	Vdc	see table 2
Maximum temperature	°C	100
Continuous thermal load at 20 °C ambient temperature	W	max. 0.4

Contact side

Order No. block 3		A101	A201	A112
Contact designation		1	1-1	1-2[1])
Symbols (see also base terminals)				
Max. switching voltage	Vdc	100		
Max. switching current break make	 A A	 — 0.5	 — 0.5	 0.25 0.5
Max. power rating	W	10		
Max. continuous current break make	 A A	 — 0.75	 — 0.75	 0.35 0.75

General

Admissible ambient temperature	°C	−25 to +70		
Operate time	µs	approx. 700		
Release time	µs	approx. 500		
Bounce time	µs	approx. 300		
Max. switching rate	ops./sec.	500		
Test voltage contact blade/blade contact/winding	 V_{rms} V_{rms}	 250 1500	 250 1500	 250 750
Electrical life[2]) at 28 Vdc/125 mA	operations	approx. 10^6		
Mechanical life	operations	approx. 10^9		

[1]) The contact arrangement 1 make + 1 break can be connected externally via the printed circuit board as a single changeover contact.

[2]) These values apply for resistive load or inductive load with suitable spark suppression.

Table 2 List of coils

Nominal voltage Vdc	Operating voltage range at 20 °C Minimum voltage U_I Vdc	Maximum voltage U_{II}*) Vdc	Resistance at 20 °C Ω	Coil No. Order No. block 2
5	3.7	10.8	430 ± 43	004
6	4.5	10.8	430 ± 43	001
12	8.4	21.6	1100 ± 110	002
24	16.4	42.5	3860 ± 580	003

*) Even in pulsed operation, the value of U_{II} stated in the table must not be exceeded on the relay version with 1 make/1 break contact.

The operting voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = Maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1.0	1.04	1.07	1.11	1.15	1.18
k_{II}	1.0	0.93	0.86	0.79	0.71	0.62

Encapsulated miniature reed relay V23020

for dc operation, neutral, monostable

Outstanding features

- Relay system is housed in a plastic enclosure and sealed with a special potting compound
- Vibration resistance; 200 ms^{-2}, 5 to 2000 Hz
- Resistance to shock: 500 ms^{-2}, 11 ms

Versions

- Choice with screening foil (inside the housing) to give protection against external magnetic fields
- Contact arrangement: 1, 2, 3 or 4 makes
- Reed switches
- Termination: printed circuit

Encapsulated miniature reed relay

V23020-A0★★★ without magnetic shield

V23020-B0★★★ with magnetic shield

With 1 to 4 makes
(Reed switches)

For direct mounting into printed circuits,
pin arrangement for 2.5 mm grid in
accordance with DIN 40801 and DIN 40803, fine

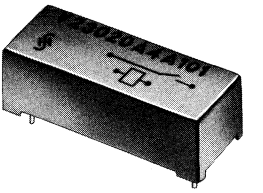
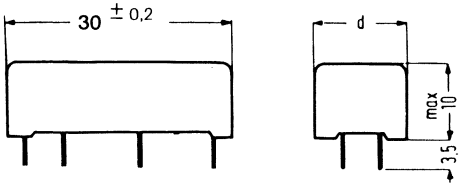
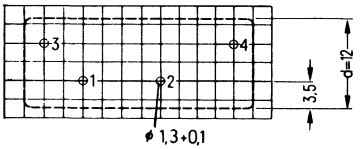


Illustration approx. original size
Approx. weight 16 g

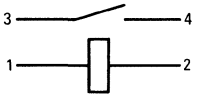


Version: 1 make

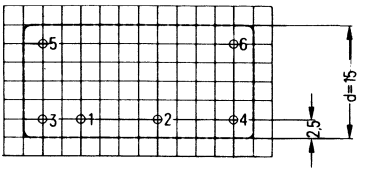


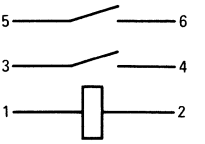
Mounting hole layout
View from the wiring side

Base terminals

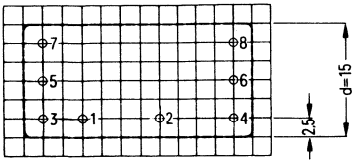


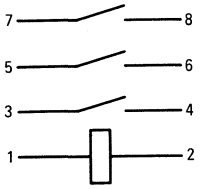
2 makes



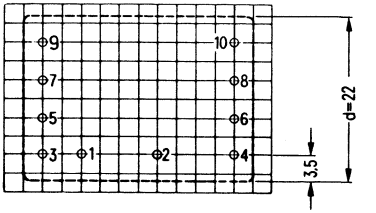


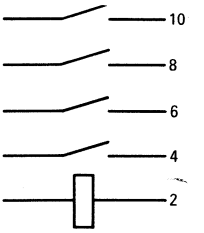
3 makes





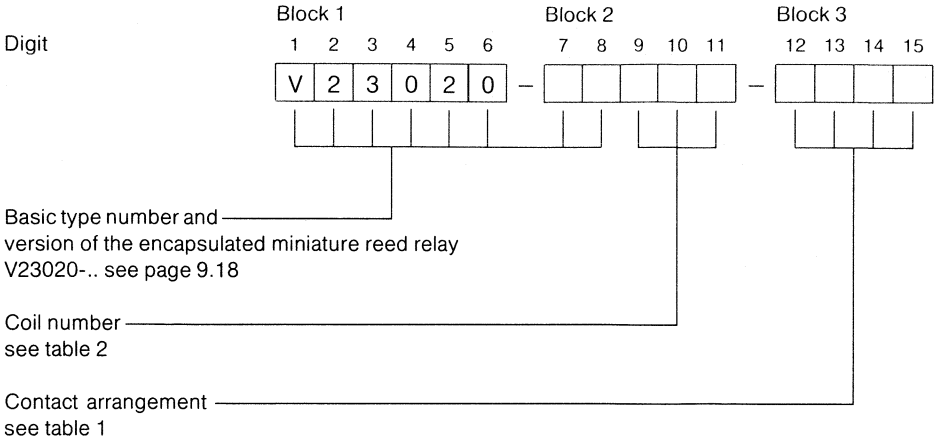
4 makes





Encapsulated miniature reed relay

Ordering code



Ordering example: V23020-B0012-A101

Encapsulated miniature reed relay, contact arrangement 1 make, with magnetic shield, coil 6 V nominal

9

Encapsulated miniature reed relay

Energising side

Operating voltages	Vdc	see table 2
Maximum temperature	°C	100
Continuous thermal load at 20 °C ambient temperature	W	1.9

Contact side

Order No. block 3		A101	A201	A301	A401
Contact designation		1	1-1	1-1-1	1-1-1-1
Symbols (see also base terminals)					
Max. switching voltage	Vdc	200			
Max. switching current	A	0.5			
Max. power rating	W	10			
Max. continuous current	A	0.75			

General

Admissible ambient temperature	°C	−25 to +70
Operate time	ms	approx. 1
Release time	ms	approx. 0.2
Bounce time	ms	approx. 0.2
Test voltage contact blade/blade contact/winding	 V_{rms} V_{rms}	 250 1500
Electrical life[1]) at max. contact rating at 28 Vdc, 125 mA	 operations operations	 approx. 10^6 approx. 10^7
Mechanical life	operations	approx. 10^9

[1]) These values apply for resistive load or inductive load with suitable spark suppression.

Table 2 List of coils

Nominal voltage Vdc	Operating voltage range at 20 °C: Minimum voltage U_I Vdc	Operating voltage range at 20 °C: Maximum voltage U_{II} Vdc	Resistance at 20 °C Ω	No. of make contacts	Coil No. Order No. block 2
6	4.6	21	180 ± 18	1	012
	4.6	17.3	130 ± 13	2	009
	4.6	21	180 ± 18	3	015
	4.6	16.8	115 ± 11.5	4	011
12	9.1	52	1100 ± 110	1	001
	9.1	43.8	850 ± 85	2	007
	9.1	47.5	1000 ± 100	3	002
	9.1	34.3	520 ± 52	4	019
24	18.4	80	3000 ± 450	1	004
	18.4	63.5	1800 ± 180	2	005
	18.4	62.5	1750 ± 175	3	006
	18.4	47.5	1000 ± 100	4	020

The operating voltage limits U_I and U_{II} depend on temperature in accordance with the following formulae:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ and $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = ambient temperature

$U_{I\,tu}$ = minimum voltage at ambient temperature t_u

$U_{II\,tu}$ = maximum voltage at ambient temperature t_u

k_I and k_{II} = factors

t_u	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1.0	1.04	1.07	1.11	1.15	1.28
k_{II}	1.0	0.93	0.86	0.79	0.71	0.62

Small polarised relays V23063 to V23067

for dc operation, polarised, monostable or bistable

Outstanding features

- Very low power consumption and extremely accurate operating values

Versions

- Types: see next page
- Contact arrangement: 1 changeover
- Termination: plug-in
- Transparent cover to give protection against damage and dust
- Accessories: socket, solderable and retainer

Note for mounting

When mounting the small polarised relays, consideration should be given to external magnetic fields. Strong dc magnetic fields, possibly caused by adjacent relays, and large iron masses, are the most common causes of interference. Experience in the field of telecommunications indicates that a minimum spacing of 10 mm between relays is sufficient to prevent cross-interference of this nature.

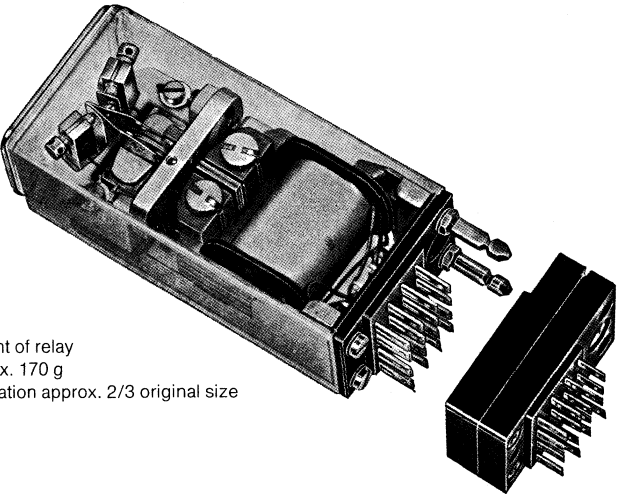
Small polarised relay

V23063-+★★★ to V23067-+★★★

With 1 changeover

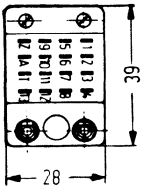
Dust protected

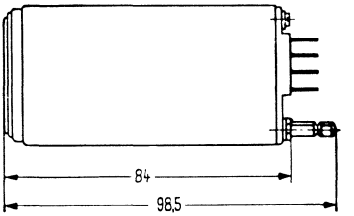
Plug-in



Weight of relay
approx. 170 g
Illustration approx. 2/3 original size

Socket





Types

The small polarised relay is produced in the following basic versions according to the switching sequence employed:

Small polarised relay, polarised, bistable
V23063-... and V23064-...

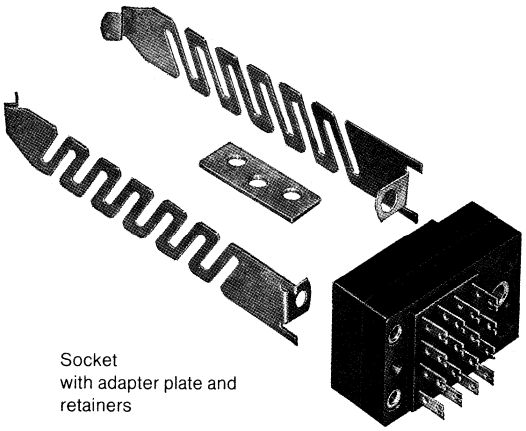
Small polarised relay, polarised, monostable with centre off position and two on-positions
V23065-...

Small polarised relay, polarised, monostable biased
V23067-...

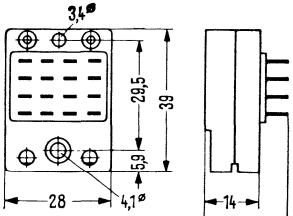
Order numbers on request

Small polarised relay

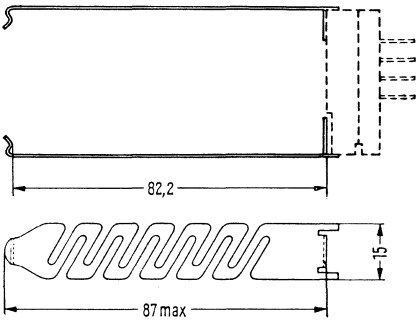
Socket and mounting



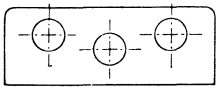
Socket
with adapter plate and
retainers



Socket
Weight approx. 20 g

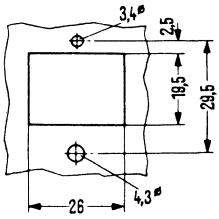


Retainer



Adapter plate
interchangeable for all relays

Mounting hole layout for socket



Order numbers on request

9

Miniature polarised relay V23021

for dc operation, polarised, monostable or bistable

Outstanding features

- Low power consumption

Versions

- Contact arrangement: 1 or 2 changeovers
- Termination: plug-in or solderable
- Hermetically sealed
- Accessories: socket, solderable and retainer

Available for spares only

9

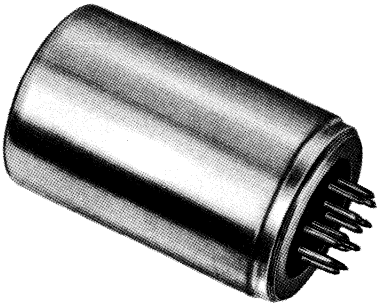
Miniature polarised relay

V23021-A★★★ plug-in

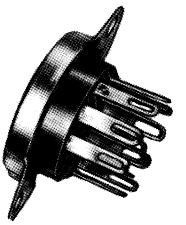
V23021-B★★★ with individual solder connections for screw mounting

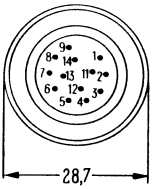
With 1 or 2 changeovers

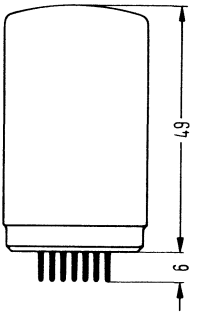
Hermetically sealed



Plug-in

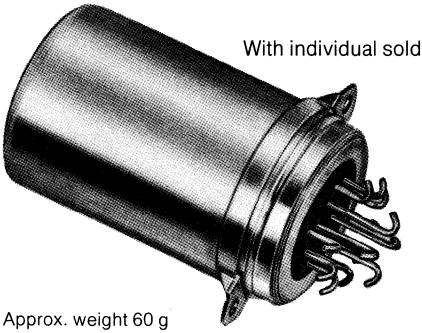


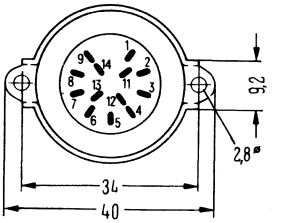


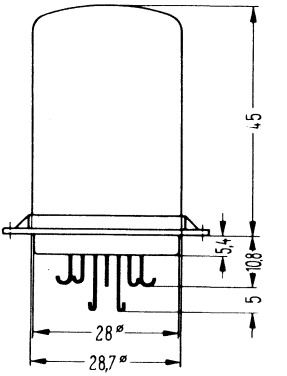


Approx. weight
relay 60 g, socket 6 g

With individual solder connections





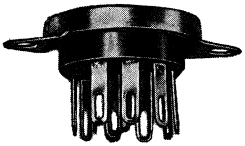


Approx. weight 60 g

Order numbers on request

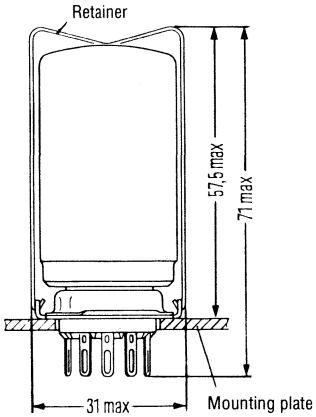
Miniature polarised relay

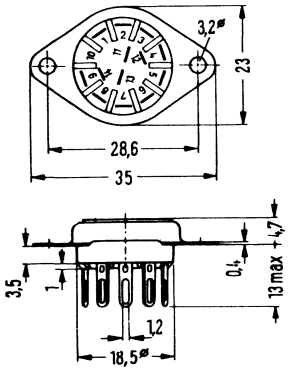
Socket and mounting



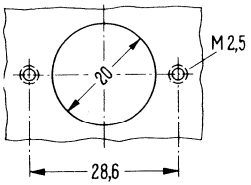
Socket V23021-Z1001
Approx. weight 6 g

Example of mounting with retainer

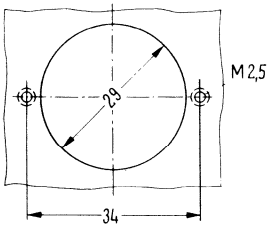




Mounting hole
layout for socket



Mounting hole layout for mounting
by screw fixing



Order numbers on request

9

Sub-miniature polarised relay V23018

for dc operation, polarised, monostable or bistable

Outstanding features

- High resistance to shock, vibration and temperature
- Complies with MIL-R-5757 F

Versions

- Contact arrangement: 1 changeover, monostable or
  2 changeovers, mono- or bistable
- Termination: printed circuit, solderable or plug-in
- Hermetically sealed
- Accessories: socket, solderable and retainer

Available for spares only

Subminiature polarised relay

V23018-A★★★

With 1 or 2 changeovers

Hermetically sealed

With long connecting leads

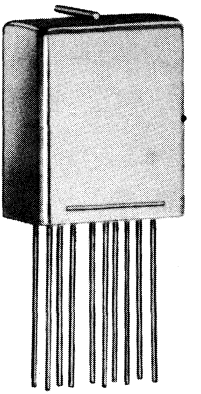
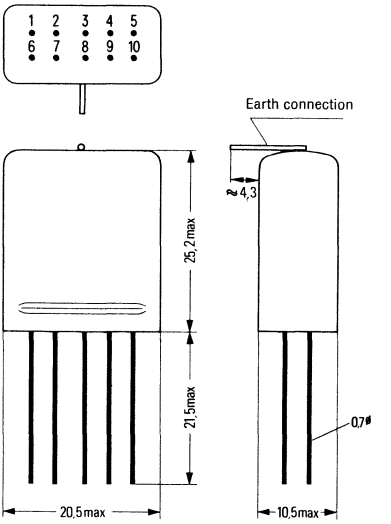


Illustration approx. original size
Approx. weight 17 g



Order numbers on request

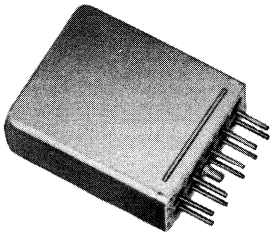
Subminiature polarised relay

V23018-D★★★

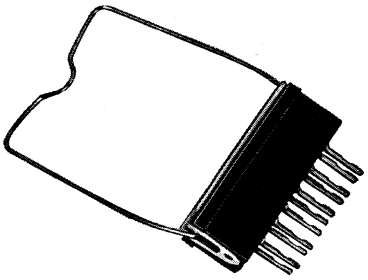
With 1 or 2 changeovers

Hermetically sealed

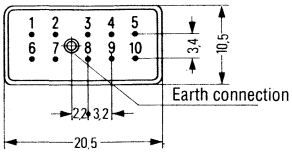
Plug-in

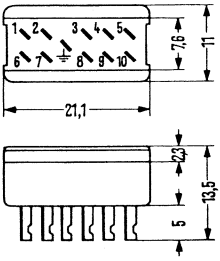


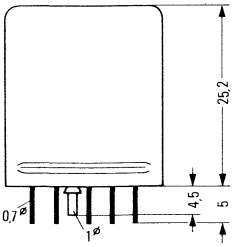
Approx. weight 16 g
Illustration approx. original size



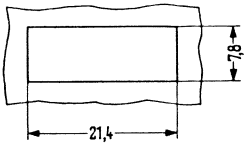
Socket
and retainer
Approx. weight 3 g

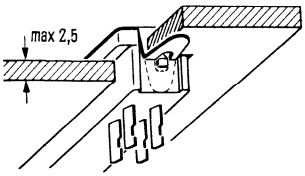




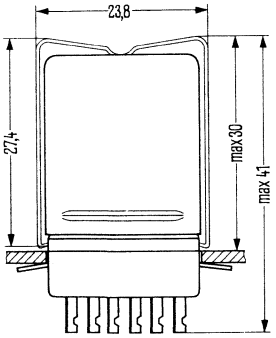


Mounting hole layout





Fixing the socket
by bending over the two lugs



Subminiature polarised
relay with socket
and retainer

Order numbers on request

Subminiature polarised relay

V23018-C★★★

With 1 or 2 changeovers

Hermetically sealed

For direct mounting into printed circuits, pin arrangement for 2.5 mm grid in accordance with DIN 40801 and DIN 40803, fine

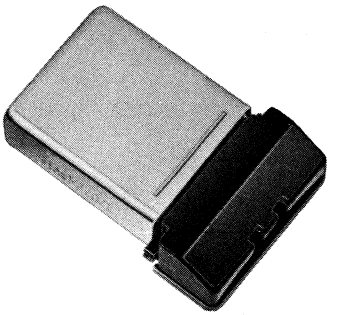
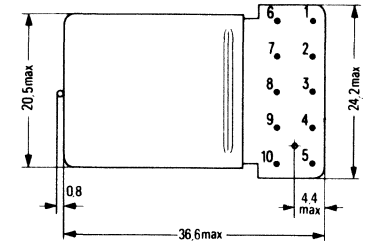
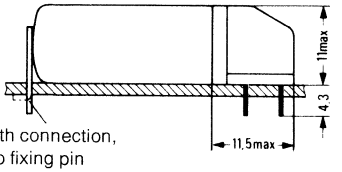
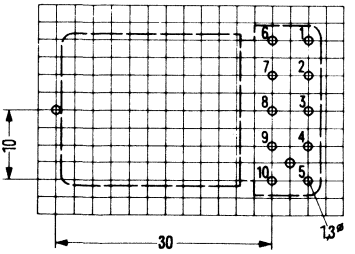


Illustration approx. original size
approx. weight 18 g





Earth connection,
also fixing pin



Mounting hole layout
View from the wiring side

Order numbers on request

Solid state relays (SSR's)

Solid state relays (SSR's) are relays based on semi-conductor technology. The switching of ac loads is undertaken by a triac or two anti-parallel thyristors. Isolation between the control circuit and switching circuit is achieved by using an opto-coupling device.

A supply of control voltage causes the triac or thyristors in the load circuit to trigger, that means a make function.

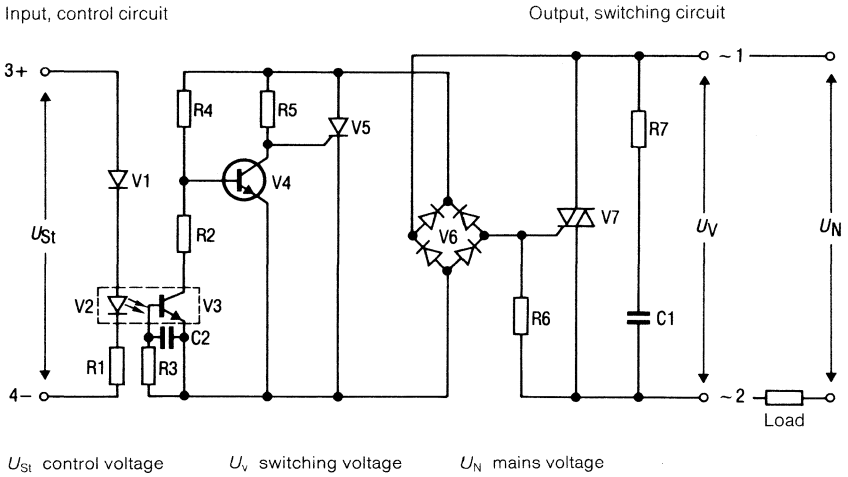


Fig. 1 Basic circuit diagram

The output stage has a built-in RC-snubber network to protect the semi-conductors. It will be necessary to take measures by using additional components in the circuit (RC-snubber networks, SIOV – varistors or similar) when switching highly inductive loads (cos $\varphi \leq 0.5$) and high transient voltages occuring in the mains supply. See hereto »SSR's without zero point switch«. Further details on request.

Control circuit

The control circuit exists of a light emitting diode (LED) V2 of the opto – coupler, which is normally connected in series with a limiting resistor R1 and a protection diode V1. The LED, which has only a few volts blocking voltage, is protected by the diode V1 against damage by reversed polarity of the control voltage or when high fluctuation voltages should overlap the control voltage. To turn-on, the SSR requires only a very small current of approximately 3 mA at a control voltage of 3 V to the light emitting diode V2. Due to this low power consumption, the SSR can be connected directly together with IC's and can for example be controlled in TTL-switching circuits via the L-level.

Switching circuit

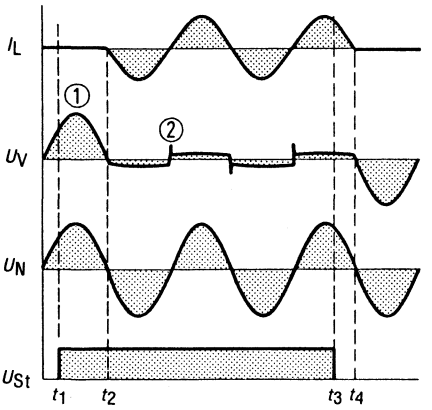
At first a supply of control voltage U_{St} ignites the auxiliary thyristor V5, which in turn triggers the triac V7 or the two anti-parallel thyristors designed for switching the current.

After the control voltage has been switched-off, the load current continues to flow in the first instance until the zero crossover, at which point the triac V7 can not ignite any more and only a negligible leakage current of a few milliamps is flowing.

SSR with zero point switch

It is sensible to use SSR's with zero point switches for pure resistive as well as capacitive loads. The zero point switch ensures that the current always rises sinusoidal from zero, and thus preventing a sudden surge of current rise at the very instant when switching-on. System faults from the mains and radio interference are hereby minimised and resulting in an extended life for the load and SSR's. Great care must be taken with capacitive loads that the rate of rise of the on-state current does not exceed the admissible di/dt value of the relay.

The zero point switch is only effective during the instant of switching-on and secures that V7 is triggered immediately the moment the control voltage is applied to a point of time, when the instantaneously value of the mains voltage is below the zero voltage. V7 remains blocked until the next half cycle, if this value has already been exceeded, and it could cause a delay in operating for almost one half cycle.



I_L	load current
U_V	voltage on triac
	not to scale:
	① peak value, 310 V
	② applied voltage e. g. 7 V
U_N	mains voltage (switching voltage)
U_L	load voltage ($U_L \approx U_N$)
U_{St}	control voltage
t_1	applying control voltage U_{St}
t_2	moment of switching circuit turn-on at zero crossover point of the voltage
t_3	to switch off control voltage U_{St}
t_4	moment of switching circuit turn-off

Fig. 2 Switching performance of an SSR with zero point switch.

SSR without zero point switch

The ideal moment of switching-on with inductive loads, such as contactors, solenoid valves, magneto couplings, motors or transformers would be at the displacement of the phase angle after the zero point of the mains voltage. The greater the phase shift, so much the more is the disadvantage of switching-on at the crossover point of the voltage, with the result of an excessive inrush current (factor 2 to 50).

SSR's without zero point switches are therefore better suited to switch inductive loads as those with zero point switches, as the moment of switching-on is statistical spread across the entire range. Furthermore, satisfactory performance of switching is guaranteed, even at the present of interference voltages caused occasionally when switching inductance.

Turn-on at the zero crossover point of the voltage can not be fully prevented by SSR's without zero point switch. Therefore, it must be taken into consideration at the state of the circuit design, that the inrush current reaches twice the value as that of the continuous current during the first half cycle, when the operational point is in the linear part of the characteristic magnitisation curve. Generally, this two-fold current value does not damage the SSR. Should the iron circuit by comparsion reach the point of saturation, the inrush current could then rise up to 50 times to the value of the continuous current, as the current is mainly limited by the dc resistance only. This applies often in the case of transformers being switched-on and this can lead to the destruction of the SSR as well as the transformer. Preventive measures, such as for example connecting a series resistor or control by electronic means are imperative.

Package oscillation control

SSR's with zero point switches are intended for applications controlled by package oscillation. In a fixed rhythm is the load hereby switched-on and off for the duration of several half cycles.

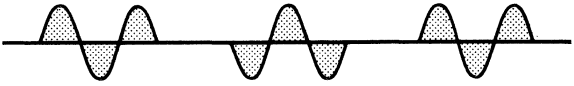


Fig. 3

Phase intersection control

The control of phase intersection frequently employed is only feasible by using SSR's without zero point switches. It should only be used in places, where for technical reasons a package oscillation control has to be ruled out, e. g. for brightness control (dimmering) of lighting installations or controlling the number of revolutions of motors.

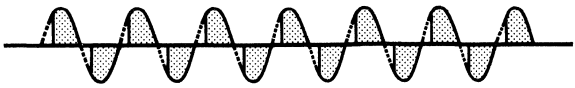


Fig. 4

The spaced letter definitions correspond to a draft of DIN VDE 0435 part 110, dated January 1986.

Solid state relays, static relays

Switching element, where the switching function is carried out by semi-conductor components (no mechanical movement).

LOAD CIRCUIT

Load circuit, output circuit

The total number of electrical conducting parts, which carry out the function of switching.

Blocked ouput circuit

Output circuit which has a resistance above a specified value.

Switching current, max. output current, continuous current

Highest value of current – rms if ac voltage – which can flow continuously in the turned-on output circuit after other determining factors have been taken into account (see derating curves »Switching current as a function of the ambient temperature«).

Switching voltage, nominal output voltage

Voltage which designate the output of an SSR.

Range of switching voltage, rated output voltage

Voltage range measured in order to ascertain the on- and off state of the output circuit.

Maximum repetitive peak blocking voltage

Highest instantaneous value (peak) of the blocking voltage, based on ratings for semiconductor components.

The highest value of the output voltage range is lower than the maximum repetitive peak blocking voltage in order to maintain a margin of safety.

Frequency range

Admissible range of frequency of the output voltage (nominal output voltage).

Surge current – max.value, max. short – time current

Highest value of the output current (peak value) of a half-oscillating sine-wave in the range of 47 to 63 Hz, corresponding to 11 to 8 ms, which the previously turned-on output circuit is capable of carrying.

The admissible temperature of the blocking layer is exceeded with loads of the maximum value of surge currents. This results in a temporary loss of the blocking ability. It is necessary to switch off at the mains. To switch-on again is only allowed after a cooling period, until the temperature of the crystals has reached operational use.

Occasionally the peak value of the surge current can be made use of, that means under fault conditions only, and can be repeated, but not periodical, after an interval of not less than 5 seconds.

Minimum switching current (holding current), minimum load current

Current in the load circuit during the on-state period, before this changes to the off-state position.

Maximum off-state current (leakage current)

Flow of current to the blocked load circuit at nominal output voltage.

Maximum on-state voltage

Voltage drop across the output circuit in the on-position with the specified factors of accessories.

Zero voltage

Range of instantaneous voltage of the rising half wave on the blocked load circuit at which the SSR turns-on when a control voltage is applied.

Critical rate of rise of off-state voltage, static

Highest admissible value of the rate of rise of off-state voltage at which the output circuit does not change from the blocked position to the on-state without the supply of a control voltage.

Critical commutating rate of rise of voltage

Rate of rise of voltage at commutating in the load circuit which does not result in changing to the on-state from the blocked position, when the input circuit remains de-energised.

Critical rate of rise of on-state current

Highest admissible value of the rate of rise of on-state current during the transition from the blocked position to the on-state.

Peak load integral

Highest admissible value of the time integral divided by the square of the current in the load circuit for 10 ms. The peak load integral of the fuse must be less than that of the SSR.

Operating time

The interval of time between the instant of applying a specified value of control voltage and the turn-on in the output circuit (see zero voltage).

CONTROL CIRCUIT

Control circuit, input circuit

The total number of electrical components of an SSR with all terminals connected and influenced when applying a given value of influx.

Control voltage, value of influx

Range of input voltage which triggers the blocked state of the load circuit into the on-position (turn-on).

Pick-up value

Lowest value of the control voltage which changes the blocked state of the load circuit into the on-position.

Release value

Highest value of the control voltage at which the load circuit changes from the on-position into the blocked state (turn-off).

Control current, value of influx

Value of the highest current in the input circuit which can flow at maximum voltage.

Resistance of the control circuit

Value of the build-in series resistor.

GENERAL DEFINITIONS

Operating temperature range, typical

The range of temperature in the immediate vicinity of the SSR (ambient temperature) in which the relay can function after taking into account the reduction of current in accordance with the derating curves.

Test voltage

Voltage (RMS value) which can be applied momentary between the closed input circuit and closed load circuit or base plate (case) in order to check the insulation.

Insulation resistance

Resistance between input and load circuit.

Solid state relays (SSR's)

V23100-S
V23103-S

Outstanding features

- High switching rate and long life
- Zero voltage turn-on, relays with zero-point switch
- Turn-off at zero current
- Bounce free switching, as no moving parts
- No mechanical switching noice
- Low control power
- Unaffected by shock and vibration

Versions

- With or without zero-point switch
- Load circuit: triac or 2 anti-parallel thyristors; corrensponds to one make
- Termination: printed circuit or screw terminals
- Use of plastic materials for sheathing

Approvals:

VDE	Certificate for monitoring of manufacturing – monogram	46896, 47738 and 49938
SEV	D7.91/480 and 86/1 11162/02	
CSA	File 45064 class 3211	
UL	Guide NMFT 2, file E 85134	

10

Table 1 Ordering code and characteristics

Type		B3	B4	B4
Order numbers Preferred standard types in bold print		V23103-S2232-B302[1])	**V23103-S2032-B402**	V23103-S2332-B402
Description	page	10.15	10.16	10.16
Load circuit				
Zero-point switch		yes	yes	no
Switching current (see derating curves)	A_{rms}	2	2.5	2.5
Switching voltage	V_{rms}	240	240	240
Switching voltage range	V_{rms}	24...280	24...280	24...280
Repetitive peak blocking voltage	V_{pk}	600	600	600
Frequency range	Hz	47...63	47...63	47...63
Peak surge current, 1 cycle 50 Hz, non-repetitive	A_{pk}	100	100	100
Min. load current (holding current)	mA_{rms}	50	50	50
Max. off-state current (leakage current)	mA_{rms}	5	4.5	4.5
Max. on-state voltage (peak value) at max. load current	V_S	1.6	1.6	1.6
Zero voltage	V_S	±60	±30	–
Critical rate of rise of off-state volt. (du/dt block.)	V/µs	200	200	200
Critical commutating rise of voltage	V/µs	5	5	5
Critical rate of rise of on-state current (di/dt)	A/µs	20	20	20
Peak load integral, 10 ms	A^2s	50	50	50
Max. operating time	ms	10	10	0.1
Control circuit				
Control voltage	Vdc	3...6	3...30	3...20
Pick-up voltage	Vdc	≤3	≤3	≤3
Release voltage	Vdc	>1	>1	>1
Control current at max. control voltage	mAdc	<18	<30	<30
Control circuit resistance	Ω	330	1000	680
General				
Operating temperature range, typical	°C	−25...+80	−25...+80	−25...+80
Storage temperature range	°C	−40...+100	−40...+100	−40...+100
Insulation voltage: Input – Output	kV_{rms}	2.5	2.5	2.5
Input – Case	kV_{rms}	–	–	–
Output – Case	kV_{rms}	–	–	–
Insulation resistance	Ω	10^{10}	10^{10}	10^{10}
Approvals		SEV, UL	SEV, UL	UL

Special versions on request.

[1]) SSR with improved immunity to line transient, details on request.
[2]) Load circuit with 2 anti-parallel thyristors.
[3]) Air gaps and creepage distances >8 mm, VDE 0806 and VDE 0750.
[4]) Air gaps and creepage distances >8 mm, VDE 0806 and VDE 0700.

type	B5	A3	B1	B1	B1	B1
	V23103-S4032-B502[4])	**V23100-S0302-A303**	V23103-S2033-B105[2])	V23103-S2333-B105[2])	V23103-S4033-B105[2])[3])	V23103-S4333-B105[2])
page	10.17	10.18	10.14	10.14	10.14	10.14
Load circuit						
	yes	yes	yes	no	yes	no
A_{rms}	2.5	3	5	5	5	5
V_{rms}	240	240	380	380	380	380
V_{rms}	24...280	24...280	24...480	24...480	24...480	24...480
V_{pk}	600	600	1200	1200	1200	1200
Hz	47...63	47...63	47...63	47...63	47...63	47...63
A_{pk}	100	50	100	100	100	100
mA_{rms}	50	50	50	50	50	50
mA_{rms}	4.5	5.5	4.5	4.5	4.5	4.5
V_S	1.6	1.6	1.6	1.6	1.6	1.6
V_S	±30	±30	±65	–	±65	–
$V/\mu s$	200	200	200	200	200	200
$V/\mu s$	5	5	–	–	–	–
$A/\mu s$	20	20	20	20	20	20
A^2s	50	18	50	50	50	50
ms	10	10	10	0.1	10	0.1
Control circuit						
Vdc	3...20	3...30	3...30	3...20	3...20	3...20
Vdc	≤3	≤3	≤3	≤3	≤3	≤3
Vdc	>1	>1	>1	>1	>1	>1
mAdc	<30	<20	<30	<30	<20	<30
Ω	680	1500	1000	680	1000	680
General						
°C	−25...+80	−25...+80	−25...+80	−25...+80	−25...+80	−25...+80
°C	−40...+100	−40...+100	−40...+100	−40...+100	−40...+100	−40...+100
kV_{rms}	3.75	2.5	2.5	2.5	4	4
kV_{rms}	–	–	–	–	–	–
kV_{rms}	–	–	–	–	–	–
Ω	10^{10}	10^{10}	10^{10}	10^{10}	10^{10}	10^{10}
	VDE[4])	–	SEV, UL	UL	VDE, SEV, CSA	–

Table 1 Ordering code and characteristics

Type		A2	A2	A2
Order Numbers Preferred standard types in bold print		**V23100-S0302-A210**	V23100-S4032-A210[3])	**V23100-S0302-A225**
Description	page	10.19	10.19	10.19
Load circuit				
Zero-point switch		yes	yes	yes
Switching current (see derating curves)	A_{rms}	10	10	25
Switching voltage	V_{rms}	240	240	240
Switching voltage range	V_{rms}	24...280	24...280	24...280
Repetitive peak blocking voltage	V_{pk}	600	600	600
Frequency range	Hz	47...63	47...63	47...63
Peak surge current, 1cycle 50 Hz, non-repetitive	A_{pk}	115	90	300
Min. load current (holding current)	mA_{rms}	50	50	50
Max. off-state current (leakage current)	mA_{rms}	8	8	8
Max. on-state voltage (peak value) at max. load current	V_S	1.6	1.6	1.6
Zero voltage	V_S	±25	±25	±25
Critical rate of rise of off-state vol. (dv/dt blocking)	V/µs	200	200	200
Critical commutating rise of voltage	V/µs	5	200	5
Critical rate of rise of on-state current (di/dt)	A/µs	10	10	10
Peak load integral, 10 ms	A^2s	66	40	450
Max. operating time	ms	10	10	10
Control circuit				
Control voltage	Vdc	3...30	3...30	3...30
Pick-up voltage	Vdc	≤3	≤3	≤3
Release voltage	Vdc	>1	>1	>1
Control current at max. control voltage	mAdc	<20	<30	<20
Control circuit resistance	Ω	1500	1000	1500
General				
Operating temperature range, typical	°C	−25...+80	−25...+80	−25...+80
Storage temperature range	°C	−40...+100	−40...+100	−40...+100
Insulation voltage: Input – Output	kV_{rms}	2.5	3.75	2.5
Input – Case	kV_{rms}	2.5	2.5	2.5
Output – Case	kV_{rms}	2.5	2.5	2.5
Insulation resistance	Ω	10^{10}	10^{10}	10^{10}
Approvals		–	VDE	–

Special versions on request.

[3]) Air gaps and creepage distances >8 mm, VDE 0806 and VDE 0750.

type	A2	A8	A8	A2	A2	A8	A8
	V23100-S4032-A225[3])	V23100-S2034-A825	V23100-S2234-A825	V23100-S0302-A240	V23100-S4032-A240[3])	V23100-S2034-A840	V23100-S2234-A840
page	10.19	10.19	10.19	10.19	10.19	10.19	10.19
Load circuit							
	yes	yes	no	yes	yes	yes	no
A_{rms}	25	25	25	40	40	40	40
V_{rms}	240	415	415	240	240	415	415
V_{rms}	24...280	24...480	24...480	24...280	24...280	24...480	24...480
V_{pk}	600	1000	1000	600	600	1000	1000
Hz	47...63	47...63	47...63	47...63	47...63	47...63	47...63
A_{pk}	230	230	230	400	350	350	350
mA_{rms}	50	50	50	50	50	50	50
mA_{rms}	8	8	8	8	8	8	8
V_S	1.6	1.6	1.6	1.6	1.6	1.6	1.6
V_S	±25	±25	–	±25	±25	±25	–
V/µs	200	200	200	200	200	200	200
V/µs	200	200	200	5	200	200	200
A/µs	10	10	10	10	10	10	10
A^2s	265	265	265	800	610	610	610
ms	10	10	0.1	10	10	10	0.1
Control circuit							
Vdc	3...30	3...30	3...30	3...30	3...30	3...30	3...30
Vdc	≤3	≤3	≤3	≤3	≤3	≤3	≤3
Vdc	>1	>1	>1	>1	>1	>1	>1
mAdc	<30	<20	<20	<20	<30	<20	<20
Ω	1000	1500	1500	1500	1000	1500	1500
General							
°C	−25...+80	−25...+80	−25...+80	−25...+80	−25...+80	−25...+80	−25...+80
°C	−40...+100	−40...+100	−40...+100	−40...+100	−40...+100	−40...+100	−40...+100
kV_{rms}	3.75	2.5	2.5	2.5	3.75	2.5	2.5
kV_{rms}	2.5	2.5	2.5	2.5	2.5	2.5	2.5
kV_{rms}	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Ω	10^{10}	10^{10}	10^{10}	10^{10}	10^{10}	10^{10}	10^{10}
	VDE	–	–	–	VDE	–	–

Solid state relay type B1

Type B1
Standard or VDE-version

Without or with zero-point switch

For direct mounting into printed circuits, pin arrangement for 2.54 mm grid in accordance with DIN 40801

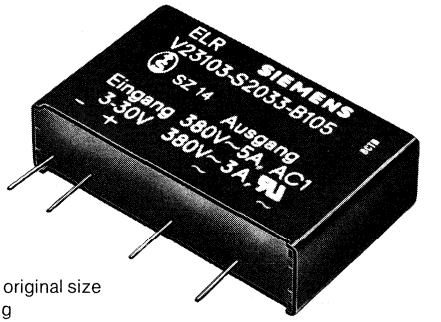
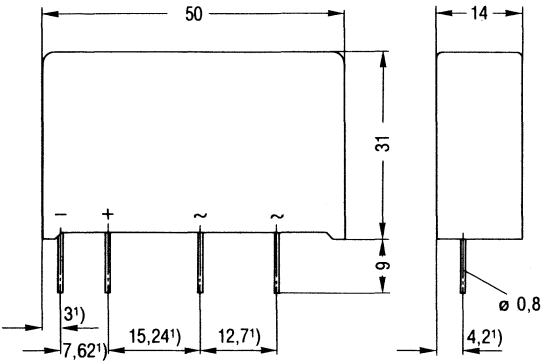
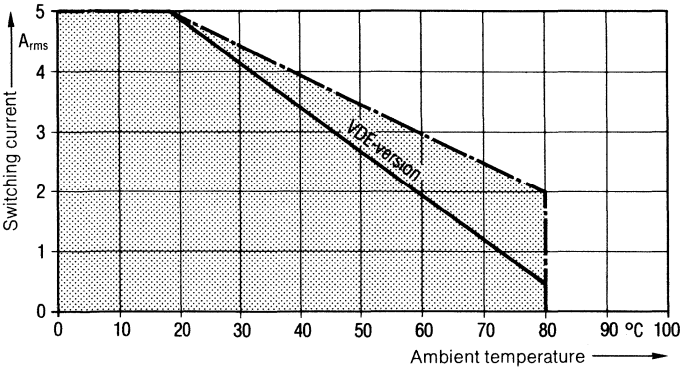


Illustration approx. original size
Approx. weight 35 g



¹) refers to wire outlet through sealing compound

Derating curves



Switching current as a function of the ambient temperature

Solid state relay type B3

Type B3

With improved immunity to line transient

With zero-point switch

For direct mounting into printed circuits, pin arrangement for 2.54 mm grid in accordance with DIN 40801

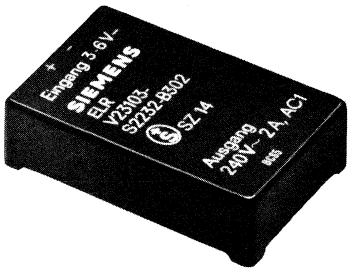
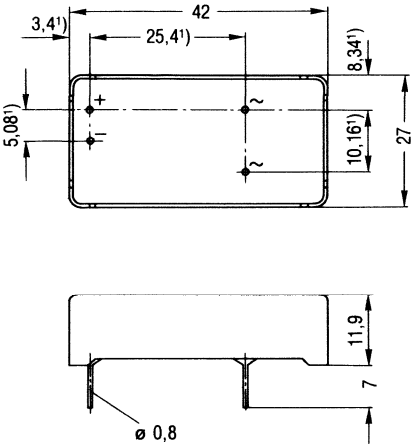
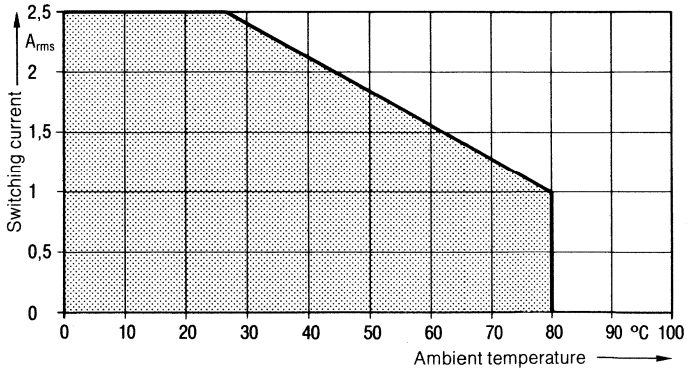


Illustration approx. original size
Approx. weight 24 g



¹) refers to wire outlet through sealing compound

Derating curve



Switching current as a function of the ambient temperature

10

Solid state relay type B4

Type B4

Without or with zero point switch

For direct mounting into printed circuits, pin arrangement for 2.54 mm grid in accordance with DIN 40801

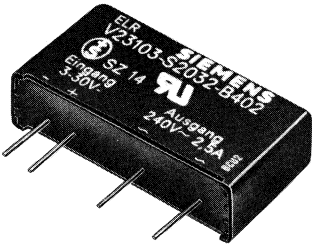
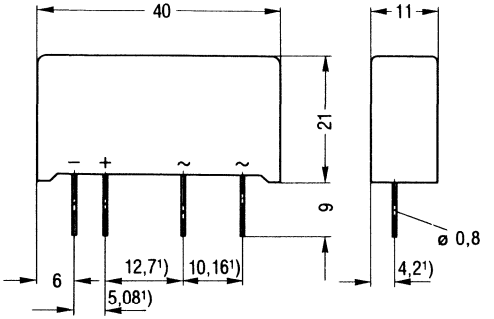
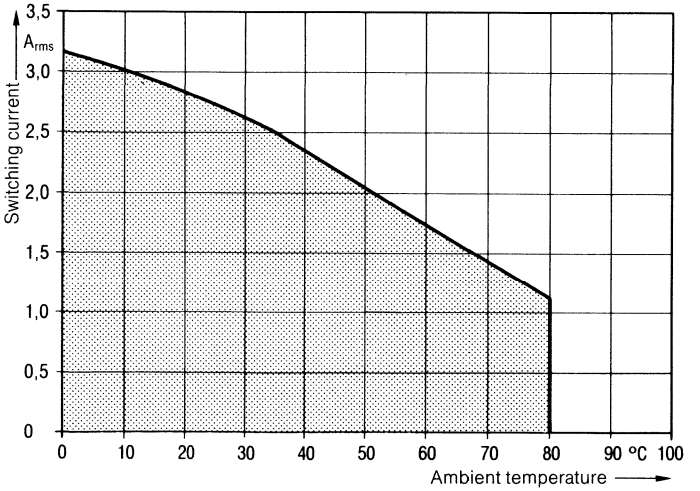


Illustration approx. original size
Approx. weight 18.5 g



¹) refers to wire outlet through sealing compound

Derating curve



Switching current as a function of the ambient temperature

Solid state relay type B5

Type B5

With zero-point switch

For direct mounting into printed circuits, pin arrangement for 2.54 mm grid in accordance with DIN 40801

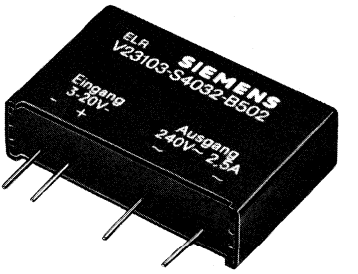
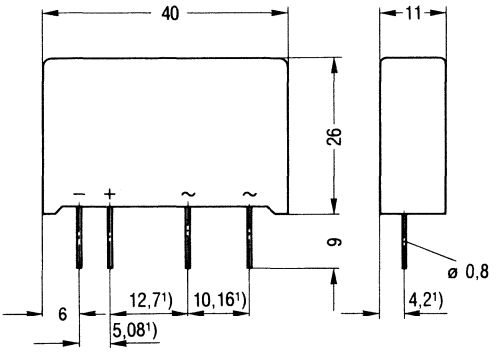
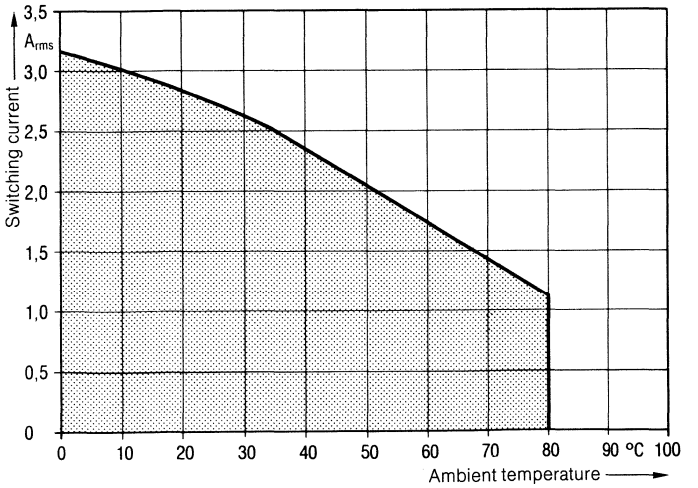


Illustration approx. original size
Approx. weight 18.5



¹) refers to wire outlet through sealing compound

Derating curve



Switching current as a function of the ambient temperature

10

Solid state relay type A3

Type A3

With zero-point switch

For direct mounting into printed circuits, pin arrangement for 2.54 mm grid in accordance with DIN 40801

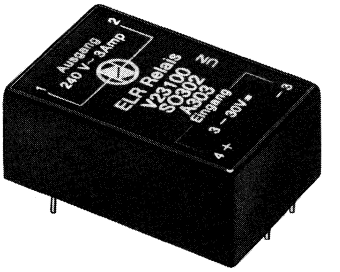
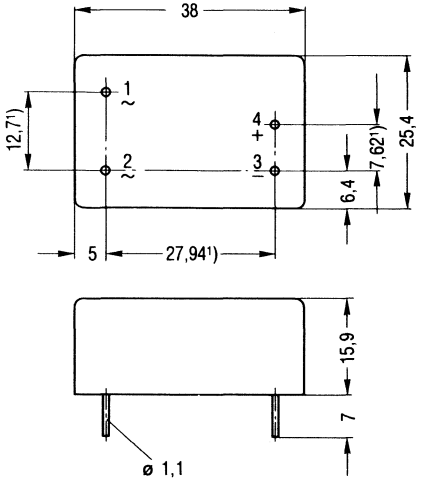
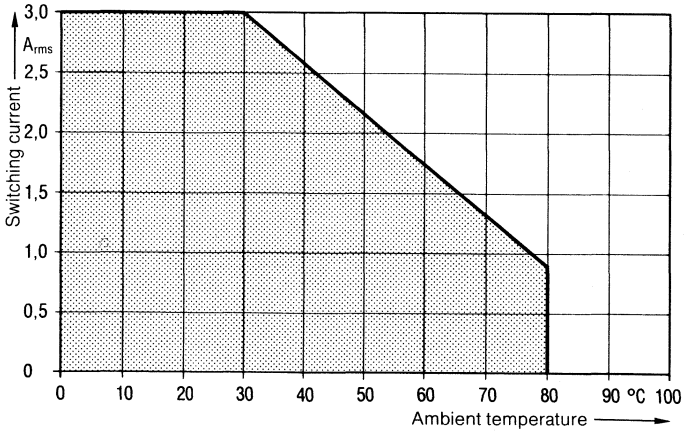


Illustration approx. original size
Approx. weight 22 g



¹) refers to wire outlet through sealing compound

Derating curve



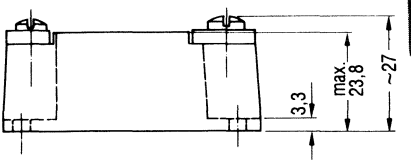
Switching current as a function of the ambient temperature

Solid state relays type A2 and A8

Types A2 up to 280 V switching voltage
and
types A8 up to 480 V switching voltage

With zero-point switch

For mounting by fixing screw



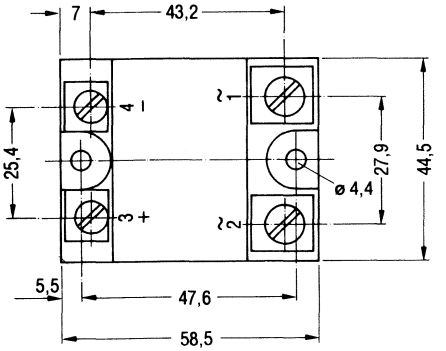


Illustration approx. original size
Approx. weight 115 g

Mounting

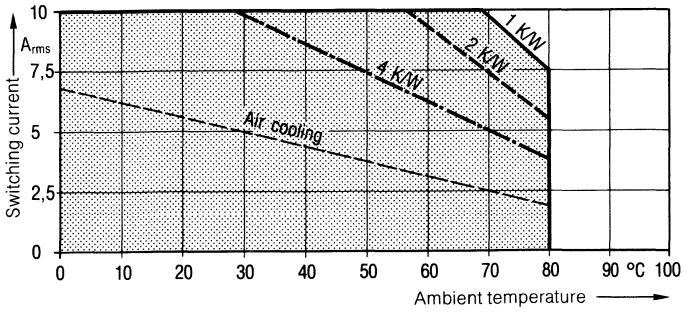
The screw terminals are chosen such, that for the load circuit two single strand wires up to 6 mm^2 and for the control circuit up to 4 mm^2 can be used or cable clamps may be employed.

Bus bars and heat sinks should be constructed in such a way, that no additional stress is transferred to the relays.

Care must be taken to ensure that supply cables are of sufficient gauge to avoid heat transfer to the relays. This especially applies when mounted direct in series with fuses.

Derating curves

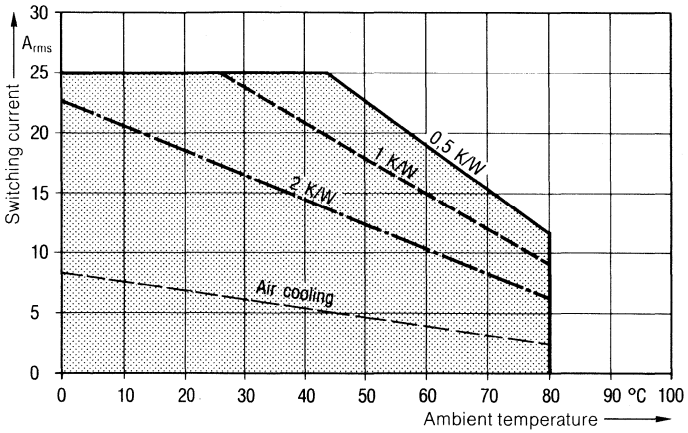
10 A



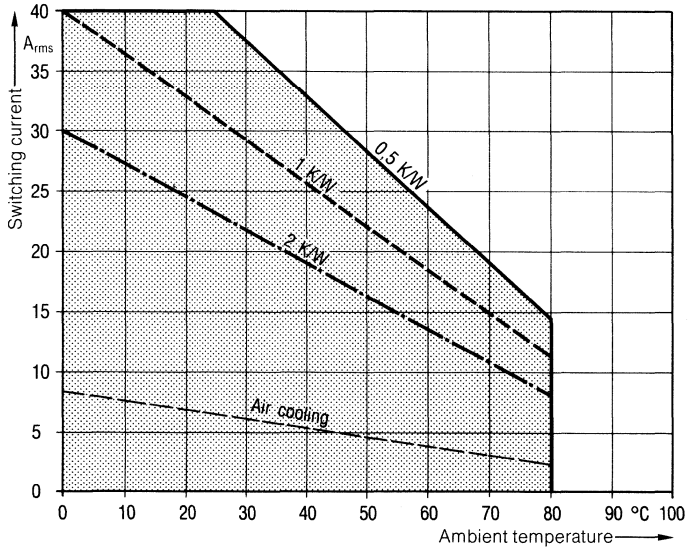
Switching current as a function of the ambient temperature

In order to attain the stated current rating it is necessary to mount the SSR's onto finned heat sinks or flat plates. The curves in the graph show the thermal resistance required of the heat sinks or plates. Heat sinks are obtainable on request. Apply thermal joint compound when fitting to heat sinks. At any rate the case temperature has to be checked.

25 A

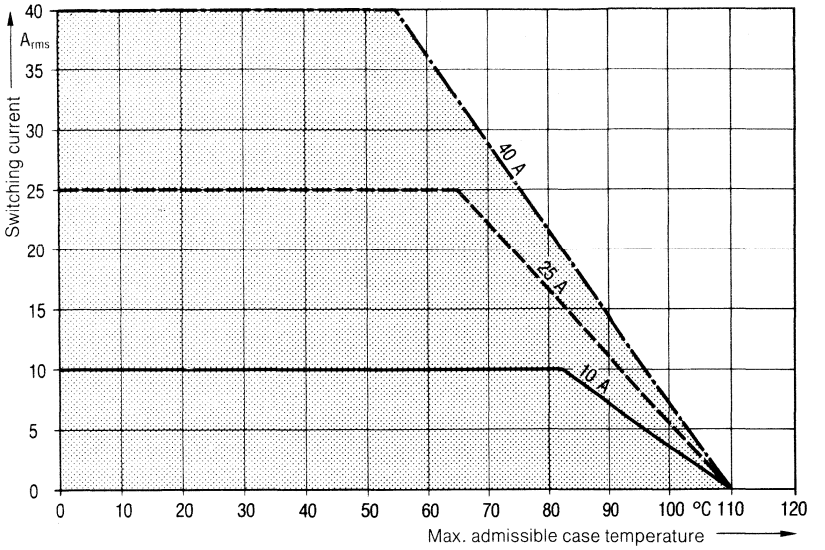


40 A



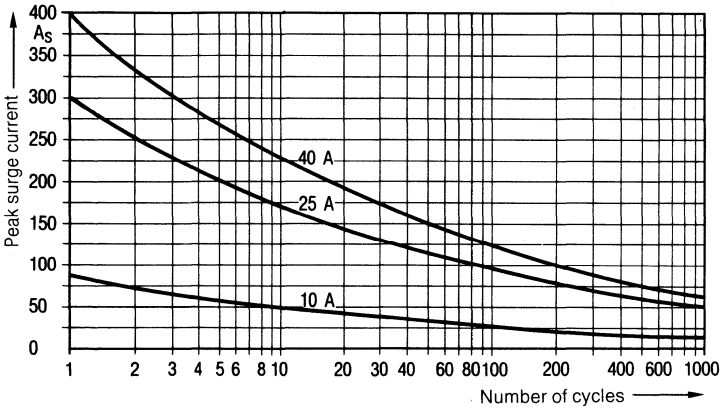
Switching current as a function of the ambient temperature

In order to attain the stated current it is necessary to mount the SSR's onto finned heat sinks or flat plates. The curves in the graph show the thermal resistance required of the heat sinks or plates. Heat sinks are obtainable on request. Apply thermal joint compound when fitting to heat sinks. At any rate the case temperature has to be checked.



Switching current as a function of the case temperature (measuring point centre of base plate)

In order to attain the stated current rating it is necessary to mount the SSR's onto heat sinks or flat plates. Heat sinks are obtainable on request. Apply thermal joint compound when fitting to heat sinks. At any rate the case temperature has to be checked.



Peak surge current (peak value admissible only occasionally) as a function of the current duration (cycles).

Note: The admissible temperature of the blocking layer will be exceeded at loads with peak surge currents. Temporary loss of blocking ability has to be taken into account. It is necessary to switch off the mains supply. Only after cooling down to the operational temperature of the crystal is it permitted to switch on again. The peak value of the surge current can only be made use of occasionally, that means under fault condition and can be repeated, but not repetitive at the earliest after an interval of at least $\geqslant$ 5 sec.

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