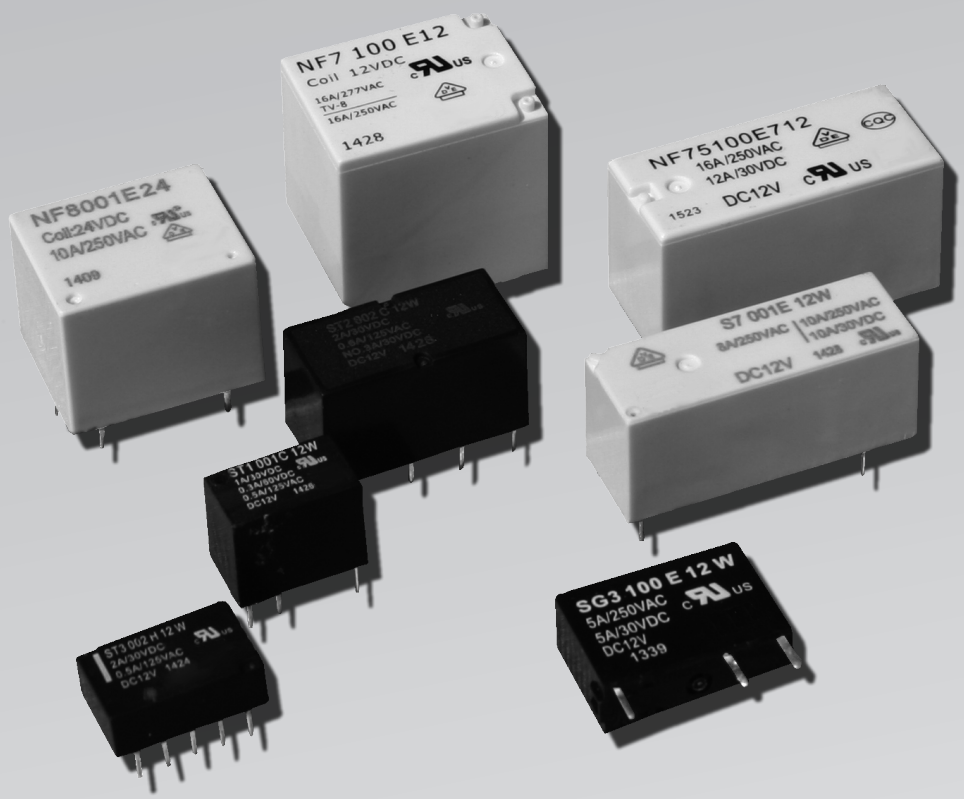
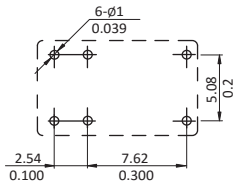
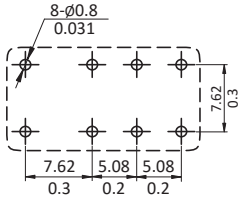
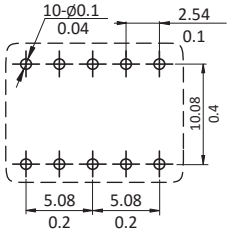
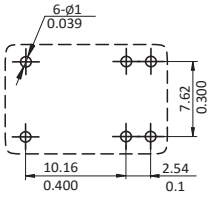


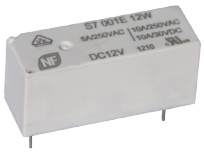
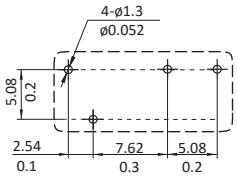
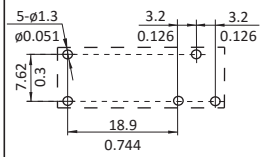
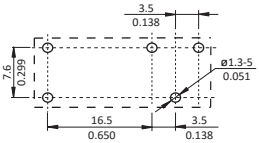
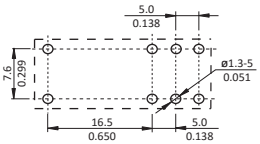
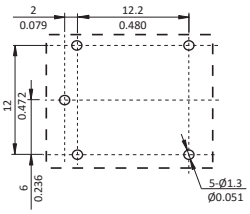
Relay Catalog

NF Forward Relay Catalog

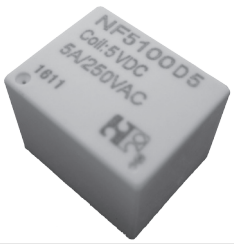
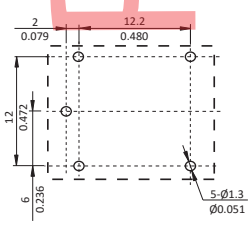
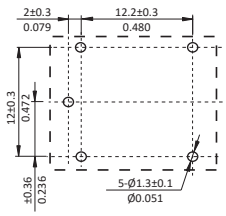
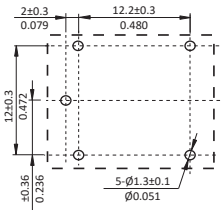
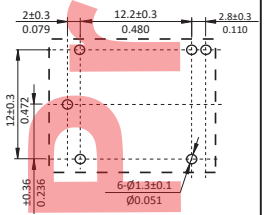
Relay Selection Chart

Type	ST1	ST2	ST3	NF42
Photo / Description				
Outline (LxWxH)mm No including terminals	12.5x7.5x10	20x9.8x12	14x9x5	15.5x11x11.5
Contact configuration	1C	2C	2C	1C
Max. Allowable Contact current (A)	1A	2A	2A	3A
Contact rating Resistive load	1A 24VDC 0.5A 125 VAC	2A 30VDC 0.6A 125VAC	2A 30VDC 0.5A 125VAC	3A 30VDC 3A 125VAC
Coil voltage [DC]	5-24V	5-48V	5-24V	5-24V
Power consumption	0.15W	0.15W - 0.2W - 0.3W	0.14W - 0.2W	0.2W
Life expectancy				
Mechanical (Min.)	$5x10^6$	$100x10^6$	$100x10^6$	$10x10^6$
Electrical (Min.)	$1x10^5$	$1x10^5$	$2x10^5$	$1x10^5$
Dielectric strength				
Open contact	400VAC	1000VAC	1000VAC	500VAC
Contact and coil	1000VAC	1000VAC	1000VAC	500VAC
Contact ciruits	------	1000VAC	1000VAC	500VAC
Terminal layout mm (inch) Bottom view (PCB layout)	 Tolerance ±0.1/±0.004	 Tolerance ±0.1/±0.004	 Tolerance ±0.1/±0.004	 Tolerance ±0.1/±0.004
Terminal type				
Safety approval	UL/CUL	UL / CUL	UL / CUL	UL / CUL
Page No.	47-49	50-52	53-55	44-46

Relay Selection Chart

SG3	S7	NF75 (12A)	NF75 (16A)	NF7
				
17.5x6.5x12.5	28.5x10.1x12.5	29x12.7x15.7	29x12.7x15.7	21.3x16.2x21
1A	1A - 1C	1A - 1C	1A - 1C	1A - 1C
 5A	 10A	 12A	 16A	 16A
5A 30VDC 5A 250VAC	1C: 8A 250VDC 1A: 10A 250VAC	12A 250VDC	16A 250VDC	16A 250VDC
5-24V	5-48V	5-48V	5-48V	3-48V
0.2W	0.22W-0.25W-0.29W	0.41W	0.41W	0.36W
$20x10^6$	$10x10^6$	$10x10^6$	$10x10^6$	$10x10^6$
see curve	$1x10^5$	$1x10^5$	$1x10^5$	see curve
750VAC	1000VAC	1000VAC	1000VAC	1000VAC
3000VAC	5000VAC	5000VAC	5000VAC	2500VAC
------	------	------	------	------
				
				
UL / CUL	UL / CUL | VDE	UL / CUL | VDE	UL / CUL | VDE	UL / CUL | VDE
12-14	15-18	19-22	19-22	23-26

Relay Selection Chart

Type	NF9	NF5	NF8	NF6
Photo / Description				
Outline (LxWxH)mm No including terminals	21.3x16.2x21	19.5x15.6x15.3	19.5x15.6x15.3	19.5x15.6x15.3
Contact configuration	1A,1C	1A,1C	1A,1C	1A,1C
Max. Allowable Contact current (A)	16A	5A	10A	12A
Contact rating Resistive load	16A 250VAC	5A 250VAC	10A 250VAC 15A 125VAC	12A 250VAC
Coil voltage [DC]	3-48V	6-48V	6-48V	6-48V
Power consumption	0.36W	0.36W	0.36W	0.36W
Life expectancy				
Mechanical (Min.)	$10x10^{6}$	$10x10^{6}$	$10x10^{6}$	$10x10^{6}$
Electrical (Min.)	$1x10^{5}$	$50x10^{3}$	$50x10^{3}$	$50x10^{3}$
Dielectric strength				
Open contact	1000VAC	750VAC	750VAC	750VAC
Contact and coil	2500VAC	1500VAC	1500VAC	1500VAC
Contact ciruits	------	------	------	------
Terminal layout mm (inch) Bottom view (PCB layout)				
Terminal type				
Safety approval	UL / CUL, VDE	UL / CUL, VDE	UL / CUL, VDE	UL / CUL, VDE
Page No.	27-29	37-39	33-36	30-32

Relay Selection Chart

NF90	NF90H
	
32.5x27.6x20.5	32.5x27.6x20.5
1A, 1B, 1C	1A, 1B, 1C
30A 	40A 
30A 250VAC	40A 250VAC
5-48V	5-48V
0.9W	0.9W
$10x10^6$	$10x10^6$
$1x10^5$	$1x10^5$
1500VAC	1500VAC
2500/4000VAC	2500/4000VAC
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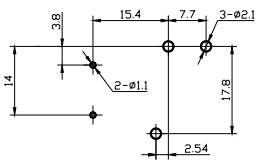
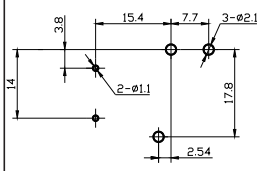
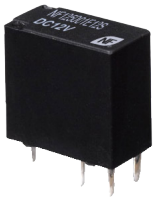
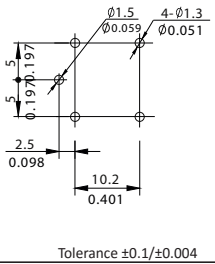
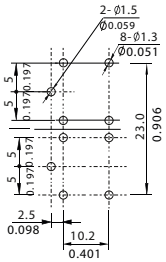
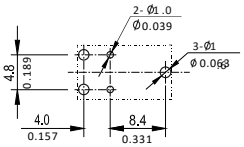
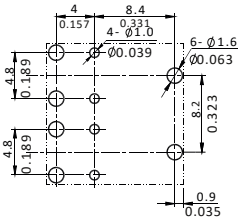
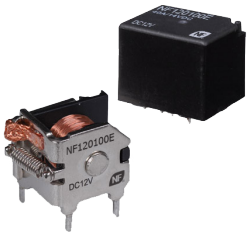
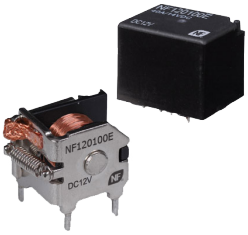
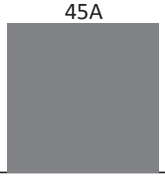
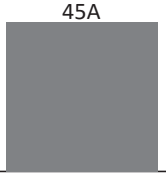
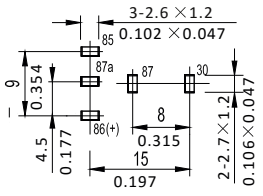
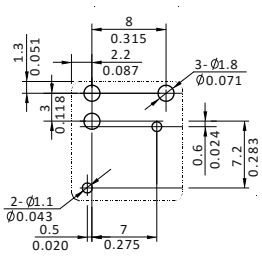
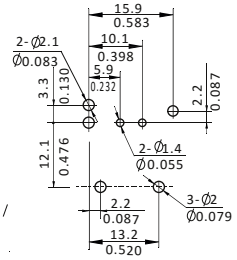
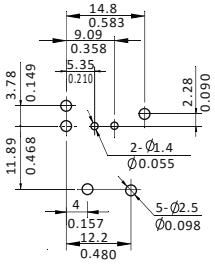
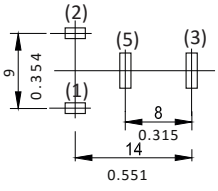
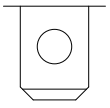
	
	
UL / CUL | VDE(pending)	UL / CUL | VDE
40-43	40-43

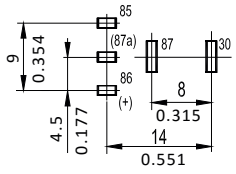
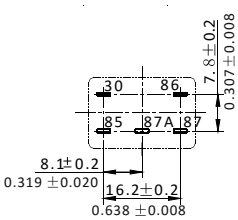
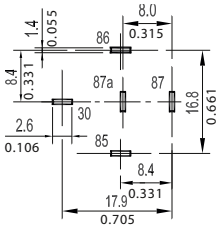
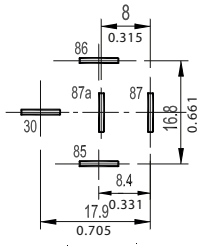
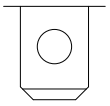
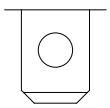
Relay Selection Chart

Type	NF108	NF108 TWIN	NF125	NF125 TWIN
Photo / Description				
Outline (LxWxH)mm No including terminals	16.0x12.5x14.4	16.0x25.5x14.4	14.3x7.5x13.8	14.3x15.7x13.8
Contact configuration	1C, 1U	2x1C	1C	2x1C
Max. Allowable Contact current (A)	20A	20A	25A	25A
Coil voltage [VDC]	12, 24	12, 24	12	12
Power consumption [W]	0.69	0.69	0.64, 0.8 (sensitive coil)	0.64, 0.8 (sensitive coil)
Life expectancy				
Mechanical (Min.)	10^7	10^7	10^6	10^6
Electrical (Min.)	10^5	10^5	10^5	10^5
Dielectric strength				
Open contact	500VAC	500VAC	500VAC	500VAC
Contact and coil	500VAC	500VAC	1000VAC	1000VAC
Contact ciruits	------	------	------	------
Terminal layout mm (inch) Bottom view (PCB layout)	 Tolerance ±0.1/±0.004	 Tolerance ±0.1/±0.004	 Tolerance ±0.1/±0.004	 Tolerance ±0.1/±0.004
Terminal type				
Page No.	56-58	56-58	62-64	62-64

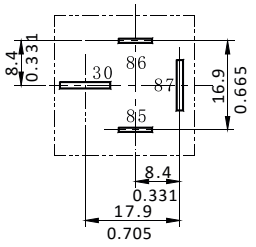
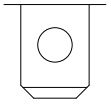
Relay Selection Chart

NF117(H) - PCB	NF123H	NF120 (European)	NF120 (USA)	NF115
				
23x15.5x26	12x12.9x9.9	26.8x25.5x14.4	26.8x12.5x14.4	22.6x15.2x16.2
1A, 1C	1A, 1C	1A, 1C	1A, 1C	1A
				
35A	30A	45A	45A	25A
12, 24	12, 24	12, 24	12, 24	12
1.2, 1.5	0.57	1.6	1.6	0.8
10^7	10^7	10^7	10^7	10^7
10^5	10^5	10^5	10^5	10^5
500VAC	500VAC	500VAC	500VAC	500VAC
1000VAC	500VAC	750VAC	750VAC	500VAC
------	------	------	------	------
 Tolerance ±0.1/±0.004	 Tolerance ±0.1/±0.004	 Tolerance ±0.1/±0.004	 Tolerance ±0.1/±0.004	 Tolerance ±0.1/±0.004
				
71-73	59-61	65-67	65-67	68-70

Relay Selection Chart

Type	NF117(H) - Plug-in	NF135	NF104(H) - PCB	NF104(H) - Plug-in I
Photo / Description				
Outline (LxWxH)mm No including terminals	23x15.5x26	22.5x15x25	Standard:26.5x26.5x24.5 w.bracket:26.5x26.5x40.5 Shrounded:35.5x35.5x66.8	Standard:26.5x26.5x24.5 w.bracket:26.5x26.5x40.5 Shrounded:35.5x35.5x66.8
Contact configuration	1A, 1C	1A, 1C	1A, 1C	1A, 1C
Max. Allowable Contact current (A)	 35A	 35A	 50A	 50A
Coil voltage [VDC]	12, 24	12, 24	12, 24	12, 24
Power consumption [W]	1.2, 1.5	1.3	1.6	1.6
Life expectancy				
Mechanical (Min.)	10^7	10^7	10^7	10^7
Electrical (Min.)	10^5	10^5	10^5	10^5
Dielectric strength				
Open contact	500VAC	500VAC	500VAC	500VAC
Contact and coil	1000VAC	500VAC	750VAC	750VAC
Contact ciruits	------	------	------	------
Terminal layout mm (inch) Bottom view (PCB layout)	 Tolerance ±0.1/±0.004	 Tolerance ±0.1/±0.004	 Tolerance ±0.1/±0.004	 Tolerance ±0.1/±0.004
Terminal type		ISO 280 		
Page No.	71-73	74-76	77-79	77-79

Relay Selection Chart

Type		NF105 - Plug-in
Photo / Description		
Outline (LxWxH)mm No including terminals		Standard:26.5x26.5x25.2 w.bracket:26.5x26.5x41.2
Contact configuration		1A
Max. Allowable Contact current (A)	80 70 60 50 40 30 20 10	70A 
Coil voltage [VDC]		12, 24
Power consumption [W]		1.6
Life expectancy Mechanical (Min.)		10^7
Electrical (Min.)		10^5
Dielectric strength Open contact		500VAC
Contact and coil		500VAC
Contact ciruits		------
Terminal layout mm (inch) Bottom view (PCB layout)		 Tolerance ±0.1/±0.004
Terminal type		
Page No.		80-82

Cross Reference

General Purpose

Ningbo Forward	Song Chuan	Fujitsu	Hongfa	Omron	Panasonic	Relpol	TE
NF42		FBR211-A	HFD41	G2E		RSM945N	
NF42A		FBR211-B	HFD41A				OUAT
ST1		SY	HFD23	G5V-1	HY1	RSM957N	TSC
ST2		RA,RY,FBR244	HFD27,HFD2	G5V-2,G6A-2	DS2E	RSM822N	OVR
ST3		A	HFD31	G6H	TQ2	RSM850	TSB
SG3				G6D			
S7		JS	HF86F,HF118F	G6RN,G6RL		RSM960	PYII
NF75 12A	507N	VS,FTR-H1	HF115F,HF14FF	G2R-1,G2RL-1	JW1	RM92,RM87	RT1,RZ01
NF75 16A	507HN	VSB,FTR-K1	HF115F,HF14FW	G2R-1-E,G2RL-1-E,G5RL	ALZ	RM83,RM85	RT3,RZ03
NF6	812H						
NF6T	812HT		HF7FD				
NF7	207		HF152F,HF152FD	G5LE-E			
NF8	899		HF3FA,HF3FF,HF3FD	G5LA, G5LB	LS	RM50N	
NF9			HF152F,HF152F-T	G5LE-E			
NF90	832, 832H		HF105F	G8P	JT	R30N,R40N	T9A

Automotive

Ningbo Forward	SONG CHUAN	Fuji/ Taka	Omron	Tyco	NEC TOKIN	Zettler	Hongfa
NF123	102			V23086	ET1	AZ987	HFKC
NF108	895	FBR 51/ 52	G8QN			AZ9471	HFKW, HFKW-SH
NF120	822E	FRL 270, FRL274	G8PE	VKP, V23076,V23133		AZ9701, AZ9711	HFKP
NF135	301		G8V	VJ28		AZ984	HFV9-G
NF117	871		G8HN	VFM, V23074		AZ988	HFV6, HFV6-G
NF104 (H)	896 - 896H		G8JN	VF4, V23134		AZ972,AZ973, AZ974	HFV4, HFV7A
NF105	897		G8JR	VF7, V23134-J		AZ979, AZ980, AZ9801	HFV7
NF125	103	FTR-P3 , FTR-G1	G8N-1 - G8NB-1	V23138	EX1	AZ989-1C	HFKA
NF125..T	103T	FTR-P4	G8NW / G8NB-2	V23138	EX2	AZ989-2C	HFKA-..-2Z
NF115	108		G8HL				

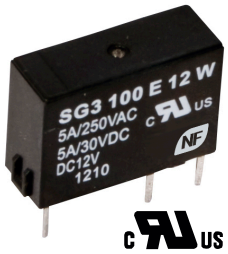
Standard Packaging

Relay series	Pcs / Tube	Box			inner Box		
		Dimensions (LxBxH) cm	Pcs / Box	G.W./Box [kg]	Dimensions (LxBxH) cm	Pcs / Box	G.W./Box [kg]
NF42	25	48x29.3x34.7	4000	20.5	48.5x27.2x15.5	2000	10
ST1	20	32x26.5x13.5	2000	6.5	28.5x10.5x9.5	1000	2.8
ST2	25	63x35x23	4000	27.6	45.5x13.5x10	1000	6.4
ST3	25	48x32x23	4000	10	38x11x6.7	1000	2.35
S7	20	63x32x14.5	2000	19.7	61x15x14	1000	9.6
SG3	20	43.5x21x22	3200	13.1	41.5x9.5x8.5	800	3.15
NF75	10	37.5x20x34	1000	16	35.5x17.8x14	500	7.75
NF7,NF9	25	47.5x29x16	1000	16.2	na		
NF8,NF5,NF6	34	59.5x25x16.56	1700	9.6	na		
NF90	15	49.5x30.5x31	600	22.5	48x29x13.5	300	11
NF108	25	40x25x31	2000	14.2	38.5x23.5x13	1000	6.7
NF108..T	12	40x25x31	960	13.8	38.5x23.5x13	480	6.5
NF117	25	48x32x30	1000	24	45.5x29.5x12.5	500	11.7
NF120-open	50	41.5x27.5x32.5	1000	22.7	25.5x19x14	250	5.5
NF120 -cover	40	31.8x25.5x35.5	800	19	23.5x14.5x15.5	200	4.6
NF123H	25	39x21x24.6	2000	9.8	37x39x10.5	1000	4.5
NF125	40	34.6x19x14	2000	10.8	na		
NF125..T	20	34.6x19x14	1000	10.4	na		
NF125	25	27.1x38.7x23.3	500	11.3	25.7x18.7x19.4	250	5.5

SG3

Features

- 6.5mm slim type miniature PCB Relay
- UL/CUL approved
- Special design for interface application and home appliance
- Comply with RoHS-Directive 2011/65/EU



Type List

Terminal style	Contact form	Designation (provided with)
		Sealed type washable
PCB Terminal	1A (SPNO)	SG3 100 E .. W

Ordering Information

SG3 100 E 24 W

1 2 3 4 5

1. SG3 -- Basic series Designation
2. 100 -- Single pole normally open
3. E -- Contact material AgSnO
4. 24 -- Coil voltage: 5 = 5VDC; 12 = 12VDC; 24 = 24 VDC
5. W -- Sealed washable

Contact Data

Type of contact	Single contact
Configuration	1 NO
Rated load	5A/250VAC; 5A/30VC
Maximum switching current	5A
Maximum switching voltage	30VDC / 250VAC
Maximum switching capacity	150W / 1250VA
Contact resistance	100mΩ (@100mA/6V)
Contact material	AgSnO

Coil rating (DC @+23°C)

Rated voltage (V)	Rated current (mA) ±10%	Resistance (Ω) ±10%	Max. continuous voltage (V)	Pick up voltage (V)	Drop out voltage (V)	Power consumption at rated voltage (mW) (mW)
5	40	125	6.5	3.5	0.5	200
12	16.6	720	15.6	8.4	1.2	
24	8.3	2880	31.2	16.8	2.4	

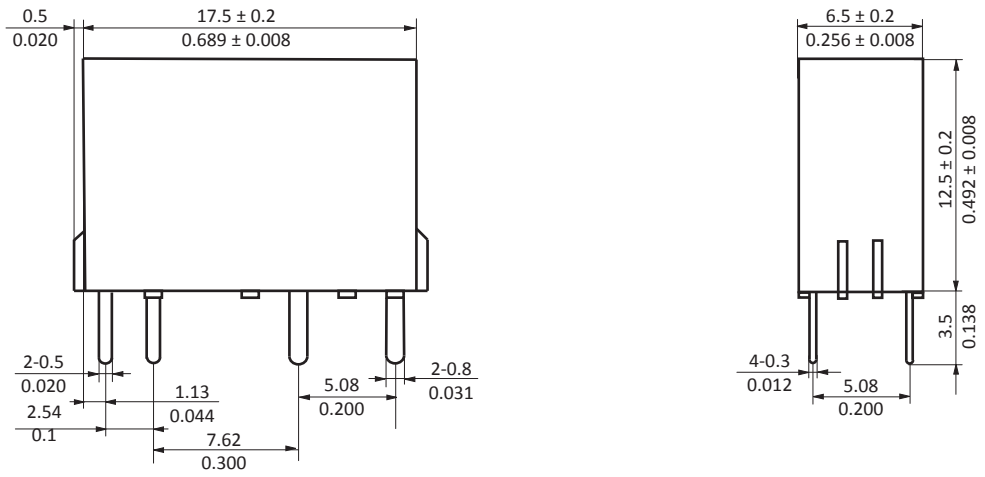
Specification

Mechanical life	20x10^6 cycles	
Electrical life	see curve	
Operate Time	10ms Max.	
Release Time	5ms Max.	
Dielectric strength	Between coil and contacts	3000V, 50/60Hz, 1min
	Between open contacts	750V, 50/60Hz, 1min
Surge voltage withstand	Between coil and contacts	6000V (wave 1.2/50μs)
Vibration resitance (10..55 Hz) double amplitude	Operation extremes	1.5mm
	Damage limits	1.5mm
Shock resistance	Operation extremes - 11ms	10g
	Damage limits - 6ms	100g
Ambient temperature	-25…+70°C	
Approvals	UL/CUL	
Weight	3g	

Safety Approval

Certified	UL / CUL
Ratings	5A/250VAC ; 5A/30VDC

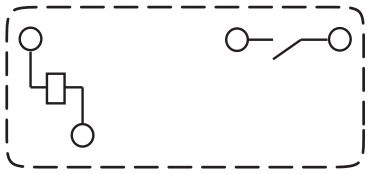
Outline Dimensions



SG3

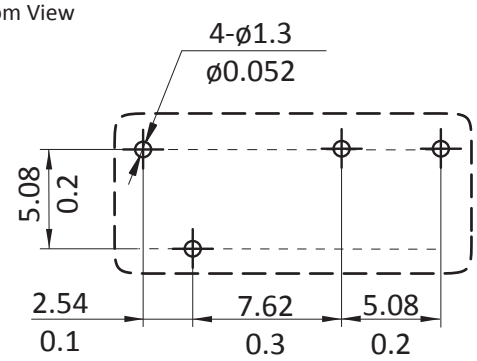
Wiring Diagram

Bottom View



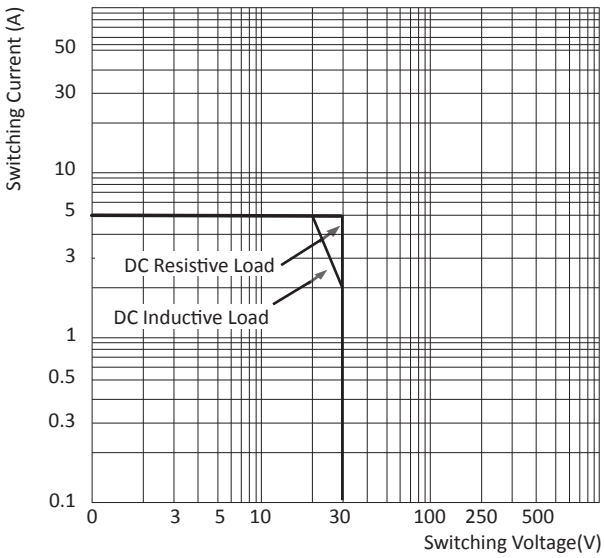
PC Board Layout

Bottom View

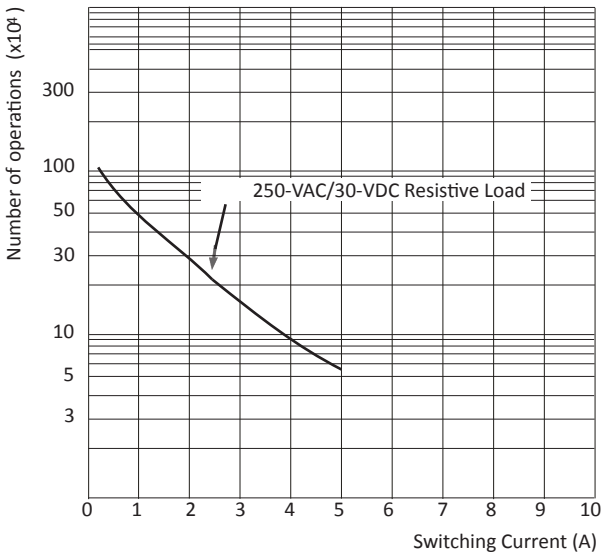


Engineering Data

Maximum Switching Capacity DC-load

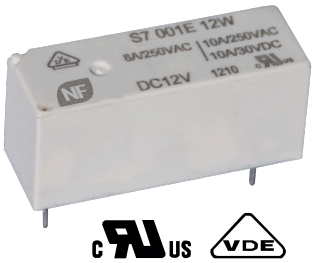


Life Expectancy



Features

- 1 CO or 1NO contact arrangement
- 10A 250VAC
- Pinning 3.2 and 5mm
- UL/CUL, VDE approved
- Special for interface application, heating control, timers
- Comply with RoHS-Directive 2011/65/EU



Type List

Terminal style	Contact form	Designation (provided with)
		Sealed type washable
PCB terminal	1A (SPNO)	S7 100 A..W
		S7 100 E..W
	1C (SPDT)	S7 001 A..W
		S7 001 E..W

Ordering Information

S7	001	E	24	W
1	2	3	4	5

1. S7 -- Basic series Designation
2. 100 -- Single pole normaly open - 5,0mm pinning
   001 -- Single pole double throw - 3,2mm pinning
3. A -- Contact material AgNi
   E -- Contact material AgSnO
4. -- Coil voltage : 5=5V; 6=6V; 9=9V; 12=12V; 18=18V; 24=24V; 48=48V
5. W -- Sealed washable

Contact Data

Type of contact	Single contact
Configuration	1 NO, 1CO
Rated load	10A/250VAC ; 10A/30VDC
Maximum switching current	10A
Maximum switching voltage	300VDC / 440VAC
Maximum switching capacity	300W / 2500VA
Contact resistance	100mΩ
Contact material	AgNi ; AgSnO

Coil rating (DC @+23°C)

Rated voltage (V)	Rated current (mA) ±10%	Coil resistance (Ω) ±10%	Max. continuous voltage	Pick up voltage	Drop out voltage	Power consumption at rated voltage (mW) (mW)
5	44.2	113	See curve below	70 % of rated voltage	10 % of rated voltage	220
6	36.6	164				220
9	25	360				230
12	19.3	620				230
18	13.9	1295				250
24	10.2	2350				250
48	6.0	8000				290

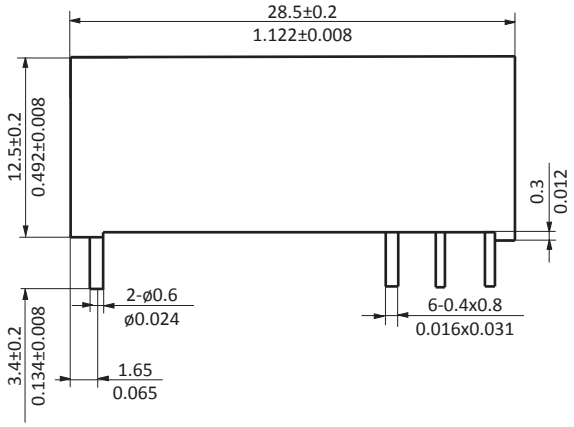
Specification

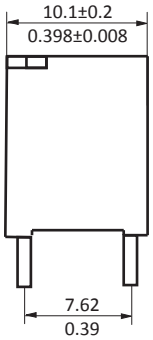
Mechanical life	$10x10^6$ cycles	
Electrical life at rated load	$1x10^5$ cycles	
Operate Time	10ms Max.	
Release Time	5ms Max.	
Dielectric strength	Between coil and contacts	5000V, 50/60Hz, 1min
	Between open contacts	1000V, 50/60Hz, 1min
Clearance / creepage	Between coil and contacts	10 / 10 mm
Vibration resistance (10..55Hz) double amplitude	Operation extremes NO/NC	1.65mm / 0.8mm
Shock resistance	Operation extremes NO/NC	10 / 5 g
	Damage limits	100 g
Operating ambient temperature	-40~+85°C (no freezing)	
Approvals	VDE, UL/CUL	
Weight	8g	

Safety Approval

Certified	UL / CUL	VDE
Ratings	10A / 250VAC ; 10A / 30VDC	1CO: 8A / 250VAC 1NO: 10A / 250 VAC

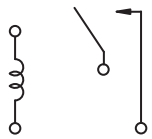
Outline Dimensions



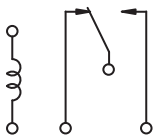


Wiring Diagram

Bottom View



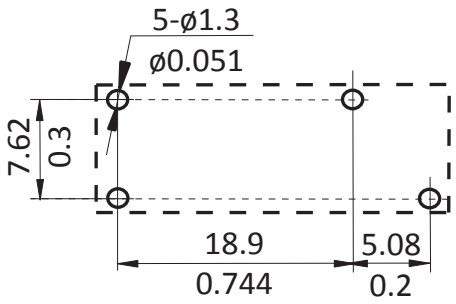
1A



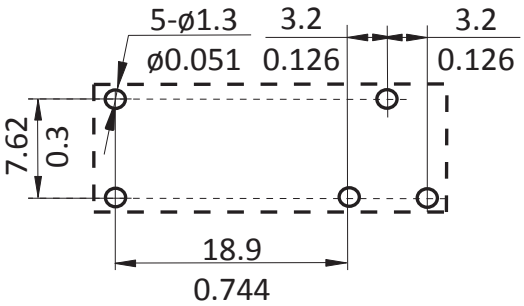
1C

PC Board Layout

Bottom View



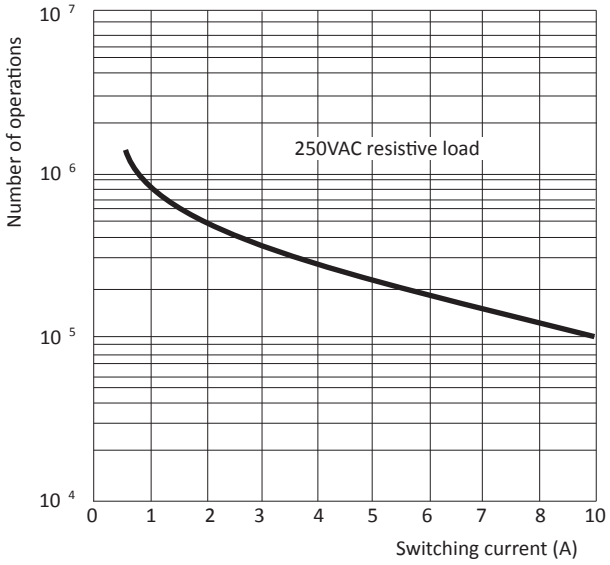
1A



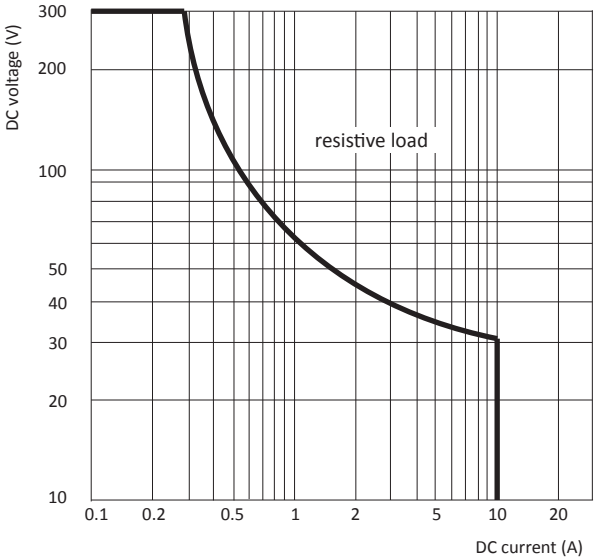
1C

Engineering Data

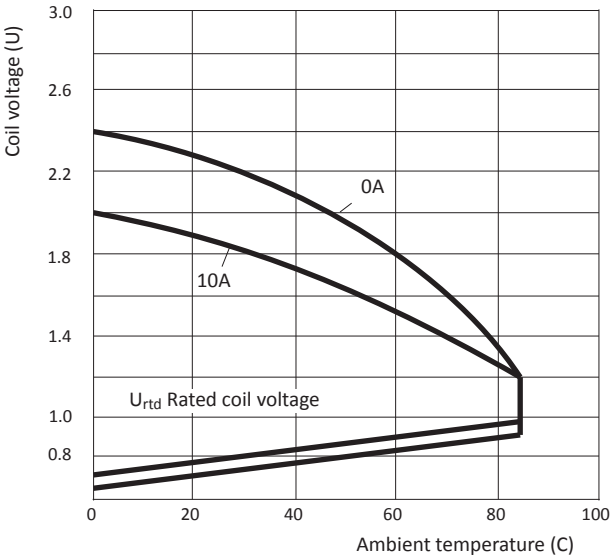
Electrical endurance



Max. DC load breaking capacity



Coil operating range DC



NF75

Features

· high rating PCB power relay
· 1 pole 12 and 16A, 250VAC
· Ag alloy contact material
· 410mW coil power
· maximum ambient temperature +85°C
· UL/CUL and VDE approved
· Comply with RoHS-Directive 2011/65/EU

Type List

Terminal style	Contact form	Rated current	Designation (provided with) Sealed type washable
PCB terminal	1A (SPNO)	12 A	NF75 100 E..S
		16 A	NF75 100 E7..S
	1C (SPDT)	12 A	NF75 001 E..S
		16 A	NF75 001 E7..S

Ordering Information

NF75 001 E7 24 - S XXXX

1 2 3 4 5 6 7 8

1. NF75 -- Basic series Designation
2. 100 -- Single pole normaly open
   001 -- Single pole double throw
3. E -- Contact Material Ag alloy
4. Blank -- 12A Version
   7 -- 16A Version
5. -- Coil Voltage [VDC]: 5, 6, 9, 12, 24, 48
6. Blank -- Coil Power 410mW
7. Blank -- Flux tight
   S -- Sealed washable
8. Blank -- Standard Type
   XXXX -- Letters and/or numbers for special customer design

Contact Data

Type of contact	Single contact
Configuration	1 NO, 1CO
Maximum switching current	12A, 16A
Maximum switching voltage	250 VAC
Contact material	Ag alloy

NF75

Coil rating (DC @+23°C) - 410mW Version

U_N (VDC)	R (Ohm)	U_{PI} (VDC)	U_{DO} (VDC)	I_N (mA)
5	61 ± 10%	3.5	0.5	82
6	688 ± 10%	4.2	0.6	68
9	198 ± 10%	6.3	0.9	46
12	351 ± 10%	8.4	1.2	34
24	1405 ± 10%	16.8	2.4	17
48	5620 ± 10%	33.6	4.8	8.5

Specification

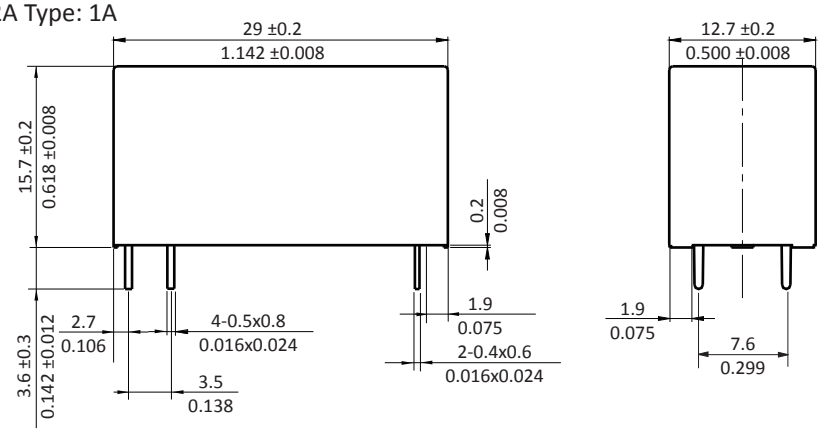
Mechanical life	$10x10^6$ cycles	
Electrical life at rated load	$1x10^5$ cycles (at 12/16A, 250VAC, +85°C)	
Max. Switching rate at rated load	360 Operations/h	
Operate Time / Release time	15 / 8 ms Max.	
Dielectric strength	Between coil and contacts	5000V, 50/60Hz, 1min
	Between open contacts	1000V, 50/60Hz, 1min
Ambient temperature	-40 .. + 85 °C	
Vibration resistance (10..55Hz)	1.5 mm	
Shock resistance 11 ms	10 g	
Approvals	VDE, UL	
Insulation materials for domestic appliances - according IEC60335-1 **-PENDING-**		

Safety Approval

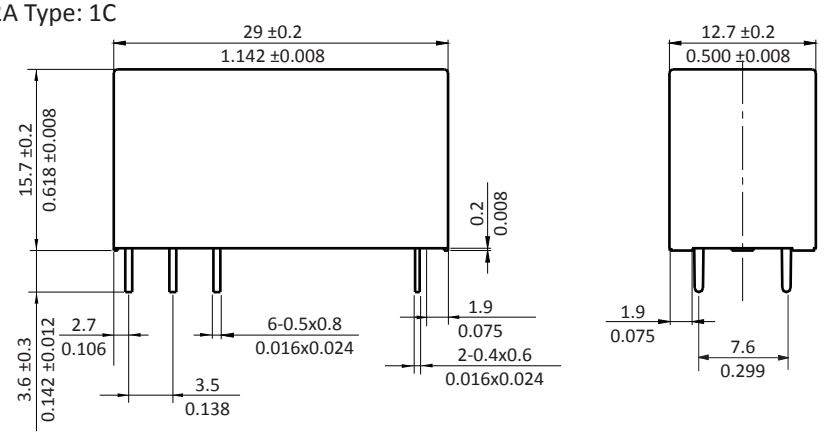
Certified	UL / CUL	VDE
Ratings	12A, 250VAC; 16A, 250VAC 12A 30VDC	12A 250VAC; 16A 250 VAC

Outline Dimensions

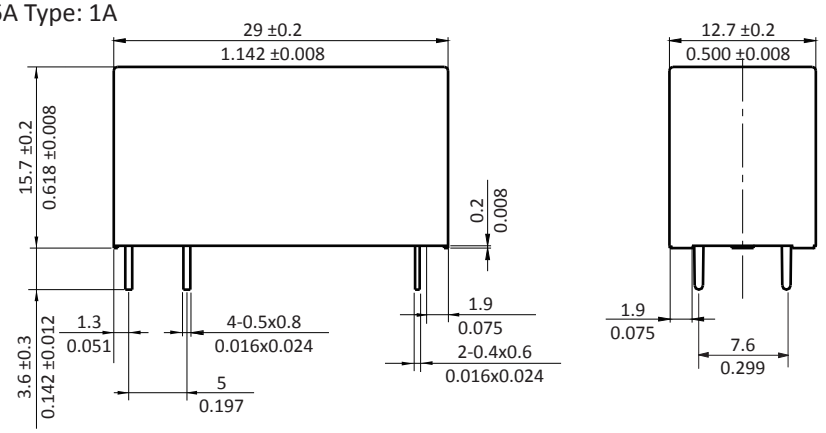
12A Type: 1A



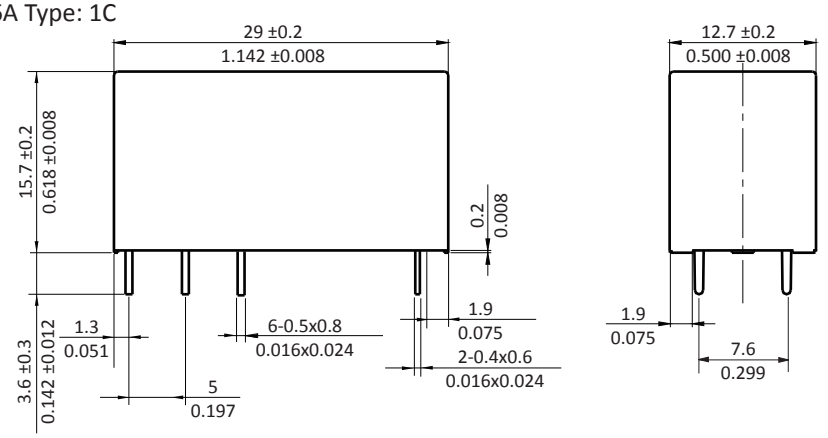
12A Type: 1C



16A Type: 1A



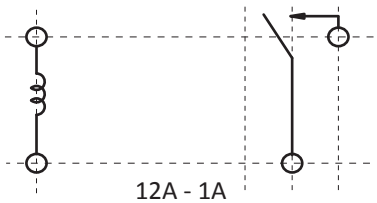
16A Type: 1C

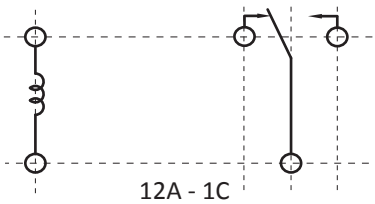


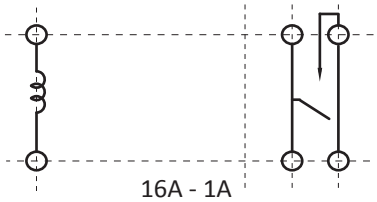
NF75

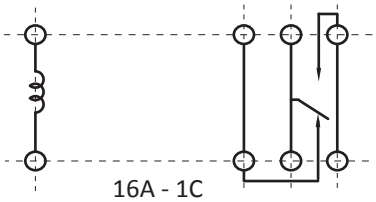
Wiring Diagram

Bottom View





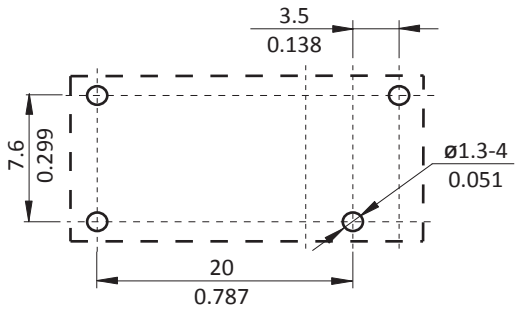




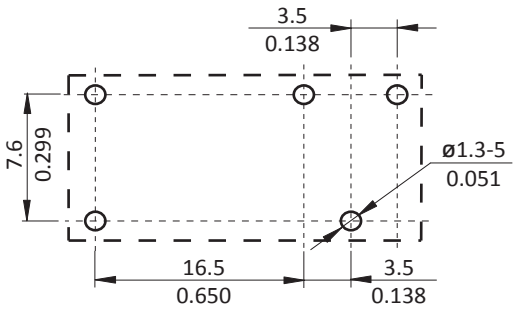
PC Board Layout

Bottom View

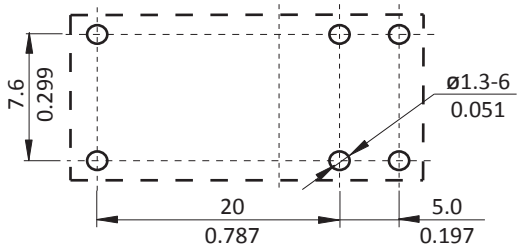
12A - 1A



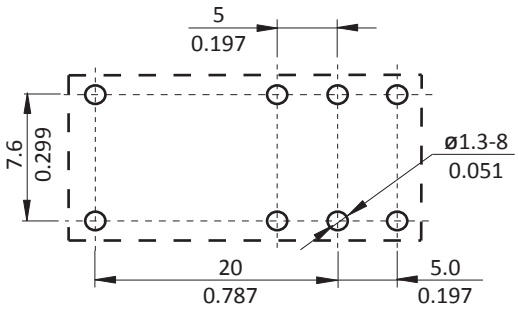
12A - 1C



16A - 1A



16A - 1C



NF7

Features

- 16A power sugar cube relay
- For high rating and high temperature applications
- Double NO terminal available
- Cd free contact material
- Maximum ambient temperature +105°C
- Approved by UL/CUL, VDE and CQC
- Comply with IEC 60335-1
- Comply with RoHS-Directive 2011/65/EU

Type List

Terminal style	Contact form	Pinning	Designation (provided with)	
			Flux tight	Sealed type washable
PCB terminal	1A (SPNO)	Standard Pinning	NF7 100 E..	NF7 100 E..S
		double NO Terminal	NF7 100 E7..	NF7 100 E7..S
	1C (SPDT)	Standard Pinning	NF7 001 E..	NF7 001 E..S
		double NO Terminal	NF7 001 E7..	NF7 001 E7..S

Ordering Information

NF7	001	E	7	24	S	-	XXXX
1	2	3	4	5	6	7	8

1. NF7 -- Basic series Designation
2. 100 -- Single pole normaly open
   001 -- Single pole double throw
3. E -- Contact Material Ag alloy
4. Blank -- Standard
   7 -- double NO Terminal
5. -- Coil Voltage [VDC]: 3, 5, 6, 9, 12, 24, 48
6. Blank -- Flux tight
   S -- Sealed washable
7. Blank -- Standard
8. Blank -- Standard Type
   XXXX -- Letters and/or numbers for special customer design

Contact Data

Type of contact	Single contact
Configuration	1 NO, 1CO
Maximum switching current	16A
Maximum switching voltage	250 VAC
Contact material	Ag alloy

Coil rating (DC @+23°C) - 360mW Version

U_N (VDC)	R (Ohm)	U_{PI} (VDC)	U_{DO} (VDC)	I_N (mA)
3	25 ± 10%	≤ 2.1	≥ 0.3	120
5	69 ± 10%	≤ 3.5	≥ 0.5	73
6	100 ± 10%	≤ 4.2	≥ 0.6	60
9	225 ± 10%	≤ 6.3	≥ 0.9	40
12	400 ± 10%	≤ 8.4	≥ 1.2	30
24	1600 ± 10%	≤ 16.8	≥ 2.4	15
48	6400 ± 10%	≤ 33.6	≥ 4.8	7.5

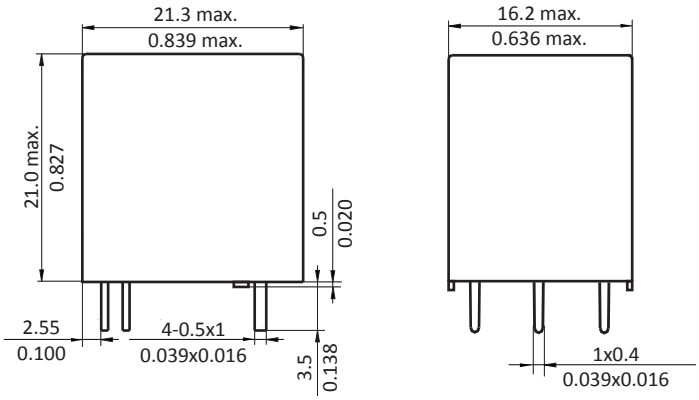
Specification

Mechanical life	$10x10^6$ cycles	
Electrical life at rated load	see curve	
Max. Switching rate at rated load	360 Operations/h	
Operate Time / Release time	15 / 5 ms Max.	
Clearance / creepage distances	3/4 mm	
Dielectric strength	Between coil and contacts	2500V, 50/60Hz, 1min
	Between open contacts	1000V, 50/60Hz, 1min
Ambient temperature	-40 .. + 105 °C	
Vibration resistance (10..55Hz)	1.5 mm	
Shock resistance 11 ms	10 g	
Approvals	UL/CUL, VDE	
Insulation materials for domestic appliances - according IEC60335-1.		

Safety Approval

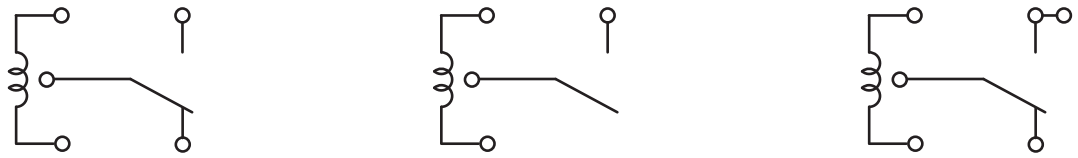
Certified	Ratings
UL/CUL	16A, 277VAC; 20A,125VAC
	NO: 1HP (16FLA) 125VAC, (8FLA) 250VAC; NC: 1/2HP (9.8FLA) 125VAC, (4.9FLA) 250VAC
VDE NF7 Standard	16A, 250VAC, + 105°C, NO contact
	10A, 250VAC, + 105°C, NO contact
	7A, 400VAC, + 105°C, NO contact
CQC - NF7 Standard	10A, 250VAC, +85°C

Outline Dimensions



Wiring Diagram

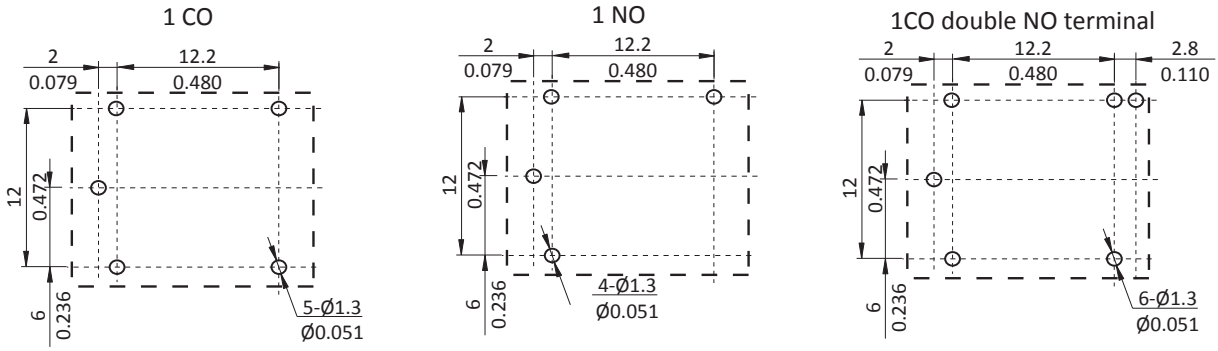
Bottom View



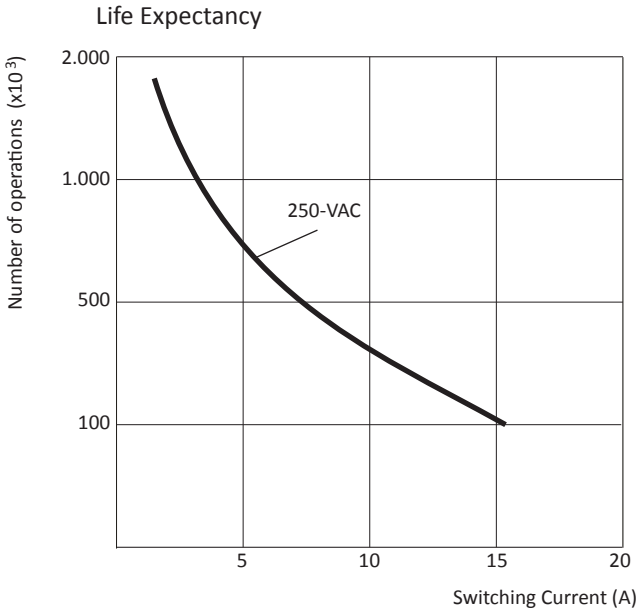
1CO　　1NO　　1CO double NO terminal

PC Board Layout

Bottom View



Engineering Data



Features

- 16A power sugar cube relay
- For high rating applications
- Double NO terminal available
- Cd free contact material
- Maximum ambient temperature +85°C
- Approved by UL/CUL, VDE and CQC
- Comply with IEC 60335-1
- Comply with RoHS-Directive 2011/65/EU

Type List

Terminal style	Contact form	Designation (provided with)	
		Flux tight	Sealed type washable
PCB terminal	1A (SPNO)	NF9 100 E..	NF9 100 E..S
	1C (SPDT)	NF9 001 E..	NF9 001 E..S

Ordering Information

NF9	100	E	24	S	-	XXXX	
1	2	3	4	5	6	7	8

1. NF7 -- Basic series Designation
2. 100 -- Single pole normaly open
   001 -- Single pole double throw
3. E -- Contact Material Ag alloy
4. -- Coil Voltage [VDC]: 3, 5, 6, 9, 12, 24, 48
5. Blank -- Flux tight
   S -- Sealed washable
6. Blank -- Standard
7. Blank -- Standard Type
   XXXX -- Letters and/or numbers for special customer design

Contact Data

Type of contact	Single contact
Configuration	1 NO, 1CO
Maximum switching current	16A
Maximum switching voltage	250 VAC
Contact resistance	<100 mΩ
Contact material	Ag alloy

NF9

Coil rating (DC @+23°C) - 360mW Version

U_N (VDC)	R (Ohm)	$U_{pull-in}$ (VDC)	$U_{drop-out}$ (VDC)	I_N (mA)
3	25 ± 10%	≤ 2.1	≥ 0.3	120
5	69 ± 10%	≤ 3.5	≥ 0.5	73
6	100 ± 10%	≤ 4.2	≥ 0.6	60
9	225 ± 10%	≤ 6.3	≥ 0.9	40
12	400 ± 10%	≤ 8.4	≥ 1.2	30
24	1600 ± 10%	≤ 16.8	≥ 2.4	15
48	6400 ± 10%	≤ 33.6	≥ 4.8	7.5

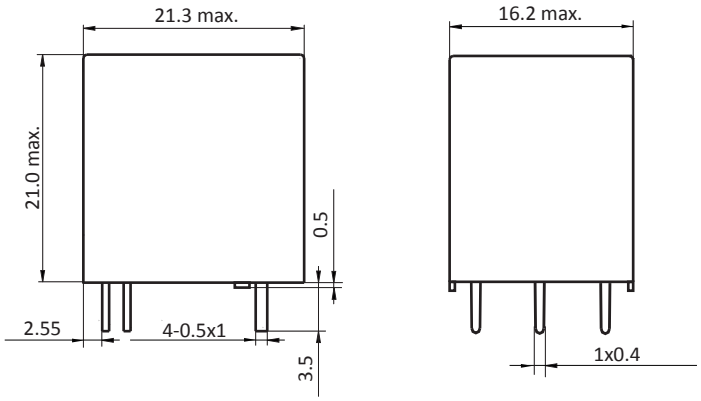
Specification

Mechanical life	10^7 cycles	
Electrical life at rated load	10^5 cycles	
Max. Switching rate at rated load	360 Operations/h	
Operate Time / Release time	15 / 5 ms Max.	
Clearance / creepage distances	3/4 mm	
Dielectric strength	Between coil and contacts	2500V, 50/60Hz, 1min
	Between open contacts	1000V, 50/60Hz, 1min
Ambient temperature	-40 .. + 105 °C	
Vibration resistance (10..55Hz)	1.5 mm	
Shock resistance 11 ms	10 g	
Approvals preliminary	UL/CUL, VDE	
Insulation materials for domestic appliances - according IEC60335-1.		

Safety Approval

VDE (pending)	UL/CUL (pending)
16A, 250VAC, +85°C, NO contact	16A, 250VAC, +85°C, NO contact

Outline Dimensions (in mm)

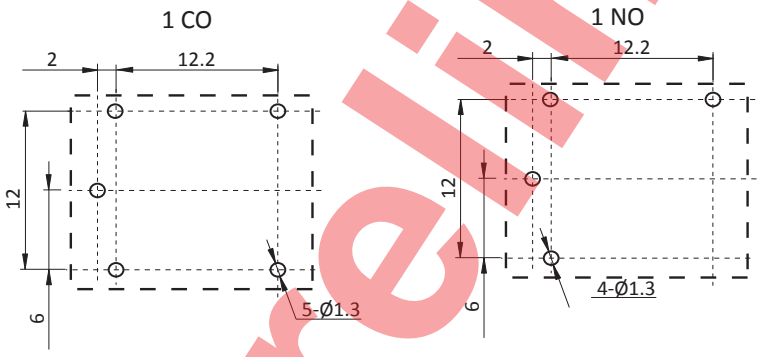


Wiring Diagram

Bottom View

PC Board Layout

Bottom View



View on solder pins.
Dimensions in mm.

NF6

Features

- · 12A sugar cube relay
- · For high rating and high temperature applications
- · Double NO terminal available
- · Cd free contact material
- · Maximum ambient temperature +105°C
- · Approved by UL/CUL, VDE and CQC
- · Comply with IEC 60335-1
- · Comply with RoHS-Directive 2011/65/EU

Ordering Information

NF6T	100	E	-	5	-	xxxx
1	2	3	4	5	6	7

1. NF6 -- standard version
   NF6T -- high temperature version
2. 100 -- 1 NO contact
   001 -- 1 CO contact
3. E -- Ag alloy
4. Blank -- Standard NO terminal
5. 5 -- 5, 6, 9, 12, 18, 24, 48 VDC
6. Blank -- Flux tight
   S -- Sealed washable
7. XXXX -- Letters and/or numbers for special customer design

Contact Data

Type of contact	Single Contact
Configuration	1NO / 1CO
Contact rating	12A / 250VAC
Max. switching power	3000W
Max. switching voltage	250 VAC
Contact Resistance	≤100mΩ
Contact material	Ag alloy

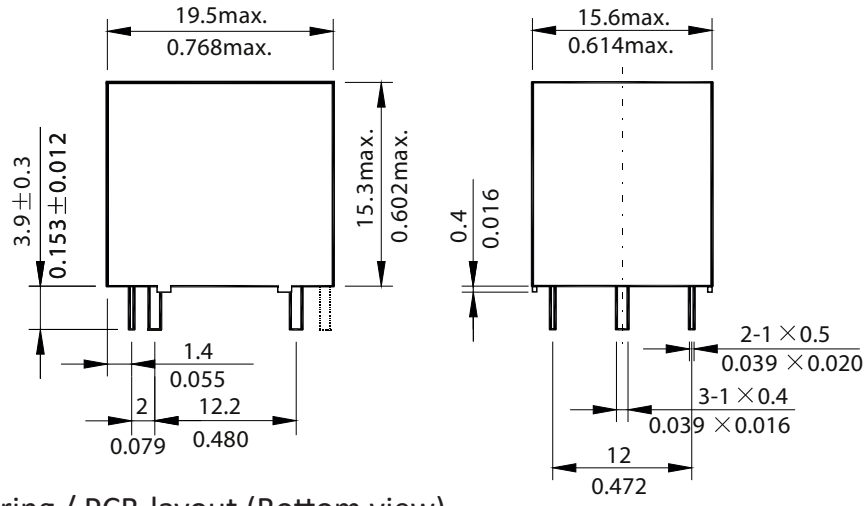
Coil rating (@+23°C)

U_N(VDC)	R (Ω) ± 10%	Pull-in Voltage U_{PI}(VDC)	Drop-out voltage U_{DO}(VDC)	Coil power P_{coil} (W)
5	69	≤ 3.5	≥ 0.5	360mW
6	100	≤ 4.2	≥ 0.6	
9	225	≤ 6.3	≥ 0.9	
12	400	≤ 8.4	≥ 1.2	
18	900	≤ 12.6	≥ 1.8	
24	1600	≤ 16.8	≥ 2.4	
48	6400	≤ 33.6	≥ 4.8	

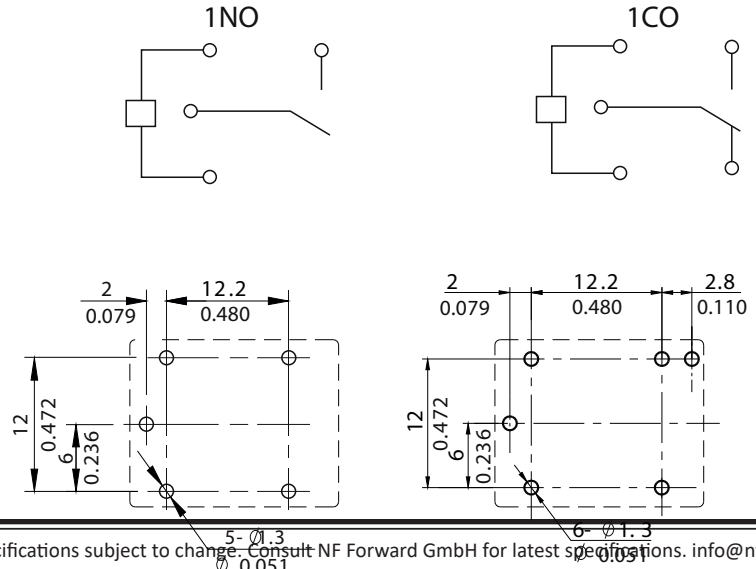
Specification

Mechanical life (frequency18000 oper. / h)		10^7 Oper.	
Electrical life (frequency360 oper. / h)	NF6	10A / 100 x 10^3	13A / 60 x 10^3
	NF6T	10A / 100 x 10^3	10A / 30 x 10^3
Operating time / Release time		≤10ms / ≤5ms	
Insulation Resistance		250M Ω (at 500VDC)	
Dielectric strength contacts/ coil		1500 VACrms	
Dielectric strength open contacts		750 VACrms	
Ambient temperature (nofreezing)		-40°C...+105°C	
Vibration resistance		10 ~ 55Hz; double amplitude 1.5mm	
Shock resistance		10G / 11ms	
Dimensions		19.5 x 15.6 x 15.3 mm	
Weight		approx. 9,5g	

Dimension (in mm)



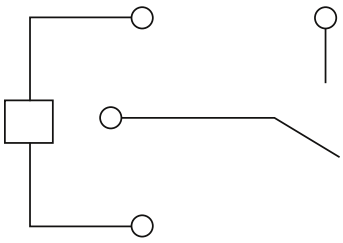
Wiring / PCB-layout (Bottom view)



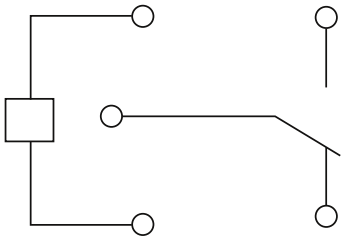
NF6

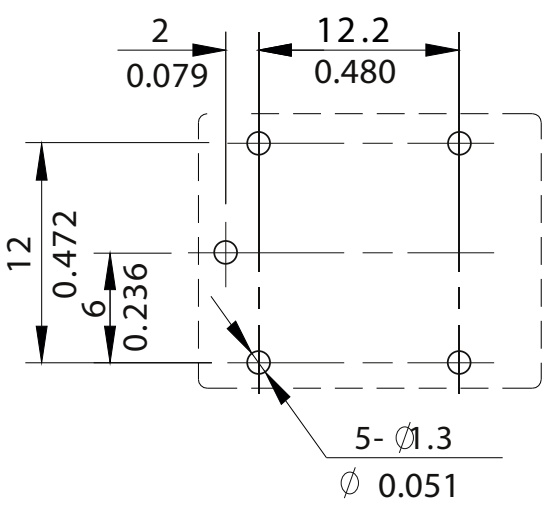
Wiring / PCB-layout (Bottom view)

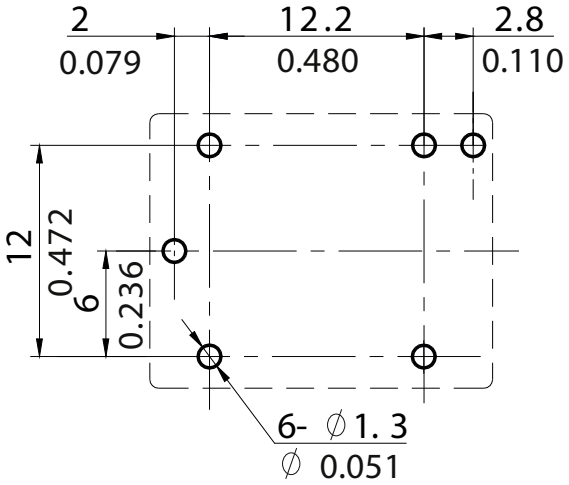
1NO



1CO







NF8

Features

- 10A sugar cube relay
- Double NO terminal available
- Cd free contact material
- Maximum ambient temperature +105°C
- Approved by UL/CUL, VDE and CQC
- Comply with IEC 60335-1
- Comply with RoHS-Directive 2011/65/EU

Type List

Terminal style	Contact form	Contact Material	Version	Designation (provided with)	
				Flux tight	Sealed type washable
PCB terminal	1A (SPNO)	AgSnO	Standard	NF8 100 E..	NF8 100 E..S
			12A	NF8 100 E7..	NF8 100 E7..S
	1C (SPDT)	AgSnO	Standard	NF8 001 E..	NF8 001 E..S
			12A	NF8 001 E7..	NF8 001 E7..S

Ordering Information

NF8	001	E	7	24	-	XXXX
1	2	3	4	5	6	7

1. NF8 -- Basic series Designation
2. 100 -- Single pole normaly open
   001 -- Single pole double throw
3. E -- Contact Material Ag alloy
4. Blank -- Standard Version 10A
   7 -- 12A Version, double NO Terminal
5. Blank -- Coil Voltage [VDC]: 6, 9, 12, 24, 48
6. Blank -- Flux tight
   S -- Sealed washable
7. Blank -- Standard
   xxxx -- letters and/or numbers for special customer design

Contact Data

Type of contact	Single contact
Configuration	1 NO, 1CO
Maximum switching current	10A,12A (refer to Ordering Information 4.)
Maximum switching voltage	250 VAC
Contact material	Ag alloy

NF8

Coil rating (DC @+23°C) - 360mW Version

U_N (VDC)	R (Ohm)	U_{PI} (VDC)	U_{DO} (VDC)	I_N (mA)
5	70 ± 10%	≤ 3.75	≥ 0.5	71
6	100 ± 10%	≤ 4.5	≥ 0.6	60
9	225 ± 10%	≤ 6.75	≥ 0.9	40
12	400 ± 10%	≤ 9	≥ 1.2	30
24	1600 ± 10%	≤ 18	≥ 2.4	15
48	6400 ± 10%	≤ 36	≥ 4.8	7.5

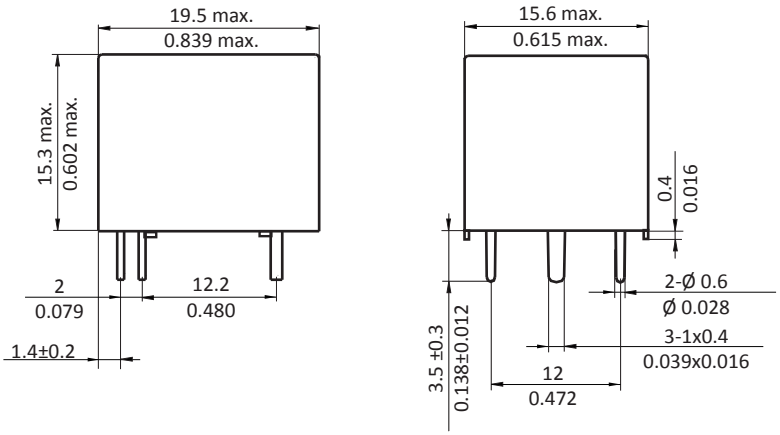
Specification

Mechanical life	$10x10^6$ cycles		
Electrical life at rated load	10A Version	10A, 250VAC +85°C	$50x10^3$
		6A, 250VAC +105°C	$100x10^3$
	12A Version	12A, 250VAC +85°C	$50x10^3$
		12A, 250VAC +70°C	$100x10^3$
Max. Switching rate at rated load	360 Operations/h		
Operate Time / Release time	10 / 5 ms Max.		
Clearance / creepage distances	1.5 / 1.8 mm		
Dielectric strength	Between coil and contacts	1500V, 50/60Hz, 1min	
	Between open contacts	750V, 50/60Hz, 1min	
Ambient temperature	10A Version: -40 .. +105 °C; 12A Version: -40 .. + 85 °C ;		
Vibration resistance (10..55Hz)	1.5 mm		
Shock resistance 11 ms	10 g		
Approvals	VDE, UL/CUL		
Insulation materials for domestic appliances - according IEC60335-1.			

Safety Approval

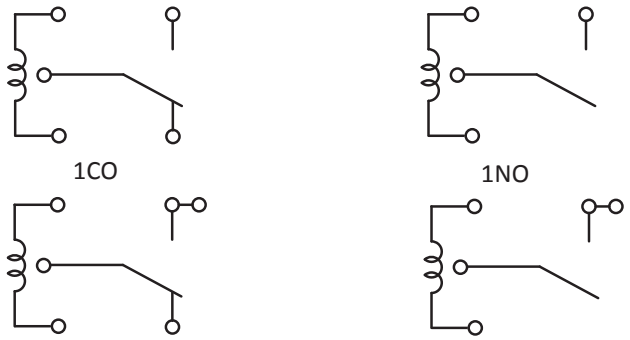
Certified	Ratings
UL/CUL	10A, 250VAC
	12A, 125VAC, +85°C, NO
	15A, 125VAC
VDE	10A, 250VAC, +85°C, NO contact
	6A, 250VAC, +105°C, NO contact
	6A, 400VAC, +85°C, NO contact
	12A, 250VAC, +85°C, NO contact
	12A, 250VAC, +70°C, NO contact
CQC	7A, 150VAC

Outline Dimensions



Wiring Diagram

Bottom View

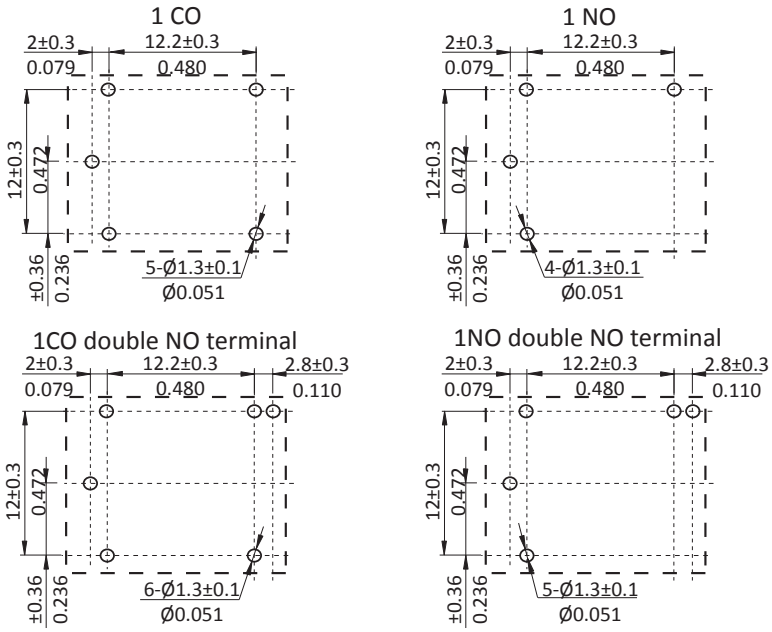


1CO double NO terminal

1NO double NO terminal

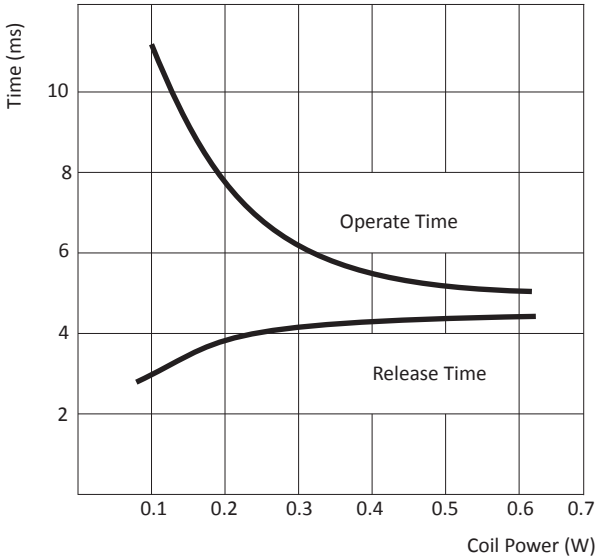
PC Board Layout

Bottom View

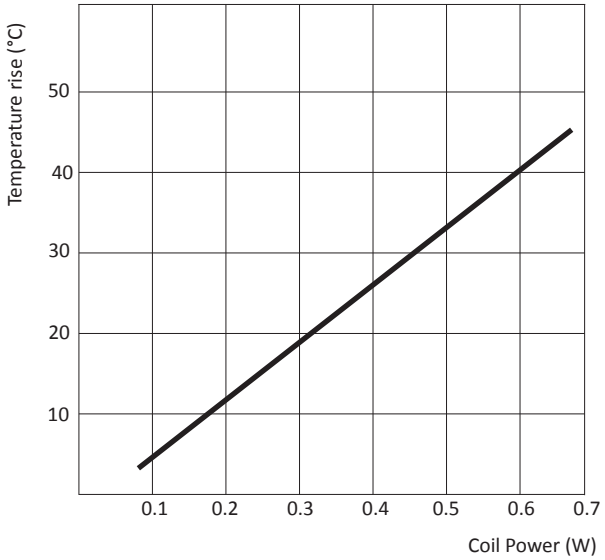


Engineering Data

Operation Time



Coil Temp. Rise



Features

- · 5A sugar cube relay
- · Cd free contact material
- · Maximum ambient temperature +85°C
- · Approved by UL/CUL, VDE and CQC
- · Comply with IEC 60335-1
- · Comply with RoHS-Directive 2011/65/EU

Type List

Terminal style	Contact form	Designation (provided with)	
		Flux tight	Sealed type washable
PCB terminal	1A (SPNO)	NF5 100 D..	NF5 100 D..S
	1C (SPDT)	NF5 001 D..	NF5 001 D..S

Ordering Information

NF5 001 E 24 - XXXX

1 2 3 4 5 6

1. NF5 -- Basic series Designation
2. 100 -- Single pole normaly open
   001 -- Single pole double throw
3. D -- Contact Material Ag alloy
4. Blank -- Coil Voltage [VDC]: 6, 9, 12, 24, 48
5. Blank -- Flux tight
   S -- Sealed washable
6. Blank -- Standard
   xxxx -- letters and/or numbers for special customer design

Contact Data

Type of contact	Single contact
Configuration	1 NO, 1CO
Maximum switching current	5A
Maximum switching voltage	250 VAC
Contact material	Ag alloy

Coil rating (DC @+23°C) - 360mW Version

U_N (VDC)	R (Ohm)	U_{PI} (VDC)	U_{DO} (VDC)	I_N (mA)
5	70 ± 10%	≤ 3.75	≥ 0.5	71
6	100 ± 10%	≤ 4.5	≥ 0.6	60
9	225 ± 10%	≤ 6.75	≥ 0.9	40
12	400 ± 10%	≤ 9	≥ 1.2	30
24	1600 ± 10%	≤ 18	≥ 2.4	15
48	6400 ± 10%	≤ 36	≥ 4.8	7.5

NF5

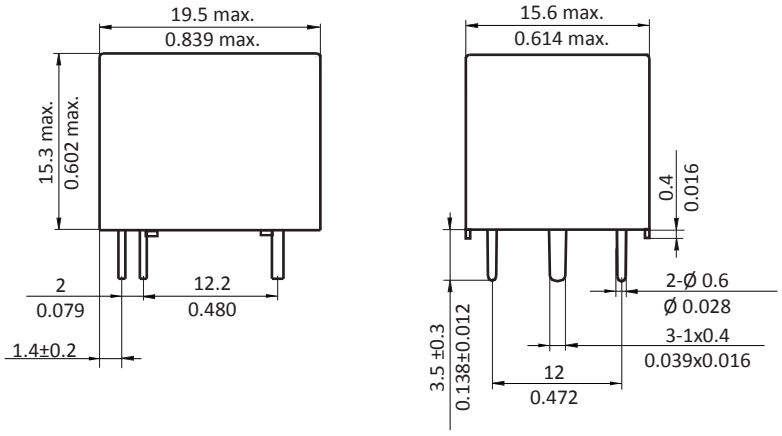
Specification

Mechanical life	$10x10^6$ cycles	
Electrical life at rated load	5A, 250VAC +85°C	$50x10^3$
	3A, 250VAC +85°C	$100x10^3$
Max. Switching rate at rated load	360 Operations/h	
Operate Time / Release time	10 / 5 ms Max.	
Clearance / creepage distances	1.5 / 1.8 mm	
Dielectric strength	Between coil and contacts	1500V, 50/60Hz, 1min
	Between open contacts	750V, 50/60Hz, 1min
Ambient temperature	-40 .. + 85 °C	
Vibration resistance (10..55Hz)	1.5 mm	
Shock resistance 11 ms	10 g	
Approvals	UL/CUL, VDE	
Insulation materials for domestic appliances - according IEC60335-1.		

Safety Approval

Certified	Ratings
UL/CUL	10A, 125VAC
VDE	5A, 250VAC, +85°C, NO contact

Outline Dimensions



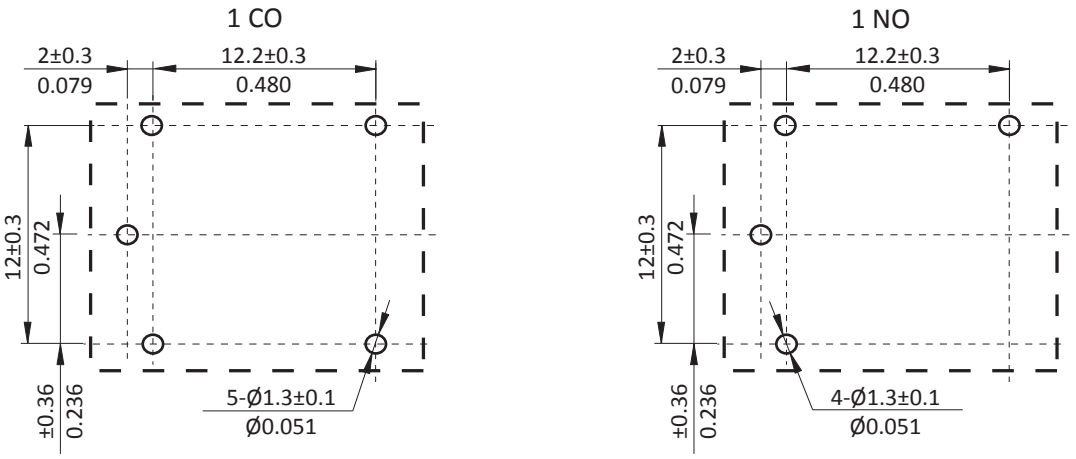
Wiring Diagram

Bottom View

1CO 1NO

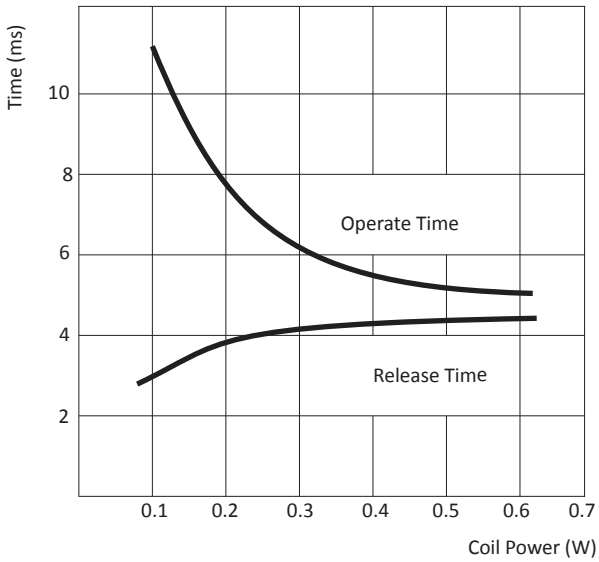
PC Board Layout

Bottom View

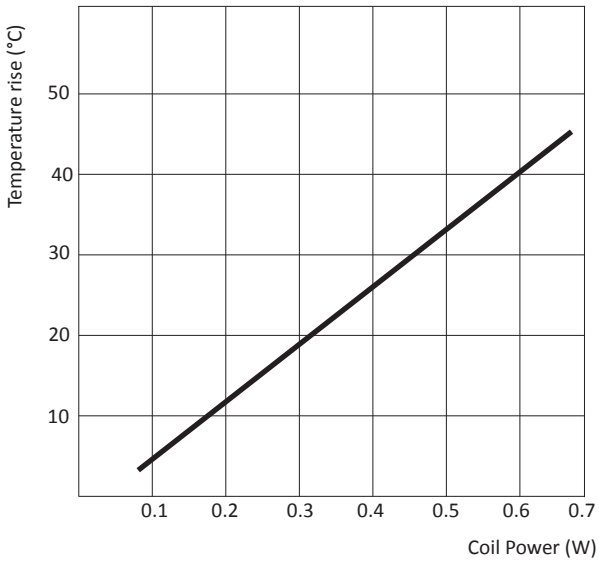


Engineering Data

Operation Time



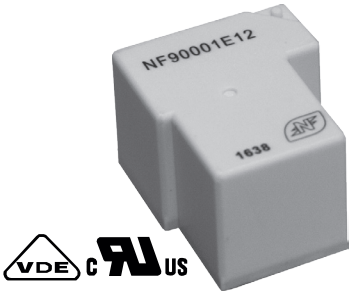
Coil Temp. Rise



NF90

Features

- 30A power relay
- Cd free contact material
- Maximum ambient temperature +100°C
- Approved by UL/CUL, VDE (Pending)
- Comply with RoHS-Directive 2011/65/EU



Type List

Relay Version	Contact form	Designation (provided with)	
		Flux tight	Sealed type washable
Standard Version	1A (SPNO)	NF90 100 E..	NF90 100 E..S
	1C (SPDT)	NF90 001 E..	NF90 001 E.S
High power Version	1A (SPNO)	NF90H 100 E..	NF90H 100 E..S
	1C (SPDT)	NF90H 001 E..	NF90H 001 E..S

Ordering Information

NF90 100 E - 24 - - XXXX

1 2 3 4 5 6 7 8

1. NF90 -- Standard Version
   NF90H -- High power Version
2. 100 -- Single pole normaly open
   001 -- Single pole double throw
3. E -- Contact Material Ag alloy
4. Blank -- Without pin6
   7 -- With pin 6
5. 5 -- Coil Voltage [VDC]: 5, 6, 9, 12, 24, 48
6. Blank -- Flux tight
   S -- Sealed washable
7. Blank -- 2500VAC (Dielectrical Strength
   B -- 4000VAC Contact/Coil)
6. Blank -- Standard
   xxxx -- letters and/or numbers for special customer design

Contact Data

Type of contact	Single contact
Configuration	1 NO, 1CO
Maximum switching current	30A / 40A
Maximum switching voltage	250 VAC
Contact material	Ag alloy

Coil rating (DC @+23°C) - 360mW Version

U_N (VDC)	R (Ohm)	$U_{Pull-in}$ (VDC)	$U_{drop-out}$ (VDC)	I_N (mA)
5	26 ± 10%	75% or less of Nominal Voltage (initial)	10% or less of Nominal Voltage (initial)	180
6	40 ± 10%			150
9	90 ± 10%			100
12	160 ± 10%			75
24	640 ± 10%			38
48	2560 ± 10%			19

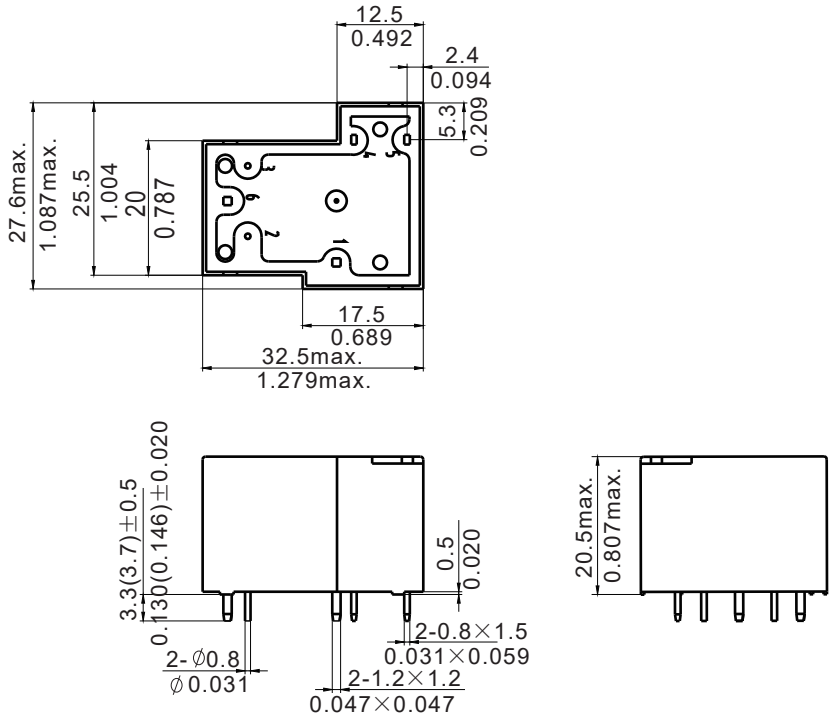
Specification

Mechanical life	10^7 cycles	
Electrical life at rated load		
Operate Time / Release time	15 / 10 ms Max.	
Dielectric strength	Between coil and contacts	
	Between open contacts	2500V / 4000V , 50/60Hz, 1min
Ambient temperature	-40 .. + 105 °C	1500V, 50/60Hz, 1min
Vibration resistance (10..55Hz)	1.5 mm	
Shock resistance 11 ms	200 g	
Approvals	UL/CUL , VDE	

Safety Approval

Certified	Ratings
UL	Pending
VDE	Pending

Outline Dimensions



Wiring Diagram

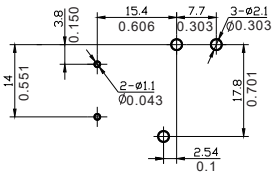
Bottom View

1CO 1NO

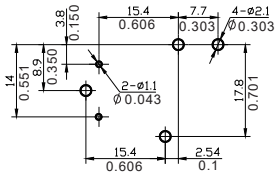
NF90

PC Board Layout

Bottom View



Without pin 6

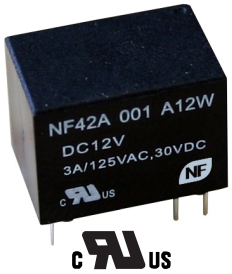


With pin 6

NF42

Features

- Small sizes 15.5 x 11 x 11.5mm
- High sensitivity 200mW
- Available with the two different terminal layouts
- UL/CUL approved
- Special design for alarm, security system, office equipement, medical equipment
- Comply with RoHS-Directive 2011/65/EU



Type List

Terminal style	Contact form	Terminal Layout	Designation (provided with)	
			Flux tight type	Sealed type washable
PCB Terminal	1C (SPDT)	Standard	NF42 001 A ..	NF42 001 A .. W
		Different	NF42A 001 A ..	NF42A 001 A .. W

Ordering Information

NF42 001 A 24 W

1 2 3 4 5

1. NF42 -- Standard type
   NF42A -- with different terminal Layout
2. 001 -- Single pole double throw - 1CO
3. A -- Ag + Au coated
4. -- Coil voltage: 5=5V; 6=6V; 9=9V; 12=12V; 18=18V; 24=24V
5. Blank -- Flux tight
   W -- Sealed washable

Contact Data

Type of contact	Single contact
Configuration	1CO
Rated load	3A/30VDC; 3A/125VAC
Maximum switching current	3A
Maximum switching voltage	60VDC / 220VAC
Maximum switching capacity	90W / 375VA
Contact resistance	50mΩ
Contact material	Ag Au coated

Coil rating (DC @+23°C)

Rated voltage (V)	Rated current (mA) ±10%	Coil resistance (Ω) ±10%	Max. continuous voltage (V)	Pick up voltage	Drop out voltage	Power consumption at rated voltage (mW) (mW)
5	40	125	100 % of rated voltage	75 % of rated voltage	10 % of rated voltage	200
6	33.3	180				
9	22.2	405				
12	16.6	720				
18	11.1	1620				
24	8.3	2880				

Specification

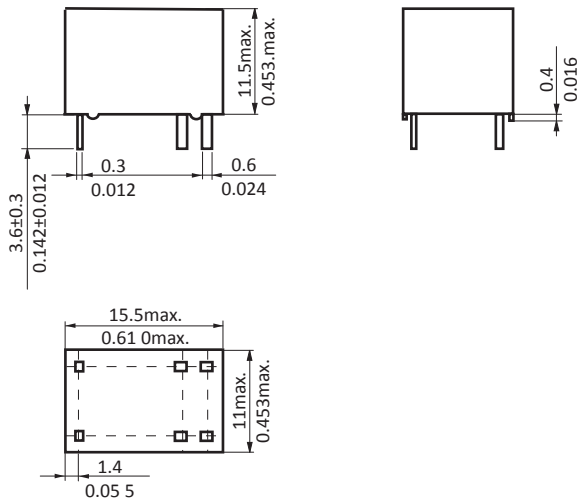
Mechanical life	$10x10^6$cycles	
Electrical life at rated load	$1x10^5$cycles	
Operate Time	5ms Max.	
Release Time	5ms Max.	
Dielectric strength	Between coil and contacts	500V, 50/60Hz, 1min
	Between open contacts	500V, 50/60Hz, 1min
Vibration resistance (10..55Hz) double amplitude	Operation extremes	1.5mm
Shock resistance	Operation extremes - 11ms	10g
Operating ambient temperature	-25~+70°C	
Approvals	UL/CUL	
Weight	3.5g	

Safety Approval

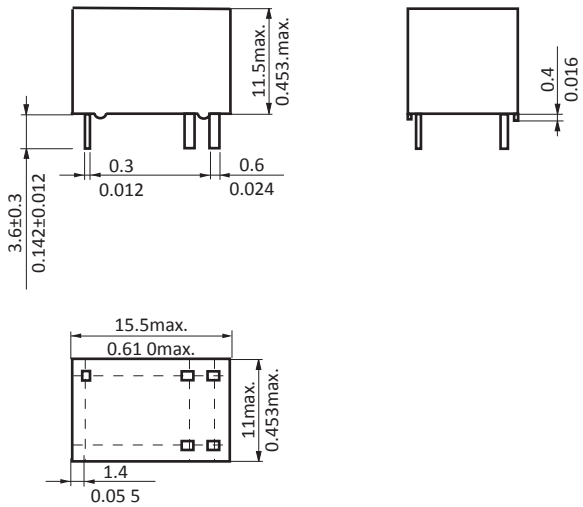
Certified	UL / CUL
Ratings	3A/125VAC; 3A/30VDC

Outline Dimensions

NF42



NF42A

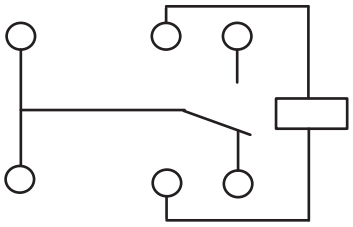


NF42

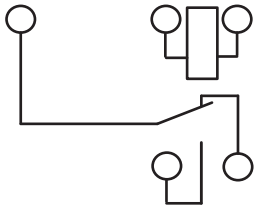
Wiring Diagram

BOTTOM VIEW

NF42

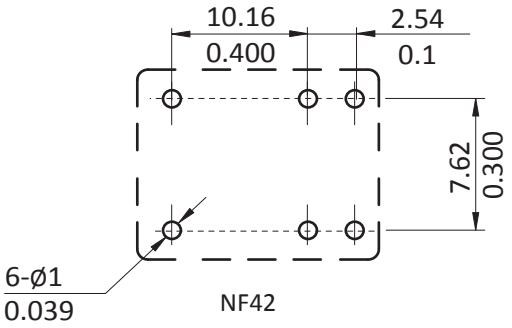


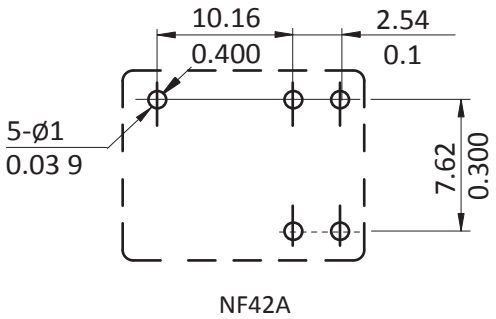
NF42A



PC Board Layout

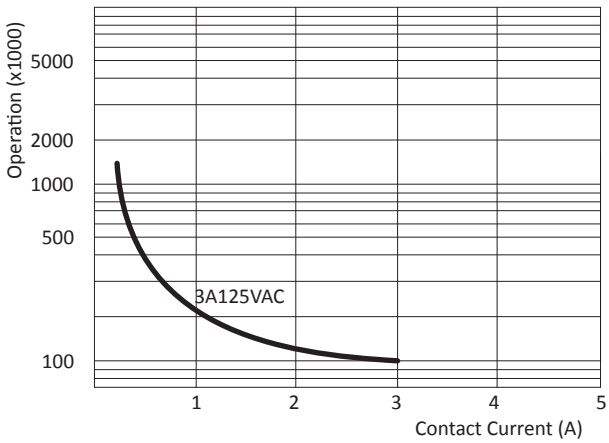
BOTTOM VIEW



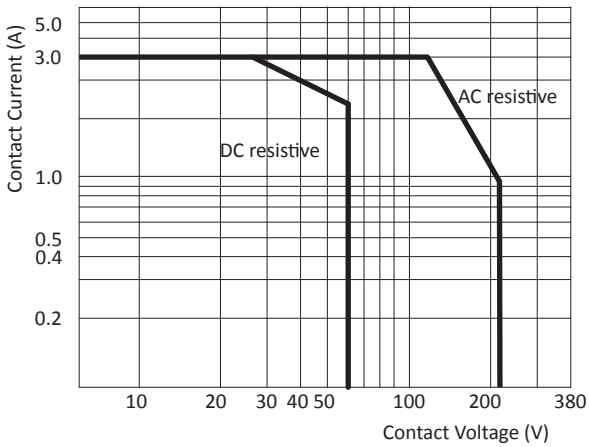


Engineering Data

Life expectancy



Contact switching capacity



ST1

Features

- Small sizes 12.5 x 7.5 x 10mm
- High sensitivity 150mW
- Fully sealed
- UL/CUL approved
- Special design for alarm, security system, office equipment, medical equipment
- Comply with RoHS-Directive 2011/65/EU

Type List

Terminal style	Contact form	Designation (provided with)
		Sealed type washable
PCB Terminal	1C (SPDT)	ST1 001 C .. W

Ordering Information

ST1	001	C	24	W
1	2	3	4	5

1. ST1 -- Basic series Designation
2. 001 -- Single pole double throw
3. C -- Contact material Ag + Au clad
4. -- Coil voltage: 05=5V; 06=6V; 09=9V; 12=12V; 24=24V
5. W -- Sealed washable

Contact Data

Type of contact	Single contact
Configuration	1CO
Rated load	1A/24VDC; 0.5A/125VAC
Maximum switching current	1A
Maximum switching voltage	60VDC / 125VAC
Maximum switching capacity	30W / 62.5VA
Contact resistance	100mΩ
Contact material	Ag + Au clad

Coil rating (DC @+23°C)

Rated voltage (V)	Rated current (mA) ±10%	Coil resistance (Ω) ±10%	Max. continuous voltage (V)	Pick up voltage	Drop out voltage	Power consumption at rated voltage (mW) (mW)
5	29.9	167	200 % of rated voltage	80 % of rated voltage	10 % of rated voltage	150
6	25	240				
9	16.6	540				
12	12.5	960				
24	6.25	3840				

ST1

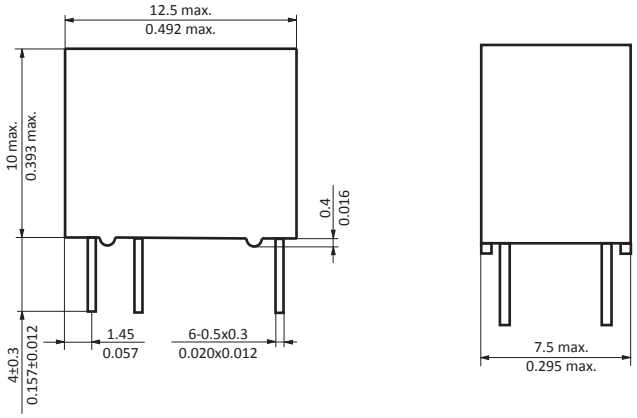
Specification

Mechanical life	$5x10^6$cycles	
Electrical life at rated load	$1x10^5$cycles	
Operate Time	5ms Max.	
Release Time	5ms Max.	
Dielectric strength	Between coil and contacts	1000V, 50/60Hz, 1min
	Between open contacts	400V, 50/60Hz, 1min
Vibration resistance (10..55Hz) double amplitude	Operation extremes	3.3mm
Shock resistance	Operation extremes - 11ms	10g
Operating ambient temperature	-30..+70°C	
Approvals	UL/CUL	
Weight	2.2g	

Safety Approval

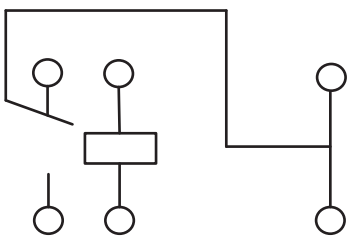
Certified	UL / CUL
Ratings	0.5A/125VAC; 1A/30VDC; 0.3A/60VDC

Outline Dimensions



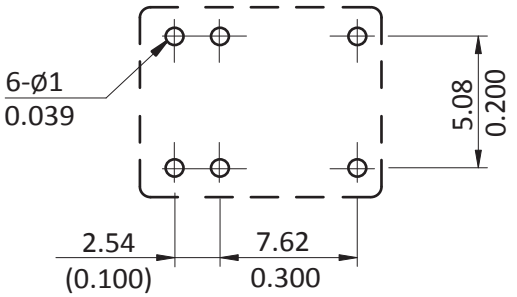
Wiring Diagram

BOTTOM VIEW



PC Board Layout

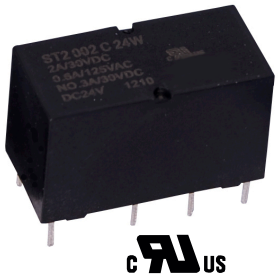
BOTTOM VIEW



ST2

Features

- DIL (Dual In Line) terminals
- Conform to FCC part 68 1.5kV surge and dielectric 1000VAC
- Fully sealed
- UL/CUL approved
- Special design for alarm, security system, office equipement, medical equipment
- Comply with RoHS-Directive 2011/65/EU



Type List

Terminal style	Contact form	Designation (provided with)
		Sealed type washable
PCB Terminal	2C (DPDT)	ST2 002 C .. W

Ordering Information

ST2	002	C	24	W
1	2	3	4	5

1. ST2 -- Basic series Designation
2. 002 -- Double pole double throw
3. C -- Contact material AgNi + Au clad
4. -- Coil voltage : 05=5V; 06=6V; 09=9V; 12=12V;24=24V;48=48V
5. W -- Sealed washable

Contact Data

Type of contact	Bifurcated contact
Configuration	2 CO
Rated load	2A/30VDC; 0.6A/125VAC
Maximum switching current	2A
Maximum switching voltage	220VDC / 250VAC
Maximum switching capacity	60W / 125VA
Contact resistance	100mΩ
Contact material	AgNi + Au clad

Coil rating (DC @+23°C)

Rated voltage (V)	Rated current (mA) ±10%	Coil resistance (Ω) ±10%	Max. continuous voltage (V)	Pick up voltage	Drop out voltage	Power consumption at rated voltage (mW) (mW)
5	29.9	167	12.5	70 % of rated voltage	5 % of rated voltage	150
6	25	240	15			
9	16.6	540	22.5			
12	12.5	960	30			
18	11.1	1620	40			200
24	8.3	2880	52.9			
48	6.25	7680	84.9			300

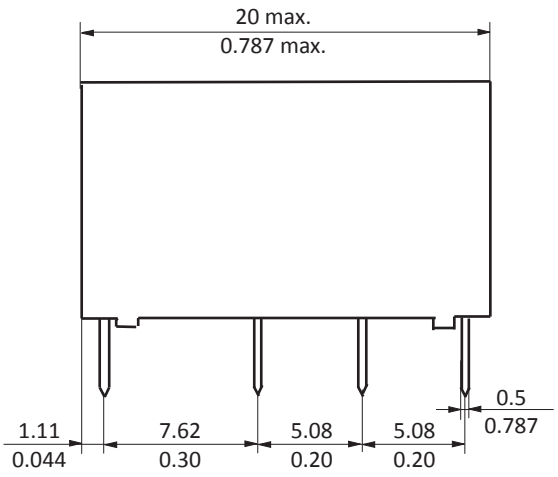
Specification

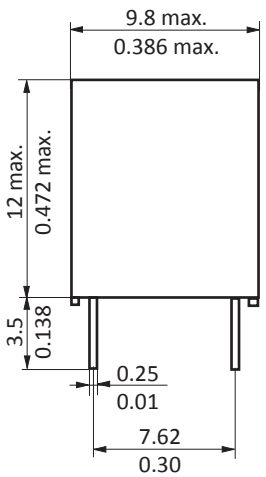
Mechanical life	100x10^6 cycles	
Electrical life at rated load	1x10^5 cycles	
Operate Time	5ms Max.	
Release Time	3ms Max.	
Dielectric strength	Between coil and contacts	1000V, 50/60Hz, 1min
	Between open contacts	1000V, 50/60Hz, 1min
	Between contact circuits	1000V, 50/60Hz, 1min
Surge withstand voltage (wave 10/160µs, conform to FCC68)	Between coil and contacts	1500V
	Between open contacts	1500V
	Between contact circuits	1500V
Vibration resitance (10..55 Hz) double amplitude	Operation extremes	1.5mm
	Damage limits	5mm
Shock resistance	Operation extremes - 11ms	10g
	Damage limits - 6ms	100g
Ambient temperature	-40...+90°C (+80°C for 48VDC coil)	
Approvals	UL/CUL	
Weight	4.5g	

Safety Approval

Certified	UL / CUL
Ratings	2A/30VDC ; 0.6A/125VAC

Outline Dimensions

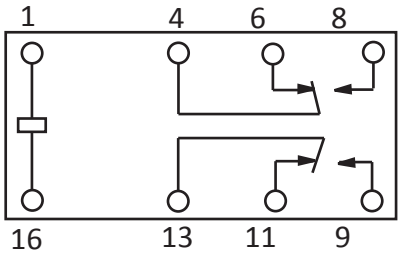




ST2

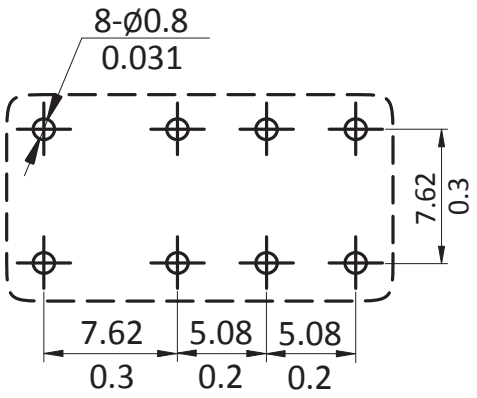
Wiring Diagram

Bottom View



PC Board Layout

Bottom View



Tolerance ±0.1/±0.004

Mounting (Bottom View)

Features

- · DIL (Dual In Line) terminals
- · Conform to FCC part 68 1.5kV surge and dielectric 1000VAC
- · Fully sealed
- · UL/CUL approved
- · Special design for alarm, security system, office equipment, medical equipment
- · Comply with RoHS-Directive 2011/65/EU

Type List

Terminal style	Contact form	Designation (provided with)
		Sealed type washable
THT	2C (DPDT)	ST3 002 H .. W
SMT	2C (DPDT)	ST3 002 H .. SM

Ordering Information

ST3	002	H	24	W
1	2	3	4	5

1. ST3 -- Basic series Designation
2. 002 -- Double pole double throw
3. H -- Contact material AgPd + Au clad
4. 24 -- Coil voltage: 5 = 5VDC; 6 = 6VDC; 9 = 9VDC; 12 = 12VDC; 24 = 24 VDC
5. W -- Sealed washable, THT version
   SM -- SMT version

Contact Data

Type of contact	Bifurcated contact
Configuration	2 CO
Rated load	2A/30VDC; 0.5A/125VAC
Maximum switching current	2A
Maximum switching voltage	220VDC / 250VAC
Maximum switching capacity	60W / 62.5VA
Minimum permissible load	0.01mA/10mV
Contact resistance	50mΩ
Contact material	AgPd + Au clad

Coil rating (DC @+23°C)

Rated voltage (V)	Rated current (mA) ±10%	Coil resistance (Ω) ±10%	Max. continuous voltage (V)	Pick up voltage	Drop out voltage	Power consumption at rated voltage (mW) (mW)
5	28	178	12.5	75 % of rated voltage	10 % of rated voltage	140
6	23.3	257	15			
9	15.5	579	22.5			
12	11.7	1028	30			
24	8.3	2880	48			200

ST3

Specification

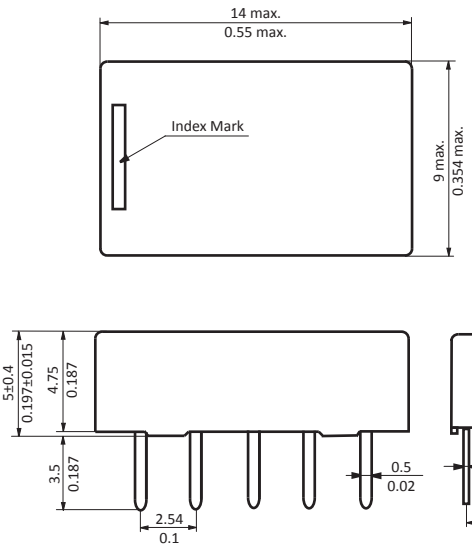
Mechanical life	100x10^6 cycles	
Electrical life	1x10^5 cycles @ 0.5A/125VAC , 2x10 cycles @ 1A/30VDC	
Operate Time	2ms Max.	
Release Time	1ms Max.	
Dielectric strength	Between coil and contacts	1000V, 50/60Hz, 1min
	Between open contacts	1000V, 50/60Hz, 1min
	Between contact circuits	1000V, 50/60Hz, 1min
Surge withstand voltage (wave 10/160µs, conform to FCC68)	Between coil and contacts	1500V
	Between open contacts	1500V
	Between contact circuits	2500V
Vibration resitance (10..55 Hz) double amplitude	Operation extremes	3mm
	Damage limits	5mm
Shock resistance	Operation extremes - 11ms	50g
	Damage limits - 6ms	100g
Ambient temperature	-40...+70°C	
Approvals	UL/CUL	
Weight	1.5g	

Safety Approval

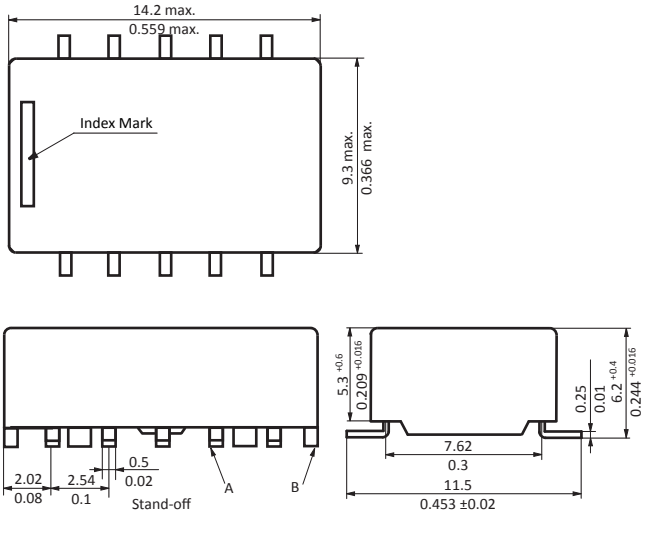
Certified	UL / CUL
Ratings	2A/30VDC ; 0.5A/125VAC

Outline Dimensions

THT Version

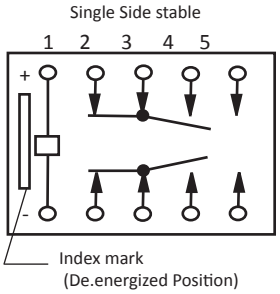


SMT Version



Wiring Diagram

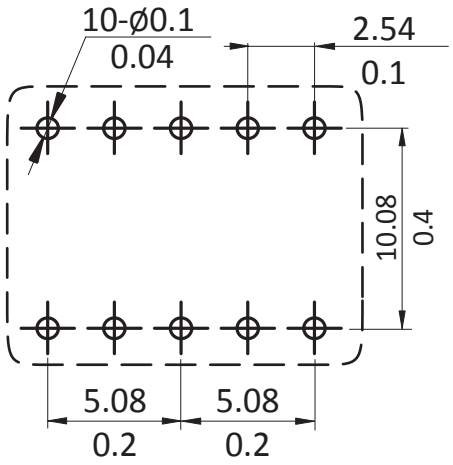
Bottom View



PC Board Layout

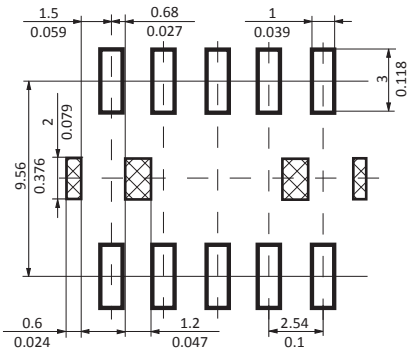
Bottom View

THT version



Tolerance ±0.1/±0.004

SMT version



Soldering Pad (for Terminal)
Temporary glue Pad
(for Stand-off A or B)

Tolerance ±0.1/±0.004

NF108

Features

- Low profile PCB automotive relay.
- High rating 20A/14VDC.
- General purpose application for motor

Ordering Information

NF108	001	T	E	12	S	XXXX
1	2	3	4	5	6	7

1. NF108 -- Relay Series
2. 100U -- 1U (Single Relay only)
   001 -- 1C
3. Blank -- Single
   T -- Twin
4. E -- Contact Material Ag alloy
5. 12 -- 12VDC Coil Voltage
   24 -- 24VDC Coil Voltage
6. Blank -- Flux tight
   S -- Sealed washable
7. XXX -- Letters and/or numbers for special customer design

Contact Data

Type of contact		Single or Twin Contact
Configuration		1CO / 1U / 2x1CO
Contact rating	1C-Form	20A / 15A, 14VDC
	1U-Form	2 x 10A, 14VDC
Max. switching power		280W
Max. switching voltage		16VDC (max.20A)
Contact Resistance		≤100 mΩ
Contact material		Ag alloy

Coil rating (DC @+23°C)

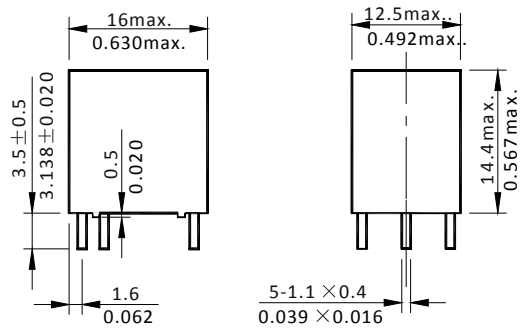
U_N (VDC) Rated	R (Ω) ± 10%	Pull-in Voltage U_{PI} (VDC)	Drop-out voltage U_{DO} (VDC)	Coil power P_{coil} (W)
12	210	7.3 / 9.0 (at 80°C)	0.9	0.69
24	840	14.6 / 18.1 (at 80°C)	1.8	

CAUTION: 1. The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.
2. Pull-in and drop-out voltage are for test purposes only and not to be used as design criteria.

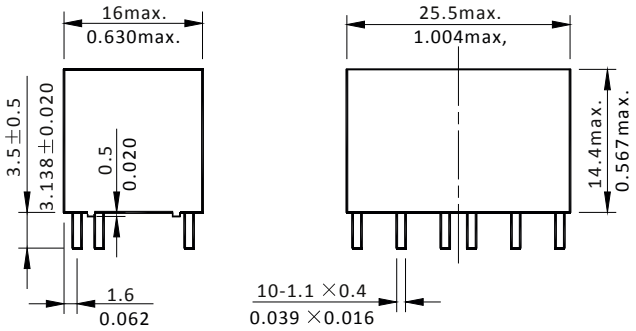
Specification

Mechanical life (frequency 18000 oper. / h)		10^7 Oper.
Electrical life (frequency 360 oper. / h)		10^5 Oper.
Operating time / Release time		≤10ms / ≤5ms
Insulation Resistance		100MΩMin (at 500VDC)
Dielectric strength contacts/ coil		500 VAC_{rms}
Dielectric strength open contacts		500 VAC_{rms}
Ambient temperature (no freezing)		-40°C...+105°C
Vibration resistance		10 ~ 55Hz; double amplitude 1.5mm
Shock resistance		100m/s^2 11ms
Dimensions	NF108 Single	16.0 x 12.5 x 14.4
	NF108 Twin	16.0 x 25.5 x 14.4
Weight	NF108 Single	approx. 5.5g
	NF108 Twin	approx. 11g

Dimension (Bottom view)

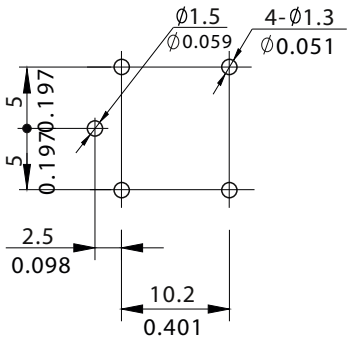


NF108 Single

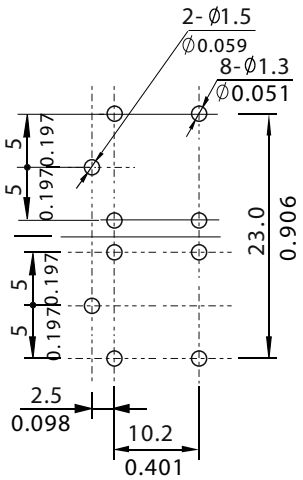


NF108 Twin

Mounting (Bottom view)



NF108 Single



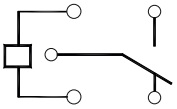
NF108 Twin

Notes: 1) Dimensions are in millimeters.
2) Inch equivalents are given for general information only.

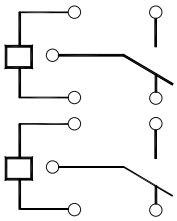
NF108

Wiring Diagram

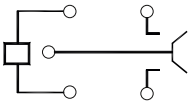
Bottom View



1C



2x1C



1U

NF123H

Features

· Compact size miniature PCB relays.
· High rating 20A with maximum switching current up to 30A.
· Extended temperature range up to 105°C.
· For automotive system, e.g. Power windows, Auto door lock, Powersunroof, Memory seat, Wiper, Defogger, etc.

Ordering Information

NF123H	100	E	12	S	XXXX
1	2	3	4	5	6

1. NF123H -- Relay Series, 30A Version

2. 100 -- 1A
   001 -- 1C

3. E -- Contact Material Ag alloy

4. 12 -- 12VDC
   24 -- 24VDC

5. Blank -- Flux tight
   S -- Sealed washable

6. XXXX -- Letters and/or numbers for special customer design

Contact Data

Type of contact		Single Contact
Configuration		1NO / 1CO
Contact rating	1A-Form	30A, 14VDC
	1C-Form	NO: 30A, 14VDC; NC 25A, 14VDC
Max. switching power		420W
Max. switching voltage		24VDC (max.30A)
Max. carrying current	NO	30A for 2min @20°C, 30A for 1h @20°C, 35A for 2min @85°C, 25A for 1h @85°C
Contact voltage drop		≤30mV (at 10A)
Contact material		Ag alloy

Coil rating (DC @+23°C)

U_N (VDC)		R (Ω) ± 10%	Pull-in Voltage U_{PI} (VDC)	Drop-out voltage U_{DO} (VDC)	Coil power P_{coil} (W)
Rated	Max.				
12	14.4	254	6.9	1.5	0.57
24	28.8	1010	13.8	3	

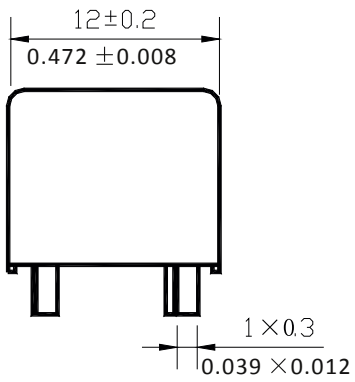
CAUTION: 1. The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.
2. Pull-in and drop-out voltage are for test purposes only and not to be used as design criteria.

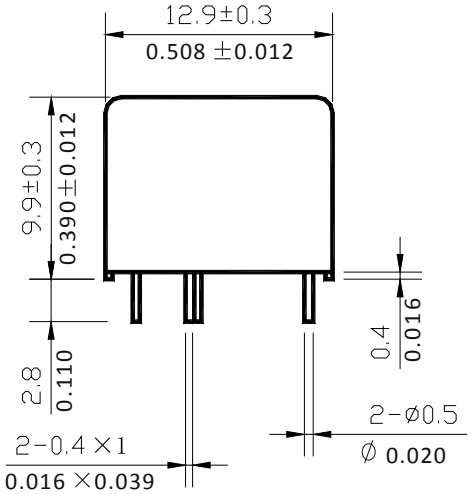
NF123H

Specification

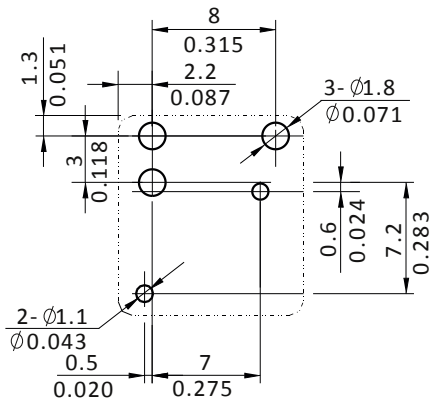
Mechanical life (frequency 18000 oper. / h)	10^7 Oper.
Electrical life (frequency 360 oper. / h)	10^5 Oper.
Operating time / Release time	≤4ms / ≤1.5ms
Insulation Resistance	100MΩ Min (at 500VDC)
Dielectric strength contacts/ coil	500 VAC_{rms}
Dielectric strength open contacts	500 VAC_{rms}
Ambient temperature (nofreezing)	-40°C...+105°C
Vibration resistance	10 ~ 55Hz; double amlitude 1.27mm 60m/s²
Shock resistance	300m/s² 6ms
Dimensions	12x12.9x12.7
Weight	approx. 4g

Dimension (Bottom view)





Mounting (Bottom view)

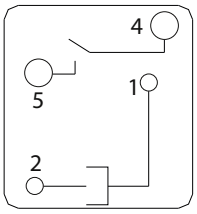


Notes: 1) Dimensions are in millimeters.
2) Inch equivalents are given for general information only.

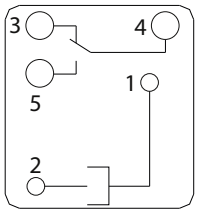
NF123H

Wiring Diagram

Bottom View



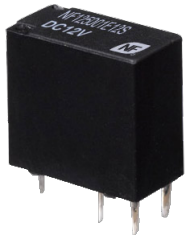
1A



1C

NF125

Features



- Smallest and slim type PCB Automotive relay.
- Switching capacity up to 25A motor lock load.
- High Temperature withstand up to 105°C.
- Single or twin relays are both available.
- Fully sealed construction

Ordering Information

NF125	001	T	E	12	S	XXXX
1	2	3	4	5	6	7

1. NF125 -- Standard Version
   NF125S -- Sensitive Coil
2. 001 -- 1C
3. Blank -- Single
   T -- Twin
4. E -- Ag alloy
5. 12 -- 12VDC
6. S -- Sealed washable
7. XXXX -- Letters and/or numbers for special customer design

Contact Data

Type of contact	Single/Twin Contact
Configuration	1C / 2x1C
Contact rating	25A motor lock (14VDC)
Max. switching power	480W
Max. switching voltage	16VDC (max.30A)
Contact voltage drop	≤250mV (at 10A)
Contact material	Ag alloy

Coil rating (DC @+23°C)

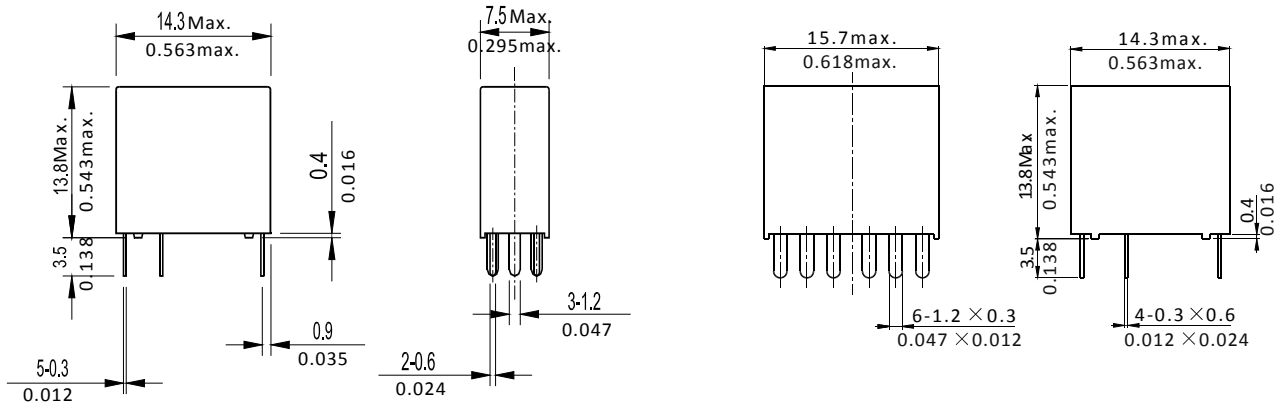
	U_N(VDC) Rated	R (Ω) ± 10%	Pull-in Voltage U_{PI}(VDC)	Drop-out voltage U_{DO}(VDC)	Coil power P_{coil} (W)
Standard	12	225	7.2	1.0	0.64
Sensitive	12	180	6.5	1.0	0.8

CAUTION: 1. The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.
2. Pull-in and drop-out voltage are for test purposes only and not to be used as design criteria.

Specification

Mechanical life (frequency 18000 oper. / h)		10^6 Oper.
Electrical life (frequency 360 oper. / h)		10^5 Oper.
Operating time / Release time		≤10ms / ≤5ms
Insulation Resistance		100MΩ Min (at 500VDC)
Dielectric strength contacts/ coil		1000 VAC_{rms}
Dielectric strength open contacts		500 VAC_{rms}
Ambient temperature (nofreezing)		-40°C...+105°C
Vibration resistance		10 ~ 500Hz; 43.1m/s²
Shock resistance		98m/s² 11ms
Dimensions	Standard	14.3 x 7.5 x 13.8
	Twin	14.3 x 15.7 x 13.8
Weight	Standard	approx. 4.1g
	Twin	approx. 8.2g

Dimension (Bottom view)

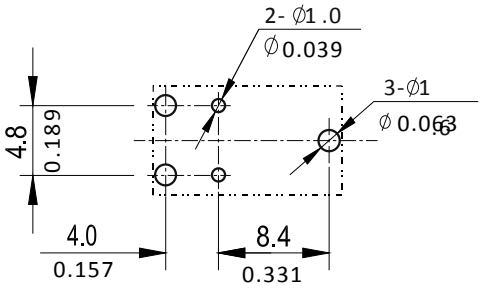


Single Twin

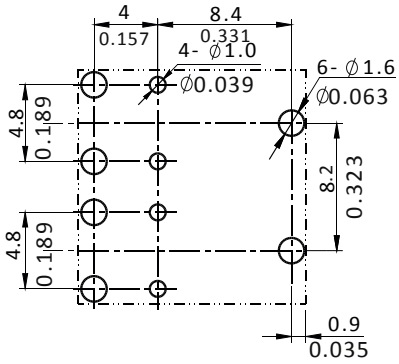
Notes: 1) Dimensions are in millimeters.
2) Inch equivalents are given for general information only.

NF125

Mounting (Bottom view)



Single

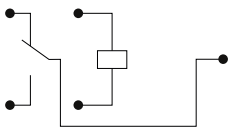


Twin

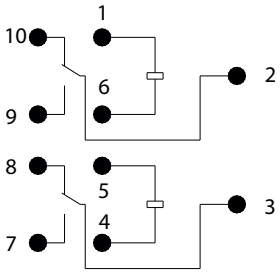
Notes: 1) Dimensions are in millimeters.
2) Inch equivalents are given for general information only.

Wiring Diagram

Bottom View



Single

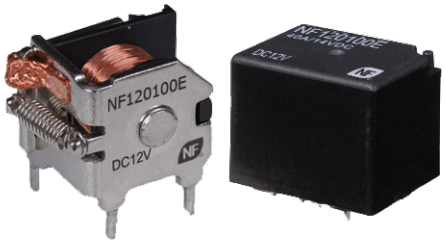


Twin

NF120

Features

- High power PCB relay with 40A rating.
- USA & European footprint are both available.
- Open frame, dust cover, flux-free type, and sealed type are available.
- General purpose applications for lamp control circuits, seat adjustment motors, window defoggers, starter solenoid switches, etc.



Ordering Information

NF120 100 E 12 S XXXX

1 2 3 4 5 6 7

1. NF120 -- Relay Series

2. 100 -- 1A
   001 -- 1C

3. E -- Contact Material Ag alloy

4. Blank -- European Version
   2 -- USA Version

5. 12 -- 12VDC
   24 -- 24VDC

6. Blank -- Flux tight
   S -- Sealed washable
   O -- Open

7. XXXX -- Letters and/or numbers for special customer design

Contact Data

Type of contact		Single Contact
Configuration		1A / 1C
Contact rating	1A-Form	45A, 14VDC
	1C-Form	NO: 40A, 14VDC; NC 30A, 14VDC
		NO: 20A, 28VDC; NC 15A, 28VDC
Max. switching power		630W 2400VA
Max. switching voltage		75VDC (max.45A)
Contact Resistance		≤30 mΩ

Coil rating (DC @+23°C)

U_N (VDC) Rated	R (Ω) ± 10%	Pull-in Voltage U_{PI} (VDC)	Drop-out voltage U_{DO} (VDC)	Coil power P_{coil} (W)
12	90	8.4	1.2	1.6
24	360	16.8	2.4	

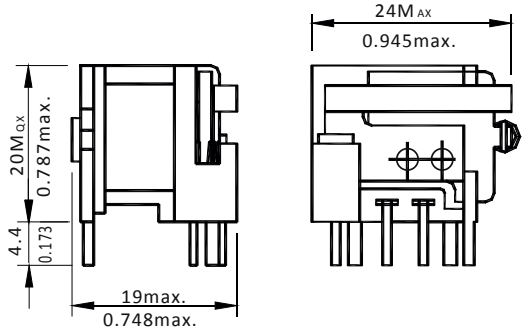
CAUTION: 1. The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.
2. Pull-in and drop-out voltage are for test purposes only and not to be used as design criteria.

NF120

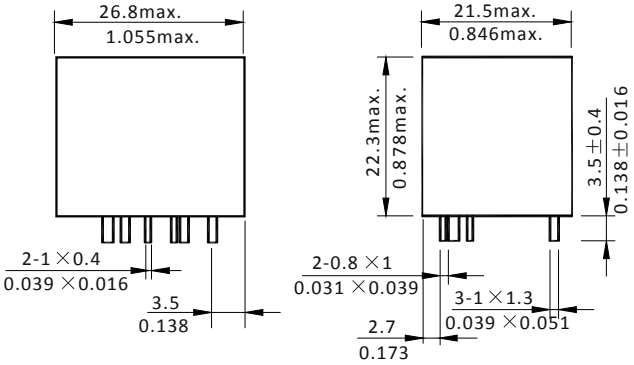
Specification

Mechanical life (frequency 18000 oper. / h)		10^7 Oper.
Electrical life (frequency 360 oper. / h)		10^5 Oper.
Operating time / Release time		≤5ms / ≤3ms
Insulation Resistance		100MΩ Min (at 500VDC)
Dielectric strength contacts/ coil		750 VAC_{rms}
Dielectric strength open contacts		500 VAC_{rms}
Ambient temperature (nofreezing)		-40°C...+125°C
Vibration resistance		10 ~ 40Hz; double amlitude 1.27mm
Shock resistance		200m/s^2 11ms
Dimensions	Covered	26.8 x 21.5 x 22.5
	Open	24 x 19 x 20
Weight	Covered	approx. 21g
	Open	approx. 19g

Dimension (Bottom view)



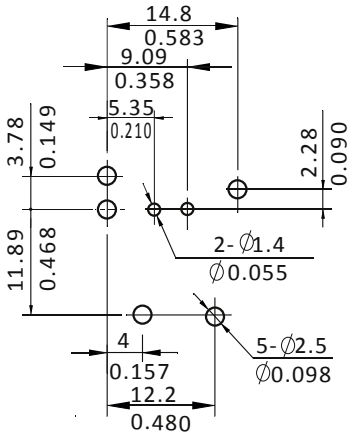
Open type



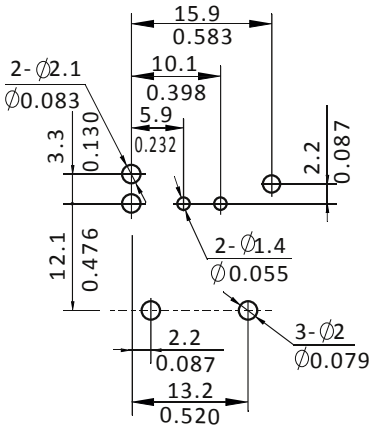
Covered type

Notes: 1) Dimensions are in millimeters.
2) Inch equivalents are given for general information only.

Mounting (Bottom view)



USA footprint

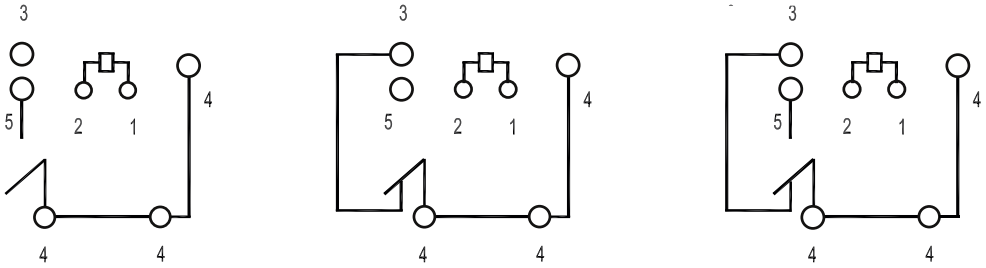


European footprint

Notes: 1) Dimensions are in millimeters.
2) Inch equivalents are given for general information only.

Wiring Diagram

Bottom View



1A 1B 1C

NF115

Features

- Low profile automotive relays for Micro-ISO terminal
- Compact and high-capacity load switching up to 25A
- High temperature withstand up to 105°C
- General purpose application for head lamp, blower fan, defogger, etc.

Ordering Information

NF115	100	E	12	S	D	XXXX
1	2	3	4	5	6	7

1. NF115 -- Relay Series
2. 100 -- 1A
3. E -- Contact Material Ag alloy
4. 12 -- 12VDC Coil Voltage
5. Blank -- Dust cover
   S -- Sealed washable
6. Blank -- Standard
   D -- Diode
   R -- Resisitor
7. XXXX -- Letters and/or numbers for special customer design

Contact Data

Type of contact		Single Contact
Configuration		1A
Contact rating	1A-Form	25A, 14VDC
Max. switching power		350W
Max. switching voltage		75VDC (max.25A)
Contact Resistance		≤50 mΩ
Contact material		Ag alloy

Coil rating (DC @+23°C)

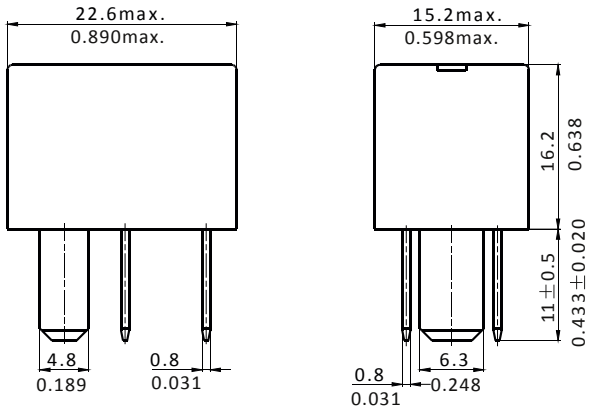
U_N(VDC) Rated	R (Ω) ± 10%	Pull-in Voltage U_{PI}(VDC)	Drop-out voltage U_{DO}(VDC)	Coil power P_{coil} (W)
12	180	7	0.6	0.8

CAUTION: 1. The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.
2. Pull-in and drop-out voltage are for test purposes only and not to be used as design criteria.

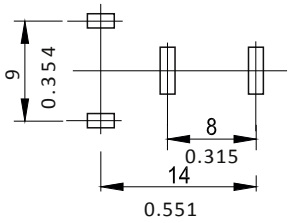
Specification

Mechanical life (frequency18000 oper. / h)		10^7 Oper.
Electrical life (frequency360 oper. / h)		10^5 Oper.
Operating time / Release time		≤10ms / ≤10ms
Insulation Resistance		20MΩ Min (at 500VDC)
Dielectric strength contacts/ coil		500 VAC_{rms}
Dielectric strength open contacts		500 VAC_{rms}
Ambient temperature (nofreezing)		-40°C...+105°C
Vibration resistance	Function	10 ~ 100Hz; 44.1 m/s^2
	Survivial	100 ~ 500Hz; 44.1 m/s^2
Shock resistance	Function	100m/s^2 11ms
	Survivial	1000m/s^2 11ms
Dimensions		22.7 x 15.2 x 16.2
Weight		approx. 15g

Dimension (Bottom view)



Mounting (Bottom view)

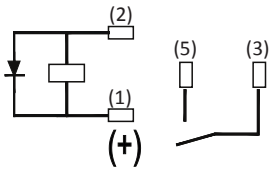


Notes: 1) Dimensions are in millimeters.
2) Inch equivalents are given for general information only.

NF115

Wiring Diagram

Bottom View



NF117

Features

· High rating Micro ISO automotive relays.
· Compact and high-capacity 35A load switching.
· Surge suppression, with diode or resistor type available.
· General purpose application for fan motor, heater, head lump, air compressor, ABS, blower fan, defogger, etc.

Ordering Information

NF117	100	E	12	S	P	D	XXXX
1	2	3	4	5	6	7	8

1. NF117 -- 30A Version
   NF117H -- 35A Version
2. 100 -- 1A
   001 -- 1C
3. E -- Contact Material Ag alloy
4. 12 -- 12VDC Coil Voltage
5. Blank -- Dust cover
   S -- Sealed washable
6. Blank -- Plug in
   P -- PCB
7. Blank -- Standard
   D -- Diode
   R -- Resisitor
8. XXXX -- Letters and/or numbers for special customer design

Contact Data

Type of contact		Single Contact
Configuration		1A/1C
Contact rating	1A-Form	30A, 14VDC (Standard) ; 35A, 14VDC (High Power)
	1C Form NO/NC	30A/25A, 14VDC (Standard) ; 35A/25A, 14VDC (High Power)
Max. switching power		490W
Max. switching voltage		75VDC (max.35A)
Contact Resistance		≤50 mΩ
Contact material		Ag alloy

Coil rating (DC @+23°C)

	U_N (VDC) Rated	R (Ω) ± 10%	Pull-in Voltage U_{PI} (VDC)	Drop-out voltage U_{DO} (VDC)	Coil power P_{coil} (W)
1A-Form	12	120	8.4	1.2	1.2
	24	480	16.8	2.4	
1C-Form	12	96	8.4	1.2	1.5
	24	384	16.8	2.4	

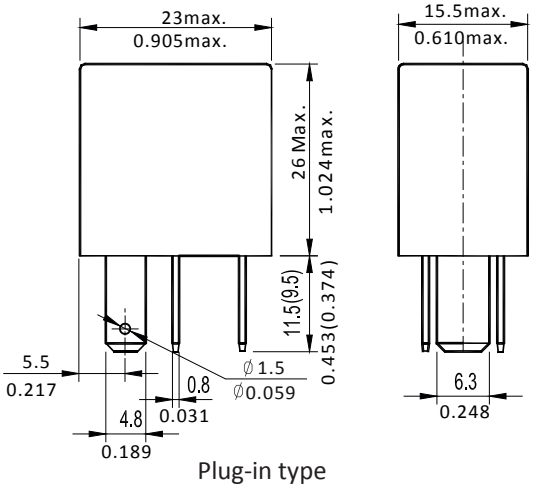
CAUTION: 1. The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.
2. Pull-in and drop-out voltage are for test purposes only and not to be used as design criteria.

NF117

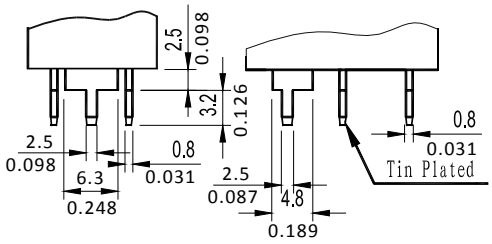
Specification

Mechanical life (frequency 18000 oper. / h)	10^7 Oper.
Electrical life (frequency 360 oper. / h)	10^5 Oper.
Operating time / Release time	≤10ms / ≤7ms
Insulation Resistance	100MΩ Min (at 500VDC)
Dielectric strength contacts/ coil	1000 VAC_{rms}
Dielectric strength open contacts	500 VAC_{rms}
Ambient temperature (nofreezing)	-40°C...+125°C
Vibration resistance	10 ~ 100Hz; double amplitude 1.27mm
Shock resistance	100m/s^2 11ms
Dimensions	23 x 15.5 x 26
Weight	approx. 18.5g

Dimension (Bottom view)

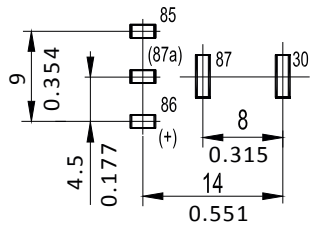


Plug-in type

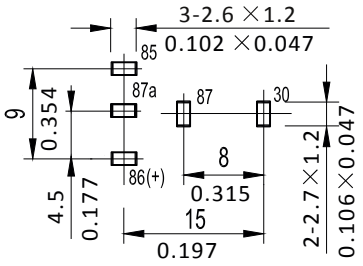


PCB type

Mounting (Bottom view)



Plug-in type



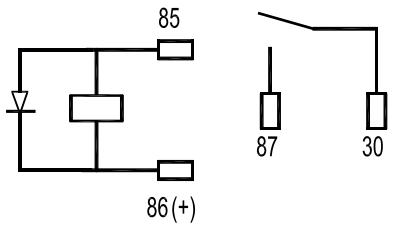
PCB type

Notes: 1) Dimensions are in millimeters.
2) Inch equivalents are given for general information only.

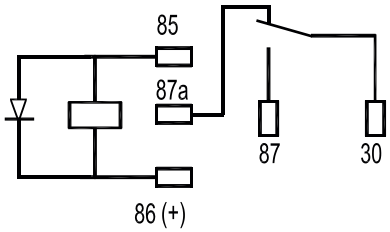
NF117

Wiring Diagram

Bottom View



1A



1C

NF135

Features

- ISO 280 footprint automotive relay.
- High rating up to 35A at 125°C
- Optional to be equipped with diode or resistor.
- General purpose applications for automotive in power control box.

Ordering Information

NF135	100	E	12		D	XXXX
1	2	3	4	5	6	7

1. NF135 -- Relay Series

2. 100 -- 1A
   001 -- 1C

3. E -- Ag alloy

4. 12 -- 12VDC
   24 -- 24VDC

5. Blank -- Dust cover

6. Blank -- Standard
   D -- Diode
   R -- Resistor

7. XXXX -- Letters and/or numbers for special customer design

Contact Data

Type of contact		Single Contact
Configuration		1A / 1C
Contact rating	1A-Form	35A, 14VDC
	1C-Form	NO:35A / NC 25A, 14 VDC
Max. switching power		560W
Max. switching voltage		75VDC (max.40A)
Max. continous current		NO:40A, NC:35A
Contact resitance		≤100mΩ (1A, 6VDC)
Contact material		Ag alloy

Coil rating (DC @+23°C)

U_N(VDC) Rated	R (Ω) ± 10%	Pull-in Voltage U_{PI}(VDC)	Drop-out voltage U_{DO}(VDC)	Coil power P_{coil} (W)
12	109	7.2	0.6	1.3
24	436	14.4	2.4	1.3

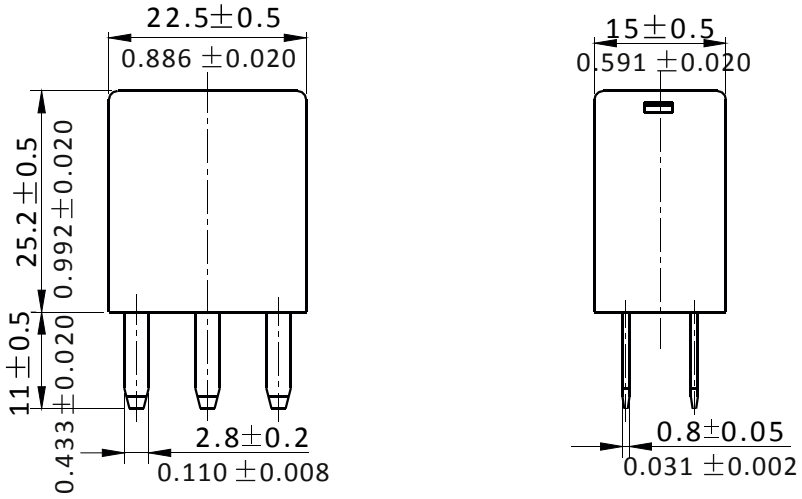
CAUTION: 1. The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.
2. Pull-in and drop-out voltage are for test purposes only and not to be used as design criteria.

NF135

Specification

Mechanical life (frequency 18000 oper. / h)	10^7 Oper.
Electrical life (frequency 360 oper. / h)	10^5 Oper.
Operating time / Release time	≤5ms / ≤2ms
Insulation Resistance	100MΩ Min (at 500VDC)
Dielectric strength contacts/ coil	500 VAC_{rms}
Dielectric strength open contacts	500 VAC_{rms}
Ambient temperature (nofreezing)	-40°C...+125°C
Vibration resistance	10 ~ 100 Hz, double amplitude 1.27mm 40 ~ 70 Hz, 49m/s² 70 ~ 100 Hz, double amplitude 0.5mm 70 ~ 100 Hz, 98m/s²
Shock resistance	200m/s² 11ms
Dimensions	22.5 x 15 x 25
Weight	approx. 21g

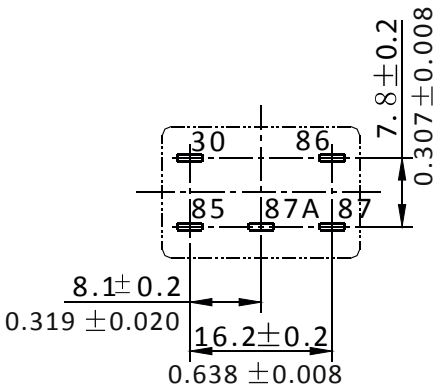
Dimension (Bottom view)



Notes: 1) Dimensions are in millimeters.
2) Inch equivalents are given for general information only.

NF135

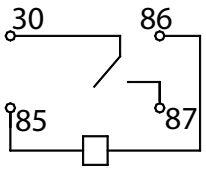
Mounting (Bottom view)



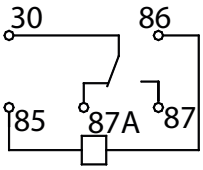
Notes: 1) Dimensions are in millimeters.
2) Inch equivalents are given for general information only.

Wiring Diagram

Bottom View



1A



1C

NF104

Features

· Mini ISO high power automotive relay 30A/50A.
· High temperature endurance up to 125°C.
· Optional to be equipped with protection diode or resistor.
· Both available PCB terminal and quick connect terminal versions.
· General purpose applications for headlights, cell motors, air conditioners, ABS, EPS, etc.

Ordering Information

NF104	100	E	7	12	S	1	V	D	XXXX
1	2	3	4	5	6	7	8	9	10

1. NF104 -- 40A version
   NF104H -- 50A version
2. 100 -- 1A
   001 -- 1C
3. E -- Contact Material Ag alloy
4. Blank -- Standard
5. 12, 24 -- Coil Voltage [VDC]
6. Blank -- Dust cover
   S -- Sealed washable (NF104 only)
7. Blank -- Standard cover
   1 -- Insulation bracket
   2 -- Metal bracket
8. Blank -- Plug-in type 1
   P -- PCB (standard cover only)
9. Blank -- Standard
   D -- Diode
   R -- Resistor
10. XXXX -- Letters and/or numbers for special customer design

Contact Data

Type of contact	Single Contact	
Configuration	1A/1C	
Contact rating	NF104 1A-Form	40A, 14VDC 20A, 24VDC
	NF104 1C-Form NO / NC	40A/ 30A, 14VDC 20A/15A, 24VDC
	NF104H 1A-Form	50A, 14VDC 25A, 24VDC
	NF104H 1C-Form	50A / 40A,14VDC 25A / 20A, 24VDC
Max. switching power	NF104: 630W; NF104H: 700W	
Max. switching voltage	NF104:75VDC (max.40A); NF104H:75VDC(max. 50A)	
Contact Resistance	≤30mΩ	
Contact material	Ag alloy	

NF104

Coil rating (DC @+23°C)

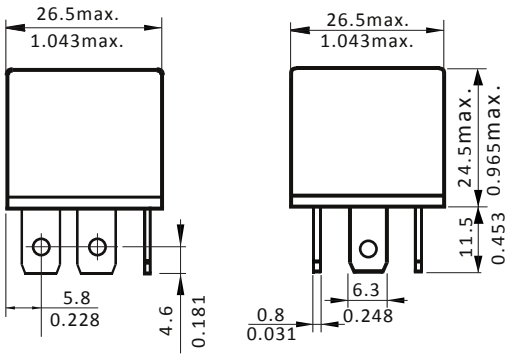
U_N (VDC)		R (Ω) ± 10%	Pull-in Voltage U_{PI} (VDC)	Drop-out voltage U_{DO} (VDC)	Coil power P_{coil} (W)
Rated	Max.				
12	15.6	90	7.8	1.2	1.6
24	31.2	360	15.6	2.4	

CAUTION: 1. The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.
2. Pull-in and drop-out voltage are for test purposes only and not to be used as design criteria.

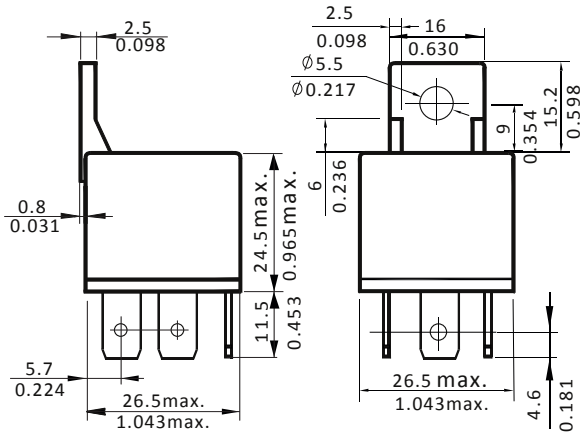
Specification

Mechanical life (frequency18000 oper. / h)		10^7 Oper.
Electrical life (frequency360 oper. / h)		10^5 Oper.
Operating time / Release time		≤7ms / ≤5ms
Insulation Resistance		100MΩMin (at 500VDC)
Dielectric strength contacts/ coil		750 VACrms
Dielectric strength open contacts		500 VACrms
Ambient temperature (nofreezing)		-40°C...+125°C
Vibration resistance		10 ~ 40Hz; double amplitude 1.5mm
Shock resistance		147m/s² 11ms
Dimensions	Standard	26.5 X 26.5 X 24.5
	With bracket	26.5 X 26.5 X 40.5
Weight	Standard	approx. 31g
	With bracket	approx. 36g

Dimension / Mounting (Bottom view)

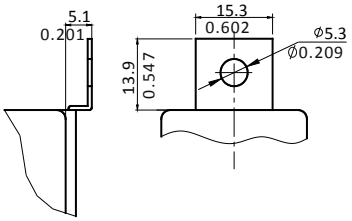


NF104 standard

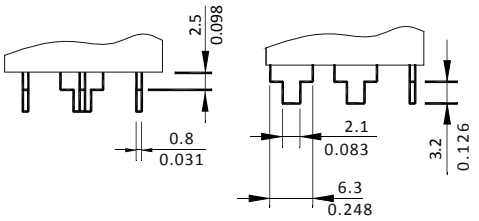


NF104 with insulation bracket

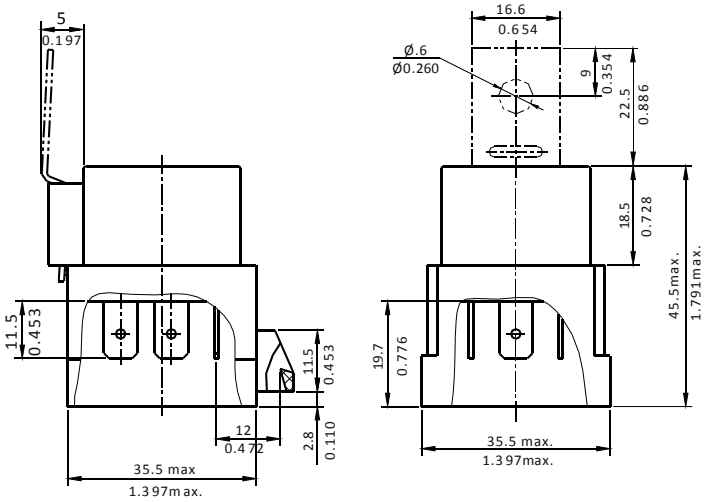
NF104



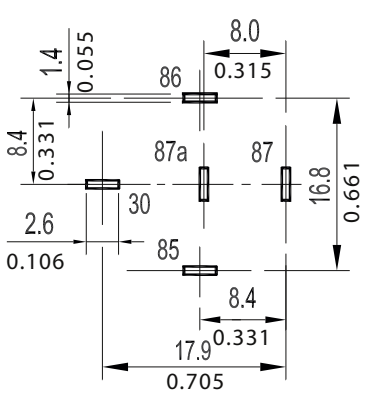
NF104 with metal bracket



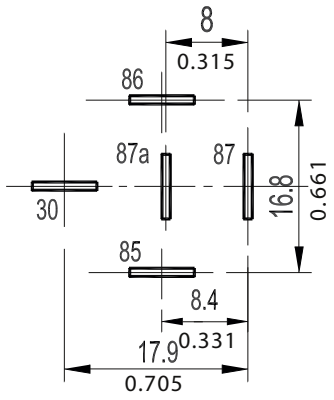
Note: Terminals as shown above are also available



NF104 shrounded with metal bracket



PCB type

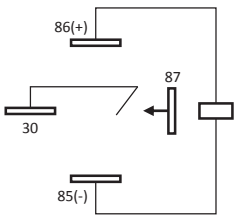


Plug in type 1

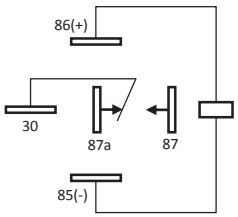
Notes: 1. Dimensions are in millimeters
2. Inch equivalents are given for general information only

Wiring Diagram

Bottom View



1A



1C plug in type 1

NF105

Features

· 70A high power automotive relay.
· High temperature endurance up to 105° C.
· Optional to be equipped with protection diode or resistor.
· General purpose applications for ABS control, cooling fan, energy management, engine control, glow plug, heated front screen, ignition, etc.

Ordering Information

NF105	100	E	12	1	P	D	XXXX
1	2	3	4	5	6	7	8

1. NF105 -- Type
2. 100 -- Single pole normaly open, 1A
3. E -- Contact Material Ag alloy
4. 12, 24 -- Coil Voltage [VDC]
5. Blank -- Standard cover
   1 -- insulation bracket (Only plug-in type)
6. Blank -- Plug-in type; Mini ISO
7. Blank -- Standard
   D -- Diode
   R -- Resistor
8. XXXX -- Letters and/or numbers for special customer design

Contact Data

Type of contact	Single Contact	
Configuration	1A/1C	
Contact rating	NF105 1A-Form	70A, 14VDC 50A, 14VDC (at 85°C)
Max. switching power	980W	
Max. switching voltage	75VDC (max. 80A)	
Contact Resistance	≤200mV (at 70A)	
Contact material	Ag alloy	

Coil rating (DC @+23°C)

U_N (VDC) Rated	R (Ω) ± 10%	Pull-in Voltage U_{PI} (VDC)	Drop-out voltage U_{DO} (VDC)	Coil power P_{coil} (W)
12	90	7.2	1.6	1.6
24	360	14.4	3.2	

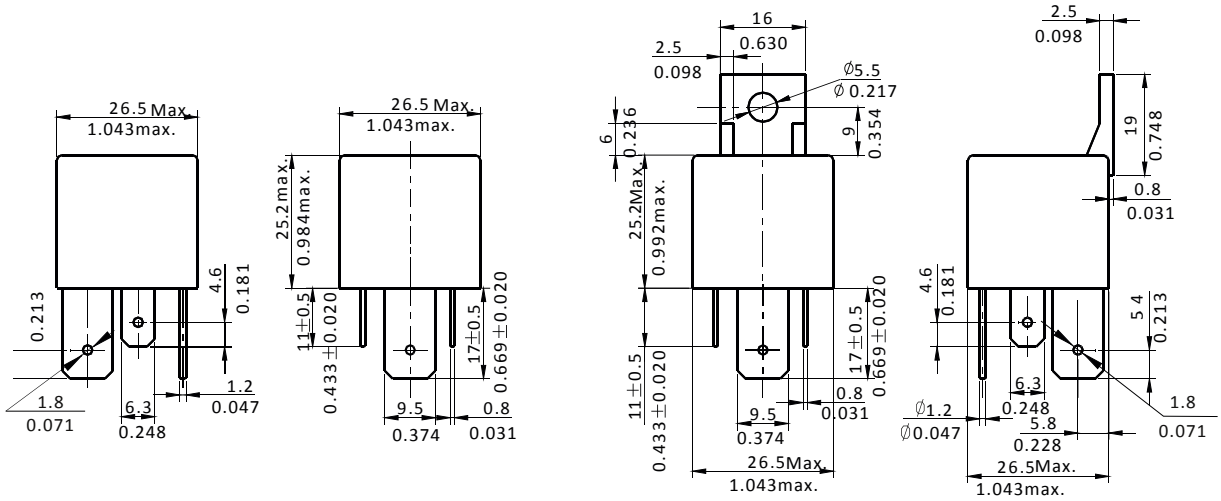
CAUTION: 1. The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.
2. Pull-in and drop-out voltage are for test purposes only and not to be used as design criteria.

NF105

Specification

Mechanical life (frequency 18000 oper. / h)		10^7 Oper.
Electrical life (frequency 360 oper. / h)		10^5 Oper.
Operating time / Release time		≤7ms / ≤2ms
Insulation Resistance		100MΩMin (at 500VDC)
Dielectric strength contacts/ coil		500 VAC_{rms}
Dielectric strength open contacts		500 VAC_{rms}
Ambient temperature (nofreezing)		-40°C...+105°C
Vibration resistance		20 ~ 500Hz; double amplitude 1.8mm
Shock resistance		30m/s² 6ms
Dimensions	Standard	26.5 X 26.5 X 25.2
	With bracket	26.5 X 26.5 X 41.2
Weight		approx. 36g

Dimension / Mounting (Bottom view)



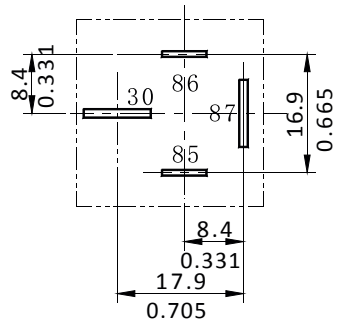
Standard

Insualtion bracket

Notes: 1) Dimensions are in millimeters.
2) Inch equivalents are given for general information only.

Mounting

Bottom View

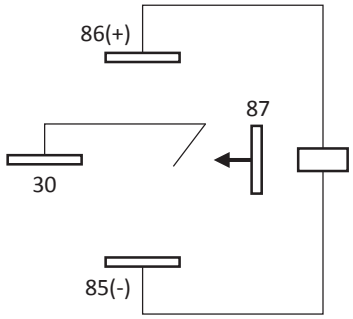


Plug-in type

Notes: 1. Dimensions are in millimeters
2. Inch equivalents are given for general information only

Wiring Diagram

Bottom View



Z302, Z303

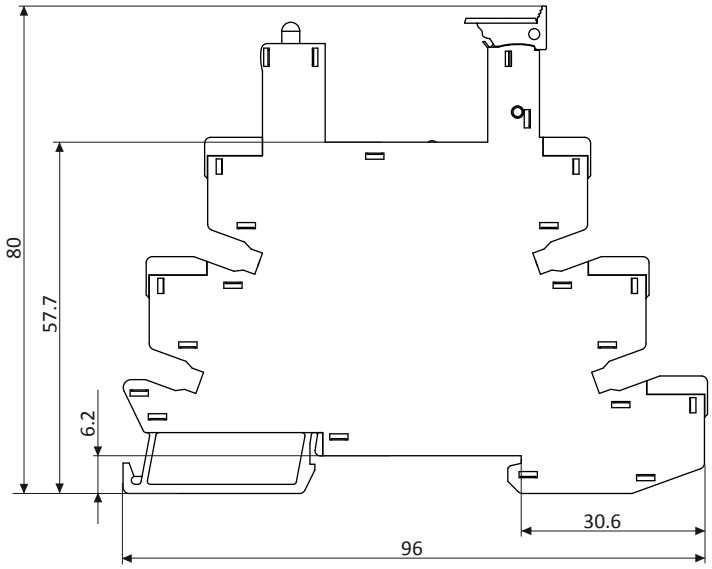
SLIM-DIN-rail socket for slim relay

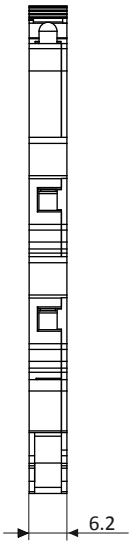
1 pole 6A

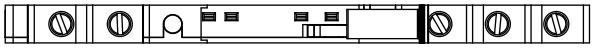
Features

- Protection group C250 (VDE 0110b/2)
- 6.2mm width sockets for 35mm DIN rail mount
- DC and AC sockets available
- Screw cage terminals available
- LED indication
- Protection circuit
- Accessories: jumper bar 20 terminals and white ID tags
- Sockets and accessories comply with RoHS Directive 2011/65/EU

Z302 & Z303 socket for slim relay with screw connection, 6.2mm width





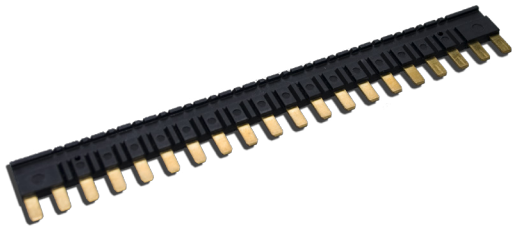


Z302, Z303

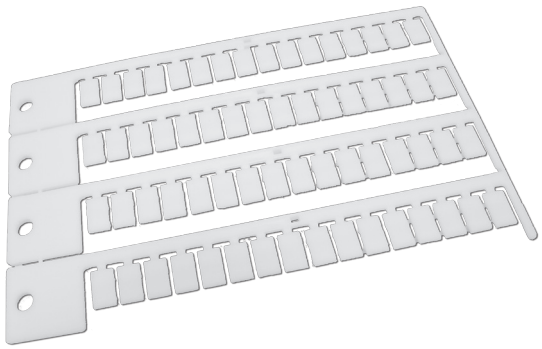
Technical data

Electrical / mechanical Data		
Rated current		6A
Rated voltage		300VAC
Dielectric strength coil/contact		4000VAC
Ambient operating temperature range	Z302 Z303	-40..+70°C -40..+55°C
Terminal protection degree acc. EN60529		IP20
Terminal capacity with or without cable end		1x0.2mm² ... 1x2.5mm²
Maximum torque		0.5 Nm
Screw type		M2.5
Approval		CE mark
Packaging unit		20 pcs.
Packaging unit jumper bar		20 pcs.
Packaging ID tags		10 pcs.

Standard part numbers	
DIN rail socket for Input 12 & 24 VAC/DC Relay coil voltage 12 & 24 VDC	Z302
DIN rail socket for Input 230 VAC/DC Relay coil voltage 60 VDC	Z303
Jumper bar 20 terminals	Z302.20
ID tags (1 set of 64 tags)	Z302.64



Z302.20



Z302.64

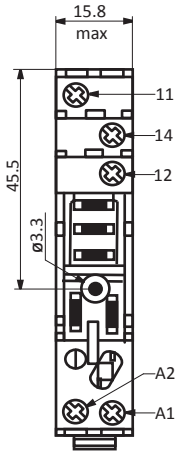
Z311.01, Z312.01

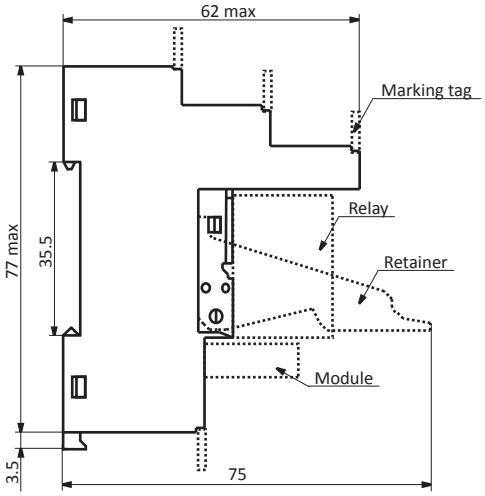
DIN-rail socket and accessories
For miniature plug-in relay 1 and 2 poles

Features

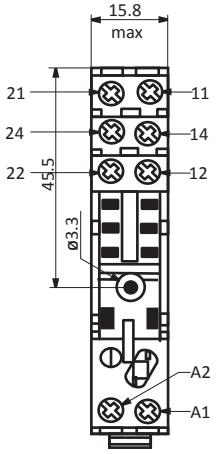
- Sockets for 35mm DIN rail mount or screw mounting
- Rising clamp terminals with screws
- Accessories: retaining clip, writing plates, modules
- Sockets and accessories comply with RoHS-Directive 2011/65/EU

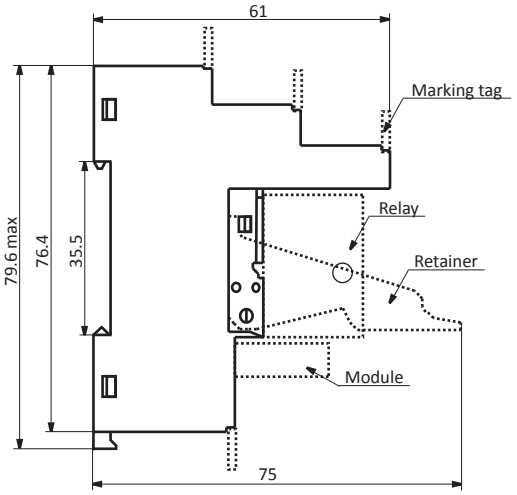
Z311.01 socket with screw connection for 1 pole relay





Z312.01 socket with screw connection for 2 pole relay





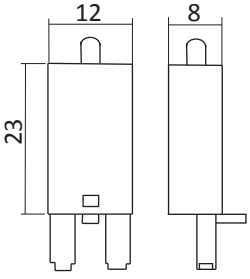
Z311.01, Z312.01

Technical data

Sockets with screw terminals for DIN-rail mounting	1 pole	2 pole
Rated current	16A	2x10A
Rated voltage	300VAC	300VAC
Dielectric strength coil / contact	4000VAC	4000VAC
Dielectric strength open contact circuit	2500VAC	2500VAC
Dielectric strength adjacent contact circuits	-------	2500VAC
Ambient temperature	-40 ..+85°C	
Terminal protection degree according to EN60529	IP20	
Terminal capacity	2 x 2.5 mm²	
Terminal capacity with cable end	2 x 1.5 mm²	
Maximum torque	1.0 Nm	
Screw type	Combination of slotted and Phillips head screw M3	
Packaging unit sockets	20 pcs	
Packaging unit retaining clips	10 pcs	
Packaging unit modules	20 pcs	
Approvals	CUL	

Standard part numbers	
DIN rail socket 1 pole	Z311.01
DIN rail socket 2 poles	Z312.01
Plastic retaining clip	Z437
Writing plate - supplied with socket	SR2P
Protection diode (+ A1)	Z318.53
Protection diode (+ A2)	Z318.50
Green LED + protection diode 6/24VDC (+ A1)	Z318.51
Red LED + protection diode 6/24VDC (+ A1)	Z318.51R
Green LED 6..24V AC/DC (+ A1)	Z318.52
Red LED 6..24V AC/DC (+ A1)	Z318.52R
Green LED + protection diode 6/24VDC (+ A2)	Z318.57
Red LED + protection diode 6/24VDC (+ A2)	Z318.57R
Green LED 110..230V AC/DC (+ A1)	Z318.58
Red LED 110..230V AC/DC (+ A1)	Z318.58R
Varistor 24VAC	Z318.54
Varistor 230VAC	Z318.55

* other Modules on request



Module Z318.5x

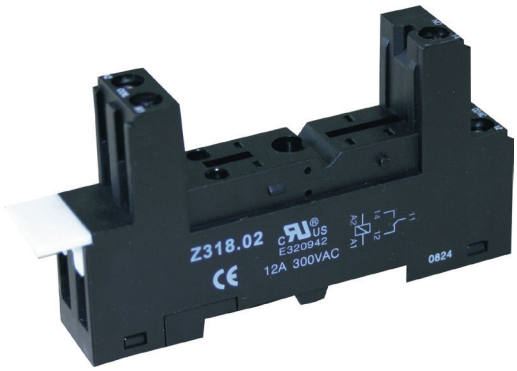
Clip Z437

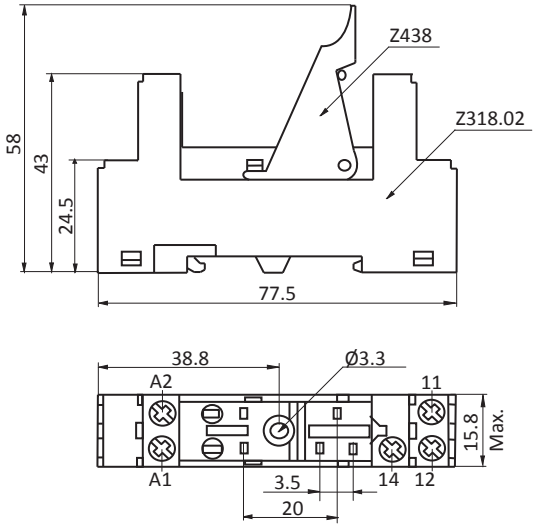
Z315 - Z319

DIN-rail socket and accessories
For power relay - 1 and 2 poles, 3.5 and 5.0 mm

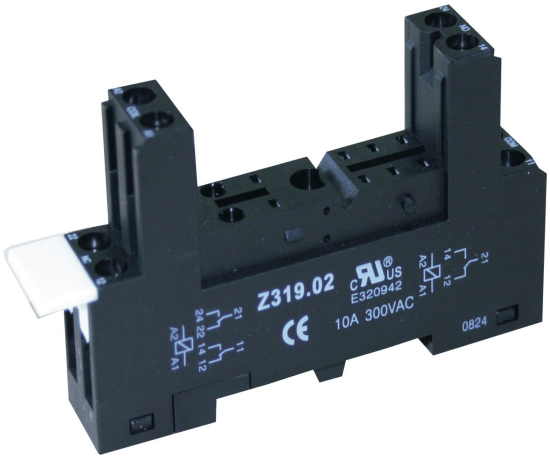
Features
- Protection group C250 (VDE 0110b/2)
- Sockets for 35mm DIN rail mount or screw mounting
- Rising clamp terminals with screws
- Accessories: modules, retaining clip, writing plates
- Sockets and accessories comply with RoHS-Directive 2011/65/EU

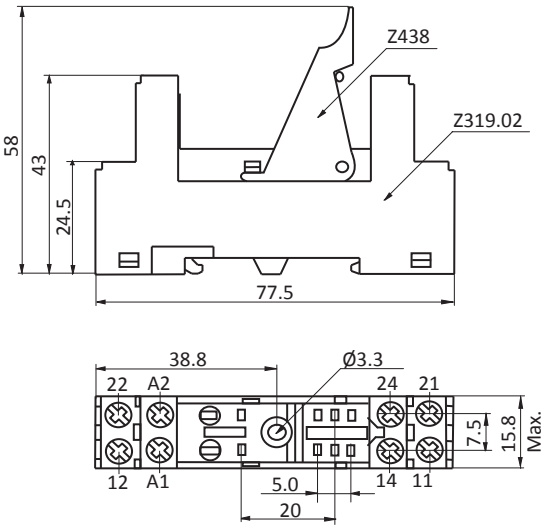
Z318.02 socket for 1 pole power relay, 3.5mm with screw connection, logical, C250





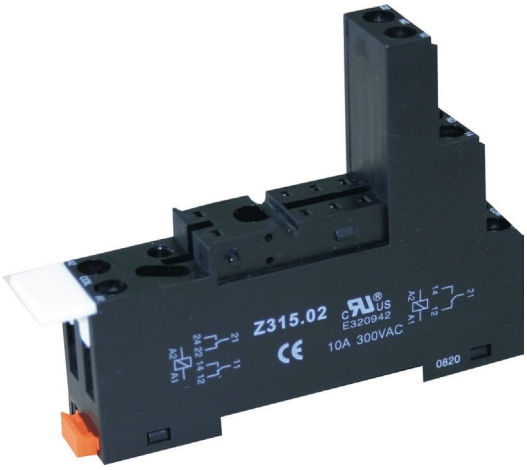
Z319.02 socket for 1 & 2 pole power relay, 5mm with screw connection, C250

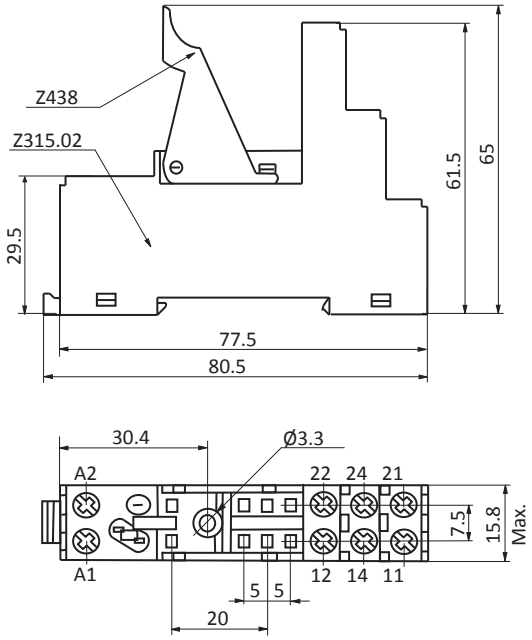




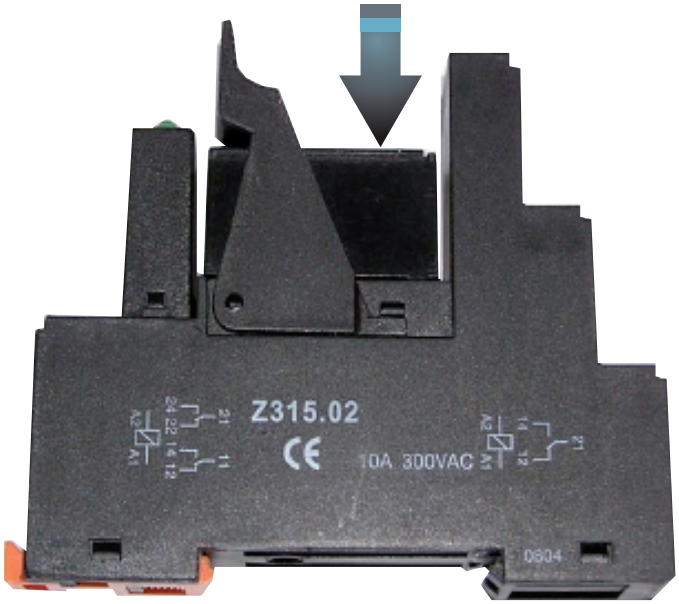
Z315 - Z319

Z315.02 socket for 1 & 2 pole power relay, 5mm with screw connection, logical, C250





To remove the relay easily, please press here while you push back the retaining clip



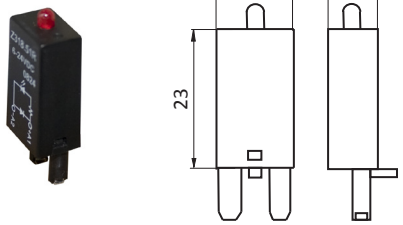
Z315 - Z319

Technical data			
Electrical / mechanical Data	Z318.02	Z319.02	Z315.02
Rated current	12A	10A*	10A*
Rated voltage	300VAC	300VAC	300VAC
Dielectric strength coil to contact circuits	4000VAC	4000VAC	4000VAC
Dielectric strength open contact circuit	1000VAC	1000VAC	1000VAC
Dielectric strength adjacent contact ciruits	-	2500VAC	2500VAC
Ambient temperature	-40 .. +70 °C		
Terminal protection degree acc. EN60529	IP20		
Terminal capacity	2 x 2.5 mm²		
Terminal capacity with cable end	2 x 1.5 mm²		
Maximum torque	0.7Nm		
Screw type	Combination of slotted and Phillips head screw - M3		
Packaging unit sockets	20 pcs.		
Packaging unit modules	20 pcs.		
Packaging unit retaining clips	20 pcs.		
Approvals	CUL		

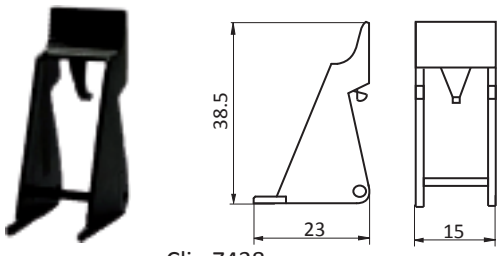
(*) for 1 pole relay 17A, the relay terminals 11-21, 12-22 and 14-24 have to be bridged.

Standard part numbers	
DIN rail socket 3.5 mm logical	Z318.02
DIN rail socket 5.0 mm	Z319.02
DIN rail socket 5.0 mm logical	Z315.02
Platic retaining clip	Z438
Writing plate - supplied with socket	SR2P
Protection diode (+ A1)	Z318.53
Protection diode (+ A2)	Z318.50
Green LED + protection diode 6/24VDC (+A1)	Z318.51
Red LED + protection diode 6/24VDC (+A1)	Z318.51R
Green LED 6..24V AC/DC (+ A1)	Z318.52
Red LED 6..24V AC/DC (+A1)	Z318.52R
Green LED + protection diode 6/24VDC (+A2)	Z318.57
Red LED + protection diode 6/24VDC (+A2)	Z318.57R
Green LED 110..230V AC/DC (+ A1)	Z318.58
Red LED 110..230V AC/DC (+ A1)	Z318.58R
Varistor 24VAC	Z318.54
Varistor 230VAC	Z318.55

* other Modules on request



Module Z318.5x



Clip Z438

Z315 - Z319

PCB socket for power relay

Features

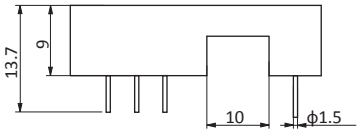
- Standard 3.5mm pinning for 1 pole relay
- Standard 5mm pinning for 1 and 2 poles relay
- Large cavity offering space to add component between sockets and PCB
- Sockets are RoHS compliant according 2011/65/EU

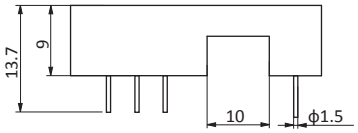
Technical data	Z316.01	Z317.01
Rated load	12A / 300V	8A / 300V
Dielectric Strength between coil and contact	5000V	5000V
Dielectric Strength between adjacent contact circuits	-	2000V
Ambient temperature	-40...+85°C	-40...+85°C
Metal retaining clip 15mm	88140	88140

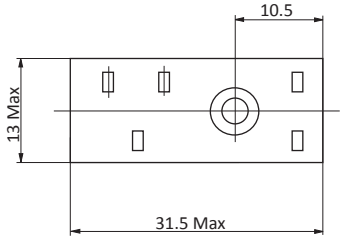
Z316.01

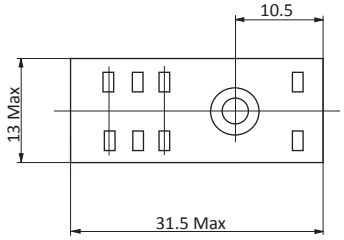
Z317.01

Dimensions

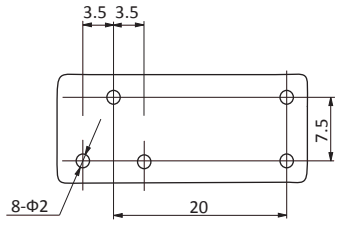


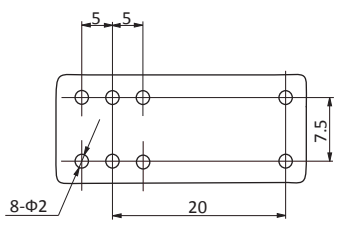






PCB-Layout





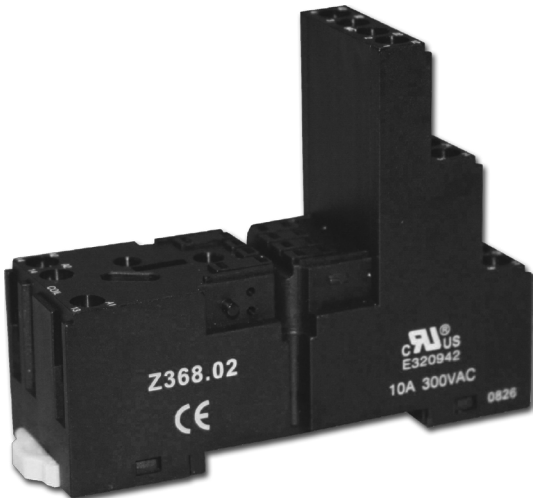
View on solder pins. Dimensions in mm.

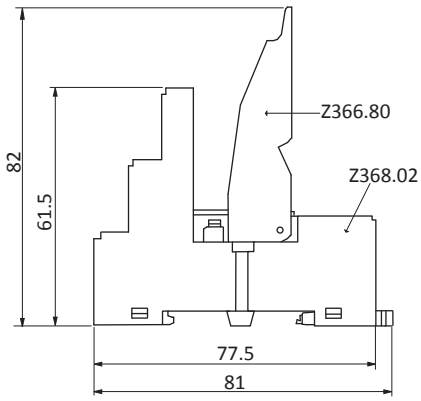
Z366.02, Z368.02

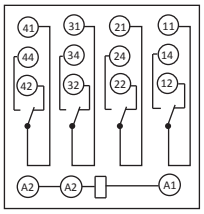
DIN-rail socket and accessories
For miniature 4 pole relay

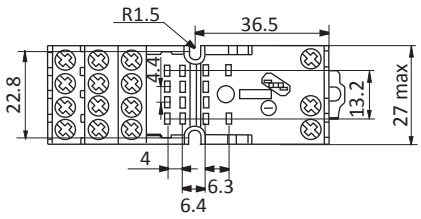
Features
- Protection group C250 (VDE 0110b/2)
- Sockets for 35mm DIN rail mount or screw mounting
- Rising clamp terminals
- Accessories: retaining clip, writing plates, modules
- Sockets and accessories comply with RoHS-Directive 2011/65/EU

Z368.02 socket for 4 pole relay with screw connection, logical

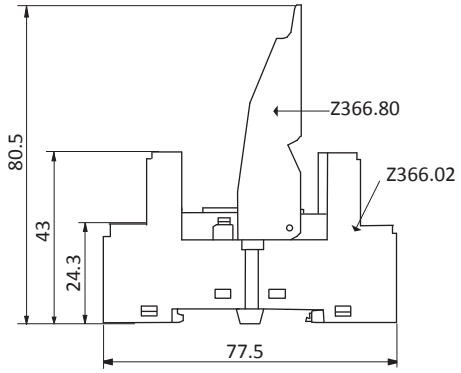


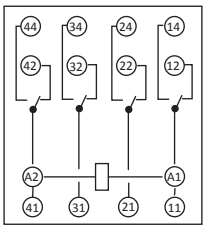


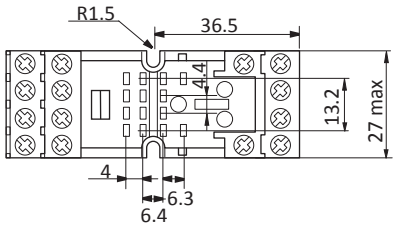




Z366.02 socket for 4 pole relay with screw connection







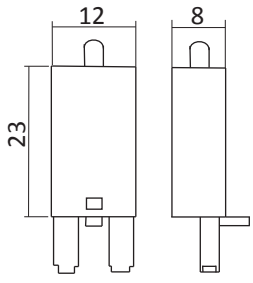
Z366.02, Z368.02

Technical data

Sockets with screw terminals for DIN-rail mounting	
Rated current	10A
Rated voltage	300VAC
Dielectric strength coil / contact	2500VAC
Dielectric strength open contact circuit	1200VAC
Dielectric strength adjacent contact circuits	2500VAC
Insulation category acc. VDE0110b/2.79	C250
Ambient temperature	-40 ..+85°C
Terminal protection degree according to EN60529	IP20
Terminal capacity	2 x 2.5 mm²
Terminal capacity with cable end	2 x 1.5 mm²
Maximum torque	0.7Nm
Screw type	Combination of slotted and Phillips head screw M3
Packaging unit sockets	10 pcs
Packaging unit retaining clips	10 pcs
Packaging unit modules	20 pcs
Approvals	CUL

Standard part numbers	
DIN rail socket - logical	Z368.02
DIN rail socket	Z366.02
Plastic retaining clip	Z366.80
Writing plate - supplied with socket	SK4P
Protection diode (+ A1)	Z318.53
Protection diode (+ A2)	Z318.50
Green LED + protection diode 6/24VDC (+ A1)	Z318.51
Red LED + protection diode 6/24VDC (+ A1)	Z318.51R
Green LED 6..24V AC/DC (+ A1)	Z318.52
Red LED 6..24V AC/DC (+ A1)	Z318.52R
Green LED + protection diode 6/24VDC (+ A2)	Z318.57
Red LED + protection diode 6/24VDC (+ A2)	Z318.57R
Green LED 110..230V AC/DC (+ A1)	Z318.58
Red LED 110..230V AC/DC (+ A1)	Z318.58R
Varistor 24VAC	Z318.54
Varistor 230VAC	Z318.55

* other Modules on request



Module Z318.5x

Clip Z366.80

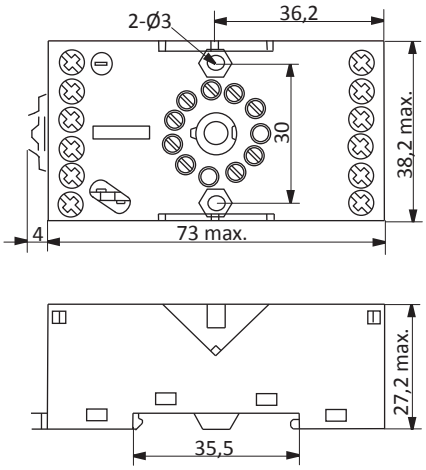
Z395, Z396

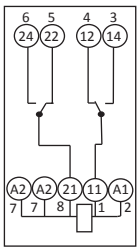
DIN-rail socket and accessories
For industrial 2 & 3 poe Relays

Features

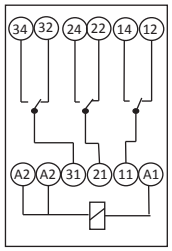
- Protection group C250 (VDE 0110b/2)
- Sockets for 35mm DIN rail mount or screw mounting
- Rising clamp terminals
- Accessories: timer, modules, retaining spring
- Sockets and accessories comply with RoHS-Directive 2011/65/EU

Z395 & Z396 sockets for 2 & 3 pole relay with screw connection, with module-slot





Z395



Z396

Z395, Z396

Technical data

Electrical / mechanical Data	Z395 & Z396
Rated current	12A
Rated voltage	300VAC
Dielectric strength coil to contact circuits	2500VAC
Dielectric strength open contact circuits	1500VAC
Dielectric strength adjacent contact circuits	2500VAC
Insulation category acc. VDE0110b/2.79	C250/B380
Ambient temperature	-40 ... +80°C
Protection category acc. EN60529	IP20
Terminal capacity	2 x 2.5 mm²
Terminal capacity with cable end	2 x 1.5 mm²
Maximum torque	0.8Nm
Screw type	Combi screw M3*
Packaging unit sockets	10 pcs.
Packaging unit modules	20 pcs.
Packaging unit retaining clips	10 pcs.
Approvals	CUL

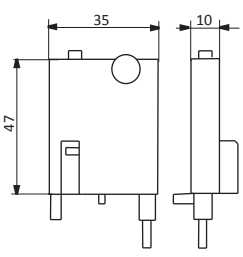
(*) Combination of slotted and Phillips head screw M3

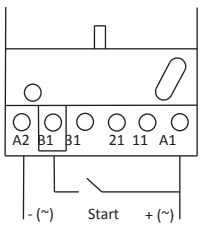
Standard part numbers	
DIN rail socket for 2 pole relay with module-slot	Z395
DIN rail socket for 3 pole relay with module-slot	Z396
Metallic retaining clip	Z434
Protection diode (+ A1)	Z396.50
Red LED + protection diode 6/24VDC (+ A1)	Z396.52
RC protection 110..240VAC	Z396.53
Varistor protection 24VAC	Z396.54
Varistor protection 230VAC	Z396.55
Red LED 230VAC	Z396.58
Timer Module with 8 functions Time from 50ms to 240h voltage from 24 to 240V AC/DC	Z396.64

Universal Timer Module Z396.64 for socket Z395 + Z396

- Multi voltage of 24 - 240VDC/AC
- Multi-functional with 8 functions
- Multi range from 50ms - 240h

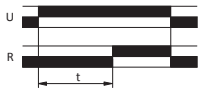
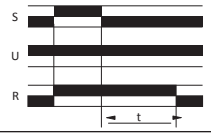
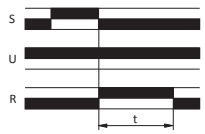
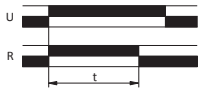
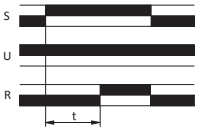
Time ranges, time range limit	Adjustment range
1 s	0.05s - 1s
10 s	0.5s - 10s
1 min	3s - 60s
10 min	30s - 600s
1 h	3min - 60min
10 h	30min - 600min
1 day / 24 h	1,2h - 24h
10 days / 240 h	12h - 240h





Z395, Z396

General data	
Voltage range supply	24V to 240VAC, 24 to 250VDC -15% to +10% in relation to rated voltage
Voltage range control contact	at 24V min. 80% of supply voltage at 230V min. 95% of supply voltage
Duty cycle	100%
Frequency	48Hz to 63Hz
Power failure bridging time	max. 10ms
Recovery time	Max. 100ms at 25°C, max. 150ms at 55°C
Adjustments	Time ranges and functions selectable via DIP switch Time setting via potentiometer
Temperature range	-25°C to +55°C
Indicators	Green “Power on” LED Green LED flashes during delay time
Supply voltage terminal	Plug-in to socket Z396

Functions	Description of Functions	Function diagram
E	Switch-on delay Start by switching the supply voltage	
R	Switch-off delay Start with control contact	
Ws	Switch-on wiper Start with control contact	
Wa	Switch-off wiper Start with control contact	
Wu	Switch-on wiper Start by switching the supply voltage	
Es	Switch-on delay Start with control contact	
Bp	Blinker 0 – starting Start by switching the supply-voltage	
Bi	Blinker 1 – starting Start by switching the supply voltage	

Memo

Relay General Application Guidelines

Preface

The product reliability is meant its working reliability. It is identified as the probability that a relay can perform a required function under given conditions for a given duration or number of cycles. It is formed by the product's intrinsic reliability and application reliability. The former is determined by the product design and manufacturing process, while the latter is related having the customer's proper selection and the manufacturer's the before-service and after-service. With many years' experience, we provide these application guidelines. Although we are not updated with the ever changing application circuits, we would like to discuss and exchange ideas with the customers so as to raise the working reliability of the relays.

1. SIMPLE PRINCIPLE

Relay is an automatic electrical switch, when given a certain input signal, such as electricity, magnetism, light, heat or pressure etc and maintain a long enough time, it can automatically switch the control circuit to produce a jump change. When the input is reduced to a certain extent and maintain a long enough time, it then restored to its original state, the control circuit is also stepped back to the original status. Regardless of the relay function principle and structure of any form, it is always consists of input circuit, comparative structure and output circuit. Therefore, the relay is a four-terminal component, and its input and output must be isolated.

Of electromagnetic relays, it is the electromagnetic suction and the elastic material mechanical reaction force that makes the jump change in the output circuit (contacts circuit) (regardless of permanent magnet of latching relay). After the relay has passed the verification of design and production, its electromagnetic suction and mechanical reaction force is generally able to meet the relationship shown in Figure 1. The arch is for electromagnetic suction, the curve is for mechanical reaction force. Here:

Uc rated voltage — Ub pick-up voltage, specified

Ue hold voltage, specified — Up actual pick-up voltage

Regarding the magnetic circuit, when the coil is powered, the magnetic components in the magnetic circuit will be magnetized. When coil is applied with Ub, it is a rational magnetic circuit design to have its partly magnetization curve of the magnetic system as A point in Figure 2, the soft magnetic parts close to full capacity when armature is pulled in ; When coil is applied with Uc, the curve is as that point B in Figure 2, the soft magnetic parts have been basically saturated when armature is pulled in.

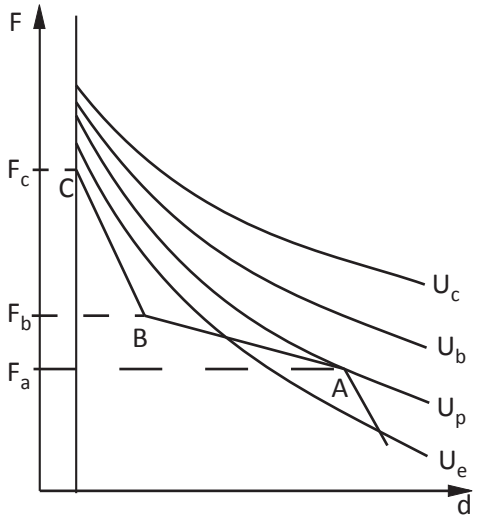


Figure 1:suction force and reaction force curve

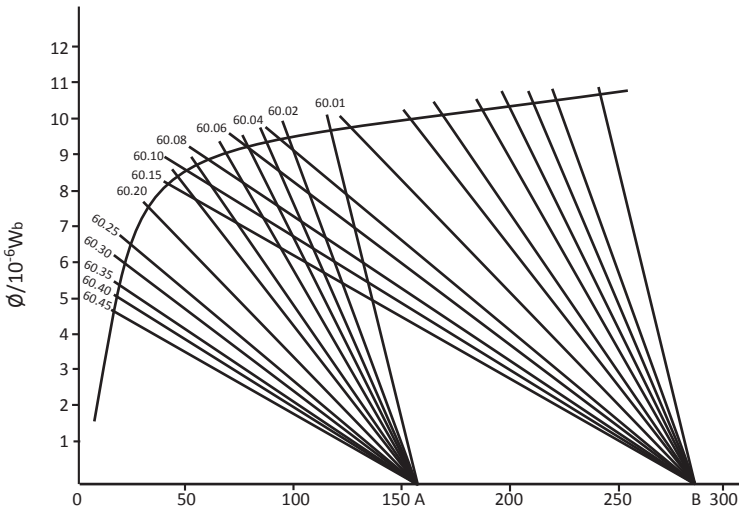


Figure 2:partly magnetization curve of the magnetic (δ is armature gap)

There are a lot of relay applications, thay summed up as follows:

1) Separation between the inout and output circuit
2) Signal transfer (from make break or whereas)
3) Strengthening output circuit (Between transfer several loads or different power loads)
4) Repeating signal
5) Transfer different voltage or current
6) Remain output signal
7) Locking circuit
8) Providing remote control

Relay General Application Guidelines

2. DEFINITION OF RELAY TERMINOLOGY

Electrical relay

Device designed to produce sudden and predetermined changes in one or more output circuits when certain conditions are fulfilled in the electric input circuits controlling the device.

All-or-Nothing Relay

Electrical relay ,which is intended to be energized by a quantity, the value of which is either within its operative range or effectively zero .

Note:"All-or-nothing relays "include both "elementary relays "and "time relays".

Electromechanical Relay

Electrical relay in which the intended response results mainly from the movement of mechanical elements.

Electromagnetic Relay

Electromechanical relay in with the designed response is produced by means of electromagnetic forces.

Monostable relay

Electrical relay which ,having responded to an energizing quantity and having changed its condition ,returns to its previous condition when that quantity is removed.

Bistable relay

Electrical relay which, having responded to an energizing quantity and having changed its condition ,remains in that condition after the quantity has been removed; a further appropriate energization is required to make it change its condition..

Polarized Relay

Elementary relay, the change of condition of which depends upon the polarity of its DC energizing quantity.

Latching Relay

A double stabilized relay remaining energizing state after energizing is gone. It is called a mechanic latching relay if the energizing state is latched mechanically. It is called a magnet latching relay if the energizing state is latched by the magnetic force from the hard magnet or half-hard magnet material.

Reed Relay

It is an electrical relay using the sealed contact part as the output circuit. The sealed contact part is also used as magnet armature. The relays are defined as wet and dry reed relays according to whether they use liquid metal mercury as their carrying liquid.

Rated Value

Value of a quantity used for specification purposes, established for a specific set of operating conditions.

Coil Rated Voltage

The coil voltage which make the relay work, meeting all the electrical, mechanical and environmental requirements.

Operate Voltage (also named pick-up value)

Value of the input voltage at which a relay operates .

Non-operate Voltage 8also named non-pick-up value)

Value of the input voltage at which a monostable relay does not operate.

Release Voltage

Value of the input voltage at which a monostable relay releases .

Non-release Voltage (sometimes it is called latching value)

Value of the input voltage at which a relay does not release .

Operate range of the input voltage

Rage of values of the input voltage for which a relay is able to perform its specified function.

Pickup value (voltage),specified

As the current or voltage on an unoperated relay is increased , the value (voltage) at or below which all contacts must function.

Hold value (voltage), specified

As the current or voltage on an operated relay is decreased , the value which must be reached before any contact change occurs.

Reset voltage

Value of the input voltage at which a bistable relay resets.

Non Reset voltage

Value of the input voltage at which a bistable relay does not reset.

Relay General Application Guidelines

Operate Time

Time interval between the application of the specified input voltage to a relay in the release condition and the change of state of the last output circuit, bounce time not included.

Release Time

Time interval between the removal of the specified input voltage from a monostable relay in the operate condition and the change of state of the last output circuit ,bounce time not included.

Reset time

Time interval between the application of the specified input voltage to a bistable relay in the operate condition and the change of state of the last output circuit, bounce time not included.

Bounce Time

For a contact which is closing /opening its circuit, time interval between the instant when the contact circuit first closes /opens and the instant when the circuit is finally closed/opened.

Notes: Bounce is defined by GJB as: it is one bounce when voltage drop between Contacts ≥ 90% of open circuit voltage, and the time≥10μs.*

Stabilization time

Time interval between the instant when a specified input voltage is applied to an electromechanical relay and the instant when the last output circuit is closed /open and fulfils the specified requirements, bounce time included.

Contact Time Difference

For a relay having several contacts of the same type, the difference between the maximum value of the operate(release) time of slowest and the minimum value of the operate(release) time of the fastest.

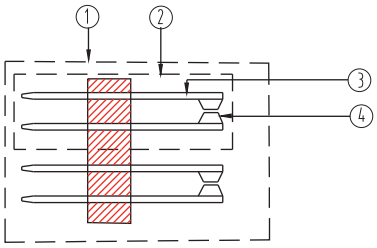
Contact circuit

Output circuit containing contact members.

Note : A change-over contact involves two connected contact circuits.

Contact set

Combination of contact within a relay, separated by their insulation (see Figure 3).



(1) contact set
(2)contact circuit; output circuit
(3)contact member
(4)contact point

Fig.3 Contact set

Contact point

Part of a contact member at which the contact circuit close or opens (see Figure 3).

Contact Resistance

Resistance or voltage-drop measured from the contact terminals when they are closed.

Notes:GJB specifies that the measuring part shall be within3.2mm from terminal end.

Contact Gap

Gap between the contact points when the contact circuit is open.

Creepage Distance

The shortest path along the surface of an insulating material between the two reference points.

Clearance

It is the shortest straight-line distance in air between the two reference points.

Shelf Life

The shelf duration interval when the relay cannot put into operation but can store before the relay's unstable change appears and when the relay cannot operate its function according to the concerned specs.

Confidence

Probability of estimated correctness.

Relay General Application Guidelines

Contact load categories - GB definition(that is IEC terminology)

CC0: A load characterized by a maximum switching voltage of 30mV and maximum switching current of 10mA

CC1: A low load without contact arcing.

NOTE Arcing with a duration of up to 1ms is disregarded.

CC2: A high load where contact arcing can occur.

Low level 10μA×50mV to 10mA×6V

Intermediate 10mA×6V to 100mA×28V

High level > 100mA×28V.

Load Types

Resistive: GB specified:L≤R×10-6;or L≤10-4 H(R-Ω,L-H)

GJB specified:L/R≤0.4ms; AC:cosΦ=1 0-001

Inductance：L/R=0.005s±15%,load range：<250V, <1A, used for communication, dataprocessing

L/R=0.040s ±15%, load range：0.02-600V, <100A, AC:cosΦ=0.4±0.1.

Note: allow to use other than 0.040s, yet consent is required between the manufacturer and the user.

Categories of protection

GB(IEC)specified:

RT0: Unenclosed contact Relay not provided with a protective case.

RTI: Dust protected relay Relay provided with a case which protects its mechanism from dust.

RTII: Flux proof relay Relay capable of being automatically soldered without allowing the migration of solder fluxes beyond the intended areas.

RTIII: Wash tight relay Relay capable of being automatically soldered and subsequently undergoing a washing process to remove flux residues without allowing the ingress of flux or washing solvents.

NOTE In service, this type of relay is sometimes vented to the atmosphere after the soldering or washing process, in this case the requirements with respect to clearances and creepage distances can change.

RTIV: Sealed relay Relay provided with a case which has no venting to the outside atmosphere, and having a time constant better than 2×104s in accordance with IEC 60068-2-17.

RTV: Hermetically sealed relay Sealed relay having an enhanced level of sealing, assuring a time constant better than 2×10^6s in accordance with IEC 60068-2-17.

GJB specified:

Dust cover;

Plastic seal:Leakage ratio≤1Pa·cm3/s;

Hermetic seal;

Effective cavity inside the product≥33cm^3,Leakage ratio≤1×10-1Pa·cm^3/s,

Effective cavity inside the product <33cm^3,Leakage ratio≤1×10-3Pa·cm^3/s.

Leakage Ratio

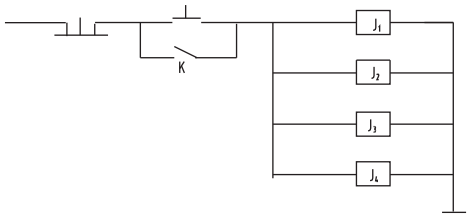
The dry air volume passing through one or several leakage channels per sec. under high pressure 101.3kPa and low pressure 0.13 kPa at 25°C.The unit is Pa·cm^3/s.

Basic Module

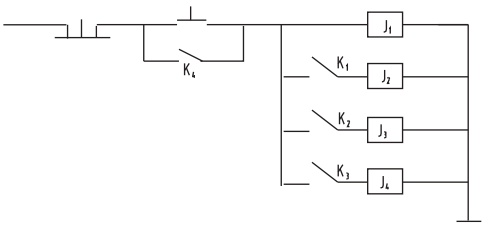
Module is a unit of size used as an increment in module co-ordination(ISO standard 1791) Basic module(M)is a step in a grid system as shown Fig 5.

Relay General Application Guidelines

Fig.7 Relay connect in parallel II



(a) Unreasonable parallel



(b) reasonable parallel

Fig.8 Relay connect in parallel III

D. Contact

1)General requirement

Contact shall be used based on rated load nature of the contact size, its upper limit shall not exceed the upper rating limit, and the lower limit shall not exceed the lower requirements. It is easy to have problems if contact not used within specs scope.

It is one of the methods to improve the reliability by use at lower rating, but be careful when decreased to intermediate current, especially at high temperatures. The relay contacts which can switch 10A reliably, may not be able to perform reliably at low current level; A product which can work reliably at rated load and low-level current, not necessarily reliable under intermediate current.

Should not improve contact rated load by using two contacts in parallel, nor enhance the rated voltage by application of contacts in series, because contacts do not always move simultaneously. When using redundancy technology to improve system reliability, pay attention to contact failure modes and failure mechanism. Two relay contacts connecting in parallel may make contact first off then on visa verse. When paralleling one relay contacts, it is important to the standards in accordance with, transfer time definition in MIL conclude several group of contacts, yet transfer time definition in IEC conclude only one group of contacts, not guaranteeing two pairs of contact group of the same product do not bridge connecting. Furthermore, the existing MIL-PRF-39016E on the contact first break then make testing is wrong. (see section 4.8.8.4.1 in M39016), need to implement the MIL-PRF-39016F: 2002 on testing method. However, its specified transfer time is only more than 1μS. By the way, the definition of transfer time in IEC 61811-50, -53 and -54 and -55 is similar with that in M39016F, but these standards for minimum transfer time specifies 100μs min.

Relay cover is marked with only the rated resistive load value, the ratings of other nature and the smallest rated load should check the product detailed specifications or obtain the related materials from manufacturer.

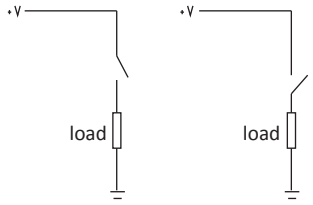
The relay which can switch single-phase AC power supply does not necessarily to be suitable to switch 2 non-synchronous single-phase AC load. Any product being used with more than 10mA/6V (resistive) or being tested is no longer recommended for low-level.

2) Contact Connect

Contact circuit and its symbol, see section 6. C.2).

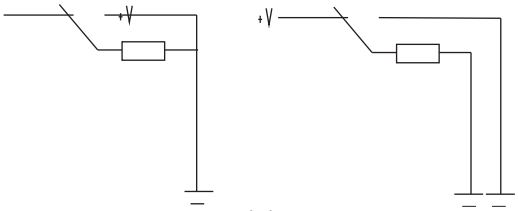
Connection of load circuits impact a lot on the contacts performance reliability. Figure 9 (b) is more reasonable than Figure 9 (a) , because the former arcing time is half shorter than the latter. Figure 10 are two unreasonable connection, especially in motor load, inductive load or capacitive load.

Relay General Application Guidelines



(a) Unreasonable

Fig.9 connection



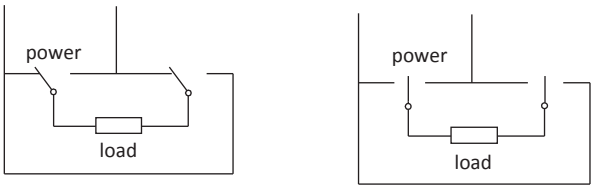
(b)Reasonable

Fig.10 Unreasonable load circuit

For phase conversion, polarity conversion load, three location contacts (E type) should be selected, such as Figure 10 and Figure 9 (b), yet, Figure 9 (a) is not recommended, unless authorized by manufacturer, at this time, product should have specific time for conversion, its life test should be in accordance with IEC 61810-1:2008 and IEC 61810-7:2006 requirements.

Contact between metal:

Contact with different metals can form electrolytic potential, at moisture or corrosive atmosphere, due to the impact of original battery, it will accelerate corrosion. Relevant relay standards require that the coupling between different metal potential difference must not exceed 0.25V. Table 4 gives commonly used metal electromotive force (with silver as the base) and permitted coupling of the metal. If the coupling after electromotive force more than 0.25V, the metal should be plated with another metal on, so as to ensure coupling electromotive force less than 0.25V.



(a) Unreasonable (b) Reasonable

Fig.11 Polarity conversion

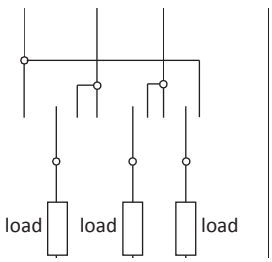


Fig.12 Phase conversion

E. When th contact load > CC1, there will be arcing, along with sparks and metal flying, therefore, RTO products are forbidden on PC board. RTO and RT I products are forbidden under explosive atmosphere or heavier wind sand condition, preferably RT 4 or RT 5 Products are recommended.

Although relay has certain anti-interference ability, but relay should not be installed near big magnetic field, unless being magnetic shielded, because of limited anti-interference ability. The interval between several relays installed side by side should be 1mm at least.

Relay General Application Guidelines

When install relays, do not hit on relays or bend the leads. For bolt or screw terminal installation, the torque should not be greater than the values listed in Table 5. If the terminal leads are too long, it is better to contact with manufacturers to get shorter leads products. The users should not cut leads short themselves.

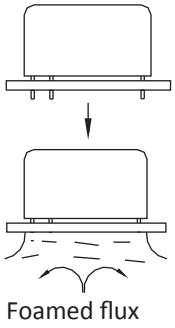
Table5 : Bolt Twisitng Force Value (Nm)

Bolt specs		M2.5	M3.0	M3.5	M4.0	M5.0	M6.0	M8.0
For wire connection	head-in	0.40	0.50	0.80	1.20	2.00	2.50	
	head-out	0.20	0.25	0.40	0.70	0.80		
For terminals		0.40	0.50	1.00	2.28	4.00	8.00	11.00
For mounting			1.00	2.00	4.20			

F. Relay soldering and Cleaning

1) Mounting

Avoid bending the terminals and hitting the relay. A bent terminal will not assure relay characteristics, especially a sealed relay. If the terminal is too long, please ask the manufacturer to make a short one, not to cut by yourself.

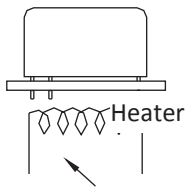


2) Flux coating

Do not overflow onto the top of PC board. Use rosin-based flux, not to use acid-based flux. Automatic flux coating is just suitable for sealed type relay, hand flux coating shall be used for dust-cover type relay.

3) Preheating

Preheating acts to improve solderability, but the preheating temp. shall not be over the highest temp. designed with the product.



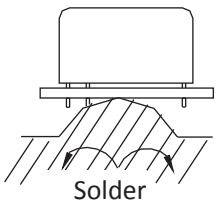
4) Soldering

The use of pure tin is not allowed, when using Sn-Pb alloy, Pb≥3%.

Table 6: Relay Soldering

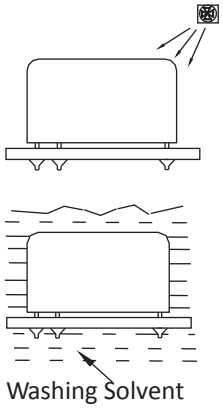
Automatic soldering	Hand soldering
Wave solering	Electric iron
No solder overflow PC board	Iron power 30-60W
Solder temp > 250°C (482°F)	Iron power ≥ 300°C (572°F)
Solder time ≤ 5s	Solder time ≤ 3s
Tin: H63, H65 or HISnPb10	Tin: H63, H65 or HISnPb10

Note: Soldering temperature with non-lead solder material should increase by 30°C.



5) Cooling

An immediate cooling after soldering, avoid using frozen gas blow. Clean relay when its temp. is back to the room temp. Avoid of terminal cut if terminal cat is carried out, breaking of wire at a coil may be caused by vibration of a catter.



6).Cleaning

Immersion cleaning is just suitable for sealed type relay. Avoid ultrasonic cleaning. Avoid the cleaning solvent penetrate the relay when brushing clean the relay. Use alcohol cleaning solvent. After cleaning, open the vent hole if there is one in the case, but avoid the solid particle dropping into the relay.

G. The contact between metals:

The contact between different metals will produce couples-potential difference, in the atmosphere of moist or corrosion, it will speed the corrosion by the effect of primary battery . The relative standard of relay have stipulated that the coupling potential difference should not be over 0.25V. The table 9 has listed common metals electromotive force (basic standard by silver) and compatible coupling metals. Ought to plate anther metal on the coupled metal to ensure coupled electromotive force being less than 0.25V, if the electromotive force is over 0.25V after coupling.

Relay General Application Guidelines

Group No.	Metallurgical category	EMF V	Anodic index 0.01V	
1	Gold, solid and plated; gold-platinum alloys; wrought platinum (most cathodic)	0.15	0	
2	Rhodium plated on silver-plated copper	0.05	10	
3	Silver, solid or plated; high silver alloys	0	15	
4	Nickel, solid or plated; monel metal high nickel-copper alloys	-0.15	30	
5	Copper, solid or plated; low brasses or bronzes silver solder; German silver; high copper-nickel alloys; nickel-chromium alloys; austenitic corrision-resistant steels	-0.20	35	
6	Commercial yellow brasses and bronzes	-0.25	40	
7	High brasses and bronzes, naval brass; Muntz metal	-0.30	45	
8	18 percent chromium type corrosion-resistant steels	-0.35	50	
9	Chromium, plated; Tin, plated; 12 percent chromium type corrosion-resistant steels	-0.45	60	
10	Tin-plate; tinplate; tin-load colder	-0.50	65	
11	Lead, solid or plated; high lead alloys	-0.55	70	
12	Aluminum, wrought alloys of the duralumin type	-0.60	75	
13	Iron, wrought alloys other than duralumin type; aluminum, case alloys of the silicon type	-0.70	85	
14	Aluminum, wrought alloys other than duralumin type; aluminum, case alloys of the silicon type	-0.75	90	
15	Aluminum, cast alloys other than silicon type; cadmium, plated and chromated	-0.80	95	
16	Hot-dip-zine plate; galvanized steel	-1.05	120	
17	Zinc, wrought; zinc-base die-casting alloys; Zinc, plated	-1.10	125	
18	Magnesium and magnesium-base alloys, cast and wrought (most anodic)	-1.60	175	

Note: Compatible couples-potential difference of 0.25V maximum between groups;

Relay General Application Guidelines

wires		Material	bareness single wire (A)	Non-bareness Wire or handle conductor (A)	Material	bareness single wire (A)	Non-bareness Wire or handle conductor (A)
Diameters (mm)	area (mm²)						
0.50	0.20	Cu	11	2	Al	60	36
0.60	0.28		16	5		83	50
0.80	0.50		22	7.5		108	66
1.00	0.79		32	10		152	82
1.25	1.23		41	13		174	105
1.60	2.01		55	17		202	123
2.00	3.14		73	23		235	145
2.80	6.16		101	33		266	162
3.15	7.80		135	46			
4.00	12.57		181	60			
5.60	24.63		211	80			
6.50	33.18		245	100			
7.20	40.72		283	125			
8.00	50.27		382	150			
9.00	63.62			175			
11.00	95.02			200			

(4) Users should select the appropriate relay based on the conditions of operation.
(5) Manufacturers should provide the necessary data such as the reliability of the rated life expectancy and its failure rate (including the confidence level) and cautions at use.

REFERENCE DOCUMENT

[1] MIL-PRF-39016F:2002;MIL-PRF-32140:2004;MIL-STD-217F:1991;MIL-STD-1346B:1985;
[2] GB/T 2900.63;GB/T 21711.1-2008;
[3] NARM:«'Engineers' Relay Handbook»1990;
[4] IEC 60255-23:IEC 61709:1996;IEC 61810-1:2008;IEC 61810-2:2005IEC 61810-7:2006;
[5] GJB 65B-94,GJB 360A-96; GJB 548;GJB 1461-92;
[6] Zhou Jian-xiong:"JRC-490M Design of Ultra-compact Sealed DC Electromagnetic Relay", Electrical components,1998 NO.2.
[7] Electronics Standardization Institute:"The Base of Reliability" 1980.
[8] Zheng Tian-pei:"Inspection of Electromagnetic Relay" Ningbo Forward Relay Corporation Ltd.2006
[9] Zhang Jiao-suo:"The Research of Relay Arc Phenomenon and Its Parameters Test", master's thesis of Xi'an Jiaotong University 1987
[10] Ningbo Forward Relay Corporation Ltd "Product Catalogue"2005

Relay General Application Guidelines

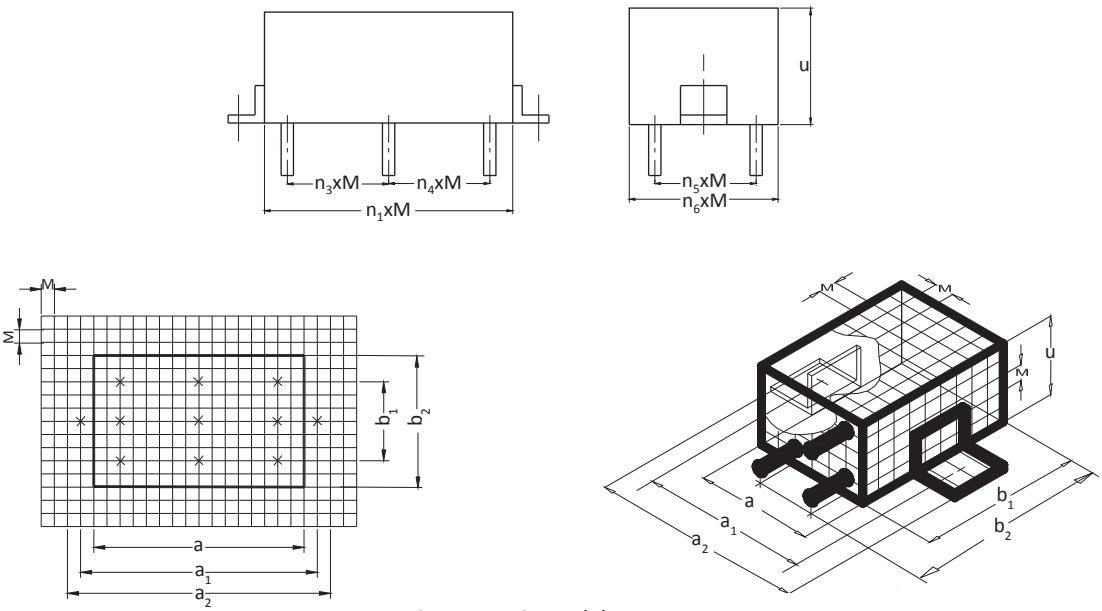


Fig.4 Basic Module

3.CONCERNED STANDARD INTRODUCTION

(Just for controlling Relays)

The standard of People's Republic of China(GB) is identical with IEC(International Electromechanical Commission),while the military standard of PRC(GJB) is identical with MIL(America Military) standard. They are specified as follows:

Table of Standard Contents

IEC 61810-1 “Electromechanical elementary relays Part 1:General and safety requirements”

IEC 61810-7 “Electromechanical elementary relays Part 7:Test and measurement procedures”

GB/T10232-94 “ Electrical Relays Part 7:Test and Measurement Procedures for electromechanical All-or-Nothing Relay”(equal to IEC 255-7)

GB/T 14598.1-2002“Electrical Relays Part 23:Contact Performance”(IEC 60255-23:1994 IDT)

GB/T 14598.2-93“Electrical Relays All-or Nothing Electrical Relays”(IEC 255-1-00 IDT)

GB/T 14598.3-93“Electrical Relays Part 5:Insulation tests for Electrical Relays”(IEC 255-5 IDT)

GB/T 14598.4-93“Electrical Relays Part 14:Endurance Test for Electrical Relays Contacts-Preferred Values for Contact Loads”(IEC 255-14 IDT)

GB/T 14598.5-93“Electrical Relays Part 15:Endurance Tests for Electrical Relays Contacts Specification for the Characteristics of Test Equipment”(IEC 255-15 IDT)

GB/T 14598.6-93“Electrical Relays Part 18:Dimensions for General Purpose All-or-Nothing Relays”(IEC 255-18 IDT)

GB/T 14598.7-95“Electrical Relays Part 3:Single Input Energizing Volume Relay with Timing Limit and Self Timing Limit”(IEC 255-3 IDT)

GB/T 14598.8-95“Electrical Relays part 20: Protective System”(IEC 255-20 IDT)

GB/T 14598.9-95“Electrical Relays Part 22:Volume Relay and Protective Device Electrical Distribution Test, Part 3 Electromagnetic Field Distribution Test”(IEC 255-22-3 IDT)

GB/T 14598.10-96“Electrical Relays Part 22:Volume Relay and Protective Device Electrical Distribution Test, Part 4 Fast Instant Distribution Test”(IEC 255-22-4 IDT)

GB/T 14598.11-1997“Electrical Relays Part 19: Sectional Specification Electromechanical All-or Nothing Relays of Assessed Quality”(IEC 255-19 IDT)

GB/T 14598.12-1998“Electrical Relays Part 19: Blank Detail Specification Electromechanical All-or Nothing Relays of Assessed Quality Test Schedules 1, 2 and 3”(IEC 255-19-1 IDT)

GB/T 16608-2002“Electrical Relays Part 10: Application of the IEC Quality Assessment System for Electronic Components to All-or-Nothing Relays”(IEC 255-10 IDT)

GJB 65B-99“Relays, electromagnetic , established reliability, general specification for”(MIL-R-39016E IDT)

GJB 1042A-2002“Relays, electromagnetic, general specification for”(MIL-R-5757H IDT)

GJB 1461“Relays electromagnetic including established Reliability Type, general specification for” (MIL-R-6106J IDT)
GJB 1513“Relays ,hybrid and solid state, time delay, general specification for”(MIL-R-83726B IDT)
GJB 1514“Relays ,mercury wetted reed, general specification for”(MIL-R-83407 IDT)
GJB 1515“Relays ,solid state, general specification for”(MIL-R-28750 IDT)
GJB1930“Switches, reed, general specification for”(equal to MIL-S-55433)
GJB2449“Relays , electromechanical ,general purpose ,non-hermetically sealed, plasticenclosure, general specification for” (equal to MIL-R-83520)
GJB2888“Relays ,electromagnetic, power switching , established reliability, general specification for” equal to (MIL-R-83536)

4. GENERAL REQUIREMENTS

A. Safety

1) Life and property safety, and pollution free

Relay should maximize the use of environmental protection materials, recyclable materials and regenerated materials. Materials should be able to self-extinguishing, Not self-ignition, non-combustion, non-release harmful levels of gases (such as to enable cover explosion, toxic or to contaminate contact); at a longer period of time (3 ~ 7 years), no transformation, non-deformation; plastics used must be thermosetting, no cotton or wood filler; reinforced plastics should not release solid particles in the thermal shock; leak test should not use silicone oil; external part shall have zinc plated; forbidden or less use of the following 18 kinds of materials, use only when other materials can not meet the performance requirements, these materials are：

Chromium and its compounds, cadmium and its compounds, lead and its compounds, mercury and its compounds, nickel and its compounds, benzene, toluene, xylene, dichloroethane, chloroform, trichlorethylene, tetrachlorophthalic ethylene, tetrafluoroethylene CFC, MEK, Freon, cyanide and its compounds, methyl isobutyl ketone, magnesium and its compounds.

Others, such as electromagnetic interference, radio frequency interference, noise and electromagnetic compatibility and other restrictions should also be limited.

Some European users claim not to use poly PBDE (PBDE), poly biphenyls (PBB) and perfluorooctane acid (PFOS) (as a flame retardant).

2)Normal performance under predictable environment

That is environmental adaptability, such as insulation (including lightning strikes, electrical clearance, creepage distance, etc.), dangerous fire test, heat and flame resistance, PTI, flame, electromagnetic interference and mechanical stress (vibration shocks, centrifugation, etc.) and some climate parameters (climate cycle, thermal shock, humidity, salt spray, thermal resistance, dust, solvent resistance and fluid contamination, etc.). Furthermore, products and their packages should be able to withstand rough road transportation, such as vibrations and swing tests, as well as storage test.

Material highest temperature specified and its proof should be in line with IEC 60695-2-10 and IEC 61810-1:2008 Article 16. Material should be subject to IEC 60695-2-12 (flammability index) and IEC 60695-2-13 (ignition temperature) test.

B. Quality consistency

Product selection can get away failed product at early stage and improve the reliability of the entire batch of products, but the selection can not improve the reliability of single product. It should not rely on selection to get best individual product from a lot. Therefore, 100% test items (such as hand-over inspection), if the failure number is cumulatively more than 10%, the entire batch should be rejected.

C. Useful life and failure rate

There are two ways to express product function reliability

1) In determining the percentage of failure (also known as the cumulative failure rate) under the cycle number, that is, the useful life expectancy. On behalf of IEC 61810-2:2005 and MIL-PRF-32140: 2004. The former specifies failure percentage as 10%, confidence level as 90%. The later specifies a cumulative failure rate as 1%, confidence level as 95%. Both get from Weibull distribution.

2) The largest failure rate within useful life expectancy, it represents in M39016E, M6106J, M83536A and IEC 60255-23. MIL indicates product failure rate got from index sub-layout, classification and upgrading test confidence level as 90%, the maintenance of test confidence level as 60%. IEC is got from Weibull distribution.

Note: a) The failure rate and useful life provided by manufacturers are got from testing lab, not the user's actual failure rate at the time of use, the conversion relations is referred in item 5.1.
b) As the test data is obtained from a test laboratory, there is an issue of confidence level (1-α), that is, the probability estimates are right. In other words, users have certain risk, the risk is (α).

D. Quality assurance

1) Quality assurance systems: Quality assurance systems are ISO9001, ISO14001, ISO/TS 16949, QS 9000 and GJB 546 and GJB/T 9001.

2)Testing instruments and equipment

Modern industrial production approach great importance to SPC (statistical process control), it requires data to do statistics, requires inspection to get the data. In relay manufacturing process, (regardless of semi-automatic automatic manufacturing) have several quality control points, inspecting a certain number of parts and components every day from time to time for quality control and supervision. There are dozens of items in ISO9001 mentioned about inspection and testing. There are two key factors in inspection and testing: First is testing instruments and equipment; second is testing standards. This is also one of the key parts in Quality Assurance, One of five elements in QS9000 is MSA (Measurement Systems Analysis).

Detected by the instrument, equipment must go through the standardization of the review should be subject to a considerable level of identification of sector organizations. Detected used instruments, equipment, testing theory, testing methods, and add stress, data collection and failure criterion must be consistent with existing standards, and even nouns, terminology. Instrumentation, the life should not be based on the length of time should be based on compliance with existing criteria. Their regular school certificates and seized standard should be marked on the name, standard number and year of release. Instrumentation, equipment manufaturers and the supplier should provide a measurement system analysis (including error analysis) and identification of certificate, identification certificate shall be marked with the name of the standard, the standard number, version and release year, rather than marked in line with the general MIL or IEC . Standard of care in general a few years will be revised or updated.

Domestic relay the relevant standards are generally equivalent to the corresponding international standards, GJB equivalent MIL, such as GJB 65B-99 idt MIL-PRF-39016E: 1994; GB / T equivalent to IEC, such as GB / T 10232-93 idt IEC 255-7 : 1991, but often after several years later. Such as MIL-PRF-39016F: 2002, MIL-PRF-32140: 2004 or IEC 61810-1:2008, IEC 61810-2:2005 and IEC 61810-7:2006 (the predecessor of which is IEC 255-7), etc. At present, no equivalent to the corresponding standard.

5. SELECTION OF RELAY

It is an important aspect to have relay reliable performance for users to select proper relay according to their usage conditions and requirements, some cases are listed in Table 1 for user reference.

Relay General Application Guidelines

Table 1 Relay parameters and their using conditions

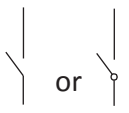
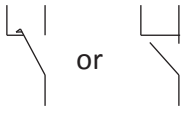
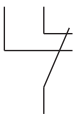
Item	Using Conditions	Requirements	Remarks
Energizing condition	DC or AC Rated Value	DC or AC relay Rated voltage Uc Pick-up voltage Ub≤75%Uc(DC) ≤85%Uc(AC) Release voltage Uf≤10%~5%(DC) ≤15%Uc(AC)	AC relay shall specify 50Hz or 60Hz Tolerance: MIL ±10%,IEC ±5%. When voltage from Ub→Uc→Ue or from Uf→0→Ua (non-operate voltage), contact is not allowed to change status (break or re-close),except for normal contact bounce back Measurement should be done at three axles.
	Output power Power supply res Rs (or Zs) Max environmental temp Tmax Provide DC supply by using component or filter, Continuous working (energizing) for several days	Coil consumption(W) Coil resistance R_0 (or Z_0)should >20 times R_S or Z_S Max allowed working temp Tmax Heat resistance=ΔT/W Temp rise ΔT= material temp-Tmax When component anti-voltage at ≤10Uc,should have coil Latching relay	 Tolerance ±10% Base temp 23°C Any transient suppresion will affect relay pu-in and drop-out time as well as life.
Load switching	Switching mode and load numbers, phase transfer. Rated load nature & level. allowed contact circuit consumption allowed contact circuit resistance abnormal change time. Rated life Failure rate	Contact mode and load numbers Best to select(K)type contact Rated load nature, max value and min value Pay attention to inrush current of special load. Contact circuit resistance(or voltage drop)and its stability. That is under Ub,Uc,Ue and Uf,zero, Ua contact circuit resistance and difference of max and min. If <10μS,it should be specified in the contract Rated life(whether with reliability) Failure rate under different rated loads	Contact types referring to table 2 Tolerance ±10%; inrush current of special load referring to table 3. Difference of max and min contact circuit resistance should be =10% of beginning value. Step function testing,test per each cycle,total 3 times. IEC specify any abnormal changes less than 10μS is to be ignored Best value under Tmax Failure ratio of middle level current under high temperature specify separately. Manufacturer should provide magnet route structure type
Time parameters	Max switching ratio Allowed max switching time Transfer time	max switching ratio $=\frac{0.1}{t_0+t_r}$(time/s) t_0 operate time, t_r release time time for contact to stable closing (or break) t_c Transfer time t_s	Higher level (or CC2) should reduce t_s≥1μS(MIL) or t_s≥100μS (IEC)

Relay General Application Guidelines

Table 1 Relay parameters and their using conditions

Item	Using Conditions	Requirements	Remarks
Environmental condition	Environmental temp	Allowed operating temp range	
	PC Board use	Not to select RT0, should select RTII ~ RTV	Terminal pin space distance and mounting holes space distance is full times of 0.508mm.
		solder ability	
		solder heat-resistant	Pb free solder material is 30°C higher than that of Pb solder material
	1000m above high air space or high vacuum	Low air pressure Best to select latching relay	
	Used on transport equipmet (tools).	It is better to add bumps and (or) swing tests besides vibration shock and centrifuge tests.	Discuss with manufacturer for specific requirement
	damp or corrosive	Relative humidity, salt spray, solvent resistant and fluid tests	
	gases containing explosiv gas	Should select RTIV or RTV	
	place sensitive to electomagnetism	Electromagnetic Compatibility	Manufacturer should provide effective internal space for the produc in accordance with GJB 151A and GJB 152A, discuss with manufacturer for specific request.
	Several products side-by-side or near large current line	Electromagnetic interference	
	Insulation property	Insulation resistance, Dielectric strength (including lightning strike) clearance, creeping distance, PTI	
	Mounting method	Mounting method	
	socket	Contact resitance between relay terminal pin and socket	May be meassured with contact circuit in the socket
	Safety certificates	UL, VDE, TÜV, CCC, CQC etc.	
	For special items, try to find the relevant standards, if there is no standards to be based on, should try to put forward specific quantitative requirements and test methods.		
Notes:	Unless otherwise specified, all electrical and mechanical and environmental parameters tolerance is ± 10% It shall be speculated in the contract if there are other requirements, as when there.		

Table 2: contact arrangements

Name		SPSTNO	SPSTNC	SPDT(B-M)	SPDTNO	SPDT(M-B)	SPSTNODM	SPSTNCDM
Marks								
Alphabet Lettet	China	H	D	Z	E	B	SH	SD
	USA	A	B	C	K	D	U	V

Relay General Application Guidelines

Table 3: Types of loads and level of inrush current

Types of loads	Level of inrush current	Inrush time(s)	Remarks
Resistive	Steady current		$L \leq 10^{-4}H$ or $\cos\phi => 0.95$
Solenoid	10-20 times as large as the steady current	0.07-0.1	Shall be regarded as inductive load, but $\tau=L/R < 10^{-4}s$ can be regarded as resistive load
Motor	5-10 times as large as the steady current	0.2-0.5	Can replace the test with 5-6 times current resistive load
Incadescent lamp	10-15 times as large as the steady current	0.34	
Mercury lamp	About 3 times as large as the steady current	180~300	
Flourescent lamp	5-10 times as large as the steady current	≤10	
Sodium vapor lamp	1-3 times as large as the steady current		
Condenser	20-40 times as large as the steady current	0.01-0.04	Long transfer wire, fiter, power source shall be regarded as capacitive load
Transformer	5-15 times as large as the steady current		
Contactor	3-10 times as large as the steady current	0.02-0.04	

6. The use of Relays

A. Reliability and an average failure interval

Reliability, as mentioned above, there are two expressions: one for rated life expectancy under certain failure percentage (cumulative failure rate); one for the greatest failure rate within a given life expectancy period. The former is raised after 2004.

1.) Reliability level

Reliability R (t) according to the definition of probability theory, there is R (t0) = 1-F (t0), F (t) for the cumulative failure rate (or failure percentage). If t0 for useful life expectancy with reliability index, according to IEC 61810-2:2005 provisions, F (t_0) ≤ 10%, confidence level is 90% then there is reliability of R (t0) = 1-F (t0) = 90%, the user's risk 10%. In accordance with MIL-PRF-32140: 2004 requirements, F (t0) ≤ 1%, confidence level is 95%, then there is reliability degree of R (t0) = 1-F (t0) = 99%, the user's risk is 5%.

Note: a) IEC and MIL get useful Life expectancy (t0) and the reliability R (t0) by using Weibull distribution.
b) Different rated load has a different failure mode and mechanism, so a Weibull straight line can only represent one rated load.
c) The rated life expectancy (tj) of a product without reliability specs, naturally not have R (tj ') values, it is not subject to restrictions of the failure percentage, only pass or failure.

2.) Mean operating time between failures MTBF

Accrding to the definition of MTBF = 1 / λ, the failure rate provided by the manufacturers is not the act al failure rate in use, user's failure rate λ should be converted based on actual usage conditions and product magnetic circui.

Military product in accordance with MIL-STD-217F: 1991 has $\lambda = \lambda T \cdot \pi L \cdot \pi Q \cdot \pi E \cdot \pi C \cdot \pi CY \cdot \pi F$ unit Fitow or h^{-1}.
Note: πF for structural parameters, related to the magnetic circuit structure. (See Appendix A)

Commercial products in accordance with IEC 61709:1996, has $\lambda c = \lambda r \cdot \pi ES \cdot \pi s \cdot \pi T$ unit1 / cycle. λR in the formula is failure rate provided by the factory, π for a variety of factors (see Appendix A).
λ = f ·λc , f for actual motion of each h.

Relay General Application Guidelines

Note: a) MIL λ_R is got by exponential distribution, and samples under test are equally patterned in accordance with the rated load, therefore, in terms of single rated load, the number of samples are not in conformity with a given failure rate by number of samples required. Furthermore, grading and upgrading qualification test confidence level 90%, user's risk 10%; maintaining qualification test confidence level 60%, user's risk is 40%.
b) M39016F specify high-temperature intermediate-current (100mA/28V) is not included in the failure rate calculation, but required samples number is 4, per action motion 5 × 104 times, one failure is allowed. If the intermediate-current test fails, the failure rate qualification test is still determined as a failure.

I think for the products with reliability specs, it is significant benefit for the users to determine the system reliability and estimate working hours if manufactures can provide useful life expectancy and failure rate under assured failure percentage, because the former can not determine failure rate of each motion within the life expectancy , while the latter can not determine the reliability level within the life expectancy.

B. Incoming inspection

Products must have a factory test certificate, if necessary, a third-party inspection report is required. Condition allowed, incoming inspection should be done, pay attention to the following for incoming inspection

1) Documentation procedures: order contract - product detail specs - general specification - quality assurance regulations, documents.
2) Inspection and testing instrument and equipment should be in accordance with the requirements of 4.D).2.
3) Manufacturer should give priority to the use of general specs or standards for test circuit and (or) equipment to make the testing, it is acceptable to use the same effective other testing methods due to production or other request, but the equivalent method must be approved by the qualification department or user. In case of dispute, arbitration is referred based on general specs or standard,.
4) Inspection and testing must be done in accordance with the relevant standards, including the measurement sequence. Product detail specs, general specification and relative standards should be the most latest updated and effective version.
5) Other cautions:

a) Unless otherwise specified, before the test. the product should not be damage or non-destructive treatment which may make the test results invalid.
b) The previous item measurement should not make the next item measurement invalid.
c) Testing should not bring any pollution and damage to the products.
d) Measurement should be repeatability and reproducibility.
e) It is better to have statistical analysis on the batch test results.

The relevant detailed information regarding testing, please see the "Electromagnetic Relay Testing " published by Ningbo Forward Relay Corporation Ltd. in 2006.

C. Coil

1)General requirement

Power: Power adjustment rate should be≤ 5%, the ripple of DC power supply should be <6% peak - peak cycle and random drift <1%; AC power should be sine wave, waveform coefficient between 0.95 ~ 1.25, waveform distortion < 1%.

Energizing amount: rated value (including polarity). If there are no other requirements, tolerance is± 10%. Actual to be zero under release status, voltage caused by the leakage current should be <2%.
Note: a) The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay .
b) pick-up, hold and release voltage for test purposes only, are not to be used as design criteria.
c) NARM states in "Engineer's Relay Handbook" 15.3.7: " relay should not work under pick-up voltage.
d) when energizing is too high, the higher part after pulling-in will be converted mostly to heat and flux leakage, more harm than good.

Energizing time: relay at continuous work should be energized continuously; magnetic latching relays energizing time is three times the operate or release time, whichever is greater; for the dual-coil magnetic latching relay, two coils should not be energized at the same time.

Relay General Application Guidelines

Suppression circuit: it is not recommended for the users to add their own suppression circuit, any transient suppression circuit will extend the action or (and) the release time, affecting life expectancy. If needed, consult with the manufacturers and state in the contract, it is best to have the factory to provided, where necessary, to carry out life test.

2)Circuit Connection

MIL specify the circuit diagrams should be printed on the relay cover in the following way.
Circuit diagrams side face up, then turn the relay through the circuit diagram axial direction, until the lead end facing the observer. At this time, every lead at the location of the circuit diagram shown up. The coil lead positive polarity indicated by special color glass insulator. IEC standard mark number for other leads, mark "+" for coil lead.

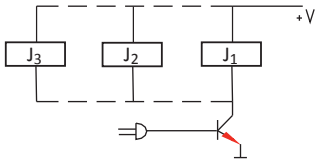
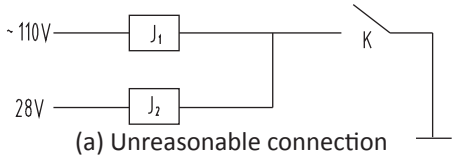
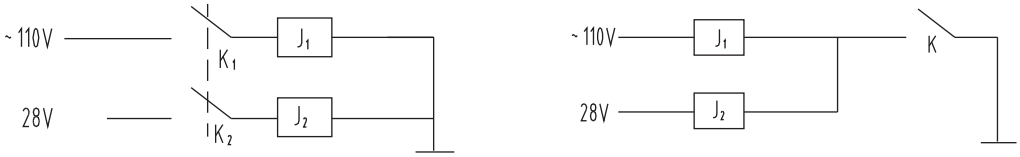


Fig.5 Transistor driven circuit

When energizing with transistors, it is important to pay attention to the relationship of leakage current and conduction voltage drop and working current, circuit as shown in Figure 5, it is OK to inspire one relay, but not functional to inspire two relays, when inspiring 3 relays, the relays will not be able to function. When several product coils in parallel, pay attention to coil counter electromotive force, because drop-out and pull-in of several products are not always at the same time. Figure 6 to Figure 8 is comparison of several commonly used circuits in parallel.

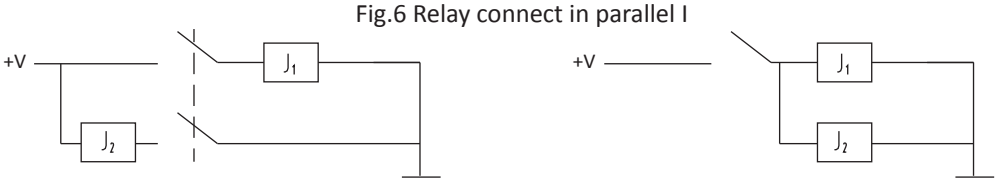


(a) Unreasonable connection

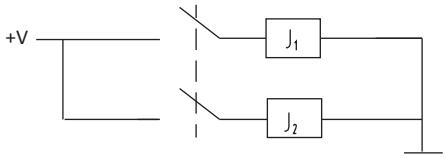


(b) Reasonable connection

Fig.6 Relay connect in parallel I



(a,b) Unreasonable connect in parallel



(c) Reasonable connect in parallel

Memo

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