HASCO®

Quality and Reliability Since 1976

HASCO Relays Are Now ISO 9002 Certified

Relays

Reed Relays

Reed Switches

RoHS Compliant

Pb

Hasco **Components International Corporation**
www.hascorelays.com • email: info@hascorelays.com
(516) 328-9292 • Fax (516) 326-9125
906 Jericho Turnpike, New Hyde Park, NY 11040

About HASCO® COMPONENTS INTERNATIONAL, CORP.

Hasco Components International Corporation was established in 1976 as a reed switch and reed relay company. In 1979 Hasco added electromechanical relays to its line. It's mission has been simple. Produce high quality parts, keep a large inventory, keeps costs down and most important, give everyone you are dealing with 100% personal attention. Our founder once said, "anyone can sell a relay, Hasco sells service."

Our Factory:

Deal with the manufacturer and not an importer

Since the mid 1990's Hasco has made its own relays in our own factory. Buying relays from a company with over three decades of experience that produces its own parts is better than buying them from someone who imports them from different factories. Factory Tours are Available

Sales & Service: 516-328-9292 email: info@hascorelays.com

Sales are done through our headquarters in New York or our branch office in Shanghai for overseas inquiries. Hasco also has 15 affiliated sales rep offices as well as a stocking branch in Brazil. Drop shipments world wide are available to save time and money.

Hasco Stocks!

For over 30 years Hasco has kept a large inventory of relays, reed switches and reed relays as well as magnets and proximity sensors in New York. We also keep inventory at our factory outside of Shanghai. Hasco specializes in JIT and Kanban programs.

Hasco Clients:

Presently we help sample, engineer and supply to the following industries. These include automotive, security and fire, UPS, Telecom, industrial controls, HVAC, lighting controls and liquid level sensors to name a few.

No Time to Read a Catalog?

Free specifying is available by our engineering experts. We recommend you stop taking the time to go through web and catalog pages. Rather than going through web or catalog pages why not simply tell us what you need. Simply advise us the number of the poles needed, switching voltage and current as well as the coil voltage? We can save you time by recommending the best relay at the lowest cost in a matter of minutes.

For instant help call: 516 328 9292 8:15AM to 5:30 PM or email: info@hascorelays.com

See us anytime at www.hascorelays.com

Table of Contents

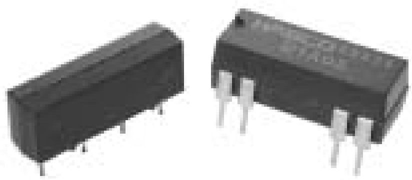
"Quality and Reliability since 1976"

✻ SINCE 1976 ✻

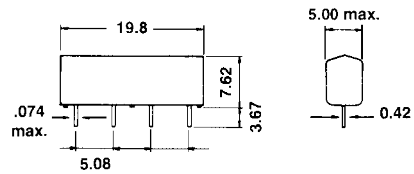
SIP/DIP REED RELAYS LOW COST D & S SERIES

- Molded epoxy body.
- FCC Part 68

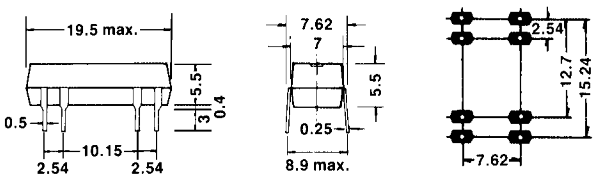
DIMENSIONS: unit in mm



S1A Series Standard SIP



Shielding optional

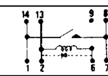
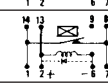
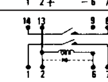
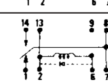


DIP TYPE

File E75887

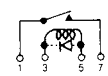
File LR49291

DIP SPECIFICATIONS COIL RATINGS (20°C)

Contact Form	Part Number	Nominal Voltage (VDC)	Coil Resistance ±10%	Must Operate (VDC)	Must Release (VDC)	Rated Current (mA)	Continuous Voltage (max)	Circuit Schematic
1A	D1A05(D)	5	500	3.75	1.0	10	10	
	D1A12(D)	12	1000	9.00	1.2	12	20	
SPST-NO	D1A24(D)	24	2150	18.00	2.4	11.1	28	
1B	D1B05(D)	5	500	3.75	1.0	10	7	
	D1B12(D)	12	1000	9.00	1.2	12	15	
SPST-NC	D1B24(D)	24	2150	18.00	2.4	11.1	28	
2A	D2A05(D)	5	140	3.75	1.0	35.7	10	
	D2A12(D)	12	500	9.00	1.2	24	20	
DPST-NO	D2A24(D)	24	2150	18.00	2.4	11.1	28	
1C	D1C05(D)	5	200	3.75	1.0	25	10	
	D1C12(D)	12	500	9.00	1.2	24	20	
SPDT-CO	D1C24(D)	24	2150	18.00	2.4	11.1	28	

(D): Clamp diode optional

SIP SPECIFICATIONS COIL RATINGS (20°C)

Contact Form	Part Number	Nominal Voltage (VDC)	Coil Resistance ±10%	Must Operate (VDC)	Must Release (VDC)	Rated Current (mA)	Continuous Voltage (max)	Circuit Schematic
1A	S1A05(D)	5	500	3.75	1.0	10	10	
	S1A12(D)	12	1000	9.00	1.2	12	20	
SPST-NO	S1A24(D)	24	2000	18.00	2.4	12	28	

(S): Shielded (D): Clamp diode optional

Form B SIP Available

CHARACTERISTICS

Item \ Contact Form	2A, 1A, 1B	1C
Contact Resistance	100mΩ max. (initial)	150mΩ max. (initial)
Operate Time	0.5msec max.	1.0msec max.
Bounce Time	0.5msec max.	2.0msec max.
Release Time	0.2msec max.	0.2msec max.
Insulation Resistance	10^{11} (min)	10^{11} (min)
Contact Material	Rhodium	Rhodium
Power	10VA max.	3VA max.
Switching Voltage	200VDCmax.	100VDCmax.
Switching Current	0.5Amps max.	0.25Amps max.
Carry Current	1.0Amps max.	0.5Amps max.
Life Expectancy	10^{8} (signal level)	5 x 10^{7} (signal level)
Breakdown Voltage	DC250V across open contact DC500V between coil and contact	DC200V across open contact DC500V between coil and contact
Operating Temp	– 40 ~ 85°C	– 40 ~ 85°C
Storage Temp	– 50 ~ 125°C	– 50 ~ 125°C
Minimum Permissible Load	100mVDC 10µA	100mVDC 10µA
Vibration	20g (10 ~ 2000Hz)	20g (10 ~ 2000Hz)
Resonant Frequency	3.5 KHz	3.5KHz

✻ SINCE 1976 ✻

DRY CONTACT REED RELAYS
700 SIP SERIES

File E75887 File LR49291

FEATURES

- Choice or normal, heavy duty or hi voltage
- Epoxy molded • FCC Part 68

SPECIFICATIONS

Part Number	Nominal Voltage (V)	Must Operate (V)	Must Release (V)	Coil Resistance (Ohms)	Contact Rating	Breakdown Voltage
711-5	5	3.75	0.5	500	AC 10VA, DC 10W max. 100V DC max. 1.0A max. carry 0.3A max. switching	250V DC across contacts 2500V DC contacts to coil
711-12	12	9.0	1.2	1000		
711-24	24	18.0	2.4	2000		

HEAVY DUTY

712-5	5	3.75	0.5	500	AC 70VA, DC 50W max. 150VAC, 200VDC 2.5A max. carry 1.0A max. switching DC 0.7A max. switching AC	300V DC across contacts 2500V DC contacts to coil
712-12	12	9.0	1.2	1000		
712-24	24	18.0	2.4	2000		

HIGH VOLTAGE

713-5	5	3.75	0.5	500	AC 50VA, DC 50W max. 300VAC, 350VDC 2.5A max. carry 0.5A max. switching	600V DC across contacts 2500V DC contacts to coil
713-12	12	9.0	1.2	1000		
713-24	24	18.0	2.4	2000		

EXTRA HIGH VOLTAGE BREAKDOWN

714-5	5	3.75	0.5	500	100VA max. 1.0A max. switching 2.5A max. carry 350 VDC / 300 VAC max. switching	1000V DC across contacts 2500V DC contacts to coil
714-12	12	9.0	1.2	1000		
714-24	24	18.0	2.4	2000		

S.P.D.T. (FORM C)

703-5	5	3.75	0.5	125	AC 3VA, DC 3W max. DC 30V 0.5Amp carry 0.2Amp switching	200V min. 2500V DC contact to coil
703-12	12	9.0	1.2	500		
703-24	24	18.0	2.4	—		

MERCURY WETTED REED RELAYS AVAILABLE

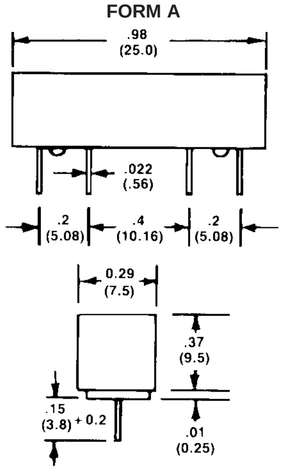
ENGINEERING DATA

Operate Time: 0.5 mSec max.
Release Time: 0.2 mSec max.
Bounce Time: 0.5 mSec max.
Contact Resistance:
150 mΩ max. (initial)

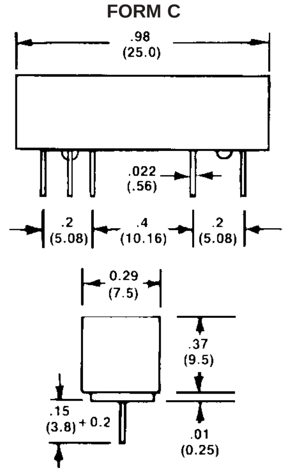
Life Expectancy:
50 x 10^6 operations at signal level
3 x 10^6 at full rated load

Insulation Resistance: 10^9Ω min.
Vibration: 20G (10-2000 Hz)
Thermal Shock: – 55 ~105°C
Moisture Resistance:
60°C-90% 240 hours
Terminal Strength: 225g
Operating Temperature: – 40 ~ 85°C
Storage Temperature: – 55 ~ 105°C

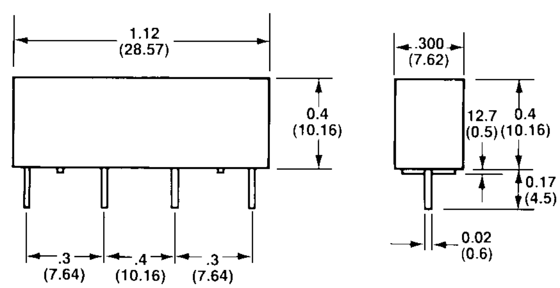
SERIES 711
FORM A

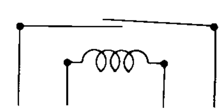


SERIES 703
FORM C

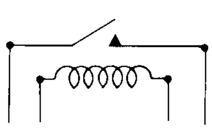


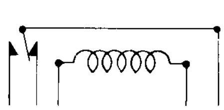
SERIES 712, 713 & 714





Dimensions: inches (mm)





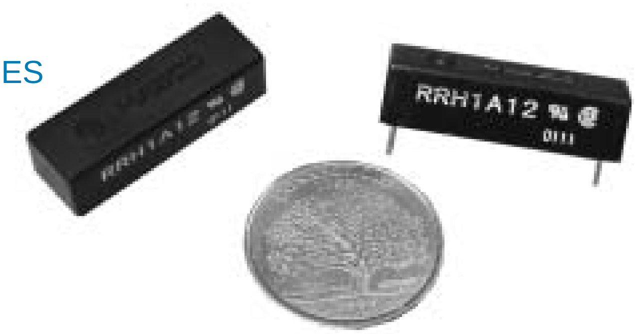
For magnetic shielding add letter: S

HASCO® COMPONENTS INTERNATIONAL, CORP.

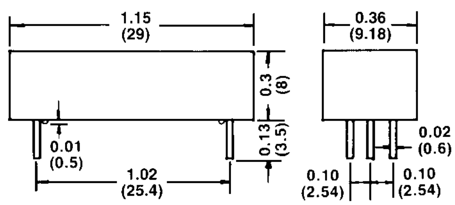
REED RELAYS

✻ SINCE 1976 ✻

STANDARD FORM 1A
REED RELAY RRH SERIES

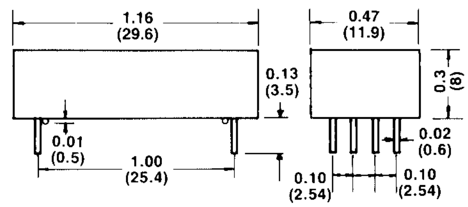


METAL COVER



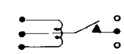
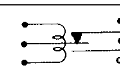
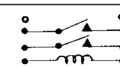
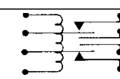
FORM 1A, 1C

DIMENSIONS: inch (mm)



FORM 2A, 2C

SPECIFICATIONS COIL RATINGS (20°C)

Contact Form	Part Number	Nominal Voltage (VDC)	Coil Resistance ±10%	Must Operate (VDC)	Must Release (VDC)	Rated Current (mA)	Continuous Voltage (max)	Circuit Schematic
1A	RRH1A05	5	500	3.75	0.8	10	10	
	RRH1A12	12	1000	9.00	1.2	12	20	
SPST-NO	RRH1A24	24	2150	18.00	2.4	11.1	28	
1C	RRH1C05	5	200	3.75	0.8	25	10	
	RRH1C12	12	500	9.00	1.2	24	20	
SPST-	RRH1C24	24	2150	18.00	2.4	11.1	28	
2A	RRH2A05	5	140	3.75	0.5	35.7	10	
	RRH2A12	12	500	9.00	1.0	24	20	
DPST-NO	RRH2A24	24	2150	18.00	2.0	11	28	
2C	RRH2C05	5	140	3.75	0.5	35.7	10	
	RRH2C12	12	500	9.00	1.0	24	20	
DPDT-	RRH2C24	24	2150	18.00	2.0	11	28	

CHARACTERISTICS

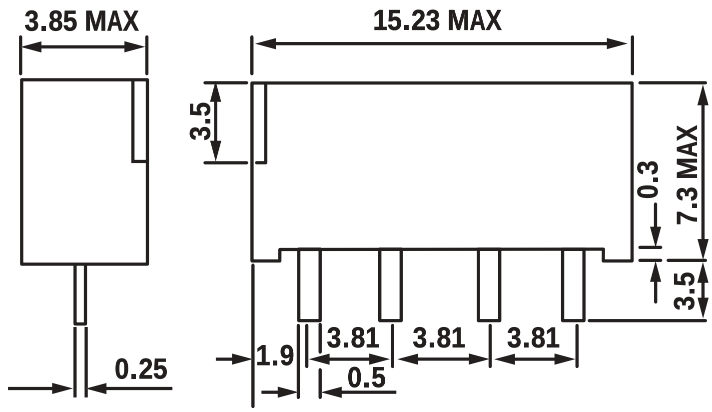
Contact Form / Item	1A, 2A	1C, 2C
Contact Resistance	100mΩ max. (initial)	150mΩ max. (initial)
Operate Time	0.5msec max.	1.0msec max.
Bounce Time	0.5msec max.	2.0msec max.
Release Time	0.2msec max.	0.2msec max.
Insulation Resistance	10^{11} (min)	10^{11} (min)
Contact Material	Rhodium	Rhodium
Power	10VA max.	3VA max.
Switching Voltage	200VDCmax.	30VDCmax.
Switching Current	0.5Amps max.	0.25Amps max.
Carry Current	1.0Amps max.	0.5Amps max.
Life Expectancy	10^{8} (signal level)	5 x 10^{7} (signal level)
Breakdown Voltage	DC250V across open contact	DC200V across open contact
	DC1500V between coil and contact	DC1500V between coil and contact
Operating Temp	– 40 ~ 80°C	– 40 ~ 80°C
Storage Temp	– 40 ~ 100°C	– 40 ~ 100°C
Minimum Permissible Load	100mVDC 10µA	100mVDC 10µA
Vibration	20g (10 ~ 2000Hz)	20g (10 ~ 2000Hz)
Resonant Frequency	3.5 KHz	3.5KHz

HASCO® COMPONENTS INTERNATIONAL, CORP.

REED RELAYS

✻ SINCE 1976 ✻

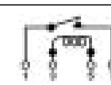
611 REED RELAY SERIES



FEATURES

- Encapsulated Body
- Small size
- Available with external shield

SIP SPECIFICATIONS COIL RATINGS (20°C)

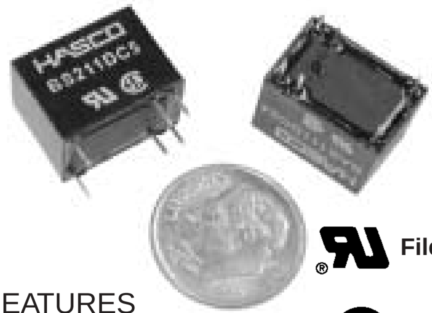
Contact Form	Part Number	Nominal Voltage (VDC)	Coil Resistance ±10%	Must Operate (VDC)	Must Release (VDC)	Rated Current (mA)	Contiguous Voltage (max)	Circuit Schematic
1A SPST-NO	611-05	5	500	3.75	0.4	10	10	

CHARACTERISTICS

Contact Arrangement	1A
Contact Resistance	200m Ohms max. (initial)
Operate Time	0.3msec max.
Bounce Time	0.3msec max.
Release Time	0.05msec max.
Insulation Resistance	10^9 (min)
Contract Material	Rhodium
Power	10VA max.
Switching Voltage	24VDC max.
Switching Current	0.1 Amps max.
Carry Current	0.3 Amps max.
Life expectancy	10 x 8 (signal level)
Breakdown Voltage	DC150V across open contact
	DC500V between coil and contact
Operating Temp	-40 ~ 85° C
Storage Temp	-50 ~ 125° C
Minimum Permissable Load	100m VDC 10µA
Vibration	20g (10 ~ 55Hz)
Resonant Frequency	3.5KHz

✻ SINCE 1976 ✻

SPDT—BAS/BS./SC SINGLE BUTTON CONTACT 2.0 AMP, 5.0 AMP

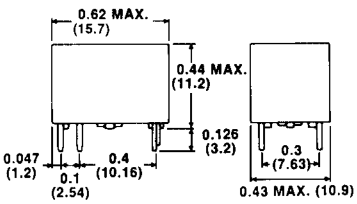


File E75887

File LR49291

FEATURES

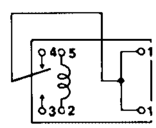
- FCC Pt 68
- Small Package
- Fully sealed



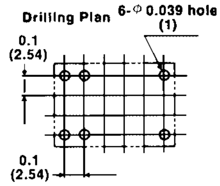
DIMENSIONS: inch (mm)

BAS/BS Series

Internal Connections (Bottom View)

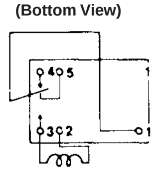


Drilling Plan 6-Φ 0.039 hole (1)



SC Series

Internal Connections (Bottom View)



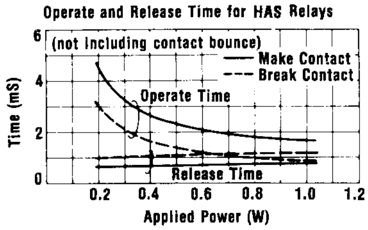
COIL RATINGS FOR **STANDARD** MODEL

Relay Codes 2 Amp	Relay Codes 5 Amp	Relay Codes 2 Amp	Contact Arrange-ment	Nom. Volt. (V)	Coil Resist. (Ω ±10%)	Nom. Curr. (mA)	Pick -Up Volt. (V)	Drop-Out Volt. (V)	Max. Volt. (V)	Nom. Pwr (W) Cons'p-tion
BAS-111-3	BAS-511-3	SC-111-3	SPDT (1 Form C)	3	20	150	2.1	0.3	3.3	Approx. 0.45
BAS-111-5	BAS-511-5	SC-111-5		5	56	89.3	3.5	0.5	5.5	
BAS-111-6	BAS-511-6	SC-111-6		6	80	75	4.2	0.6	6.6	
BAS-111-9	BAS-511-9	SC-111-9		9	180	50	6.3	0.9	9.9	
BAS-111-12	BAS-511-12	SC-111-12		12	320	37.5	8.4	1.2	13.2	
BAS-111-24	BAS-511-24	SC-111-24		24	1280	18.8	16.8	2.4	26.4	
BAS-111-48	BAS-511-48	SC-111-48		48	5120	9.4	33.6	4.8	52.8	

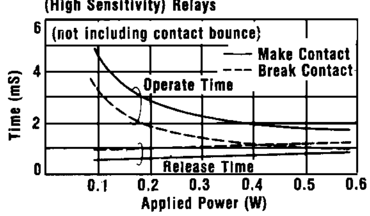
COIL RATINGS FOR **SENSITIVE** MODEL

Relay Codes 2 Amp	Relay Codes 2 Amp	Contact Arrange-ment	Coil Nom. Volt. (V)	Resist. (Ω ±10%)	Pick Nom. Curr. (mA)	Drop--Up Volt. (V)	Out Volt. (V)	Nom. Max. Volt. (V)	Pwr (W) Cons'p-tion
BS-211-3	SC-211-3	SPDT (1 Form C)	3	45	66.7	2.1	0.3	4.8	Approx. 0.20
BS-211-5	SC-211-5		5	120	41.7	3.5	0.5	8.0	
BS-211-6	SC-211-6		6	180	33.3	4.2	0.6	9.6	
BS-211-9	SC-211-9		9	400	22.5	6.3	0.9	14.4	
BS-21112	SC-211-12		12	700	17.1	8.4	1.2	19.2	
BS-21124	SC-211-24		24	2800	8.6	16.8	2.4	38.4	

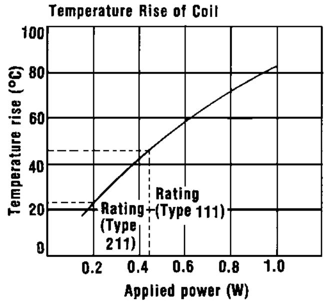
Operate and Release Time for HAS Relays



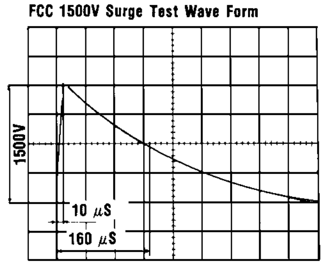
Operate and Release Time for HS (High Sensitivity) Relays



Temperature Rise of Coil



FCC 1500V Surge Test Wave Form



RATING PERFORMANCE

Specifications			Note
Coil	Nominal Voltage	3, 5, 6, 9, 12, 24, 48 VDC	
	Nominal Power Consumption	0.45W	
	Pick-up Voltage	70% of nominal voltage	
	Drop-out Voltage	10% of nominal voltage	
Contact	Contact Arrangement	SPDT, 1 Form C	
	Contact Material	SC111 SC211 BAS 111 BS 211 Silver BAS 511 Silver-Cadmium Oxide	
	Contact Resistance	Max. 100 mΩ	at initial value
	Max. Switching Power	DC 30W/ AC 60 VA	at resistive load
	Max. Switching Volt.	60 VDC/120 VAC	
	Max. Switching Current	2A DC/AC BAS BS,SC 5A DC/AC BAS 511	
Time	Operate Time	Approx. 2 mS	at nominal voltage
	Release Time	Approx. 1 mS	
	Bounce Time (Operating)	Max. 2 mS	no bounce in break contact
	Bounce Time (Releasing)	Max. 7 mS	no bounce in make contact
Insulation Resistance		Min. 100 MΩ	at 500 VDC
Dielectric Strength		1000 VAC	1 minute
Vibration Resistance		1.5 mm DA 10 ~ 55 Hz	
Temperature Range		–25°C ~ +55°C	
Life	Mechanical Life	500 x 10⁴ times	
	Electrical Life	50 x 10⁴ times	at 24 VDC, 1A resistive load
		10 x 10⁴ times	at 120 VAC, 0.5A, resistive load
Weight		Approx. 4 g	

DPDT—DIP PC STANDARD or SENSITIVE 2.0 AMP BIFURCATED CONTACT RELAY

COIL RATINGS FOR **STANDARD** CAS 112

Relay Code (V)	Contact Arrange-ment	Nom. Volt. (VDC)	Coil Resist. (Ω ±10%)	Nom. Curr. (mA)	Pick-Up Volt. (VDC)	Drop-Out Volt. (V)	Max. Volt. (VDC)	Nom. Pwr (W) Cons'p-tion
CAS-112-5	DPDT (2 Form C)	5	45	111.0	3.5	0.5	7.8	Approx. 0.56
CAS-112-6		6	70	90.9	4.4	0.6	9.7	
CAS-112-9		9	140	85.7	6.3	0.9	12.6	
CAS-112-12		12	280	43.1	8.7	1.2	19.4	
CAS-112-24		24	1070	22.4	17.6	2.4	37.6	
CAS-112-48		48	4300	11.1	35.7	4.8	74.2	

Data Measured at 20°C

COIL RATINGS FOR **SENSITIVE** CS 212

Relay Code (V)	Contact Arrange-ment	Nom. Volt. (VDC)	Coil Resist. (Ω ±10%)	Nom. Curr. (mA)	Pick-Up Volt. (VDC)	Drop-Out Volt. (V)	Max. Volt. (VDC)	Nom. Pwr (W) Cons'p-tion
CS-212-5	DPDT (2 Form C)	5	167	29.9	3.2	0.5	15.0	0.15
CS-212-6		6	240	25.0	3.7	0.6	18.0	0.15
CS-212-9		9	540	16.7	5.8	0.9	27.0	0.15
CS-212-12		12	960	12.5	8.2	1.2	35.6	0.15
CS-212-18		18	2160	8.3	11.8	1.8	53.4	0.15
CS-212-24		24	3840	6.3	16.6	2.4	70.1	0.15
CS-212B-48		48	11520	4.2	28.1	4.8	121.4	0.20
CS-212-48		48	7680	6.5	22.6	4.8	99.1	0.31

The tolerance is ±10% for the resistance value, pull-in voltage and drop-out voltage. The values are at ambient temperature, 20°C.

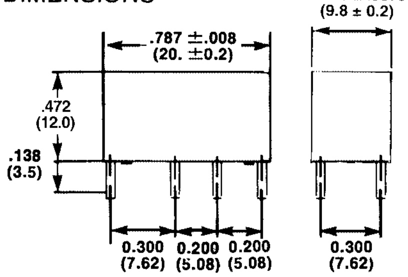
FEATURES

- Sensitive available.
- Fully sealed.

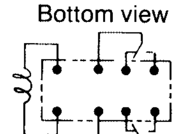
File E75887

File LR49291

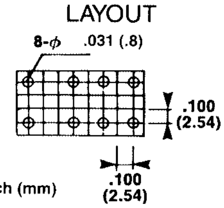
DIMENSIONS



SCHEMATIC
Bottom view



MOUNTING HOLE LAYOUT



DIMENSIONS: inch (mm)

RATING PERFORMANCE

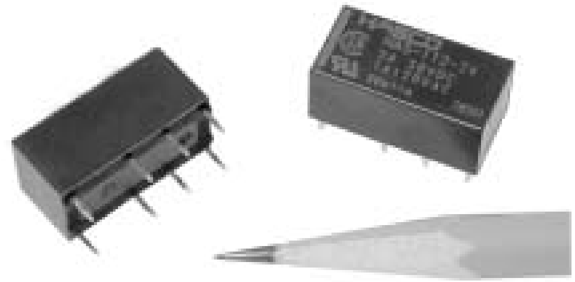
Specifications				Note
Contact	Contact Arrangement		DPDT, 2 Form C	
	Contact Material		Gold-clad, Ag-Pd alloy	
	Contact Resistance		100 mΩ	at initial value
	Max. Switching Power		DC 30W AC 50 VA	at resistive load
	Max. Switching Voltage		125VDC 150VAC	
	Max. Switching Current		2A 30VDC 0.6 / 125 VAC 2.5A @ 12V	
Time	Operate Time	(Type CS)	Approx. 5 msec.	
		(Type CAS)	Approx. 5 msec.	
	Release Time	(Type CS)	Approx. 3 msec.	
		(Type CAS)	Approx. 5 msec.	
	Bounce Time (Operating)		Approx. 0.5 to 1 msec.	
	Bounce Time Releasing		Approx. 02.5 to 3 msec.	
Insulation Resistance			1000 MΩ	at 500 VAC, 25°C, 50% relative humidity
Dielectric Strength	1000VAC Between coil and contacts 1000VAC Between open contacts			CAS, CS
FCC Surge Strength	1500V Between coil and contacts Between Adjacent contacts			CS
Vibration Resistance			10g (10 - 55 Hz)	
Temperature			-25°C ~ +75°C -25°C ~ +85°C	CAS, CS
Life	Mechanical Life		2 x 10^7 times	
	Electrical Life		2 x 10^6 times	at 20mV 1KHz 1mA resistive load
Weight			5 g	

RELAYS

COMPONENTS INTERNATIONAL, CORP.

✻ SINCE 1976 ✻

POWER CONSUMPTION 150mW
SMALL SIZED POLARIZED RELAY
BEING CAPABLE FOR WIDE USE

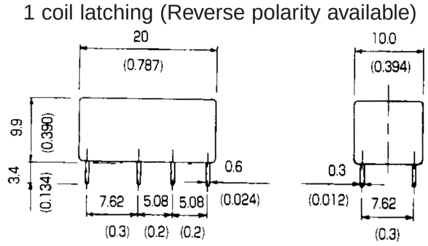


FEATURES
- High sensitive 2 pole relay suitable for signal circuit
- Ultra-high sensitive type 150mW.
  High sensitive type 200mW. Standard type 400mW
- Latching type relay provided with memory function
  is available too
- Adopts twin contacts that are superior in contact reliability
- Gold-clad Silver palladium contact available too
- Completely enclosed type relay with sealed construction
  being superior in durability to the environment
- UL File No. 75887
- CSA File No. 180958 (LR93742)
- BABT Certificate No. 609662

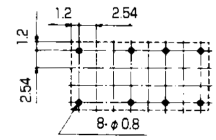
APPLICATIONS
- Switch board. Facsimile. Telephones
- Audio equipment. Industrial machines

DIMENSIONS

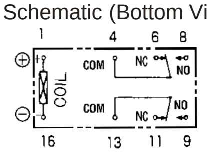
Single Side Stable
1 coil latching (Reverse polarity available)



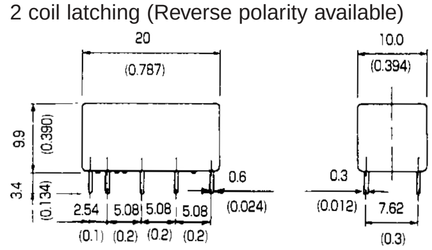
PC Board Pattern



Schematic (Bottom View)



2 coil latching (Reverse polarity available)



CONTACT RATING

Contact arrangement		DPDT (2C)
Contact Material.		Ag + Au clad or AgPd + Au Clad
Initial contact resistance max. .		Max. 50mΩ
Contacting (Resistive load)	Max. switching voltage	220V DC 250V AC.
	Max. switching current	2A
	Max. switching power	60W (DC) 125VA (AC)
	Max. carry current	2A
	Rated contact load	2A 30VDC 1A 125VAC

GENERAL DATA

Life expectancy	Mechanical Life		100,000,000 Operations (at 600cpm)
	Electrical Life		300,000 Operations (2A 30VDC) (at 20cpm)
			1,000,000 Operations (1A 30VDC) (at 20cpm)
Operate/Release time	Operate time (Set/Reset time)		Max. 5 msec.
	Release time		Max. 3.5 msec.
Temperature Characteristics	Coil Temp. Rise	Standard	Less than 40°C (at nominal coil voltage)
		Sensitive	Less than 30°C (at nominal coil voltage)
	Operate ambient temp.		-40°C to +70°C (Without being frozen)
	Storage ambient temp.		-40°C to +80°C (Without being frozen)
Initial breakdown voltage	Between coil and contacts		1,500Vrms (1 minute)
	Between open contacts		1,000Vrms (1 minute)
Initial insulation resistance			Min. 100M Ω (at 500V DC)
Environmental requirement	Ambient humidity		Max. 85% RH
Vibration resistance	Vibration (Malfunction)		10 ~ 55Hz at double amplitude of 1.5mm
Shock resistance	Mechanical damage		Min. 980m/s² (100G)
	Malfunction		Min. 342m/s² (40G)

ORDERING INFORMATION

☐ ☐ ☐

HAS112 (standard)
HS212 (sensitive)

NIL: Single side stable
L: 2 coil latching K: 1 coil latching

Coil Voltage
5, 6, 9, 12, 24, 48

See Page 12 for Graphs

906 JERICHO TPKE., NEW HYDE PARK, NY 11040 / (516) 328-9292 FAX: (516) 326-9125 www.hascorelays.com email: info@hascorelays.com

COIL RATING Single Side Stable at 120°C *1.5 & 3V Available

Relay Code	Nominal Voltage	Coil Resistance (Ω) ±10%	Nominal Current (mA)	Pick-Up Voltage	Drop-Out Voltage	Max. Allowable Voltage	Nominal Power (mW)
HAS-112-5	5	62.5	80	70% of Nominal Voltage	10% of Nominal Voltage	150% of Nominal Voltage	Approx. 400mW
HAS-112-6	6	90	60				
HAS-112-9	9	203	40				
HAS-112-12	12	360	30				
HAS-112-24	24	1440	10				
HAS-112-48	48	5760	8				

COIL RATING 1 Coil Latching at 20°C

Relay Code	Nominal Voltage	Coil Resistance (Ω) ±10%	Nominal Current (mA)	Pick-Up Voltage	Max. Allowable Voltage	Nominal Power (mW)
HAS-112K-5	5	69.4	72	70% of Nominal Voltage	150% of Nominal Voltage	Approx. 360mW
HAS-112K-6	6	100	60			
HAS-112K-9	9	225	40			
HAS-112K-12	12	400	30			
HAS-112K-24	24	1600	15			
HAS-112K-48	48	6400	7.5			

COIL RATING 2 Coil Latching at 20°C

Relay Code	Nominal Voltage	Coil Resistance (Ω) ±10%	Nominal Current (mA)	Pick-Up Voltage	Max. Allowable Voltage	Nominal Power (mW)
HAS-112L-5	5	69.4	72	70% of Nominal Voltage	150% of Nominal Voltage	Approx. 360mW
HAS-112L-6	6	100	60			
HAS-112L-9	9	225	40			
HAS-112L-12	12	400	30			
HAS-112L-24	24	1600	15			
HAS-112L-48	48	6400	7.5			

COIL RATING Single Stable at 20°C

Relay Code	Nominal Voltage	Coil Resistance (Ω) ±10%	Nominal Current (mA)	Pick-Up Voltage	Drop-Out Voltage	Max. Allowable Voltage	Nominal Power (mW)
HS-212-5	5	167	29	80% of Nominal Voltage	10% of Nominal Voltage	230% of Nominal Voltage	Approx. 150mW
HS-212-6	6	240	25				
HS-212-9	9	540	16.6				
HS-212-12	12	960	12.5				
HS-212-24	24	3840	6				
HS-212-48	48	15360	3				

COIL RATING 1 Coil Latching at 20°C

Relay Code	Nominal Voltage	Coil Resistance (Ω) ±10%	Nominal Current (mA)	Pick-Up Voltage	Max. Allowable Voltage	Nominal Power (mW)
HS-212K-5	5	139	35.9	70% of Nominal Voltage	200% of Nominal Voltage	Approx. 180mW
HS-212K-6	6	200	30			
HS-212K-9	9	450	20			
HS-212K-12	12	800	15			
HS-212K-24	24	3200	7.5			
HS-212K-48	48	12800	3.7			

COIL RATING 2 Coil Latching at 20°C

Relay Code	Nominal Voltage	Coil Resistance (Ω) ±10%	Nominal Current (mA)	Pick-Up Voltage	Max. Allowable Voltage	Nominal Power (mW)
HS-212L-5	5	139	35.9	70% of Nominal Voltage	200% of Nominal Voltage	Approx. 180mW
HS-212L-6	6	200	30			
HS-212L-9	9	450	20			
HS-212L-12	12	800	15			
HS-212L-24	24	3200	7.5			
HS-212L-48	48	12800	3.7			

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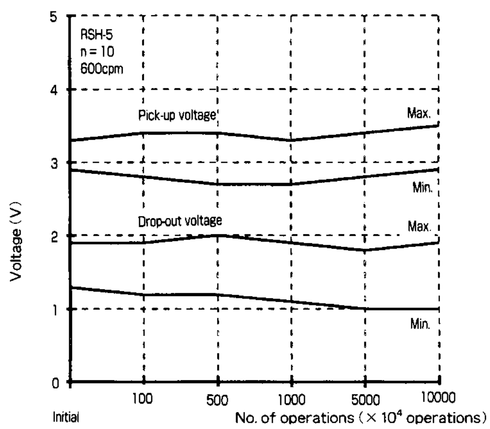
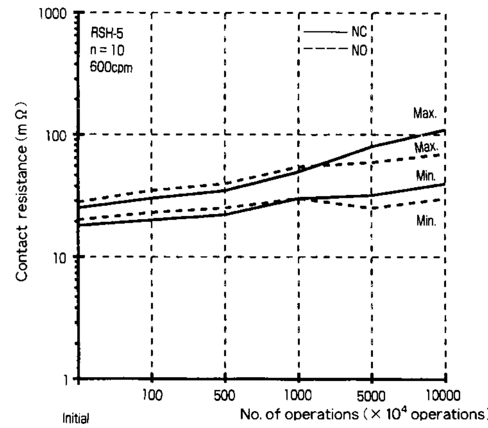
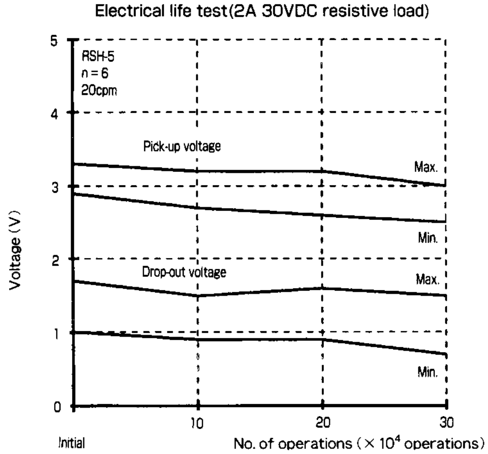
Mechanical life test



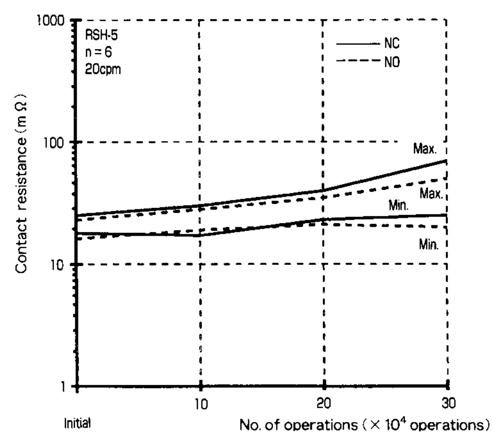
Mechanical life test



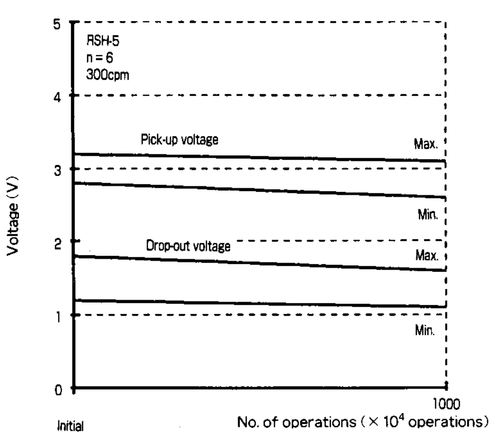
Electrical life test(2A 30VDC resistive load)



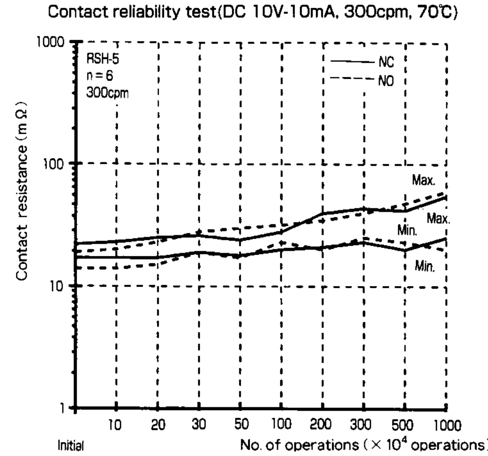
Electrical life test(2A 30VDC resistive load)



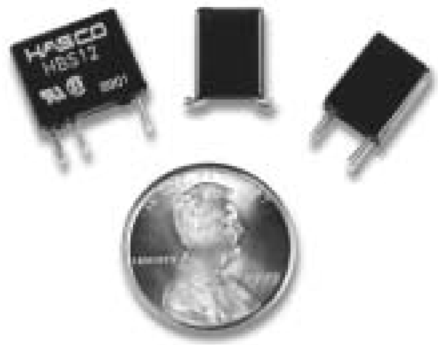
Contact reliability test(DC 10V-10mA, 300cpm, 70℃)



Contact reliability test(DC 10V-10mA, 300cpm, 70℃)



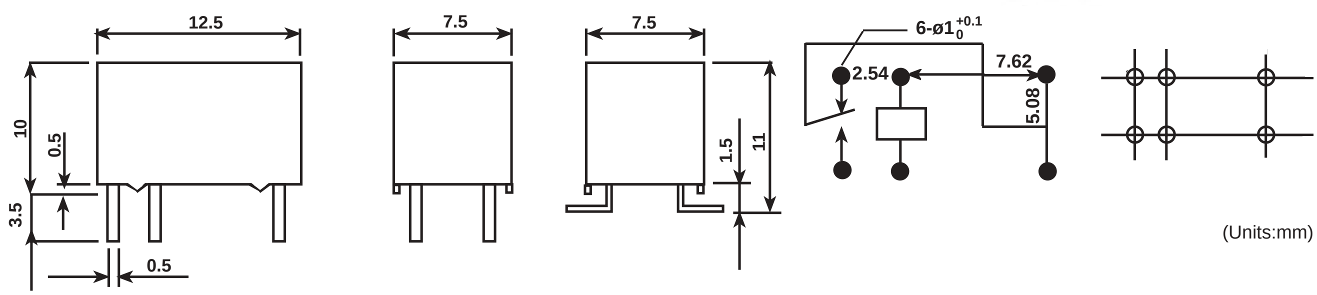
HBS RELAYS



FEATURES

- Small size
- Through hole and surface mount available
- Full sealed

DIMENSIONS



COIL DATA (at 20°C)

FOR **STANDARD** TYPE | FOR **SENSITIVE** TYPE

Coil Power W	Coil Resistance Ohm±10%	Must Coil Current mA	Must Operate Voltage VDC(max)	Release Voltage VDC(min)	Rated Voltage VDC	Coil Resistance Ohm±10%	Coil Current mA	Must Operate Voltage VDC(max)	Must Release Voltage VDC(min)	Coil Power W
	11.3	132.7	1.20	0.15	1.5	15	100	1.20	0.15	
	45	66.7	2.40	0.30	3	60	50.0	2.40	0.30	
	125	40.0	4.00	0.50	5	167	29.9	4.00	0.50	
0.20	180	33.3	4.80	0.60	6	240	25.0	4.80	0.60	0.15
	405	22.2	7.20	0.90	9	540	16.7	7.20	0.90	
	720	16.7	9.60	1.20	12	960	12.5	9.60	1.20	
	2880	8.3	19.2	2.40	24	3840	6.25	19.2	2.40	

CHARACTERISTICS

Contact Arrangement		SPDT
Contact Material		AgPd (Au clad)
Rated Load		0.5A/125VAC 30VDC
Permission Load		Min. 1mA 5VDC
Max. Switching Power		62.5VA/30W
Max. Switching Current1A		
Max. Switching Voltage		125VAC/60VDC
Contact Resistance		MAX. 100mOhm (measured at 1A 6VDC)
Operate Time		5ms
Release Time		5ms
Bounce Time		5ms
Insulation Resistance		1000Mohm min (at 500VDC)
Dielectric Strength		400VAC 1min. between open contacts
		1000VAC 1min. between contact and coil
Shock Operation		100m/s^2
Vibration Operational		10~55Hz 3.3mm
Ambient Temperature		-30~70°C
Humidity		35% ~85%
Operation Life	**Mechanical**	1 x 10^5 (1800 operation times/hour)
	Electrical	1 x 10^7 (36000 operation times/hour)
Dimensions		12.5 x 7.5 x 10 mm
Construction		Sealed
Termination		PCB & SMT
Weight		2.2g Approx

ORDERING INFORMATION

HBS 12 S GW

- GW: Gull WIng P: PCB
- S: Sensitive; Nil: Standard
- Coil Voltage
- Series

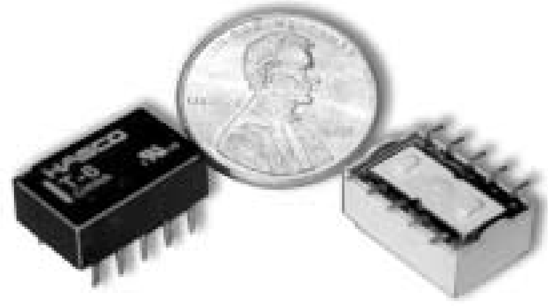
HASCO® COMPONENTS INTERNATIONAL, CORP.

RELAYS

✻ SINCE 1976 ✻

SUBMINIATURE RELAYS T SERIES

Compact, Highly Sensitive Relays with Balanced Armature Mechanism



FEATURES

- Compact size and low profile: 5H x 14L x 9W (mm)
- Meets FCC part 68 requirements
- High sensitivity: 140 mW nominal operating power
- Dual-in line packaging arrangement fits IC socket
- Single latching type available
- Fully sealed (immersion cleanable)
- UL/CSA

File E75887

File LR49291

SPECIFICATIONS

Contacts

Arrangement 2 Form C (DPDT)	
Type Bifurcated crossbar	
Material Movable contact Station contact	Ag-Pd alloy Gold-clad Ag-Pd alloy
Rating (resistive load) Max. switching power Max. switching voltage Max. switching current	 30W DC, 62.5VA AC 125V DC/AC 1A DC/AC
UL/CSA rating 1A 30V DC, 0.5A 125V AC	
Expected life (min. operations) mechanical Electrical (resistive load)	 100 million 0.2 million at 1A 30V DC 0.1 million at 0.5A 125V AC
Contact Resistance	50mΩ max. at initial value

Single side stable	Minimum operating power	80 to 110mW
	Nominal operating power	140 to 200mW
1 Coil latching	Minimum set and reset power	60 to 80mW
	Nominal set and reset power	100 to 150mW

Characteristics (at 20° C)

Single side stabel	Max. operate time Max. release time (not including bounce)	3mS 3mS
Latching	Max. set time Max. reset time (not including bounce)	3mS 3mS
Dielectric withstand voltage Between open contacts Between coil and contacts Between contact poles	 1000V AC 1000V AC 1000V AC	
Surge withstand voltage Between open contacts Between coil and contacts Between contact poles	 1500V AC 1500V AC 1500V AC	
Insulation resistance		
Vibration resistance Functional Destructive	 3mm DA, 10 to 55Hz 5mm DA, 10 to 55Hz	
Shock resistance Functional Destructive	 50G (11mS) 100G (6mS)	
Temperature range Thru-hole type	 -40°C to 70°C	
Weight	Approx. 1.5g	

TYPES AND COIL DATA AT 20°C (68°F)

Single side stable

Thru-hole type	Nominal voltage V DC	Coil resistance (Ω±10%)	Pick-up voltage V DC	Drop-out voltage V DC	Nominal power consumption W DC	Maximum continuous voltage V DC
T-3	3	64.4	2.25	0.3	0.14	4.5
T-5	5	178	3.75	0.5	0.14	7.5
T-6	6	257	4.5	0.6	0.14	9.0
T-9	9	579	6.75	0.9	0.14	13.5
T-12	12	1028	9.0	1.2	0.14	18.0
T-24	24	2880	18.0	2.4	0.2	36.0

1 Coil latching

Thru-hole type	Nominal voltage V DC	Coil resistance (Ω±10%)	Pick-up voltage V DC	Drop-out voltage V DC	Nominal power consumption W DC	Maximum continuous voltage V DC
TL-3	3	90	2.25	2.25	0.1	4.5
TL-5	5	250	3.75	3.75	0.1	7.5
TL-6	6	360	4.5	4.5	0.1	9.0
TL-9	9	810	6.75	6.75	0.1	13.5
TL-12	12	1440	9.0	9.0	0.1	18.0
TL-24	24	3840	18.0	18.0	0.15	36.0

ORDERING INFORMATION

EXAMPLE **T S L—12**

Type of relay
T : Thru-hole type
S : SMD

Operating function
Nil: Single side stable
L : 1 Coil latching

Nominal coil voltage
DC 3, 5, 6, 9, 12 or 24V

Also Available As Surface Mount Device Call for Availability

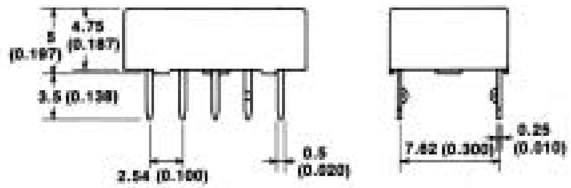
906 JERICHO TPKE., NEW HYDE PARK, NY 11040 / (516) 328-9292 FAX: (516) 326-9125 www.hascorelays.com email: info@hascorelays.com

SUBMINIATURE RELAYS T SERIES

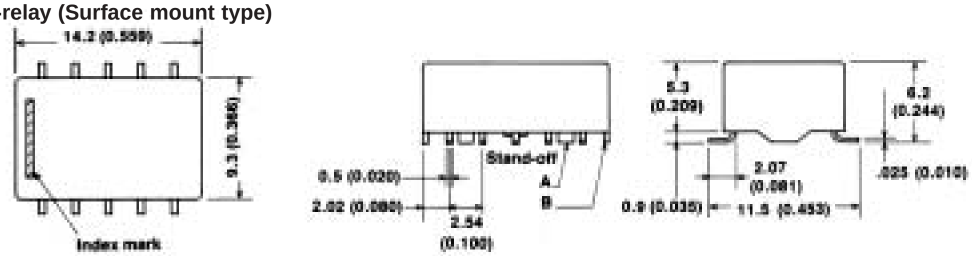
DIMENSIONS
T-RELAY (THRU-HOLE TYPE)

(b) Formed terminal type

DIMENSIONS: mm (inch)



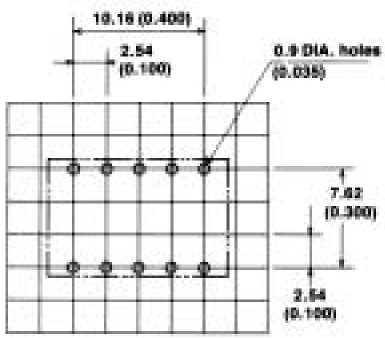
TS-relay (Surface mount type)



(Call for specifications on complete mounting & hole layout as well as surface mount pinouts)

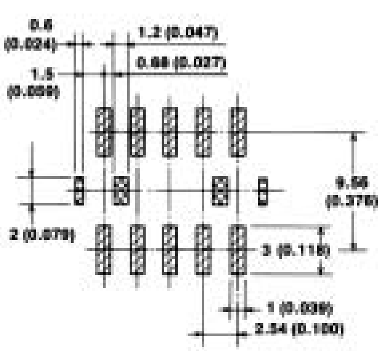
MOUNTING LAYOUT

Mounting hole layout for T-relay



Tolerance: ±0.1 (±0.004)

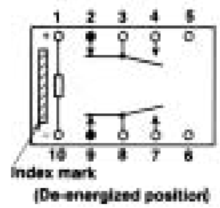
Mounting pad layout for TS-relay



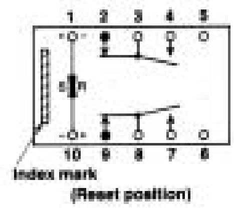
Soldering pad for terminal
Temporary glue pad for stand-off A or B
Tolerance: ±0.1 (±0.004)

WIRING DIAGRAM

Single side stable



1 coil latching



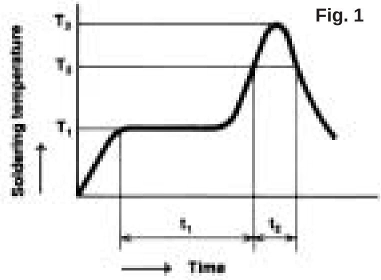
SURFACE MOUNT TYPE–Soldering & Mounting

Recommendations

1. Conditions for terminal soldering by reflow soldering method.

a. In case of infrared soldering

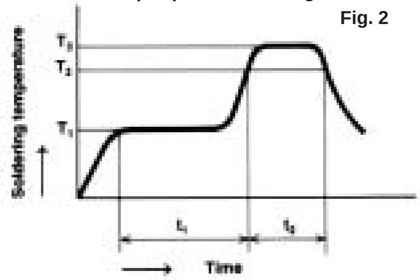
Fig. 1



T_1= +120°C to +150°C t_1=60s to 90s
T_2= +180°C to +200°C t_2=30s max.
T_3= +245°C max.

b. In case of vapor phase soldering

Fig. 2

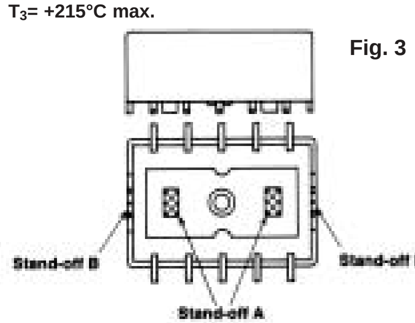


T_1= +120°C to +150°C t_1=40s to 60s
T_2= +180°C to +200°C t_2=60s max.
T_3= +215°C max.

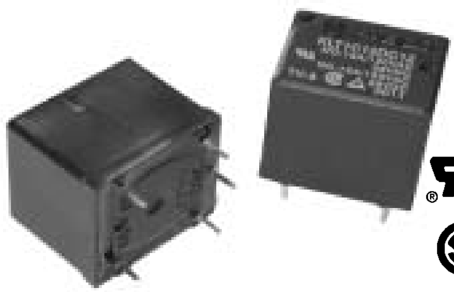
2. Usage of stand-off A & B in base area.

The Stand-offs shown in the Fig. 3 are designed to anchor relays temporarily to PC board with glue before terminal soldering.

Fig. 3



KLT MINIATURE POWER RELAYS
SPDT 3, 6, 12, 15 & 20 AMP

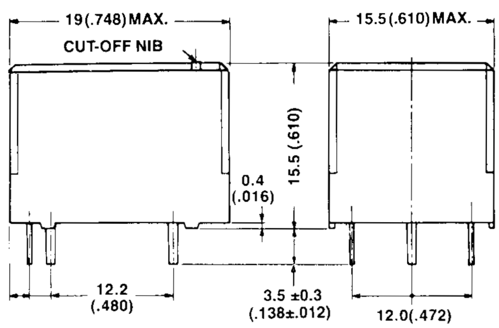


File E75887

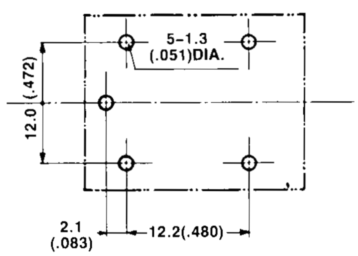
File LR49291

TÜV

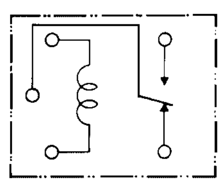
DIMENSIONS: mm (inch)



MOUNTING HOLES
(BOTTOM VIEW)



TERMINAL ARRANGEMENT
(BOTTOM VIEW)



ORDERING INFORMATION

KLT - F - 1C - 12 - DC12 - 1

Model No.

NIL: Class B
Class F

Contact Arrangement:
A = 1 Form A (SPST-NO)
B = 1 Form B (SPST-NC)
C = 1 Form C (SPDT)

Contact Material & Rating:
3 Amp = Silver, gold flash
6 Amp = Silver cadmium oxide
12 Amp = Silver cadmium oxide
15 Amp = Silver tin indium oxide
20 Amp = Silver tin indium oxide

Nominal Voltage:
3 = 3VDC; 5= 5VDC; 6 = 6VDC
9 = 9VDC; 12 = 12VDC; 24 = 24VDC; 48 = 48VDC

NIL = Sealed
1 = Unsealed

FEATURES

- Highly reliable, low cost
- Miniature size & large switch capacity up to 20A
- High dielectric strength type
- Fully Sealed
- Inexpensive

ELECTRICAL RATINGS

3 Amp: 3A at 120VAC or 28VDC resistive
6 Amp: 6A at 120VAC or 28VDC; 6A at 240VAC general purpose; 1/4 hp at 120VAC
12 & 15 Amp: 12A at 120VAC or 28VDC; 12A at 240VAC general purpose; 7A at 277VAC general purpose; 1/4 hp at 120VAC; 15A at 120VAC resistive
Pilot duty: 40A in-rush, 4A steady state at 125VAC
10A in-rush, 1A steady state at 240VAC
N.O. only, Single Pole:
10A at 12VDC Tungsten; 15A at 120VAC Tungsten
1/2 hp at 120VAC; 5.4A at 277 VAC Ballast

GENERAL DATA

Contact resistance: 50mΩ Max.
Operate Time: 8ms Max. (at nominal voltage)
Operate Bounce Time: 3 ms Max.
Release Time: 5 ms Max.
Release Bounce Time: 8 ms Max.
Max. Switching Voltage: 277VAC & 125VDC
Min. Permissible Load (reference value):
3 Amp: 5VDC at 1mA
6, 12, 15 & 20 Amp: 5VDC at 100mA
Insulation Rating: Class B & Class F
Insulation Resistance: more than 100MΩ at 500VDC
Dielectric Strength: 750VAC (50/60Hz), between open contacts
1500VAC (50/60Hz), between coil & contact
Vibration: 1.5mm double amplitude, 10 to 50Hz
Shock: 100 m/sec^2 (approx. 10G's)
Operation Frequency: Mechanical: 18,000 operations/hour
Electrical: 1,800 operations/hour (under rated load)
Service Life: Mechanical: 10 million operations
Electrical: 100,000 operations min. at rated resistive load
Temperature Range: Class B: –40°C to 85°C
Class F: –40°C to 105°C
Temperature Rise: Less than 35 degrees
Humidity: 45% - 85% RH
Approximate Weight: 12 grams

COIL RATINGS

Nominal Coil Voltage	Coil Resistance in Ohms, ±10% at 20°C 6, 12, 15 Amp	Coil Resistance in Ohms, ±10% at 20°C 20 Amp	Must Operate Voltage at 20°C	Must Release Voltage at 20°C	Maximum Voltage
3VDC	25	20	75% max. of nominal voltage	10% min. of nominal voltage	130% of nominal voltage
5VDC	70	55			
6VDC	100	80			
9VDC	225	180			
12VDC	400	320			
18VDC	900	1100			
24VDC	1600	1280			
48VDC	6400	5120			

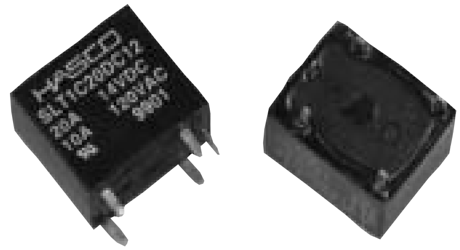
REMARK

- Use alcohol, freon or water for cleaning. (water temperature not to exceed 50°C)

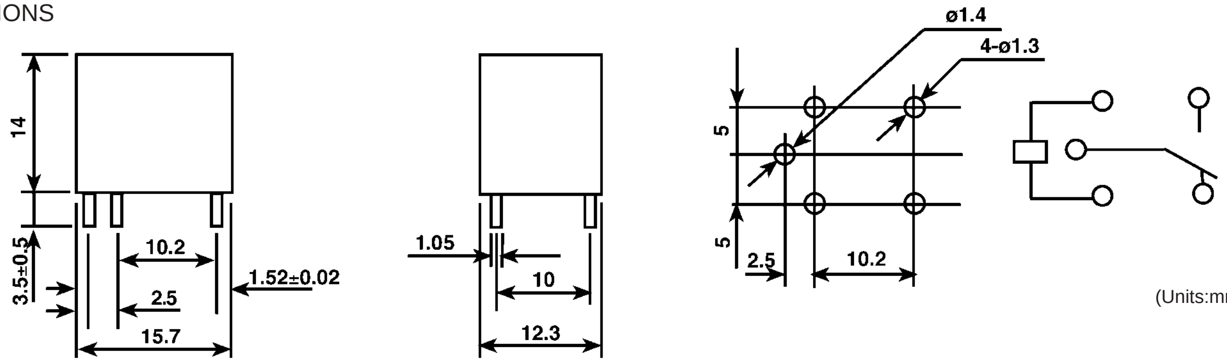
SLT RELAYS

FEATURES

- Small size
- Light weight
- Low power consumption
- PC board mounting
- Fully sealed



DIMENSIONS



(Units:mm)

COIL DATA (at 20°C)

Rated Voltage VDC	Coil Resistance Ohm±10%	Must Operate Voltage VDC(max)	Must Release Voltage VDC(min)	Maximum Voltage VDC	Coil Power W
6	60	4.8	0.30	110% of rated voltage	0.6
9	135	7.2	0.45		
12	240	9.6	0.60		
24	960	19.2	1.20		

CHARACTERISTICS

Contact Arrangement		1A, 1C
Contact Material		AgCdo AgSnO2 AgSnO2In2O3
Contact Rating (resistive)		20A/14VAC 10A/120VAC
Max. Switching Power		280W 120VA
Max. Switching Voltage		42VDC 380VAC
Contact Resistance		MAX. 100mOhm
Operate Time		MAX. 10ms
Release Time		MAX. 5ms
Insulation Resistance		1000Mohm min (at 500VDC)
Dielectric Strength		50Hz 500VAC between contacts
		50Hz 500VAC between contact and coil
Shock Operation		100g
Vibration Operational		10~55Hz Double Amplitude 1.5mm
Ambient Temperature		-40~85 C degree
Humidity		20 C degree 85%
Operation Life	**Mechanical**	10M times
	Electrical	0.1M times
Weight		6g Approx

ORDERING INFORMATION

SLT 1A 20 DC12 -1

- -1: Sealed; Nil: Sealed
- DC12: Coil Voltage
- 20: Contact Current: 10 A & 20A
- 1A: Contact Form 1A, 1C
- SLT: Series

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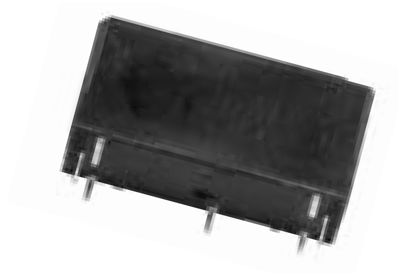
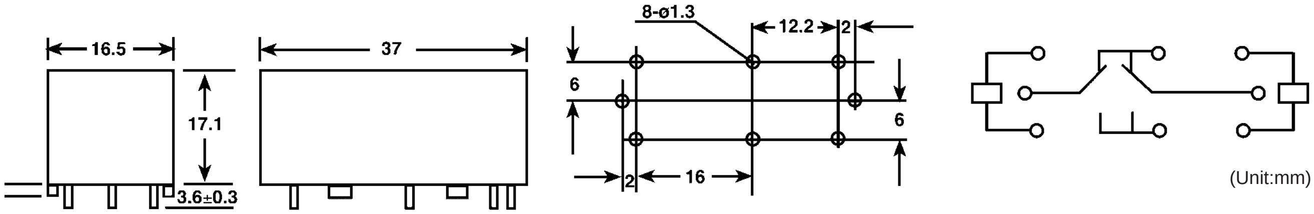
2KLT RELAYS

FEATURES

- Small size, light weight
- Withstands high temperature, operational under 105°C ambient temperature



DIMENSIONS



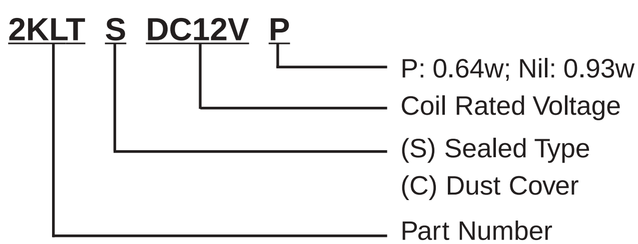
COIL DATA

Rated Voltage	Coil Resistance Ω±10%	Must Operate Voltage VDC(max)	Must Release Voltage VDC(min)	Maximum Voltage VDC	Coil Power W
12	225	6.8	1.2	120% of rated voltage	0.64
	155	6.0	0.9		0.93

CHARACTERISTICS

Contact Arrangement		Two 2 x 1C
Contact Material		AgSnO2 Ag -SnO_2 In_2O_3
Contact Rating (resistive)		2 x 10A 14VDC
Max. Switching Power		2 x 140W
Max. Switching Voltage		2 x 24VDC
Contact Resistance		≤ 100mΩ Max.
Operate Time		10ms
Release Time		5ms
Insulation Resistance		1000MΩ min (500VDC)
Dielectric Strength		50Hz 1000V 1min. between contacts 50Hz 1000V 1min. between contact and coil
Shock Operation		10g
Vibration Operational		10~40Hz Amplitude 1.27mm
Ambient Temperature		-40~105°C
Operation Life	**Mechanical**	10^7
	Electrical	10^5 (at rated load)
Weight		25g Approx

ORDERING INFORMATION



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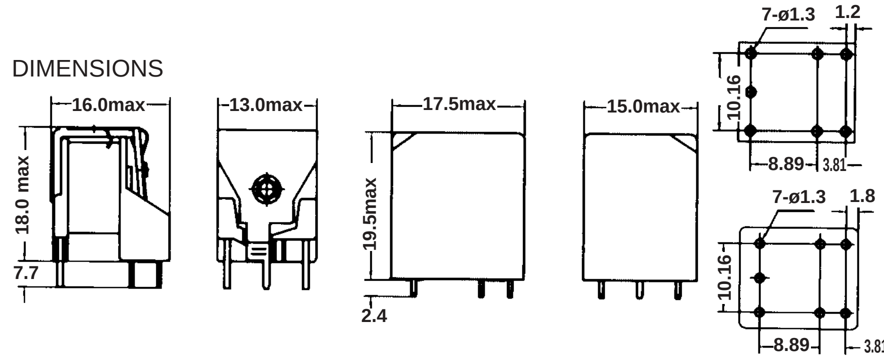
MKB

DIMENSIONS



FEATURES

- Switching capacity up to 20A
- Six different contact arrangements
- PCB mounting
- Open and sealed type is available

CONTACT DATA

Arrangements	1 Form A 1A	1 Form B 1B	1 Form C No	1C NC	2 Form mA 2A	2 Form B 2B	2 Form C No	2C NC
Schematic								
Max. Switching Current	20A	10A	20A	10A	2X20A	2X7A	2X15A	2X5A
Max. Switching Voltage	75VDC/60VAC							
Continuous Current	15A	10A	15A	10A	2X10A	2X7A	2X7A	2X5A
Max. Switching Power	200W/500VA							
Min. Load	0.5A, 12VDC							
Contact Material	Silver Alloy							
Initial Resistance	100 mΩ (at 1 A, 5 VDC)							
Electrical Life	$2X10^5$ OPS (at 10 A, 5VDC)							
Mechanical Life	$1X10^7$ OPS							

SPECIFICATIONS

Insulation Resistance	100MΩ, 500VDC, 1min	**Vibration**	DA, 1.5mm, 10~55Hz, functional
Dielectric Strength	500Vrms	**Shock**	10g, 11ms, functional
Operate Time	3ms	**Drop**	1 m
Release Time	1.5ms	**Ambient Temperature**	-40 ~ +85°C
Power Consumption	1.1W	**Weight**	Open: 8g Sealed : 12g

COIL DATA

Coil VDC	Pull-in Voltage VDC		Drop-out Voltage VDC		Nominal Current mA	Coil Resistance Ω±10%	Max. Operating Voltage VDC
	1A, 1B, 1C, 2A, 2B	2C	1B, 2B	1A, 1C, 2A, 2C			
006	3.75	4.5	0.35	0.7	215	28	8
012	7.5	9.0	0.7	1.4	93	130	16
024	15.0	18	1.4	2.8	46	520	31

ORDERING INFORMATION

MKB 012 1H S

Construction
S: Sealed Nil: Open

Contact Form
1 Form A = 1A, 1 Form B = 1B, 1 Form C, 1C
2 Form A = 2A, 2 Form B = 2B, 2 Form C = 2C

Coil Voltage

Model

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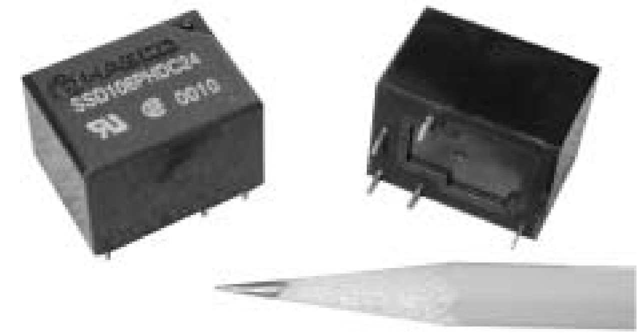
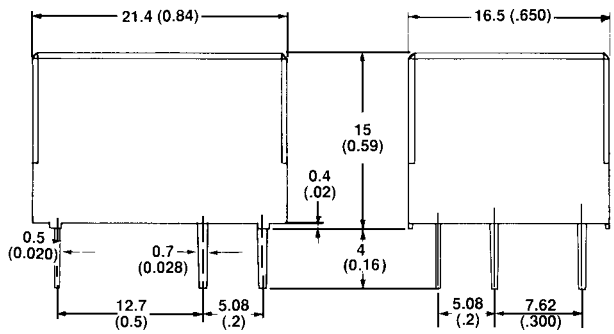
SSD SERIES/3, 6 OR 10 AMP SPDT RELAY



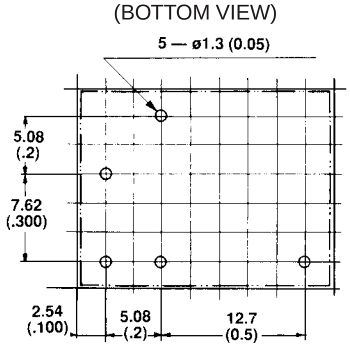
File E75887

File LR49291

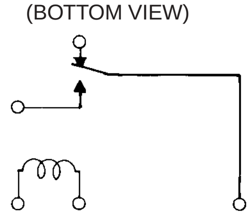
DIMENSIONS: mm (inch)



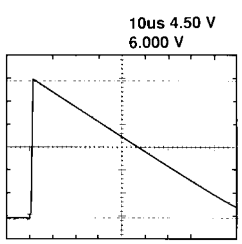
MOUNTING HOLES
(BOTTOM VIEW)



TERMINAL ARRANGEMENT
(BOTTOM VIEW)



LIGHTNING IMPULSE TEST



ORDERING INFORMATION

SSD		106PH	DC12
		Contact Material & Rating:	Nominal Voltage:
Model No.	Nil = Class B F = Class F	103 = Silver, gold flash, 3A 106 = Silver Cadmium oxide, 6A 110 = Silver Cadmium oxide, 10A	3 = 3VDC; 5 = 5VDC; 6 = 6VDC; 9 = 9VDC; 12 = 12VDC; 24 = 24VDC; 48 = 48VDC

FEATURES

- Highly reliable, low cost
- Miniature size & large switch capacity up to 10A
- High dielectric strength type
- Printed circuit terminals fits grid with 2.54 mm
- UL/CSA recognized
- Fully Sealed

SPECIFICATIONS

CONTACT DATA

Arrangement: 1 Form C (SPDT), 1 Form A (SPST-NO), 1 Form B (SPST-NC)

Material & Rating: Silver, gold flash: 3A at 24 VDC or 120V AC, 1.5A at 240V AC, resistive

Silver Cadmium oxide: 6A at 24VDC or 120VDC, 3A at 240V AC, resistive

Silver Cadmium Oxide: 10A at 24 VDC or 120VAC, 5A at 240VAC, resistive 6A, 300VAC and 1/8hp. 120/240VAC

Max. operating Voltage: 250VAC & 125VDC

Min. permissible load (reference value): Silver contact: 5VDC, 1mA

Other contact: 5VDC, 100mA

Service life: Mechanical: 20 Million operations

Electrical: 100,000 operations min. at rated resistive load

(See coil data chart)

Voltages: From 3V to 48V

Power (at 20°C): Nominal: 0.45 watt

GENERAL DATA

Contact resistance: 50m Ω Max.

Operate time: Approx. 6ms (at nominal voltage)

Operate bounce time: Approx. 2ms

Release time: Approx 2ms

Insulation resistance: More than 100M Ω at DC 500V

Dielectric strength: 750V AC (50/60 Hz), between open contact; 3000V AC (50/60 Hz), between coil & contact

Vibration: 1.5mm double amplitude, 10 to 50 Hz

Shock: 100m/sec^2 (approx. 10G's)

Operation frequency: Mechanical: 18,000 operations/hour

Electrical: 1,800 operations/hour (under rated load)

Temperature range: Class B: –45°C to 85°C
Class F: –45°C to 105°C

Temperature rise: Less than 35 degrees

Humidity: 45% – 85% RH

Approximate weight: 10g

NOTE: The data shown above are of initial value

4000V AC DIELECTRIC STRENGTH BETWEEN COIL & CONTACT AVAILABLE

COIL RATINGS

Nominal Coil Voltage	Coil Resistance in Ohms ± 10% at 20°C	Sensitive Coil Resistance in Ohms ±10% at 20°C	Must Operate Voltage at 20°C	Must Release Voltage at 20°C	Maximum Voltage
3VDC	20		75% max. of nominal voltage	10% min. of nominal voltage	130% of nominal voltage
5VDC	56	80			
6VDC	80	110			
9VDC	180	250			
12VDC	320	440			
24VDC	1150	1780			

REMARK

- Use alcohol, freon or water for cleaning. (water temperature not to exceed 50°C)

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SPDT 10 AMP HIGH SENSITIVE LOW PROFILE

MHR SERIES

FEATURES

- Subminiature Light Weight Relay
- High Sensitivity
- Switching Capacity Up to 16 Amp
- P.C. Board Mounting, Direct Pitch Terminal

COIL RATING

Rate Voltage (VDC)	Coil Resistance Ω±10%		Rated Current (mA)		Must Operate Voltage	Must Dropout Voltage	Maximum Voltage	Power Consumption (W)
	1A	1C	1A	1C	% of Rate Voltage (at+20°C)			
5	125	55.5	40	90	80 Max	5 Min	130 Max	1 Form A: 0.2 Approx. 1 Form C: 0.4 Approx.
6	180	80	33	76				
9	405	180	22	50				
12	720	320	16	37.5				
24	2880	1280	8	18.7				

ORDERING INFORMATION

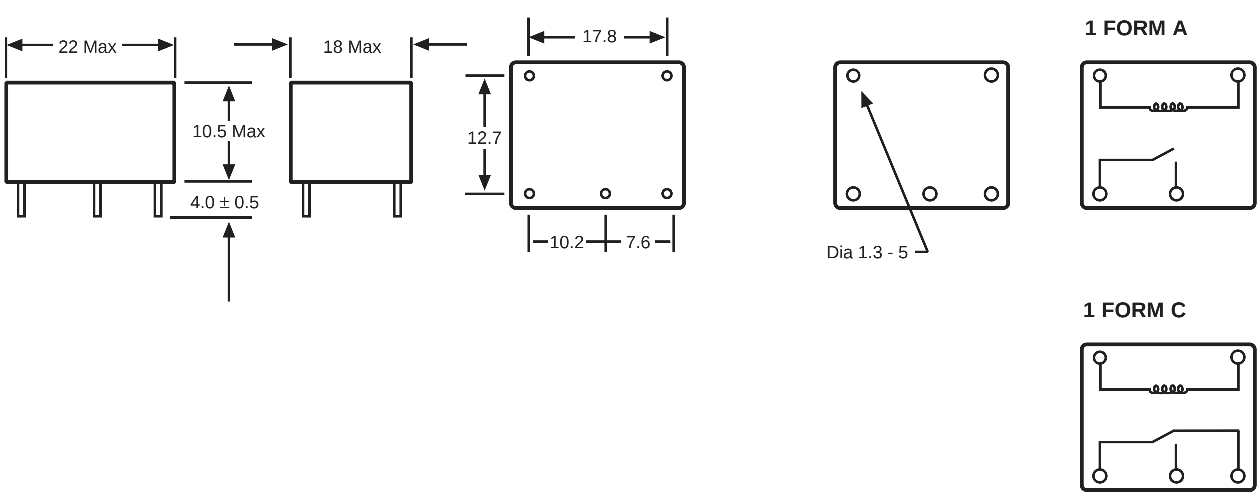
MHR 16 C DC12V

- DC12V: Rated Voltage
- C: A: 1 Form A; C: 1 Form C
- 16: 10: 10 Amp; 16: 16 Amp
- MHR: Relay Series

CHARACTERISTICS

Contact Arrangement	SPST (1 Form A)
Contact Material	$AgCdO_2$, $AgSnO_3$, $AgInO_2$
Contact Resistance	50mOhms Max
Contact Rating (resistive load)	1 Form A: “H” Type: 16A/125, 250VAC; Standard: 10A/125, 250VAC, 10A/30VDC; 1/10 HP 125, 277VAC 1 Form C: 10A/125VAC; 5A/250VAC, 3VDC; 1/10HP125, 277VAC
Switching Voltage	DC125V/AC 250V Max
Operate Time	10ms Max
Release Time	4ms Max
Insulation Resistance	500MOhms min. (500V DC)
Dielectric Strength	1000V/ms, 1 minute between open contact 1500V/ms, 1 minute between coil and contact
Shock resistance	10g Approx.
Vibration	55Hz, Amplitude 1.5mm
Ambient Temperature	–40°C to +85°C
Operation Life	Mechanical: 10^7 Electrical: 10^5
Weight	9g Approx.

DIMENSIONS mm (inches)



HASCO® COMPONENTS INTERNATIONAL, CORP.

RELAYS

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KSD205
DPDT 6 AMP

File E75887

FEATURES

- Miniature Two Pole Relay
- High Reliability
- 6 Amp Switching
- Fully Sealed
- Low Cost

COIL RATINGS

Type	Rated Voltage	Rated current (mA)	Coil resistance (Ω)	Must operate Voltage	Must dropout Voltage	Maximum Voltage	Power consumption (mW)
				% of rated voltage			
KSD	3VDC	167	18	Max	10 min.		Approx. 510
	5VDC	102	49	70 at 20°C		150 at 20°C	
	6VDC	85.7	70	73 30°C		142 30°C	
	9VDC	56.3	160	76 40°C		133 40°C	
	12VDC	42.9	280	79 50°C		123 50°C	
	24VDC	21.2	1130	82 60°C		113 60°C	

Note: The rated current and coil resistance are measured at a coil temperature at 20°C with tolerances of +15%, –20% for rated current +10% for rated coil resistance.

CONTACT RATINGS

Item \ Load Type	Resistive load (p.f. = 1)	Inductive Load (p.f. = 0.4, L/R = 7msec)
Material	Ag CdO	
Rated load	120VAC 6A 30VDC 6A	120VAC 3.0A 30VDC 3.0A
Carry current	6A	
Max. operating voltage	250VAC, 125VDC	
Max. operating current	6A	3.0A
Max. switching capacity	600A, 120W	300VA, 60W
Minimum permissible load (reference value)	5VDC, 100mA	

CHARACTERISTICS

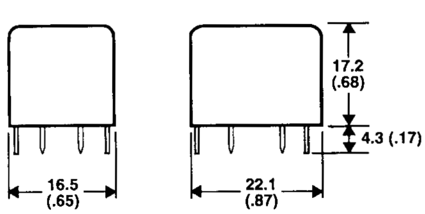
Contact resistance	50m Ω max.
Operate time	10 msec. max.
Release time	5 msec. max.
Operating Frequency	Mechanically: 18,000 operations/hour, Electrically: 1,800 operations/hour (under rated load)
Insulation resistance	100M Ω min. (at 500VDC)
Dielectric strength	1,500 VAC, 50/60 Hz for 1 minute between coil and contact, dissimilar pole 750 VAC, 50/60 Hz for 1 minute between non-continuous contacts of same pole
Vibration	1.5mm double amplitude, 10 to 55 Hz
Shock	100 m/sec^2 (approx 10 G's)
Ambient temperature	Operating: –25 to +60°C
Humidity	45-85% RH
Service life	Mechanically: 10,000,000 operations min.
Weight	Approx. 10g.

ORDERING INFORMATION

KSD205 **DC xx**

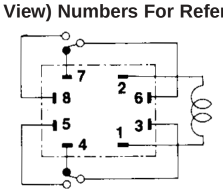
3 to 24 VDC

DIMENSIONS: mm (inch)



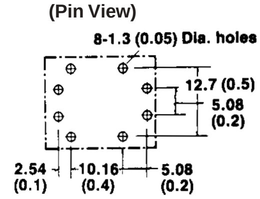
TERMINAL ARRANGEMENT

(Bottom View) Numbers For Reference Only



MOUNTING HOLES

(Pin View)



HAT-900 SERIES HEAVY DUTY
SPDT 40A NORMALLY OPEN & 30A NORMALLY CLOSED

File E75887

File LR49291

GENERAL SPECIFICATIONS

Contact Material: silver cadmium oxide with copper base
Max. continuous rated voltage: 110% of nominal voltage.
Pull-In voltage: 75% of nominal voltage. Max @ 25°C.
Drop-Out voltage: 10% of nominal voltage. Min @ 25°C.
Contact Resistance: 20 mΩ max. (Initial value)
Operating Temp: Class B: -20°C to 85°C
Class F: -20°C to 105°C
Insulation Resist: DC 500V 10 MΩ min.
Dielectric Strength: AC 2000V between contact and coil, frame and contact, coil and frame one minute. AC 1500V between contacts one minute.
Operate Time: approx. 15 ms.
Release Time: approx. 10 ms.
Electrical Life: 10 x 10^4 operation min. for 30A resistive load (N.O.)
5 x 10^4 operations min. for 40A Resistive Load (N.O.)
Mechanical Life: 10 x 10^6 operation min.

ORDERING INFORMATION

HAT — [ ] — 901 — C — S — DC — 12 — -1

Temp. Class	Type	Form	Style	Coil	Coil Voltage	Option
Nil: Class B F: Class F	901: PC Pins Only 902: PC Pins & Quick Connects 903: Quick Connects Only — Flange Mount	A: SPST-NO B: SPST-NC C: SPDT	Nil: Open C: Cover, not sealed S: Cover, sealed	AC or DC	See Table	Pin 6 is Omitted UL 840 *

*Note: 902 relays do not have pin 6.

DC COIL SPECIFICATIONS

Nominal Voltage (VDC)	Resistance ±10% @ 25°C (Ohms)	Coil Power @ 25°C (Watts)
5	27	.93
6	40	.90
9	97	.84
12	155	.93
15	256	.88
18	380	.85
22	640	.76
24	660	.87
48	2560	.88
110	13400	.90

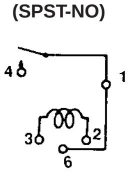
AC COIL SPECIFICATIONS

Nominal Voltage (at 25°C)	Resistance ±10% @ 25°C (Ohms)	Coil Power @ 25°C (VA)
12VAC	27	Approx 2VA
24VAC	120	
110VAC	2,360	
120VAC	3,040	
220VAC	13,490	
240VAC	15,735	
277VAC	20,300	

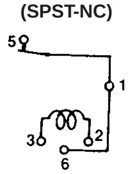
WIRING DIAGRAMS

PIN VIEW

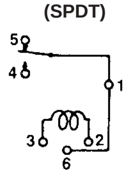
1 FORM A (SPST-NO)



1 FORM B (SPST-NC)



1 FORM C (SPDT)



MAXIMUM LOAD SPECIFICATIONS

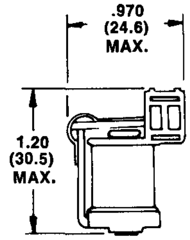
Voltage	Load Type	SPNC	SPNO
AC	Resistive	30A 277VAC	40A 277VAC
	Motor	1HP 120VAC 2HP 277VAC	1HP 120 VAC 2HP 277VAC
	General Purpose	30A 277VAC	40A 277VAC
	Ballast	10A 120VAC 10A 277VAC	30A 120VAC 20A 277VAC
	Tungsten	2A 120VAC	10A 120VAC
DC	Resistive	30A 28VDC	30A 28VDC

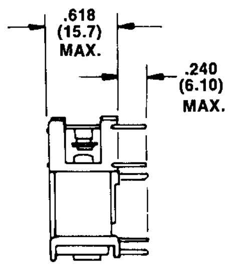
Shock Operational - 10g for 11ms w/no contact opening
Shock Destructive - 100g

HAT-900 SERIES HEAVY DUTY

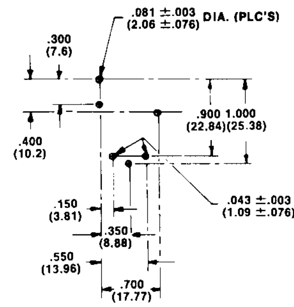
OUTLINE DIMENSIONS

MECHANICAL SPECIFICATIONS
901 OPEN STYLE

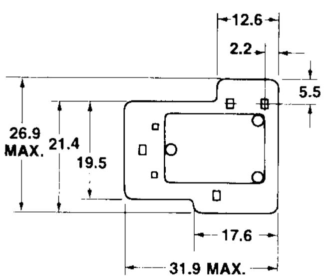


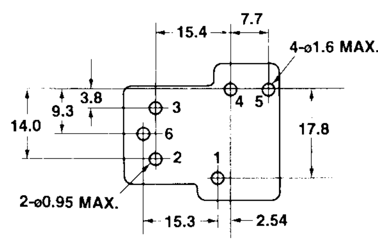


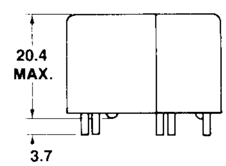
PC BOARD LAYOUT
VIEWED TOWARD TERMINALS



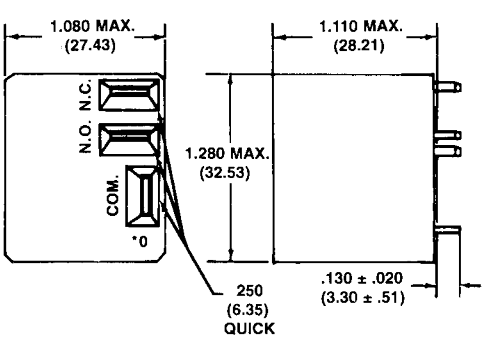
HAT 901 SERIES



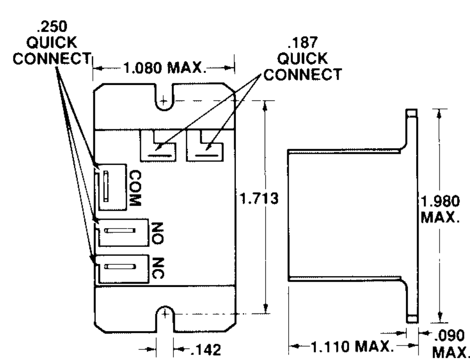




HAT 902 SERIES



HAT 903 SERIES



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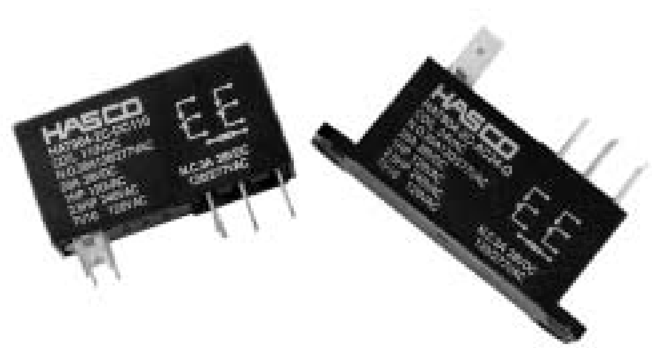
HAT-904 SERIES DPDT HEAVY DUTY



FEATURES

- 30A switching capabilities
- DPST-NO and DPDT configuration
- Meets VDE 8mm spacing, 4 KV dielectric
- Meets UL Class F construction
- Dust cover or sealed version: PCB or QC Terminal

CONTACT DATA

Contact Form		DPST-NO(2H), DPDT (2Z)
Initial Contact Resistance		50mΩ (measured at 1A 6VDC)
Contact Material		Silver cadmium oxide
RATING	NO	30A 120VAC/277V AC 20A 28VDC 1HP 120V AC, 2.5HP25V AC TV - 10
	NC	3A 28VDC/277V AC 2A 480V AC 1A 600V AC
Switching Current		Max 30A
Switching Voltage		Max 277V AC
Electrical Life		(Resistive)30A 250V AC $1\text{-}10^5$ (Motor)2HP 250V AC $1\text{-}10^5$
Mechanical Life		$5 - 10^6$

COIL DATA

Coil Consumption	AC±4.0VA,DC±1.7W
Coil Voltage	DC±6 – 110V, AC±24 – 277V
Coil Resistance	see table below

SPECIFICATION

Insulation Resistance	1000MΩ 500VDC
Dielectric Strength	
Between coil & contacts	4000V AC
Between open contacts	1500V AC
Between contact poles	2000V
Operate Time	15 ms
Release Time	10 ms
Ambient Temperature	At rated voltage
AC	-40 ±66°C
DC	-55 ±85°C
Humidity	35 – 85%
Vibration	1.65mm 10 – 55Hz
Shock	100 m/s² Malfunction 1000 m/s² Mechanical
Dimensions (mm)	52.32 x 34.5 x 30.43
Weight	approx. 86g
Termination	PCB & QC
Construction	Dust cover and Sealed
Flammability	U1.94-V0

TABLE

Nominal Voltage VDC	Pull-in Voltage VDC	Drop-out Voltage VDC	Coil Resistance Ω (±10%)	Nominal Voltage V AC	Pull-in Voltage V AC	Drop-out Voltage V AC	Coil Ω (±10%) 60 Hz	Coil Ω (±10%) 50 Hz
6	4.5	0.6	22	24	19.2	7.2	39	52
12	9.0	1.2	86	120	96.0	36.0	950	1390
24	18.0	2.4	350	208	166.4	62.4	2841	3900
48	36.0	4.8	1390	240	192.0	72.0	3800	5200
110	82.5	11.0	7255	277	221.6	83.1	5200	7255

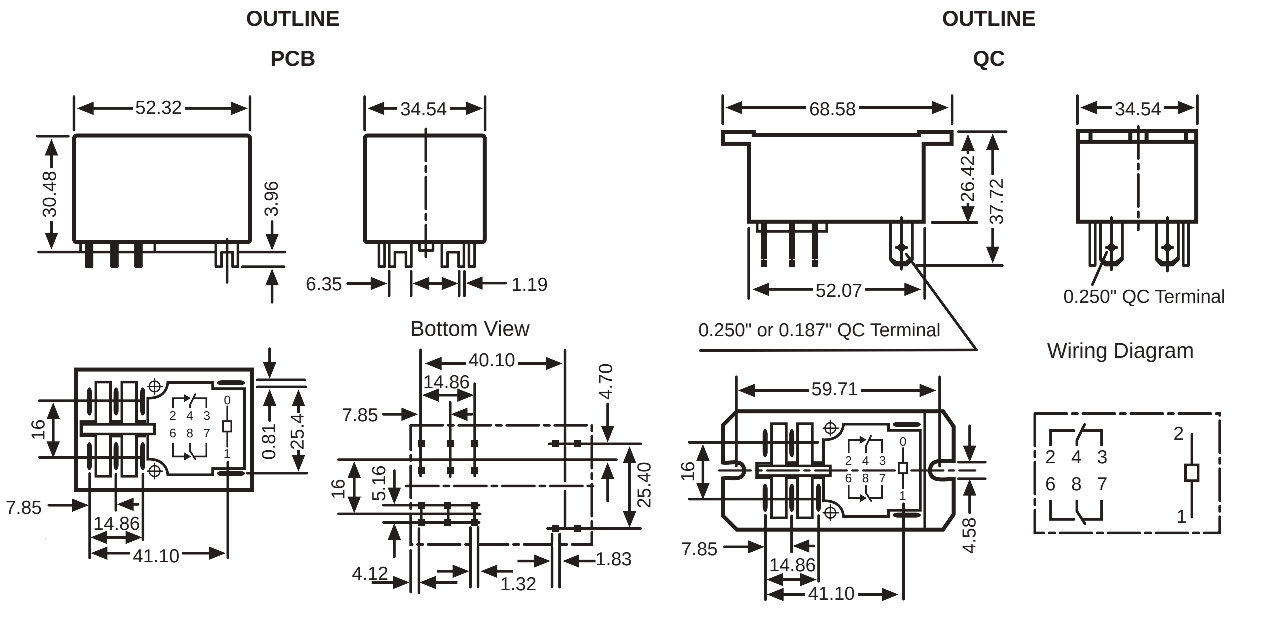
*When recounting pull-in voltage < 70% of nominal voltage, special order powered.

ORDERING INFORMATION

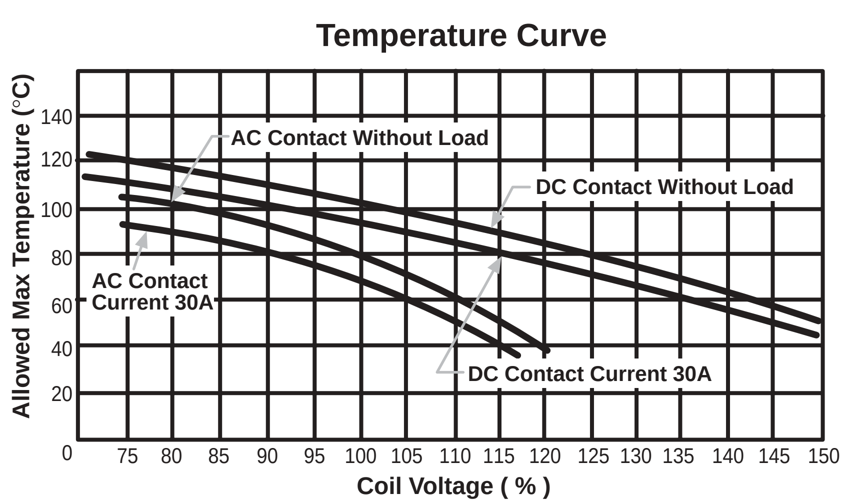
HATF904 2C DC 12 Q C

MODEL	FORM	COIL	COIL VOLTAGE		
HATF904	2A: 2 FORM A 2C: 2 FORM C	DC: DC COIL AC: AC COIL	DC: 5 → 120 AC: 5 → 277	NIL: PC PINS Q: QUICK CONNECT W/FLANGE MOUNTING	NIL: SEALED C: COVERED

OUTLINE DIMENSIONS, WIRING DIAGRAM AND PC BOARD LAYOUT



USEFUL CURVES



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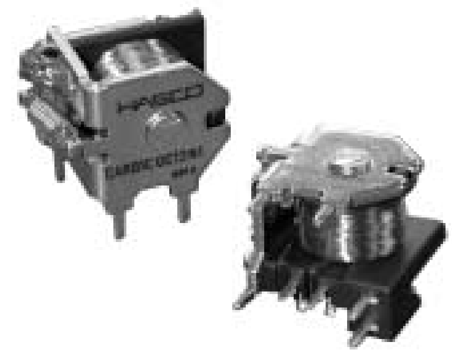
SUBMINIATURE RELAYS/AUTOMOBILE RELAYS
P.C. BOARD TYPE CARB SERIES



SPECIFICATIONS

Operate Time		15 msec. max.
Release Time		10 msec. max.
Breakdown Voltage		1000C AC (60HZ) for 1 minute between open contacts. 1500V AC (60HZ) for 1 minute between coil and contacts.
Insulation Resistance		More than 100MΩ at 500V DC
Shock Resistance		10G min.
Ambient Temperature	N	– 40°C ~ + 85°C
	H	– 55°C ~ + 125°C
Operating Speed		1800 operations/hour
Life	Mechanical	Over 10,000,000 operations
	Electrical	Over 100,000 operations
Weight		Approx. 18 ~ 19 g

COIL RATINGS

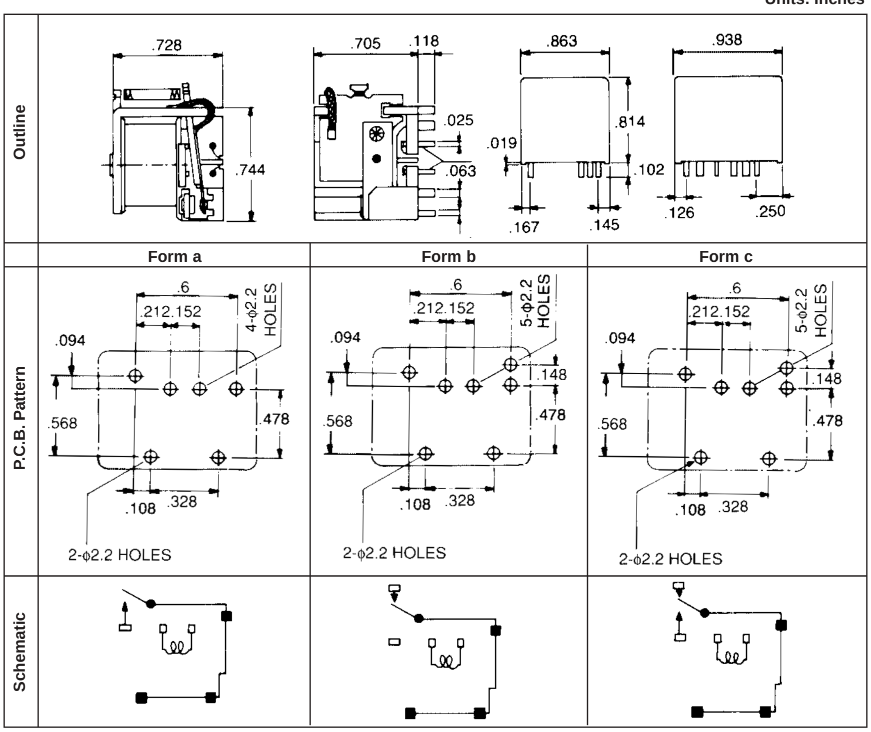
Rated Voltage	Resistance (±10% at 20C)	Rated Current (±10% at 20C)	Pick-up Voltage (Max.)	Drop-out Voltage (Min.)	Allowable Voltage (Max.)	Rated Operating Power Consumption
12V DC	90 ohm	133mA	9.6V	1.2V	14.4V	1.6W
24V DC	380 ohm	63mA	19.2V	2.4V	28.8V	1.5W
48V DC	2300 ohm	21mA	38.4V	4.8V	57.6V	1.0W

CONTACT RATINGS

Type & Arrangement		1 Form A		1 Form B		1 Form C	
Item \ Load		R Load (p.f. = 1)	L Load (p.f. = 0.4)	R Load (p.f. = 1)	L Load (p.f. = 0.4)	R Load (p.f. = 1)	L Load (p.f. = 0.4)
Rated Load	NC	—	—	15A 250V AC 15A 28V AC	7.5A 240V AC 7.5A 28V DC	15A 240V AC 15A 28V DC	7.5A 240V AC 7.5A 28V DC
	NO	30A 240V AC 30A 28V DC	15A 240V AC 15A 28V DC	—	—	20A 240V AC 20A 28V DC	10A 240V AC 10A 28V DC
Carry Current		30A		15A		20A	
Max. operating Vol.		380V AC 120V DC					
Max. operating Current		30A		15A		20A	
Max. switching capacity	NC	—	—	3600VA 420A	1800VA 210W	3600VA 420W	1800VA 210W
	NO	7200VA 840W	3600VA 420W	—	—	4800VA 560W	2400VA 280W
Material		Ag Alloy					
Contact Resistance		Less than 50mΩ (an initial value)					

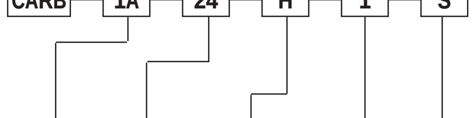
DIMENSIONS AND SCHEMATICS

Units: Inches



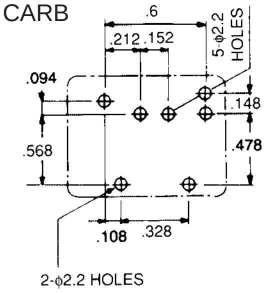
ORDERING INFORMATION

CARB	1A	24	H	1	S



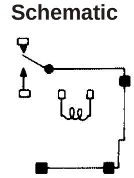
Contact Arrangement	Rated Coil Voltage	Ambient temperature range	Construction	Option
1A: 1 FORM A 1B: 1 FORM B 1C: 1 FORM C	12:12V DC 24:24V DC 48:48V DC	N: –40°C ~ +85° H: –55°C ~ +125°C	1. Open Type 2. Cover Type	Sealed

CARB



Top View

Schematic



Bottom View

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AUTOMOTIVE RELAY

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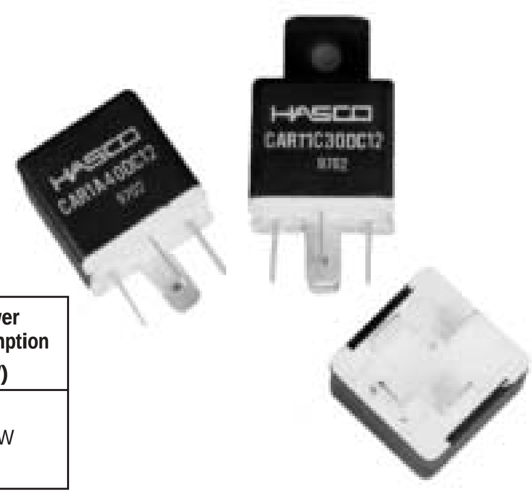
CAR 40 AMP OR 30 AMP AUTOMOTIVE RELAY



FEATURES

- High contact rating (40A)
- High temperature design
- 1 Form A and 1 Form C arrangements
- Quick connect and P.C. Board terminals
- Mounting Tab option

COIL RATING

Rate Voltage (VDC)	Coil Resistance Ω±10%	Rated Current (mA)	Must Operate Voltage	Must Dropout Voltage	Maximum Voltage (20°C)	Power Consumption (W)
			% of Rate Voltage (At+20°C)			
6	20	300	70 Max	10 Min	130Max	1.8W
12	80	150				
24	320	75				

ORDERING INFORMATION

CAR T 1C P 30 DC12-S

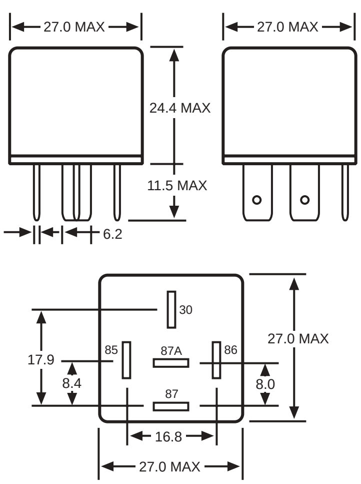
- S: Sealed / NIL: Not sealed
- Rated Voltage
- 30: 30 Amp P / 40: 40 Amp P
- Nil: Quick Connect / P: PC Pin
- 1A: 1 Form A / 1C: 1 Form C
- T = Mounting Tab / Nil: No Mounting Tab
- Series

CHARACTERISTICS

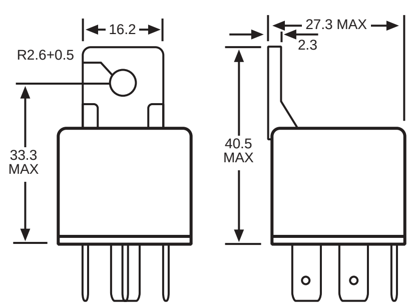
Contact Arrangement	SPST (1 Form A), SPDT (1 Form C)
Contact Material	40A (AGSNO2)
Contact Resistance	50mΩ Max
Contact Rating (resistive load)	40A 14VDC (1 Form A) 30A/14VDC (1 Form C)
Switching Voltage	DC75V
Operate Time	10ms Max
Release Time	10ms Max
Insulation Resistance	100MΩ min. (500V DC)
Dielectric Strength	500V/ msBetween coil and contact
Shock resistance	20g Approx. 20g
Vibration Resistance	10–40Hz, Amplitude 1.27mm, 10–40Hz 1.27mm
Ambient Temperature	–40°C to +85°C
Humidity	20 to 85% R.H
Operation Life	Mechanical: 10^6 Electrical: 10^5
Weight	30 gr. Approx.

DIMENSIONS mm (inches)

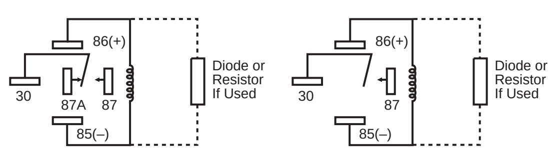
Dust Cover



Shrouded Cover

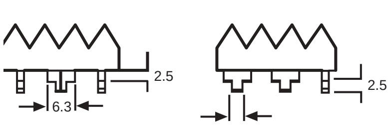


Terminal Arrangement



1 FORM C **1 FORM A**

P.C. Board Terminals



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CAR & CART 80 AMP AUTOMOTIVE RELAY

FEATURES

- High contact rating (80A)
- 1 Form A and 1 Form C arrangements
- Quick connect and P.C. Board terminals
- Mounting Tab optional

COIL RATING

Rate Voltage (VDC)	Coil Resistance Ohms±10%	Max Coil Voltage	Rated Current (mA)	Must Operate Voltage	Must Dropout Voltage	Power Consumption (W)
6	20	7.8	300	4.2	0.6	1.8W
12	80	15.6	150	8.4	1.2	
24	320	31.2	75	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. Pickup and release voltages are for test purposes only and are not to be used for design criteria

CHARACTERISTICS

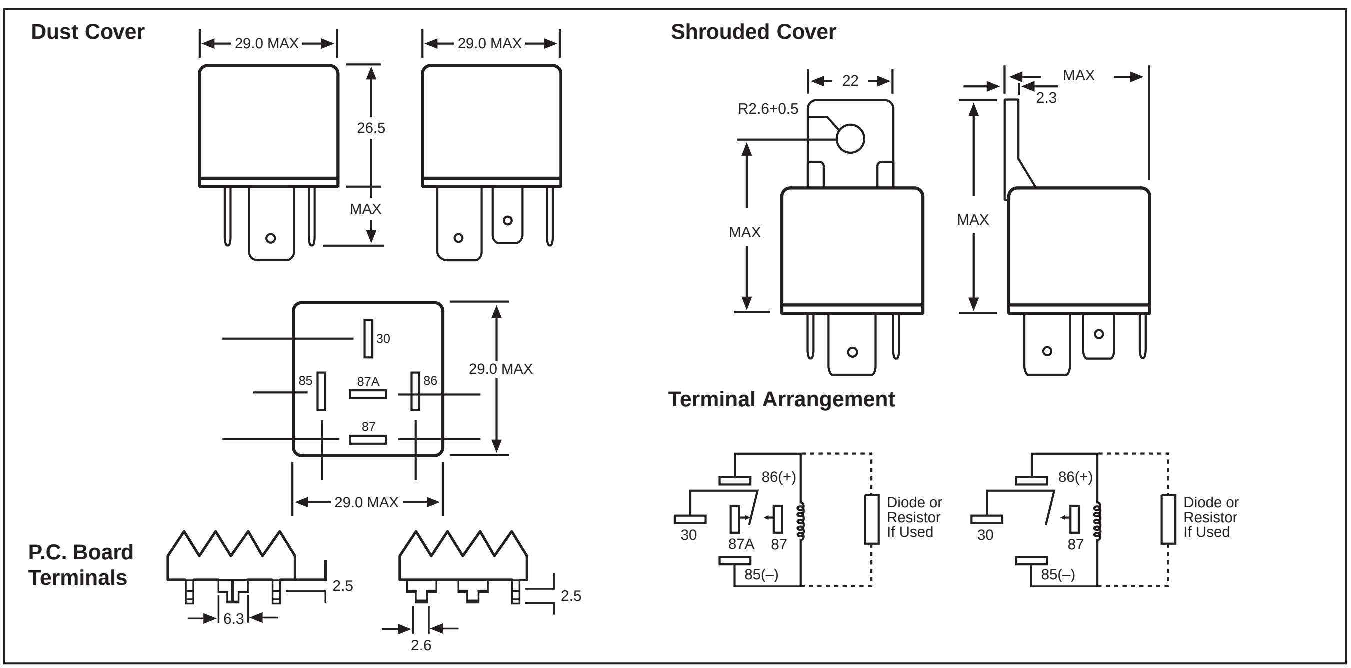
Contact Arrangement		SPST (1 Form A), SPST (1 Form B), SPDT (1 Form C)
Contact Material		$AgSnO_2$, AgNi
Contact Resistance		≤ 30 mΩ Item 3.12 of IEC2555-7
Contact Rating (resistive load)		50A, 80A 14 VDC (1 Form A); 40A, 60A/ 14 VDC (1 Form B);
		NO: 50A, 80A 14VDC; NC: 40A, 60A/14VDC (1 Form C)
Max Switching Voltage		75VDC
Max Switching Power		980W
Max Switching Current		80A
Operate Time		≤ 7mS Max
Release Time		≤ 5 mS Max
Operation Life	**Mechanical**	1,000,000
	Electrical	100,000 1 Form A@ 80Amp; 15,000 1 Form B & 1 Form C @ 80 Amps,
Insulation Resistance[1)]		100MOhms min. (500V DC)
Dielectric Strength[1)]		500V/ms between coil and contact
Shock Resistance		20g Approx. 20g
Vibration Resistance		10-40Hz, Amplitude 1.27mm, 10-40Hz 1.27mm
Ambient Temperature		-40°C to +85°C
Relative Humidity		85% R.H. (at 40°C)
Weight		46g (CAR); 48g (CART)

ORDERING INFORMATION

CAR T 1C P 80 DC12-S

- S: Sealed; NIL: Not sealed
- 6: 6VDC; 12: 12VDC; 24: 24VDC
- 1 Form A 80 Amp; 1 Form C 60 Amp NC 80 Amp NO; 1 Form A 60 Amp
- Nil: Quick Connect; P: PC Pin
- 1A: 1 Form A; 1C: 1 Form C; 1B: 1 Form B
- T = Mounting Tab; Nil: No Mounting Tab
- Series

DIMENSIONS mm (inches)



HASCO® COMPONENTS INTERNATIONAL, CORP.

RELAYS

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SPR RELAYS

FEATURES

- Small size for high density mounting
- Up to 5000VAC Dielectric strength
- Fully Sealed

DIMENSIONS (Units: mm)

Rated Voltage V DC	Coil Resistance Ohm ±10%	Must Operate Voltage V DC (max)	Must Release Voltage V DC (min)	Maximum Voltage V DC	Coil Power W
5	62	3.50	0.5	130% of rated voltage	0.40
6	90	4.20	0.6		
12	360	8.40	1.2		
24	1,440	16.8	2.4		
48	5,760	33.6	4.8		
60	7,500	42.0	6.0		
110	25,200	77.0	11.0		

CHARACTERISTICS

Contact Arrangement		1A, 1B, 1C,	2A, 2B, 2C
Contact Material		$AgCdO_2$, $AgSnO_2$	
Contact Rating (resistive);		12A/ 16A 250VAC; 10A 24VDC	8A 250VAC, 8A 24VDC
Max. Switching Power		3,000VA/ 4,000VA	2,000VA
Max. Switching Voltage		440VAC	
Max. Switching Current		16 A	8 A
Initial Contact Resistance (at 1A 6VDC)		MAX. 50mOhm	
Operate time		MAX. 10 ms	
Release Time		MAX. 5 ms	
Insulation Resistance		1,000 M ohm min (at 500VDC)	
Dielectric Strength		1,000VAC between open contacts 5,000VAC between contact and coil 2,500VAC between contact sets	
Operating temperature Storage temperature		-40°C~85°C -40°C~100°C	
Humidity		20°C 35% - 85%	
Operation life	Mechanical	10 x 10^6 operations (72,000 operations/hour)	
	Electric	10 x 10^4 operations (360 operations/hour)	
Weight		13.5 g Approx.	
Vibration Resistance		10 to 150 Hz 10g/5g	
Shock	Functional	100m/s2	
Resistance	Destructive	1000m/s2	

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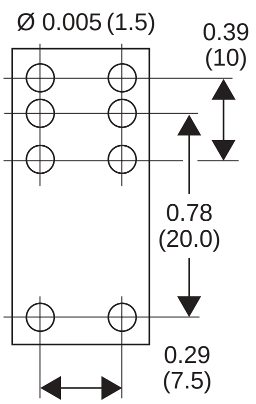
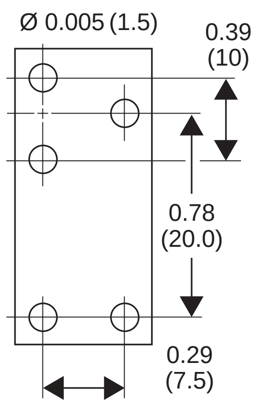
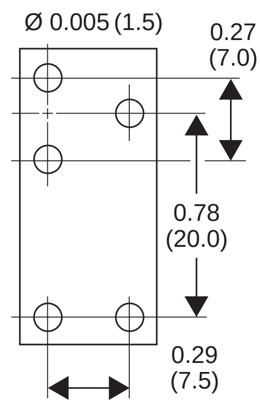
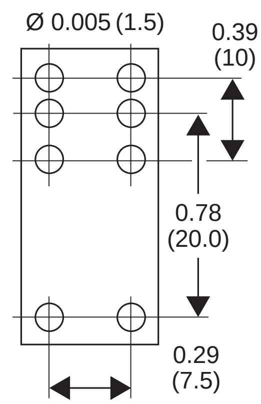
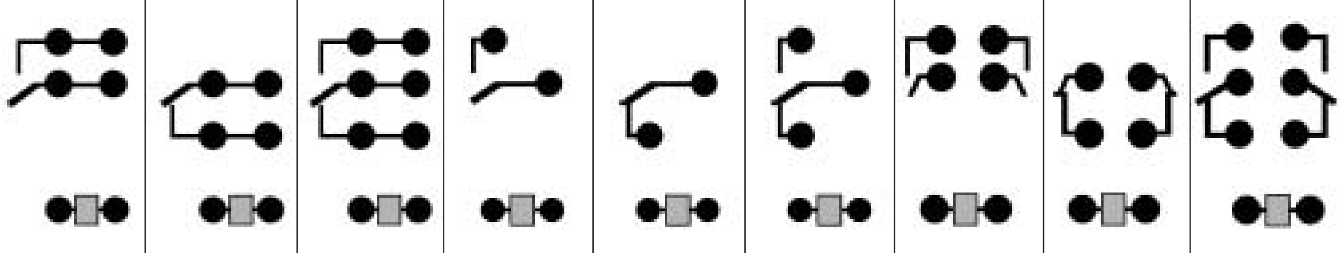
SPR RELAYS

SPR PCB LAYOUT (BOTTOM VIEW) 400 mW COIL

16A: 1A, 1B, 1C	12A: 1A, 1B, 1C		8A: 2A, 2B, 2C
K Type	K Type	R Type	K Type
			

SCHEMATIC

16A Type	12A Type	8A Type



ORDERING INFORMATION

SPR		16	DC	K
Series	Contact Form: 1A, 1B, 1C	Contact Current	Voltage DC: 5, 6, 12, 24, 48, 60, 110	Pole Distance K: 5mm **ONLY**

SPR		12	DC	
Series	Contact Form: 1A, 1B, 1C	Contact Current	Voltage DC: 5, 6, 12, 24, 48, 60, 110	Pole Distance: K: 5mm R: 3.5mm

SPR		8	DC	
Series	Contact Form: 2A, 2B, 2C	Contact Current	Voltage DC: 5, 6, 12, 24, 48, 60, 110	Pole Distance: K: 5mm **ONLY**

RELAYS

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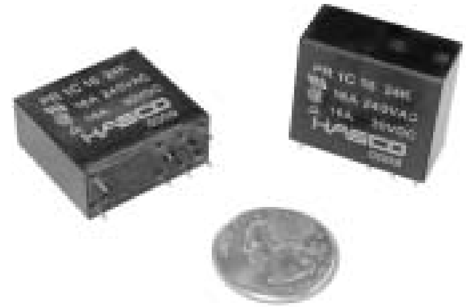
PR SERIES
COMPACT POWER RELAYS 1C (16A, 10A), 2C (5A)



FEATURES
- High breakdown voltage (4,000V AC between coil and contact)
- Large switching capacity (16A 240V AC)
- Fully sealed

File E75887 File LR49291

TÜV

TYPICAL APPLICATIONS
General electronic controls or systems, Machine tool controls, Energy control circuits, Industrial machinery controls, Consumer controls (Air-conditioner, Rerigerator, Microwave Oven, etc.), Vending machine, Office machine, etc.

COIL RATINGS

Rated Voltage	Resistance (±10% at 20°C)	Rated Current (±10% at 20°C)	Pick-up Voltage (Max.)	Drop-Out Voltage (Min.)	Allowable Voltage (Max.)	Rated operating power
5V DC	47 Ω	106.3 mA	4V DC	0.5V DC	6V DC	Approx 0.5W
6V DC	68 Ω	88 mA	4.8V DC	0.6V DC	7.2V DC	
9V DC	155 Ω	58 mA	7.2V DC	0.9V DC	10.8V DC	
12V DC	275 Ω	44 mA	9.6V DC	1.2V DC	14.4V DC	
24V DC	1,100 Ω	22 mA	19.2V DC	2.4V DC	28.8V DC	
48V DC	4,400 Ω	11 mA	38.4V DC	4.8V DC	57.6V DC	
110V DC	14,400 Ω	7.6 mA	80V DC	11V DC	120V DC	

* Coil resistance varies ± 0.4% for each ± 1°C change in coil temperature

CONTACT RATINGS

Type & Arrangement	PR-1 (1a, 1c)		PR-1 (1a, 1c)		PR-2 (2a, 2c)	
Load / Item	R load (p.f. = 1)	L load (p.f. = 0.7)	R load (p.f. = 1)	L load (p.f. = 0.7)	R load (p.f. = 1)	L load (p.f. = 0.7)
Rated load	16A 220V AC 16A 30V DC	16A 220V AC 8A 30V DC	10A 220V AC 10A 30V DC	10A 220V AC 5A 30V DC	5A 220V AC 5A 30V DC	5A 220V AC 2.5A 30V DC
Carry current	1/2 hp 120VAC 16A		1/4 hp 120VAC 10A		1/8 hp 120VAC 5A	
Max. operating voltage	380V AC, 120V DC					
Max. operating current	16A/3A Tungsten		10A/3A Tungsten		5A	
Max. switching capacity	3,520VA, 480W	1,760VA, 240W	2,200VA, 300W	1,100VA, 150W	1,100VA, 150W	550VA, 75W
Material	AgCdO					
Contact resistance	Less than 50mΩ (initial value)					

SPECIFICATIONS

Operate time		15m sec. max.
Release time		10m sec. max.
Breakdown voltage		1,000V AC (60Hz) for 1 minute between open contacts 4,000V AC (60Hz) for 1 minute between coil and contacts
Insulation resistance		More than 1,000 MΩ at 500V DC
Vibration resistance		10 ~ 55 Hz at double amplitude of 1.5 mm
Shock resistance		10G min.
Ambient temperature range		-40°C ~ +85°C
Operating speed		1,800 operations/hour
Life	Mechanical	Over 10,000,000 operations
	Electrical (R load)	Over 100,000 operations
Weight		Approx. 17 g (PR-1), Approx. 22 g (PR-2)

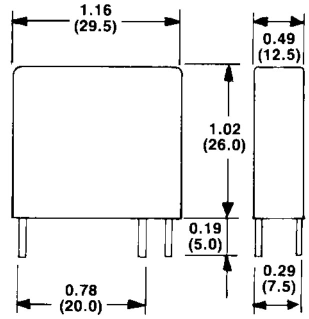
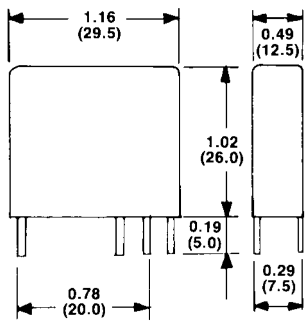
ORDERING INFORMATION

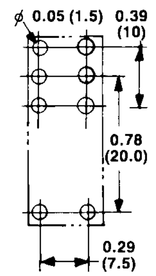
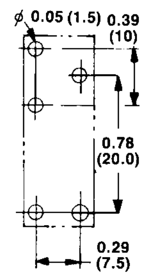
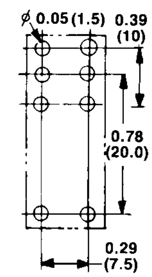
PR — 2C — 5 — 12 — K

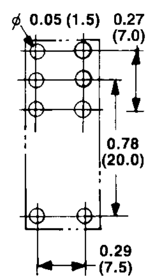
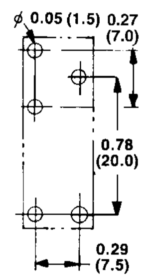
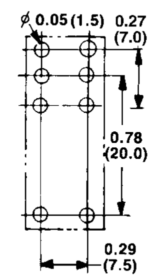
CONTACT ARRANGEMENT	CONTACT RATING	RATED COIL VOLTAGE	POLE DISTANCE
1c, 1a 2c, 2a	16 10 5	5 12 6 24 9 48	K: 5 mm R: 3.5 mm

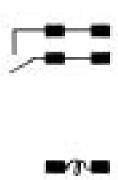
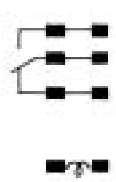
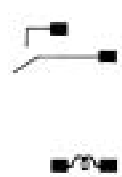
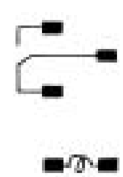
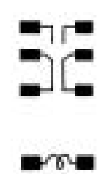
PR SERIES
COMPACT POWER RELAYS

DIMENSIONS AND SCHEMATICS PR

Outline	
Contact Arrangement "a"	
Contact Arrangement "c"	

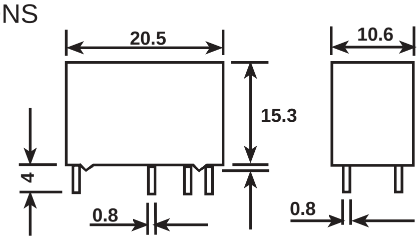
P.C.B. Pattern (Bottom View)		
PR1		PR2
16A Type	10A Type	5A Type
K Type	K Type	K Type
		

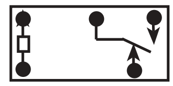
P.C.B. Pattern (Bottom View)		
PR1		PR2
16A Type	10A Type	5A Type
R Type	R Type	R Type
		

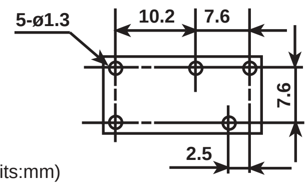
P.C.B. Pattern (Bottom View)					
PR1				PR2	
16A Type		10A Type		5A Type	
a	c	a	c	a	c
					

HPR RELAYS

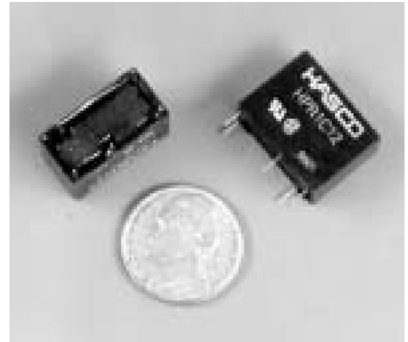
DIMENSIONS







(Units:mm)



COIL DATA (at 20°C)

Rated Voltage VDC	Coil Resistance Standard Type Ohm±10%	Coil Resistance Sensitive Type Ohm±10%	Must Operate Voltage VDC(max)	Must Release Voltage VDC(min)	Coil Power Standard Type W	Coil Power Sensitive Type W
3	20	45	2.25	0.15	0.45	0.20
5	55	125	3.75	0.25		
6	80	180	4.50	0.30		
9	180	400	6.75	0.45		
12	320	720	9.00	0.60		
18	720	1600	13.5	0.90		
24	1280	2800	18.0	1.20		

CHARACTERISTICS

Contact Arrangement		SPST-NO, SPDT	
Contact Material		Silver Alloy	
Contact Rating (resistive)	SPST-NO		5A/250VAC, 5A/30VDC, 10A/125VAC
	SPDT	NO	5A/250VAC, 5A/30VDC, 10A/125VAC
		NC	3A/250VAC, 3A/30VDC
Contact Resistance		Max. 100mOhm (measured at 1A, 24VDC)	
Operate Time		Max. 8ms	
Release Time		Max. 5ms	
Insulation Resistance		1000Mohm min (at 500VDC)	
Dielectric Strength		1000VAC 1min. between open contacts	
		4000VAC 1min. between contact and coil	
Shock Operation		$100m/s^2$ Malfunction	
		$1000m/s^2$ Mechanical	
Vibration Operational		10~55Hz 1.66mm	
Ambient Temperature		-40~70°C	
Humidity		35%~95%	
Operation Life	**Mechanical**	10×10^7	
	Electrical	10×10^6	
Dimensions		20.5 x 10.6 x 15.3mm	
Terminal		PCB	
Weight		7g Approx	

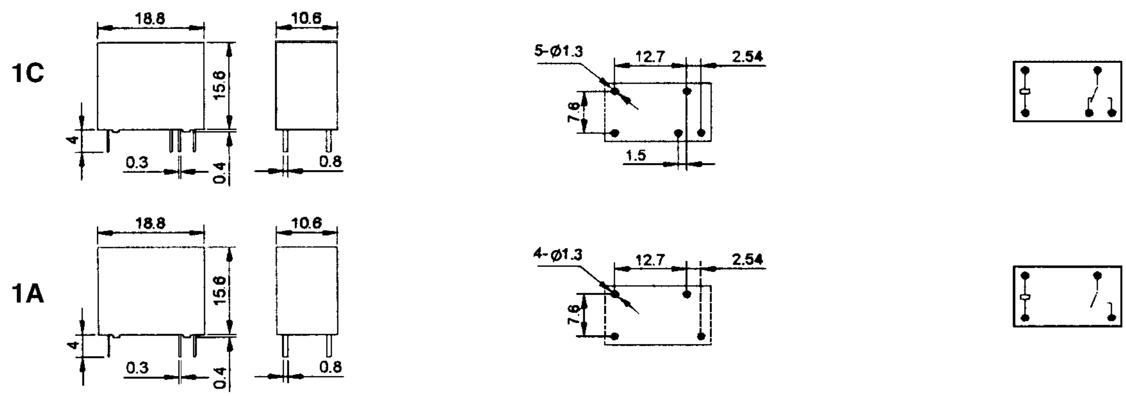
ORDERING INFORMATION

HPR 1A 12 -1 S

- S: Sensitive; Nil: Standard
- Nil: Sealed; I: Unsealed
- Coil Voltage
- Contact Form
- Series

RPR RELAYS

DIMENSIONS



(Unit: mm) **Dimensions** **Mounting (Bottom views)** **Wiring diagram**

COIL RATINGS

Rated Voltage VDC	Coil Resistance Standard Type Ohm+/-10%	Coil Resistance Sensitive Ohm+/-10%	must Operate Voltage VDC(max)	Must Release Voltage VDC(max)	Coil Power Standard Type	Coil Power Sensitive Type
3	20	45	2.25	0.15	0.45	0.20
5	55	125	3.75	0.25		
6	80	180	4.50	0.30		
9	180	400	6.75	0.45		
12	320	720	9.00	0.60		
18	720	1600	13.5	0.90		
24	1280	2800	18.0	1.20		

CONTACT RATINGS

Contact Arrangement	Form 1A = SPST-NO Form 1C = SPDT		
Contact Material	Silver Alloy		
Contact Rating (Resistive)	Form 1A = SPDT-NO	0.20W 3A/250VAC, 3A/30VDC,	0.45W 5A/250VAC, 5A/30VDC, 10A/125VAC
	SPDT NO	5A/250VAC, 5A/30VDC, 10A/125VAC	
	NC	3A/250VAC, 3A/30VDC	
Contact Resistance	MAX. 100mOhm (measured at 1A, 24VDC)		
Operate Time	MAX. 8ms		
Release Time	MAX. 5ms		
Insulation Resistance	1000Mohm min (at 500VDC)		
Dielectric Strength	1000VAC 1min between open contacts		
	2500VAC 1min between contact and coil		
Shock Operation	10g		
Vibration Operational	10~55Hz 1.5mm		
Ambient Temperature	~40~700°C		
Humidity	35%~95%		
Operational Life — **Mechanical**	10 times 10^7		
Electrical	10 times 10^5		
Terminal	PCB		
Weight	6g Approx		

ORDERING INFORMATION

RPR	1A	12	-1	S
Series	Contact Form 1A, 1C	Coil Voltage 3, 5, 6, 9, 12, 18, 24	Nil: Sealed, I: Unsealed	S: Sensitive; Nil: Standard

HASCO® COMPONENTS INTERNATIONAL, CORP.

RELAYS

✻ SINCE 1976 ✻

UJ SERIES
MINI POWER RELAYS, 15A (1C), 10A (2C)

PCB AND RAILMOUNT SOCKETS AVAILABLE

ORDERING INFORMATION

UJ 2 C P AC 220 L FT

- SERIES: UJ
- NUMBER POLES: 1, 2, 3, 4
- CONTACT ARRANGEMENT: A: SPST-NO; B: SPST-NC; C: SPDT
- TERMINAL STYLE: P: P.C. Board; S: Quick Connect
- COIL INPUT: A: AC; D: DC
- RATED COIL VOLTAGE: SEE COIL RATINGS
- OPTION: L: LED; N: NEON
- OPTION: FT: FLANGE TOP; FB: FLANGE BOTTOM; FS: FLANGE SIDE

SPECIFICATIONS

Operate time		25 msec. max. (AC, DC)
Release time		25 msec. max. (AC, DC)
Breakdown voltage		1,000V AC (60Hz) for 1 minute between open contacts 1,500V AC (60Hz) for 1 minute between coil and contacts
Insulation resistance		More than 100 MΩ at 500V DC
Vibration resistance		10~55 Hz at double amplitude of 1mm.
Shock resistance		100 m/s^2 Malfunction, 1000 m/s^2 Mechanical
Ambient temperature range		-40~ +70°C
Life	**Mechanical**	2 x 10^7
	Electrical (R load)	10 x 10^4
Weight		Approx 37 g

TABLE

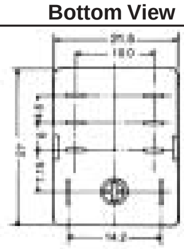
Nominal Voltage VDC	Pick-up Voltage VDC	Drop-Out Voltage VDC	Coil Resistance Ω	Nominal Voltage VAC	Pick-up Voltage VAC	Drop-out Voltage VAC	Coil Resistance Ω
5	4.0	0.5	27.5±10%	6	4.8	1.8	11.5±10%
6	4.8	0.6	40±10%	12	9.6	3.6	46±10%
12	9.6	1.2	160±10%	24	19.2	7.2	184±10%
24	19.2	2.4	650±10%	48	38.4	14.4	735±10%
48	38.4	4.8	2600±5%	120	96.0	36.0	4550±15%
110	88.0	11.0	11000±15%	220/240	176.0	66.0	14400±15%

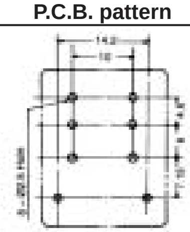
* When requiring pull-in voltage <80% of nominal voltage, special order.

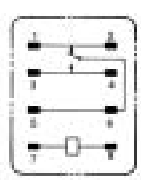
DIMENSIONS

Bottom View | **P.C.B. pattern** | **Schematic** | **Outline**

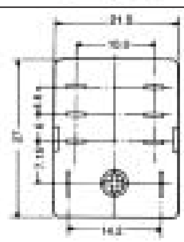
UJ-1

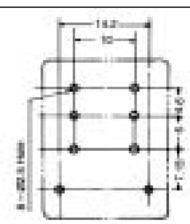


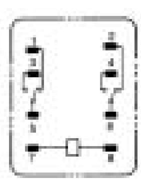




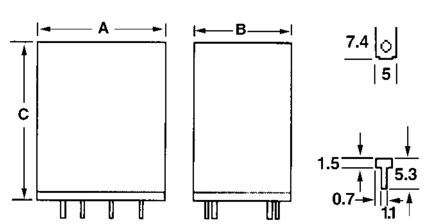
UJ-2







Outline



Series	5mm Terminals (Quick Connect)		
	A	B	C
UJ1	27.6	21.5	34
UJ2	27.6	21.5	36
UJ3	27.6	31.5	36
UJ4	27.6	41.5	36

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UJJ SERIES
MINI POWER RELAYS

RAILMOUNT SOCKET AVAILABLE

ORDERING INFORMATION

UJJ 2 C S AC 220 L FT

- **SERIES**: UJJ
- **NUMBER POLES**: 1, 2, 3, 4
- **CONTACT ARRANGEMENT**: A: SPST-NO; B: SPST-NC; C: SPDT
- **TERMINAL STYLE**: P: P.C. Board; S: Plug-In 2.5mm Pin
- **COIL INPUT**: A: AC; D: DC
- **RATED COIL VOLTAGE**: SEE COIL RATINGS
- **OPTION**: L: LED; N: NEON LIGHT
- **OPTION**: FT: FLANGE TOP

CONTACT DATA

Contact Form	2C, 3C		4C	
Initial Contact Resistance	50mΩ (measured at 1A, 30VDc)			
Contact Material	Silver Alloy			
Contact Rating	5A	7A	3A	5A
	30VDC/220VAC			
Switching Capacity	150W/110VA	210W/1540VA	90W/660VA	150W/110VA
Switching Current	5A	7A	3A	5A
Switching Voltage	125VDC/250VAC			
Electrical Life	2X10^5OPS	1X10^5OPS	2X10^5OPS	1x10^5OPS
Mechanical Life	2X10^7 OPS			

COIL DATA

Coil Consumption	DC: 0.9W	AC: 1.2VA
Coil Voltage	5~110VDC	6~240VDC
Coil Resistance	see table below	

SPECIFICATIONS

Insulation Resistance	1000MΩ, 500VDC
Dilectric Strength	
Between coil and Contact	1500VAC, 1 min
Between open contacts	1000VAC, 1min
Operate Time	25ms
Release Time	25ms
Ambient Temperature	-40~85°C
Humidity	35%~95%RH
Vibration Resistance	1.5mm, 10~55Hz
Shock Resistance	100m/s^3 Malfunction 1000m/s^2 Mechanical
Dimensions (mm)	28X21.5X35
Weight	approx. 37g
Termination	PCB & Plug-in
Construction	Dust Cover

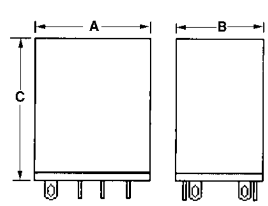
TABLE

Nominal Voltage VDC	Pick-up Voltage VDC	Drop-Out Voltage VDC	Coil Resistance Ω	Nominal Voltage VAC	Pick-up Voltage VAC	Drop-out Voltage VAC	Coiil Resistance Ω
5	4.0	0.5	27.5±10%	6	4.8	1.8	11.5±10%
6	4.8	0.6	40±10%	12	9.6	3.6	46±10%
12	9.6	1.2	160±10%	24	19.2	7.2	184±10%
24	19.2	2.4	650±10%	48	38.4	14.4	735±10%
48	38.4	4.8	2600±5%	120	96.0	36.0	4550±15%
110	88.0	11.0	11000±15%	220/240	176.0	66.0	14400±15%

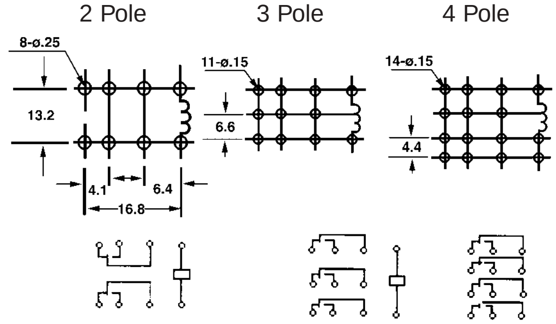
* When requiring pull-in voltage <80% of nominal voltage, special order.

DIMENSIONS

Series	A	B	C
UJ1	27.6	21.5	34
UJ2	27.6	21.5	36
UJ3	27.6	21.5	36
UJ4	27.6	21.5	36



2 Pole 3 Pole 4 Pole



CONTACT

(1) Contact arrangement

Denotes the contact switching combinations available on a relay and are defined in terms of number of poles, number of throws (single or double), normal position (open or close), and the sequence to make and break.

Fundamental contact arrangements are given in Table 1.

(2) Contact type

The one structure of contact forming the contact parts, Single contact and Bifurcated contact are offered.

(3) Contact material

The contacts are fastened to the movable leaf spring and stationary terminal to ensure electrical contact. Usually they are made of materials that mainly consist of silver because of its high electrical and thermal conductivity. For small-current loads, the gold-plated or the gold-overlay silver contacts are generally used.

(4) Contacting

The typical power, voltage or current, which a relay can turn on and off under specified conditions of load, ambient temperature and humidity. Usually, the contact rating refers to resistive load.

(5) Max. switching power

The upper limit of power which can be switched by the contacts. This value will be lower than the product of the maximum voltage and the maximum current. Care should be taken not to be exceed this value.

(6) Max. switching voltage

The maximum open circuit voltage which can safely be switched by the contacts. AC and DC voltage maximums will differ in most cases.

(7) Max. switching current

The maximum current which can safely be switched by the contacts. AC and DC current maximums may differ.

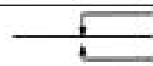
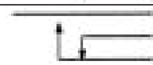
(8) Min. switching current

The minimum value of current that can be reliably switched by the contacts.

(9) Contact resistance

The electrical resistance of closed contacts measured at their associated terminals.

Table 1 Fundamental contact arrangement

Form	Description	Symbol	Performance
A	Make (NO)		The combination in which the contacts are open in normal or unoperated position.
B	Break (NC)		The combination in which the contacts are closed in the unoperated position.
C	Transfer (BBM)		The combination in which Form B (NC) contact open before Form A (NO) contacts close.
D	Continuous (BBM)		The combination in which Form A (NO) contact close before Form B (NC) contacts open.

Note: 1. Abbreviations used to define the nature of the contacts are as follows:

NO:	Nomally open	M:	Make	BBM:	Break before Make
NC:	Nomally closed	B:	Break	MBB:	Make before Break

2. Double switching combinations are called 2 Form A (2A) or 2 Form C (2C).
3. The following abbreviations are used occasionally.

SP:	Single pole	ST:	Single throw
DP:	Double pole	DT:	Double throw

Ex. SPST	NO : 1 Make		(1 Form A or 1a)
SPST	NC : 1 Break		(1 Form B or 1b)
SPDT	:	1 Transfer	(1 Form C or 1c)
DPDT	:	2 Transfer	(2 Form C or 2c)
4 PDT	:	4 Transfer	(4 Form C or 4c)

COIL

(1) Nominal voltage

A single value of voltage intended to be applied to the coil.

(2) Nominal power

The value of power used by the coil at nominal voltage. For DC coils, expressed in Watts.

$$\text{Nominal power} = \frac{V^2}{R}$$

V: Nominal Voltage
R: Coil Resistance (at 20°C)

(3) Coil resistance

The resistance of the coil for temperature conditions listed in the catalog. (usually at 20°C/68°F)

(4) Pick-up (Set) voltage

When the coil voltage is increased gradually from 0V, the relay will operate at a certain voltage. This voltage is called the Pick-up voltage. The Pick-up voltage in the catalog shows the maximum value. In case of latching relay, the Pick-up voltage is called the Set Voltage.

(5) Drop-out (Reset) voltage

When the coil voltage on an operate relay is decreased gradually, the relay will release at a certain voltage. This voltage is called the Drop-out voltage. The Drop-out Voltage in the catalog shows the minimum value. In case of latching relay, the Drop-out voltage is called the Reset voltage, when the reverse voltage is increased on the coil of operate relay, the voltage which the relay will release.

(6) Operating power

The value of power used by the coil at Pick-up voltage

(7) Max. continuous voltage

The maximum value of voltage that can be applied continuously to the coil without causing damage.

(8) Operating function

- *Single side stable type:*

  Relay which turns on when the coil is energized and turns off when de-energized.
- *1 Coil latching type:*

  Relay with a latching construction that can maintain the on or off state with a pulse input. With one coil, the relay is set or reset by applying signals of opposite polarities.
- *2 Coil latching type:*

  Relay with a latching construction composed of 2 coils, set coil and reset coil. The relay is set or reset by alternately applying pulse signals of the same polarity.

MAIN POINTS TO SELECT SUITABLE RELAY

A relay may meet with a variety of ambient conditions during actual usage. In order to avoid unexpected failure in result, testing over practical range under actual operating condition is required. For proper use of relays, the characteristics of the selected relay should be well known, and the conditions of relay use has to be investigated to determine whether they are matched to the environmental conditions, In addition, the coil conditions, contact conditions, and the ambient conditions for the relay that is actually used must be sufficiently known in determining the relay specifications. The table below shows a summary of points of consideration for relay selection. It may be used as a reference for investigation of items and points of caution.

Table 2. Main Ponts to Select Relays

Item	Specification Points	Consideration Points
Contact	Contact arrangement	Contact forms, number of poles, Contact sequence
	Contact load	Level of load, AC or DC, resistive or indicative or capacitive, counter voltage of inductive load
	Contact material	Contact material should be matched to the level of load
	Life	Number of operations, Frequency in switching
Coil	Coll voltage	Nominal voltage, power source ripple
	Pick-up and Drop-out voltage	Fluctuation in supply voltage, Rise in Pick-up and Drop-out voltage due to the coil resistance rise
	Coil resistance	Power consumption of coil. Increase of resistance due to the coil temperature rise
	Temperature rise	Ambient temperature and coil temperature rise according to the applied voltage.
Insulation	Dielectric strength Surge withstand voltage Insulation resistance	Do specifications of the relays match that required in the equipment?
Environment	Ambient temperature and humidity	Range of ambient temperature and humidity in the use location.
	Vibration and shock	Level of vibration and shock in the use location.
	Ambient atmophere	No presence of gas which may cause contact failure.
Others	Mounting method	The method of flux coating, soldering, washing and mounting
	Cover	Material of cover (compatibility with washing solution)
	Relay construction	Sealed or non-sealed type relays
	Special condition	Are there any special conditions?

CONTACT

(1) Contact load

The phenomena in the contacts of relays greatly vary depending on contact load level such as kind of load and current level as well as contact material and size, opening speed and contact bounce.

- *Switching current*
  AC current is alternately reduced to zero but DC current is not, so the arc discharge current at breaking of load current is hard to be extinguished for DC current.
  Therefore the duration of the arc discharge is longer in DC circuit than AC circuit and the maximum DC switching current is smaller than AC load.

- *Resistive load*
  Resistive load is a standard load in life tests and the contact ratings in catalogue are usually specified with resistive load. In resistive load circuit, it is assumed that there is no inrush or counter breaking current on switching of loads.

- *Inductive load*
  Inductive loads such as electromagnetic relay, solenoids and motors easily generate a high counter voltage between their coils and cause arc discharge across the relay contacts.
  Because the level of inductive load is affected by the load current and the power factor (coso), the life is decreased when the power factor is lowered.
  In circuit with load such as motor, solenoid, transformer and others, an inrush current of several times larger than the steady current is generated at the time of connecting the load.
  It is necessary to select the contact that has a sufficient capacity for the conditions.

- *Capacitive load*
  In a capacitive load circuit, an inrush current of 20 to 40 times larger than the steady state current is produced. A surge suppressor should be used to prevent contact welding.

Table 3. Typical Load and Inrush Current

Kind of Load	Inrush current
Resistive load	Steady state current
Solenoid load	10 ~ 20 times of the steady state current
Motor load	5 ~ 10 times of the steady state current
Incandescent lamp load	10 ~ 15 times of the steady state current
Mercury lamp load	Approx. 3 times of the steady state current
Condenser load	20 ~ 40 times of the steady state current
Transformer load	5 ~ 15 times of the steady state current
Contactor load	3 ~ 10 times of the steady state current

(2) Contact material

Relay contacts must be made from material that allows contact resistance to be low and stable, that is not quickly worn by the arc, and that has a high fusing point. At present there is no material that meets these conditions, and it appears unlikely that one will be found in the near future.

(3) Low level circuit

Circuits with several volts and several mA or less are called low-level circuits. At low levels, silver contacts form an oxide or sulfide film on their surface under certain conditions, which makes contact resistance unstable.
If the circuit impedance is high, although the high contact resistance itself does not cause problems, the noise is easily produced.
To maintain stability of contact resistance in a sulfurating atmosphere, contacts of gold overlayed on silver-palladium are effective.

COIL

(1) Coil voltage of DC relay

For the operation of DC relays, standards exist for power source voltage, with DC voltage standards set at 5, 6, 9, 12, 24 and 48.
Because of the gradual increase or decrease of the current impressed on the coil causing possible delay in movement of the contacts, there is a possibility that the specified contact capacity may not be satisfied.
So, consideration should be given to the method of applying voltage on the coil.

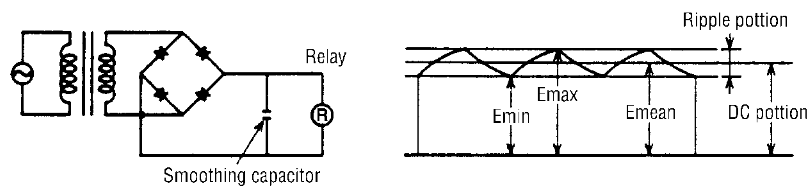
(2) Power source fluctuation

As a power source for DC relays, a battery or either a half or full wave rectifier circuit with smoothing capacitor is used.
The characteristics with regard to the excitation voltage of the relay will change depending on the type of power source, and thus, in order to display stable characteristics, the most desirable method is perfect DC.
In the case of ripple included in the DC power source, if the smoothing capacitor is too small, humming develops and unsatisfactory condition is produced, due to the influence of the ripple.
This ripple is calculated using the formula described in Fig. 4 and it is necessary to give consideration to use of a power source with less than a 5% ripple.

(3) Coil resistance

The resistance of coil is specified according to the nominal voltage of the relay. Generally, the nominal value of coil resistance is that at 20°C (68°F) and the allowable range is limited to within ±10%.
The resistance/temperature relationship for copper wire is about 0.4% for 1°C, and with this ratio, the coil resistance increases.
In order to operate the relay, the voltage necessary, becomes higher than the specified voltage accompanying the rise in the coil resistance.

Fig. 4. Ripple factor of rectifier circuit



$$\text{Ripple factor} = \frac{E\ max. - E\ min.}{E\ mean} \times 100\ (\%)$$

E max. = Maximum value of ripple portion
E min. = Minimum value of ripple portion
E mean = Average value of ripple portion

PERFORMANCE

(I) Contact resistance

(a) Contact wipe

The contact resistance of clean surface is extremely low, such as several mΩ. In practice, some kind of film is formed on to almost all of the contact surfaces and the contact resistance varies depending on the properties of that film.
To clean such film and stabilize contact resistance, distance of the contact wipe is increased.
When contacts open and close, the contacted surfaces slid together, thus effecting a breakage of nonconductive film formed on the contact surfaces.

(b) Contamination of contact surface

The possible causes of contamination that effects increases in contact resistance are as follows.

- Adherence of fiber, scale and particles of plastic mold, etc.
- Adherence of silicone oxides.
- Adherence and deposits of non-conducting material produced through a chemical reaction with the gas absorbed onto the contact face.
- Adherence and deposits of carbon powders produced at contact surface.
- Oxidation and sulfuration of metallic powders on the contact surface.

(c) A bifurcated contact is contaminated

The bifurcated spring is cut deeply enough and separated so as to provide a good independence in a contact even when some insulating particle is trapped between the contact on one side.
In this case, the contact of the other side can serve to maintain a good contact, with the sufficient mechanical independence between the two members. So, the bifurcated contacts have successfully reduced contact failures.

(d) Sealed relay

Sealed relays are available. This feature excludes the ingress of organic gases and dust in atmosphere and allows immersion cleaning.
When a sealed type relay switches the load in the presence of organic gases inside relay, it produces carbon powders on the contacts which create rise of contact resistance and acceleration of contact consumption. In order to avoid such problems, the constituent components are annealed for physical and chemical stability. This annealing process drives off residual volatiles in the plastics, insuring a contaminant free environment inside the sealed relay, resulting in more stable contact resistance over life.

(2) Coil

- Nominal Coil Voltage (Rated Coil Voltage)

A single value voltage intended by design to be applied to the coil or input.

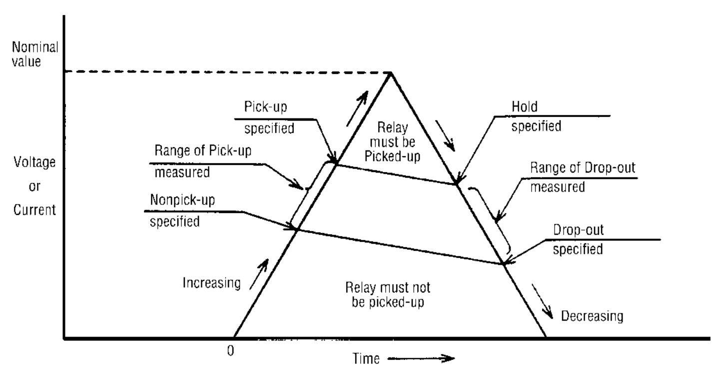
- Pick-up Voltage (Pull-In Voltage or Must Operate Voltage)

When the voltage on an unoperated relay is increased, the value at or below which all contacts must function (transferred). The pick-up voltage is generally assigned to 70% of nominal coil voltage so that the relay can function without failure owing to fluctuation of voltage supplied, ambient temperature raise and irregularity of coil resistance.

- Drop-out Voltage (Release or Must Release Voltage)

When the voltage on an operated relay is decreased, the value at or above which all contacts must revert to their unoperated position. The drop-out voltage is generally assigned to 10% of nominal coil voltage. Figure 5 shows the relationship between Pick-up Voltage and Drop-Out Voltage.

Fig. 5. Relationship of Relay Performance



PERFORMANCE

(3) Coil temperature rise
When voltage is applied to a coil, its temperature increases due to juele heat. Coil temperature rise can be calculated from the temperature coefficient of the copper wire by measuring the coil resistance.
The coil temperature rise can be obtained by the next expression.

$$T = T2 - Ta = \frac{R2 - RI}{RI}(K + TI) + T1 - Ta$$

where, T: Coil temperature rise (°C)
TI: Initial ambient temperature (°C)
T2: Coil temperature after the test (°C)
Ta: Ambient temperature after the test (°C)
RI: Coil resistance at T1 °C (Ω)
R2: Coil resistance at T2 °C (Ω)
K: Constance (= 235 for copper wire)

however, I T1 - Ta 1 $\leq$ 5 (°C)

Coil temperature rise

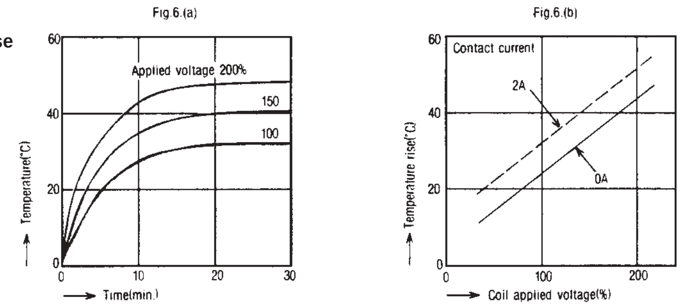
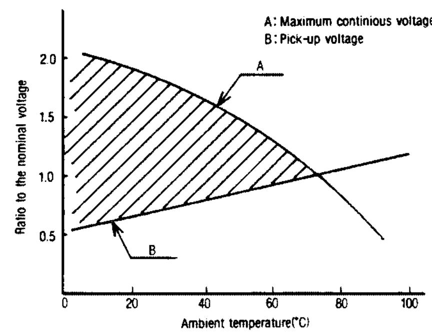


Figure 6(a) shows the duration characteristics. Fig. 6(b) shows the voltage characteristics in a steady state at constant supply voltage.

(4) Hot coil and Cool coil
The coil temperature with no voltage applied on the coil is usually to be equal to the ambient temperalure. When voltage is applied to the coil, the coil temperature rises, increasing both coil resistance and pick-up voltage. The coil with it's temperature rise due to voltage impression is called a Hot Coil. To the contrary, when no voltage is impressed on coil, the coil, temperature of which is equal to ambient temperature, is called a Cool Coil.
In general, the values for characteristics such as pick-up voltage, drop-out voltage and so on are measured at the ambient temperature of 20°C 68°F, Cool Coil conditions. For the Hot Coil, because of it's pick-up voltage rise, there is a possibility that it may not operate under the same conditions as Cool Coil. Thus, care is required.

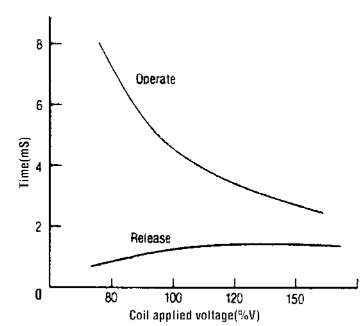
(5) Operating range
(a) Maximum continuous voltage
The maximum voltage that can be applied continuously to the coil without causing damage. When a voltage greater than the maximum continuous voltage is applied to the coil (layers may short) the coil may burn out, due to the temperature rise. Do not exceed the usable operating range shown in the Fig. 7.
(b) Pick-up voltage
As the ambient temperature rises, the coil resistance increases, pick-up voltage. Figure 7, line B refers to the relationship. The upper portion of line-B in Fig. 7 shows the range of voltage which can be applied to the coil. Line-A is maximum continuous voltage. Thus the relay operating range is the portion surrounded by line A and B.
In order to have stable operation of relay, the APP voltage and the ambient temperature should be in the operating range.
If the ambient temperature increases, pick-up voltages rises, while maximum continuous voltage decrease. Care is required.

Fig. 7 Operating range



(6) Operate time and Release time
There is variation in Operate time and Release Time depending upon voltage/ power applied to coil.
Figure 8 shows an example of relationship between Operate Time and Release Time. Figure 8 refers to the phenomenon that according to the fluctuation of coil impressed voltage, Operate Time greatly varies, while Release Time is small. To the extent of large coil impressed voltage, the Operate Time is rapid, but if it is too rapid, the make contact bounce time may be extended.

Fig. 8 Operate and Release time



(7) Safety standards
Laws and regulations demand securing the safety of users from dangers such as electric shock and fire lying around household appliances and other consumer electric equipment or devices.
Major industrial countries across the world already have their own safety standards such as those under control of 'The Electrical Appliance and Material Control Law' in Japan, UL in U.S. .A., CSA in Canada, VDE in Germany, SEMKO in North Europe and BS in GB.

AMBIENT ENVIRONMENT

(1) Silicone compound atmosphere
Silicone compounds such as silicone rubber, silicone paint, silicone grease, etc. emit volatile silicone gas. Note that when silicone is used near relays, switching contacts in the presence of its gas causes silicon to adhere to the contacts and may result in contact failure. In this case, use a substitute that is not silicone based. If the use of silicone compound is inevitable, use a plastic-sealed relay.

(2) Influence of external magnetic field
When transformers, speakers or magnets are located near a relay the characteristics may change and faulty operations may result due to the strong magnetic field generated from the equipment.
The influence depends on the strength of the magnetic field and it should be checked at the installation. In such a case suitable measures such as magnetic shielding or selection of adequate in arrangement of relay should be taken so as to avoid problems.

MOUNTING OF RELAYS

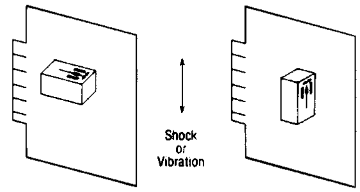
(I) Mounting direction
Mounting direction is important for optimum relay characteristics.

(2) Shock and vibration resistance
It is ideal to mount the relay so that the movement of contacts and armature is perpendicular to the direction of vibration or shock, as shown in Fig. 10.

(3) Contact reliability
It is recommended to mount the relays so that the surfaces of its contacts are vertical and in Lipper location of relay inside. Such mounting methods prevent dirt and dust as well as scattered contact material (produced due to large loads from which arcs are generated) and powdered metal from adhering to them. Furthermore, it is not desirable to switch both a large load and a low level load with a single relay. The scattered contact material produced when switching large load adheres to the contacts when switching the low level load and may cause contact failure. Therefore, avoid mounting the relay with its low level load contacts located below the large load contacts.

(4) Adjacent mounting
When many relays are mounted close together, abnormally high temperatures may result from the combined heat generated. Mount relays with sufficient spacing between them to prevent heat buildup. This also applies when a large number of boards mounted with relays are installed as in a card rack. Be sure the ambient temperature of the relays does not exceed the value listed in the catalog.

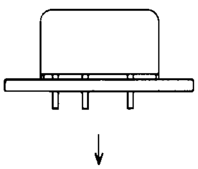
Fig 10. Direction of relays



RELAY SOLDERING AND WASHING GUIDELINES

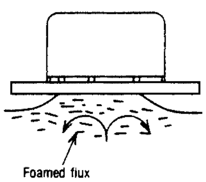
Process	Guidelines

1. Mounting of relay



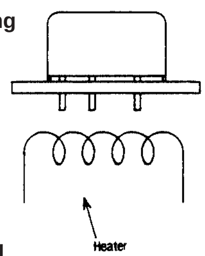
- *Avoid bending and terminals to make the relay self-clinching.*
  Relay performance cannot be guaranteed if the terminals are bent.

2. Flux coating



- Adjust the position of the PC board so that flux does not overflow onto the top of it.
- Use rosin-based flux, which is non-corrosive and requires no washing.
- Do not use Automatic Flux Coating Method to dust-cover type relays.
- Do not overflow onto the top of PC Board, in such a case, the flux may even penetrate a flux-resistant type relay.

3. Preheating

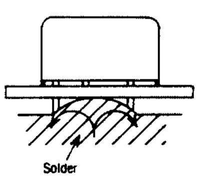


- Be sure to preheat before soldering.
- Preheating acts to improve solderability.
- Preheat according to the following conditions.

Temperature	100°C 212°F or less
Time	Within approx.1 minute

- Note that long exposure to high temperatures (e.g. due to a malfunctioning unit) may affect relay characteristics.

4. Soldering



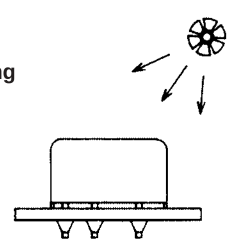
Automatic Soldering
- Flow solder is the optimum method for soldering.
- Adjust the level of solder so that It does not overflow onto the top of the PC board.
- Unless otherwise specified, solder under the following conditions depending on the type of relay.

Solder Temperature	Approx. 250°C 482°F
Soldering Time	Within approx. 5 seconds
Solder Ratio	Sn/Pb = 60/40 or 63/37

Hand Soldering • Keep the tip of the soldering iron clean.

Solder Iron	30W to 60W
Iron Tip Temperature	Approx. 300°C 572°F
Solder Time	Within approx. 3 seconds

5. Cooling

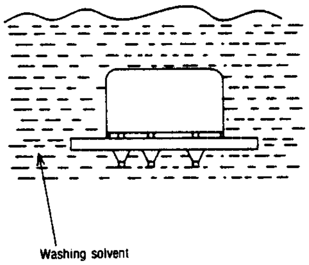


- Immediate air cooling is recommended to prevent deterioration of the relay and surrounding parts due to soldering heat.
- Although the sealed type relay can be cleaned, avoid immersing the relay into cold liquid (such as washing solvent) immediately after soldering. Doing so may deteriorate the sealing performance.

RELAY SOLDERING AND WASHING GUIDELINES

Process	Guidelines

6. Washing

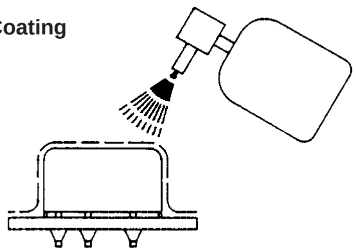


- Do not wash flux-resistant type relays and dust cover type relays by immersion.
- Careless washing may cause washing solvent to penetrate the relay.
- Plastic sealed type relays can be washed by immersion. Use washing solvents shown in Table 6.
- Use of other washing solvents may damage the relay case and cover, and also cause washing solvent to penetrate the relay.
- Avoid ultrasonic washing on relays. Use of ultrasonic cleaning may cause breaks In the coil or slight sticking of contacts due to the ultrasonic energy.

Table 6. Washing solvent compatibility chart for sealed relays

Washing solvent	
Chlorinated	Chlorothene VG, N Trichloroethylene Perchloroethylene Methylene chloride
Alcohol	Ethanol IPA
Aqueous	Hollis 310 Indusco 624, 1000 Lonco Terg

7. Coating



- If the PC board is to be coated to prevent the insulation of the PC board from deteriorating due to corrosive gases and high temperature, note the following.
  - Do not coat dust-cover type relays and flux-resistant type relays.
  - Depending on the type, some coating materials may have an adverse affect on relays, select coating materials carefully.

RELAY TERMINOLOGY: PERFORMANCE

(1) Operate (Set) time
Time from initial energization to the first opening of closed contact or first closing of open contact. This time does not include any bounce time. In case of latching relays, this is called “Set time”. (cf. Fig. 1.)

(2) Release (Reset) time
Time from initial de-energization of the relay coil to first opening of closed contact or first closing of open contact. This time does not include any bounce time.
In case of latching relays, this is called “Reset time”.
This means the time from initial reverse energization of the coil to first opening of closed contact or first closing of open contact. (cf. Fig. 1.)

(3) Bounce time
Internally caused intermittent and undesired opening of closed contact or closing of open contacts of a relay. (cf. Fig. 1)

(4) Dielectric strength
The maximum. allowable AC (RMS) voltage (50/60 Hz) which may be applied between two specified test points, usually for 1 minute in duration. In general, the maximum leak current is I mA.

(5) Surge withstand voltage
The maximum allowable peak surge voltage which may be applied between two specified test points.
Usually, wave form of this test is specified indicating peak value, rise time and. fall time. (cf. Fig. 2.) In FCC Part 66, T1 = 10 µS, Vp 1500V are specified.

(6) Insulation resistance
The resistance between all mutually insulated conducting sections of the relay. This value changes depending on the ambient temperature and humidity.

Fig. 1 Typical time traces of relay

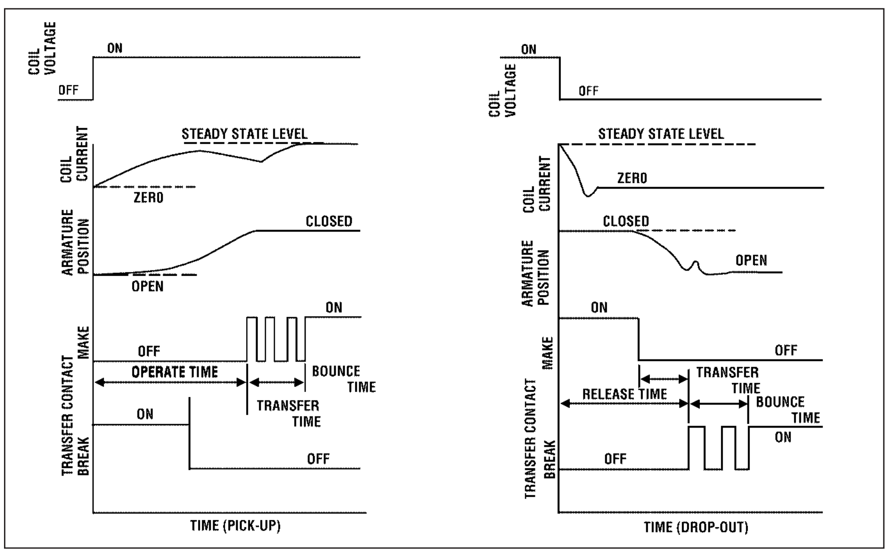
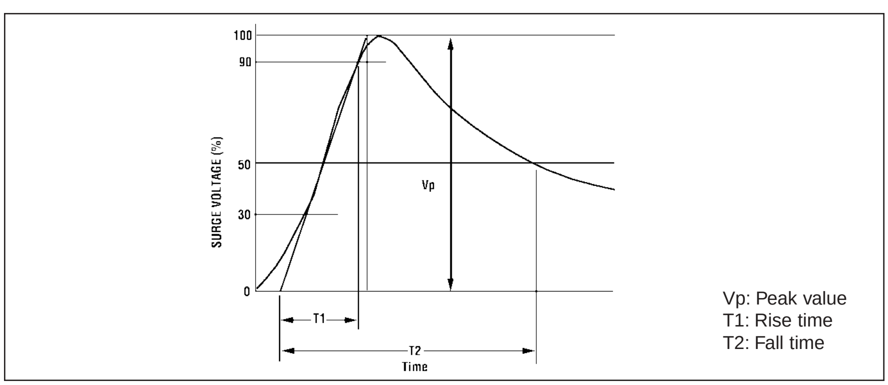


Fig. 1 Ware form of Surge test



RELAY TERMINOLOGY: PERFORMANCE

(7) Capacitance
The electrostatic capacitance between mutually insulated conducting sections of the relay. Usually this value is measured at 1 kHz.

(8) Life
- Mechanical life
  The minimum number of operations which the relay can be operated under nominal conditions with no load on the contacts.
- Electrical life
  The minimum number of operations which the relay can be operated under nominal conditions with specified load on the contacts.

(9) Vibration resistance
The resistance to the vibration applicable to the relay, expressed as a displacement and frequency range.
- Functional
  The vibration which can be applied to the relay during service without causing the openings of the closed contacts for more than the specified time.
- Destructive
  The vibration which can be allowed by the relay during shipping, installation, without damages and changes in its operating characteristics.

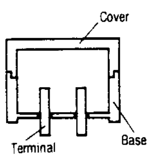
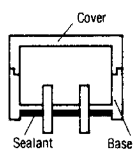
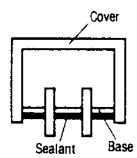
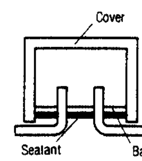
(10) Shock resistance
The resistance to the shock applicable to the relay, expressed as an acceleration in G.
- Functional
  The shock can be applied to the relay during service without causing the openings of the closed contacts for more than the specified time.
- Destructive
  The shock which can be allowed by the relay during shipping, installation, without damage and changes in its operating characteristics.

(11) Temperature range
The range of ambient temperature in which the relay can be used without damages in its characteristics or functions.

(12) Safely standard
Standard for the prevention of electric shock hazards and fire accidents differs in content from country to country.
UL (U.S.A.), VDE (Germany)
SEMKO (Sweden), CSA (Canada)
BS (G.B.)

(13) Structure of relays
Relays are classified in 4 types as Fig. 3 by the structure of terminals, cover and case, and mounting method of the relay.

Fig. 3. Structure of relays (Y: Yes N: No)

Item	Dust cover Type	Flux Free Type	Sealed Type	Surface Mount Type
Structure				
Characteristics	Most basic construction and there is gap between cover and base, and between base and terminals.	Terminals are sealed with base by sealant. The joint level between cover and base is higher than the PC board surface.	All the gaps between case and base, base and terminals are sealed by sealant.	All the gaps between case and base, base and terminals are sealed by sealant. Terminals are formed in “L” shape intended to be soldered by reflow soldering.
Mounting Method	Insertion mounting	Insertion mounting	Insertion mounting	Surface mounting
Automatic Flux Coating	N	Y	Y	Y
Automatic Soldering	N	Y	Y	Y
Automatic Washing	N	N	Y Note 1	Y Note I
Manual Soldering	Y	Y	Y	–
Environmental Gas Resistance	N	N	Y Note 2	Y Note 2

Note 1. It is needed to select suitable washing solvent.
2. In explosive gas environment, use the metallic hermetic seal types.

High Reliability Supported by Uniques Technology

Deactivated Rhodium Contact:

OKI reed switches are highly reliable because rhodium is used as the contact material. Rhodium has two excellent features as the contact material: Extreme hardness, which improves the resistance against sticking; and a high melting point, which greatly reduces the contact surface consumption due to Joule heat or arc discharge affected by the current, and also improves the resistance against sticking. However, being a platinum metal, the surface of rhodium has active absorption and catalytic actions. Rhodium plating greatly absorbs organic impurities and forms a polymer in the course of operation, increasing contact resistance as shown in Fig. 21. This is especially noticeable a lower load level operation. OKI has developed a unique oxygen treatment method to deactivate the rhodium surface, in which organic impurities adhered to the surface are burned with oxygen and oxygen molecules are selectively absorbed to produce a stabilized contact resistance. This unique method won the highest prize (Schneider Award) on the occasion of the 21st Annual National Relay Conference held in Oklahoma, U.S.A. in 1973. Patents have been obtained not only in Japan (Pat. No. 916386) but also in U.S.A. (Pat. No. 3857175) and West Germany (Pat. No. 2303587).

Automatic Sealing:

Sealing, the moment when a pressed and plated reed contact and a glass tube are united to form a reed switch, is the most important stage in the manufacturing process requiring strict control of conditions. At this stage, the working temperature reaches approx. 1,000°C causing evaporation of impurities from the glass tube and contamination and damage of the contact part of the reed switch. To prevent this, OKI has imposed severe standards on the selection of materials, and established a unique automatic sealing method. By thus improving the manufacturing process, OKI is able to produce reed switches of the highest quality.

Flux Scanning Method:

In spite of severe control of the sealing process, there is a slight probability that foreign matter such as magnetic particles may enter the glass. After extensive study in the detection of micro impurities, OKI has adopted the highly reliable flux scanning method. In flux scanning, as shown in Fig. 22, external magnetism is moved so that foreign matter near the reed is forced to jump to the contact part. The contact resistance then measured is used as the standard for the selection of characteristics. We have thus succeeded in remarkably improving the reliability of reed switches by replacing conventional visual checking with the latest flux scanning method.

Fig. 21

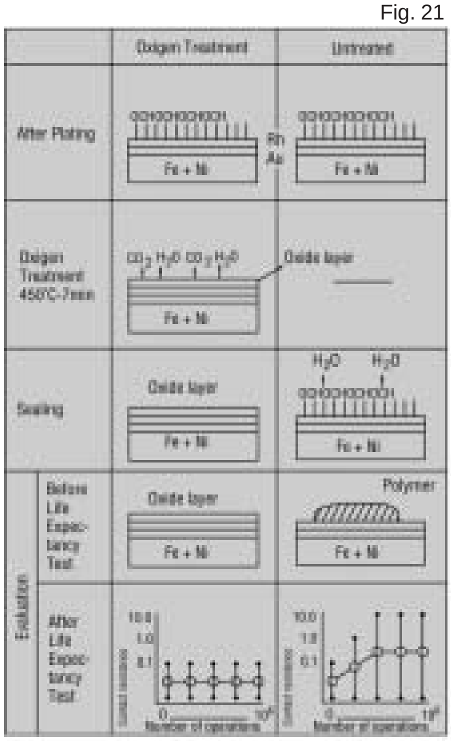
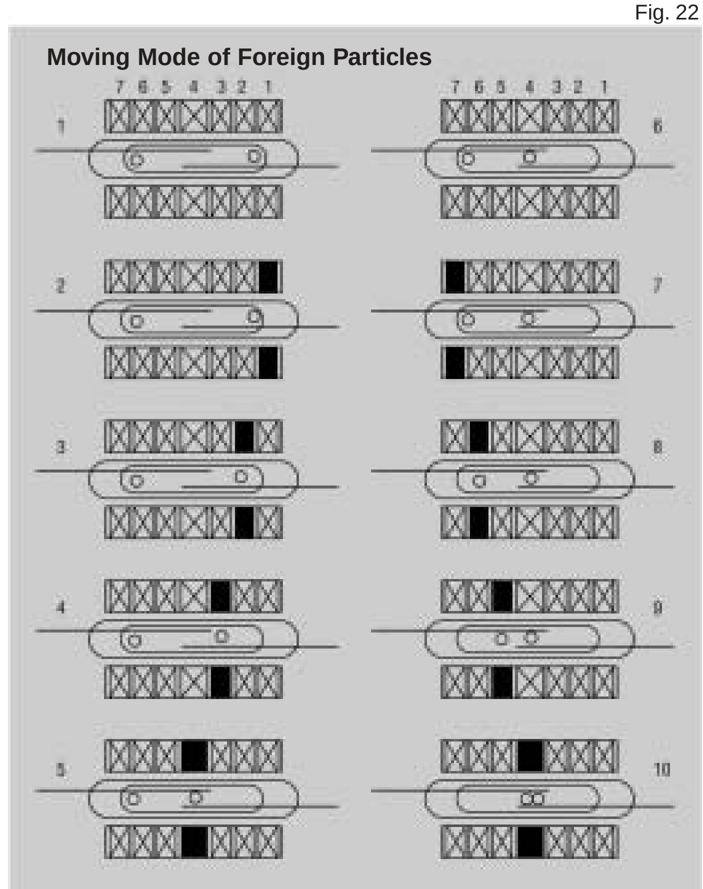


Fig. 22

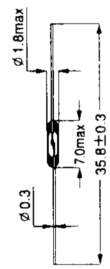


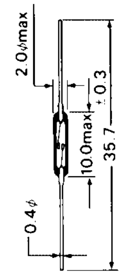
Specifications

UL File E70063

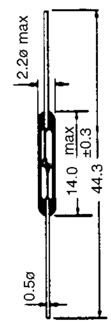
See following pages for technical quality control support (or reliability data).

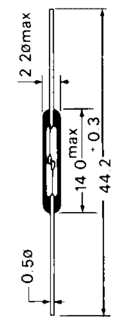
Actual dimensions
All dimensions are in mm.

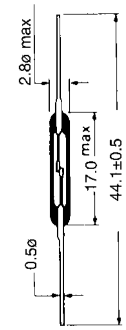




Best Value







			ORD213	ORD211	ORD9216	ORD228	ORD9215
Electrical	Contact		1A	1A	1A	1A	1A
Characteristics	Pull-in Available in ±5 AT ranges		10 ~ 40	10 ~ 40	10 ~ 50	10 ~ 50	10 ~ 50
	Drop-out	[AT]	5 min.	5 min.	5 min.	5 min.	4 min.
	Contact resistance (Initial)	[mΩ]	200 max.	100 max.	100 max.	100 max.	150 max.
	Breakdown voltage	[DCV]	150 min.	150 min.	200 min.	200 min.	200 min.
	Insulation resistance	[Ω]	10^9 min.	10^9 min.	10^9 min.	10^9 min.	10^9 min.
	Electrostatic capacitance	[pF]	0.4 max.	0.2 max.	0.3 max.	0.3 max.	0.3 max.
	Contact rating	[VA, W]	1.0	1.0	10	10	10
	Maximum switching voltage	[V]	AC 24 / DC 24	AC 24 / DC 24	AC 100 / DC 100	AC 100 / DC 100	AC 100 / DC 100
	Maximum switching current	[A]	DC 0.1	DC 0.1	DC 0.5	DC 0.4	0.3
	Maximum carry current	[A]	0.3	0.3	1.0	1.0	1.0
Operating	Operating time	[ms]	0.3 max.	0.3 max.	0.3 max.	0.3 max.	0.4 max.
Characteristics	Bounce time	[ms]	0.3 max.	0.3 max.	0.3 max.	0.3 max.	0.4 max.
	Release time	[ms]	0.05 max.	0.05 max.	0.05 max.	0.05 max.	0.05 max.
	Resonant frequency	[Hz]	1100 ± 500	7500 ± 500	5000 ± 400	5300 ± 300	3700 ± 300
	Maximum operating frequency	[Hz]	500	500	500	500	500
Standard coil	Coil resistance	[Ω]	600	600	450	450	450
	No. of turns	[T]	5000	5000	5000	5000	5000
	Dimensions	[mm]	3.3ø x 10	3.3ø x 10	3.7ø x 15	3.7ø x 15	3.7ø x 15
	Type No.		8	8	6	6	6
Features (Contact material)			Ultra-miniature (Rh)	Ultra-miniature (Rh)	General purpose miniature (Rh)	General purpose miniature (Rh)	General purpose miniature (Rh)

*** Magnets also available** **Available Cut and Bent as Well as on Reed.**

Notes:

1 Pull-in & drop-out were measured by using OKI standard coil. * This value of drop-out is prescribed when pull-in is over 20AT. When pull-in is less than 20AT, drop-out are 5 MIN & RLS/OP > 0.7. Tolerance at measurement is ±2AT. (Fig.1)

2 Measurements are made by the four-terminal voltage reduction method where the 100AT excitation is given to the switch using the OKI standard coil to close the contacts, and 10 mA current is applied.

3 This value varies depending on the pull-in value (contact gap). In this measurement, the pull-in value is about 20AT. (MIL-STD-202D METHOD 301)

4 Measurement is made by using a DC 100 V super megger. (MIL-STD-202D METHOD 302)

5 The values show those at MHz.

6 The value is obtained from the dry test under continuous current flow.

7 The value shows the time required for the contacts to cause the first contact bounce after applying the voltage to the OKI standard test coil. The time is shown at Top in Fig. 2

8 Bouncing is caused when the contact close. Bounce time means the time when opening and closing of the contacts are being repeated before the contacts are completely closed. Shown byT bounce.

9 Release time means the time from the moment the voltage applied to the test coil as removed to the moment the contacts open. Shown by Tris.

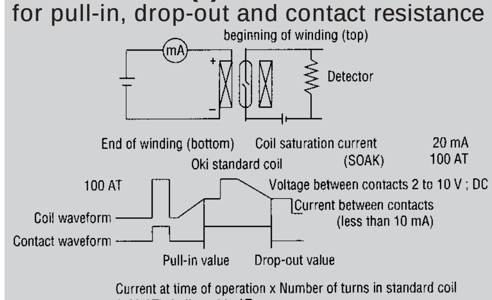
10 Resonant frequency is a vibrating frequency inherent to the reed switch. Avoid application of vibration at this frequency to the switch, otherwise it will cause misoperation.

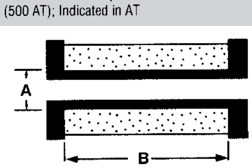
11 The reed switch can be operated with a frequency higher than the maximum operating frequency. However, operation with such a frequency will often cause an endless chattering at the time of ON operation. It is recommended for the designer to take the maximum operating frequency into consideration when designing systems and circuits.

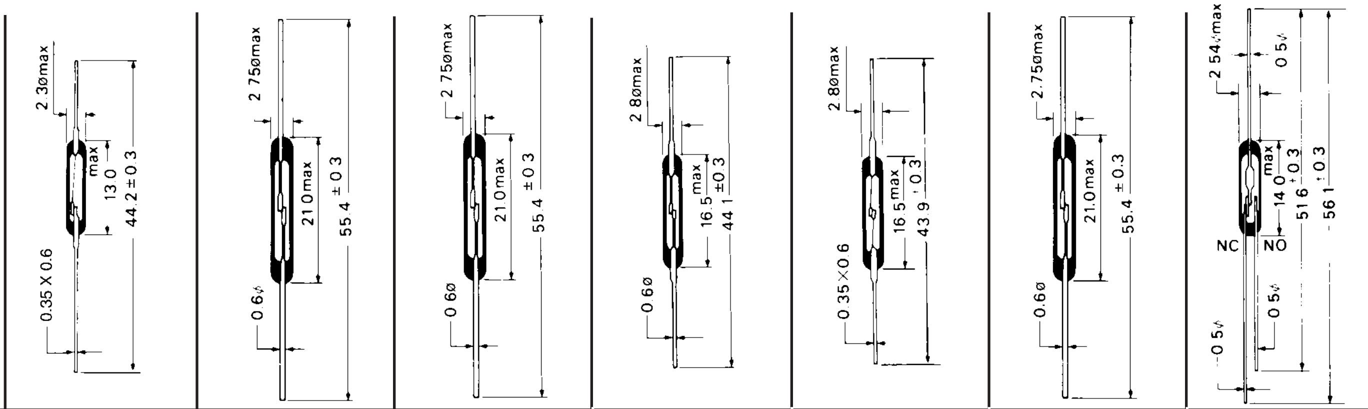
12 Dimensions of standard coil.
A: Inner diameter of standard coil.
B: Length of standard coil.

Fig. 1

Test Procedure (1)
for pull-in, drop-out and contact resistance







	ORD221	ORD229	ORD2210	ORD2211	ORD2212	ORD2210V	ORT551
	1A (offset)	1A	1A	1A	1A	1A	1C
	1 ~ 40	15 ~ 60	15 ~ 60	15 ~ 60	15 ~ 45	20 ~ 60	10 ~ 30
	5 min.	6 min.	7 min.	8 min.	RLS/OP>0.8	7 min.	5 min.
	100 max.	100 max.	100 max.	100 max.	100 max.	100 max.	100 max.
	200 min.	600 min.	250 min.	200 min.	150 min.	1000 min.*	200 min.
	10^{9} min.	10^{10} min.	10^{10} min.	10^{9} min.	10^{9} min.	10^{10} min.	10^{9} min.
	0.3 max.	0.5 max.	0.5 max.	0.3 max.	0.5 max.	0.5 max.	1.5 max.
	10	50	AC70(VA) / DC50(W)	50	10	100	3
	AC100 / DC100	AC300 / DC350	AC150 / DC200	AC100 / DC100	AC100 / DC100	AC300 / DC350	AC30 / DC30
	DC 0.3	DC 0.5	AC0.7 / DC1.0	0.5 In rush 3A	DC 0.2	DC 1.0 max	DC 0.2
	1.0	2.5	2.5	2.5	0.5	2.5 max	0.5
	0.3 max.	0.6 max.	0.5 max.	0.6 max.	0.4 max.	0.5 max.	1.0 max.
	0.5 max.	0.5 max.	0.5 max.	0.4 max.	1.0 max.	0.5 max.	(NC)1.5 max. / (NO)1.0 max.
	0.5 max.	0.05 max.	0.05 max.	0.05 max.	0.05 max.	0.05 max.	0.5 max.
	2750 ± 250	2500 ± 250	2500 ± 250	4600 ± 500	4200 ± 300	2500 ± 250	6000 ± 4000
	500	500	500	500	500	500	200
	450	500	500	450	450	450	550
	5000	5000	5000	5000	5000	5000	5000
	3.7ø x 15	4.6ø x 21	4.6ø x 21	3.7ø x 15	3.7ø x 15	3.7ø x 15	4.6ø x 10
	6	3	3	6	6	6	10
	Miniature offset (Rh)	High breakdown voltage (Rh)	High power (Rh)	Lamp load (Rh) 3.4W Low sound (Rh)	Closed differential type	Vacuum *Dependent on A/T	Ultra-miniature transfer (Rh)

Fig. 2

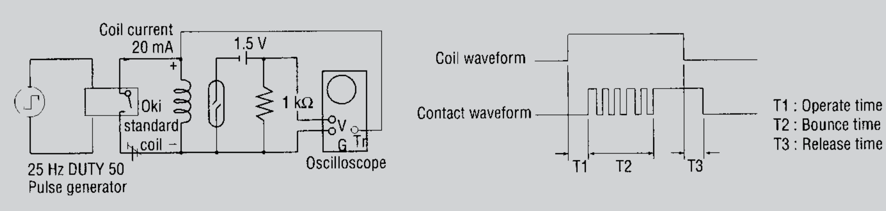
13 If a shock of more than 30G is applied to a reed switch, the pull-in value of the switch will be often caused to change from the standard specification. Therefore, it is recommended not to use the reed switch which has been given such a shock.

14 If a vibration of more than 1 kHz is applied to a reed switch, even a very small acceleration to it will easily cause the switch to misoperate to close due to its resonant frequency.

15 In practice the reed switch can operate beyond the specified range. In case of magnet driving, however, some magnets show decrease of magnetic flux even at the lowest temperature of the range depending on their temperature characteristics. Therefore, it is recommended to consider the range as a general guide line.

16 The actual tensile strength is more than 5 kg (breakdown). However, considering the lead not to get out of position, the value for the static load is shown here.

Test Procedure (2)
for operate, release and bounce time



Environmental Characteristics Table 2

	Characteristics (Common to All Types)	Test Conditions	Notes
Shock	Shall not misoperate with shock of 30G (11 msec) applied	MIL-STD-202E METHOD 213B	13
Vibration	Shall not misoperate with max. 20G (10–55Hz)	MIL-STD-202E METHOD 210A	14
Temperature range	Shall be operational in the range of –40 to 125°C	MIL-STD-202E METHOD 107D	15
Lead tensile strength	Shall withstand against 2 kg static load	MIL-STD-202E METHOD 211A	16

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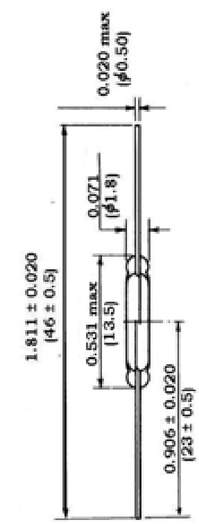

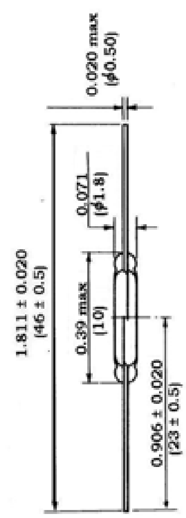

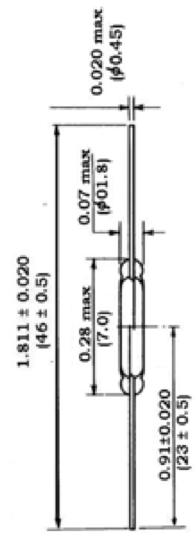

	HCC228	HCC211	HCC213
Contact Form	1A	A	1A
Contact Position	Center	Center	Center
Contact Material	Ruthenium/Gold	Ruthenium/Gold	Ruthenium/Gold
Max Contact Rating	10W	10W	10W
Max Switching Voltage	200VDC 140VAC	200VDC 140VAC	170 DC 120 AC
Max Switching Current	500mA	500 mA VDC VAC	500mA AC/DC
Max Initial Contact Resistance	10^6 mΩ	95 mΩ (25AT)	150mΩ (AT)
Pull in Value ±5(AT)	10-35	7/20	7/20
Min Drop out Value (AT)	4-20	3-15	3-16
Min Breakdown Voltage	10/15 15/20 20/35 180 240 280	230V	210
Max Contact Capacitance	0.3pF	0.25pF	0.35pF
Min Insulation Resistance	10^6 mΩ	10^6 mΩ	10^6 mΩ
Typ Resonant Frequency	6700Hz	11300 HZ	17900Hz
Electrical Life (Resistive loads)	2x10^7@5V 100mA 125Hz	2x10^7@5V 100mA 125Hz	2x10^7@50V 100mA 125Hz

For a comprehensive engineering Reed Switch Catalog, contact factory. (Magnets Also Available.)

SURFACE MOUNT AVAILABLE

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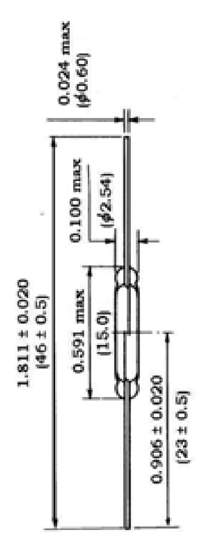

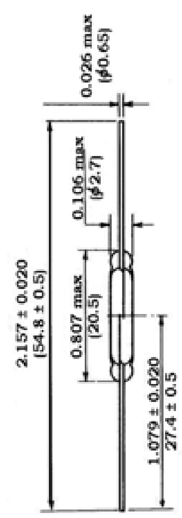

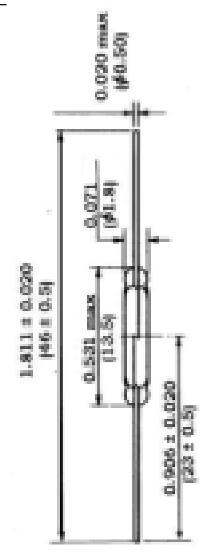

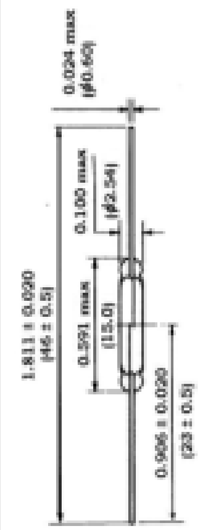

	HCC2212	**HCC229**	**HCC9216**	**HCC9215**
Contact Form	1A	1A	1A	1A
Contact Position	Center	Center	Center	Center
Contact Material	Ruthenium/Gold	Ruthenium/Gold	Ruthenium/Gold	Gold/Ruthenium
Max Contact Rating	15/30 30/50 15W 20W	70W	10W	10W
Max Switching Voltage	200 VDC 140VAC	200VDC 250VDC	7/15 AT 15/25 AT 180VDC 130VAC 200VDC 140VAC	200VDC 140VAC
Max Switching Current	1000 mA AC/DC	15/25 25/70	7/15 AT 15/25AT 250mA AC/DC 500 AC/DC	8/15 15/70 250mA DC/AC 500 AC/DC
Max Initial Contact Resistance	110mΩ	90mΩ	100mΩ	100mΩ
Pull in Value ±5(AT)	15/50	15/70	7/25	8/70
Min Drop out Value (AT)	11/35	8/32	3/18	4/16
Min Breakdown Voltage	15/25 25/35 35/50 275 325 400	15/25 25/51 45/70 400 580 780	7/15AT 15/25AT 200 250	8/15 15/25 20/30 200 275 325
Max Contact Capacitance	15/25 25/50 0.3PF 0.25PF	0.2pF	7/15 15/25 0.30pF 125pF	8/25AT 20/ 0.3
Min Insulation Resistance	10^6mΩ	10^6mΩ	10^6mΩ	10^6mΩ
Typ Resonant Frequency	5500Hz	3200	9000Hz	5500Hz
Electrical Life (Resistive loads)	$5x10^7$@20V 500mA 125Hz	10^7@20V 500mA 125Hz	10^6@12V 4mA 170Hz	10^7 12V 4mA

For a comprehensive engineering Reed Switch Catalog, contact factory. (Magnets Also Available.)

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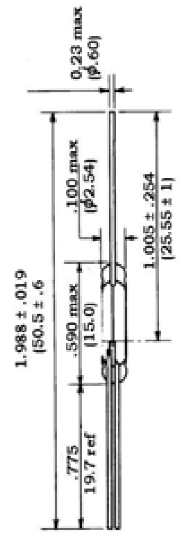

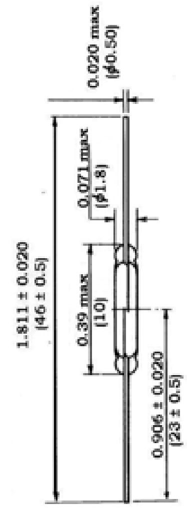

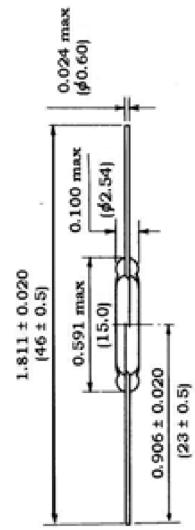

	HCC551	**HCC311**	**HCC3215**
Contact Form	C	A	1A
Contact Position	Offset	Center	Center
Contact Material	Ruthenium/Gold	Ruthenium/Gold	Ruthenium/Gold
Max Contact Rating	5W	10W	5/15 15/35 5W 10W
Max Switching Voltage	175VDC 125VAC	200VDC 140VAC	5/15 15/35 160VDC 200VAC 140VAC
Max Switching Current	400mA DC 280mA AC	500mA 1000 mA AC/DC	5/15 15/35 250mA 500
Max Initial Contact Resistance	140mΩ	150mΩ	100mΩ
Pull in Value	10/30	7/21	6/35
Min Drop out Value (AT)	5	3/16	3/27
Min Breakdown Voltage	200V	200V	15/15 14/23 18/32 200 250 300
Max Contact	0.8pF	0.30pF	0.30pF
Min Insulation Resistance	10^6mΩ	10^6mΩ	10^6mΩ
Typ Resonant Frequency		10800	8600Hz
Electrical Life (Resistive loads)		$2x10^6$@5V 100mA 125Hz	10^6@12V 4mA 170Hz

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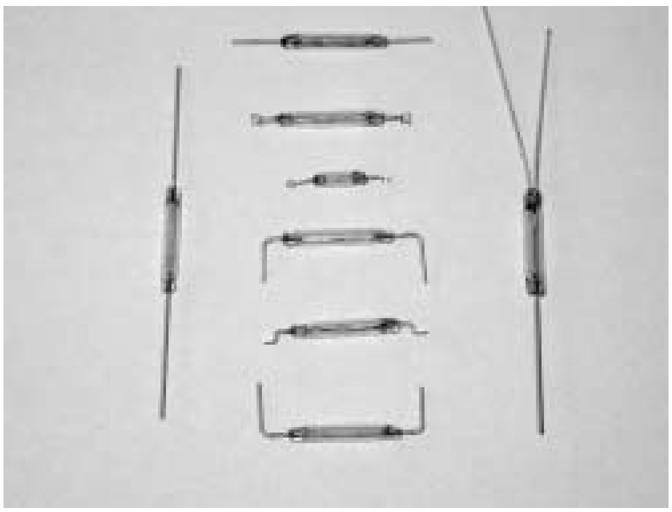
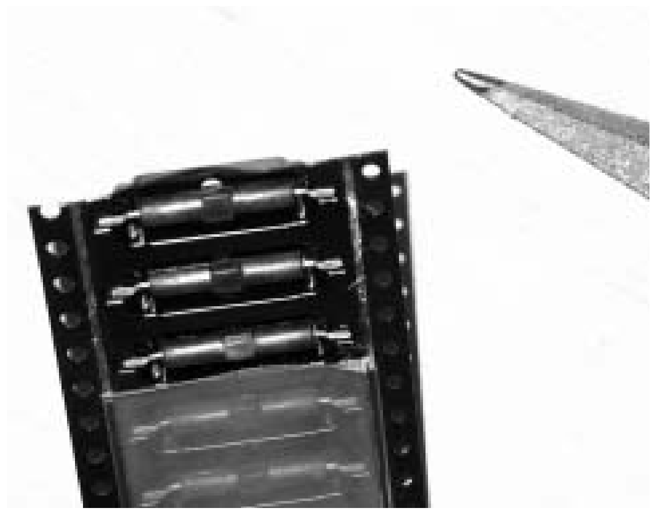
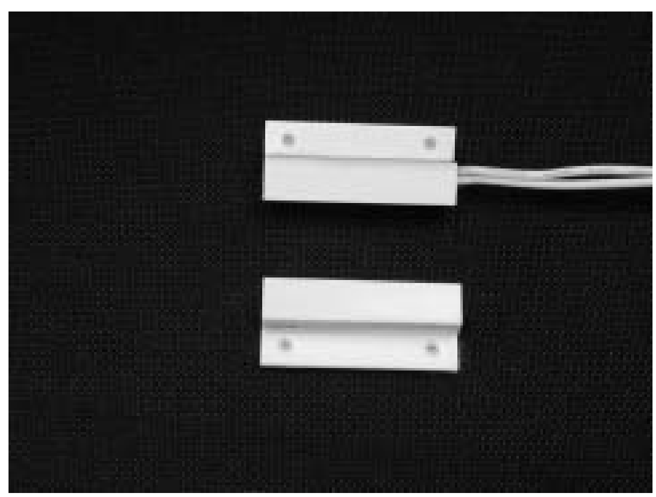
Our reed switches are available in multiple styles and housing types in either SMT or through hole designs. We can custom bend and produce any reed configuration either bare or in a housing. Simply send us your specs for us to quote.

Please note: Hasco can produce and/or stuff any PC board with a reed switch or relay in house at our state of the art production facility.







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