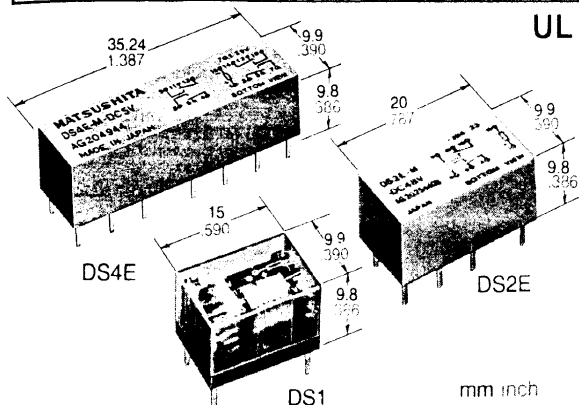


NAIS

HIGHLY SENSITIVE 1500 V FCC SURGE WITHSTANDING MINIATURE RELAY

DS-RELAYS



UL File No.: E43149 CSA File No.: LR26550

- High sensitivity 200 mW pick-up power
100 mW pick-up power types available
- Latching types available
- High switching capacity: 60 W, 125 VA
- High breakdown voltage 1,500 V FCC surge between open contacts
1,000 V AC between open contacts
- DIP—1C type can be used with 14 pin IC socket
2C type can be used with 16 pin IC socket,
4C type can be used with 2 sets of 14 pin IC sockets
- Amber sealed types available
- Gold-cap silver palladium types available for 2 Form C type
- Bifurcated contacts are standard

SPECIFICATIONS

Contact

Arrangement	1 Form C, 2 Form C, 4 Form C
Initial contact resistance, max. (By voltage drop 6 V DC 1 A)	50 mΩ
Contact material	Gold-clad silver
Rating (resistive)	
Max. switching power	60 W, 125 VA
Max. switching voltage	220 V DC, 250 V AC
Max. switching current	2 A DC, AC
Max. carrying current	3 A DC, AC
UL/CSA rating	0.6 A 125 V AC 0.6 A 110 V DC 2 A 30 V DC
Expected life (min. operations)	
Mechanical (at 600 cpm)	10 ⁸ (1 Form C 2 coil latching type: 10 ⁷)
Electrical 2 A 30 V DC resistive	5 × 10 ⁵
1 A 30 V DC resistive	2 × 10 ⁶

*Gold capped silver-palladium contact also available for 2 Form C 10⁷ operations at 0.1 A 50 V DC resistive

Coil (polarized) (at 25°C 77°F)

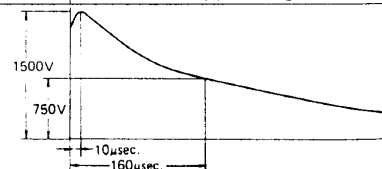
Type	Coil	Latching	Single side stable	
			Minimum operating power	Nominal operating power
"M"	1 coil	latching	Minimum set and reset power	Approx. 90 mW
			Nominal set and reset power	Approx. 180 mW
	2 coil	latching	Minimum set and reset power	Approx. 180 mW
			Nominal set and reset power	Approx. 360 mW
"S"	1 coil	latching	Minimum set and reset power	Approx. 45 mW (58mW)*
			Nominal set and reset power	Approx. 90 mW
	2 coil	latching	Minimum set and reset power	Approx. 90 mW (115 mW)*
			Nominal set and reset power	Approx. 180 mW

*For 1 Form C high sensitive types.

Characteristics (at 25°C 77°F, 50% Relative humidity)

Max. operating speed	20 cpm at rated load 50 cps at low level load	
Operate time* (at nominal voltage)	Min. 10 msec. (Approx. 3 msec.)	
Release time* (at nominal voltage)	Min. 5 msec. (Approx. 2 msec.)	
Set time (latching) (at nominal voltage)	Approx. 3 msec.	
Reset time (latching) (at nominal voltage)	Approx. 3 msec.	
Initial breakdown voltage	(DS1-S type) 500 Vrms (Other types) 1,000 Vrms	
Between open contacts	500 Vrms	
Between contact sets	—	
Between contacts and coil	1,000 Vrms	
Initial insulation resistance	Min. 1,000 MΩ (at 500 V DC)	
FCC** surge voltage between contacts and coil	1,500 V (Except DS1-S type)	
Temperature rise (at nominal voltage)	Max. 65°C	
Ambient temperature	-40°C to +70°C -40 F to +158 F (Not freezing and condensing at low temperature)	
Shock resistance	Functional	1C, 2C: Min. 490 m/s ² (50 G) 4C: Min. 294 m/s ² (30 G)
	Destructive	Min. 980 m/s ² (100 G)
Vibration resistance	Functional	196 m/s ² (20 G), 10 to 55 Hz at double amplitude of 3.3 mm
	Destructive	294 m/s ² (30 G), 10 to 55 Hz at double amplitude of 5 mm
Unit weight	1 Form C: Approx. 3.2 g .11 oz 2 Form C: Approx. 4 g .14 oz 4 Form C: Approx. 7 g .25 oz	

*Excluding contact bounce time
**FCC (Federal Communication Commission) requests following standard as Breakdown Voltage specification.



ORDERING INFORMATION

Ex. DS **2** **E** — **M** **L2** — **DC 48V** — **R**

Contact arrangement	Classification of type	Sensitivity	Operating function	Coil voltage
1: 1 Form C 2: 2 Form C 4: 4 Form C	Nil: Standard type E: Amber sealed type	M: 400 mW nominal operating power S: 200 mW nominal operating power	Nil: Single side stable L: 1 coil latching L2: 2 coil latching	DC 1.5, 3, 5, 6, 9, 12, 24, 48 V

- (Notes) 1. *Reverse polarity types available (Add suffix-R)
2. For UL/CSA recognized types, add suffix UL/CSA.
3. Standard packing: Carton: 50 pcs. Case: 500 pcs.

TYPICAL APPLICATIONS

- Telecommunication equipment
- Office equipment
- Computer peripherals
- Security equipment
- Measuring instrumentation

TYPES AND COIL DATA at 20°C 68°F

Single side stable

	Nominal voltage, V DC	*Pick-up voltage, V DC (max.)	Drop-out voltage, V DC (min.)	*Maximum allowable, V DC (at 50°C 122°F)	Coil resistance, Ω (±10%)
"M" type	1.5	1.05	0.15	1.8 2.25	5.63
	3	2.1	0.3	3.6 4.5	22.5
	5	3.5	0.5	6 7.5	62.5
	6	4.2	0.6	7.2 9	90
	9	6.3	0.9	10.8 13.5	203
	12	8.4	1.2	14.4 18	360
	24	16.8	2.4	28.8 36	1440
	48	33.6	4.8	57.6 72	5760
"S" type	1.5	1.2 1.05	0.15	2.4 3	11.3
	3	2.4 2.1	0.3	4.8 6	45
	5	4.0 3.5	0.5	8.0 10	125
	6	4.8 4.2	0.6	9.6 12	180
	9	7.2 6.3	0.9	14.4 18	405
	12	9.6 8.4	1.2	19.2 24	720
	24	19.2 16.8	2.4	38.4 48	2880
	48	38.4 33.6	4.8	76.8 96	11520

1 coil latching

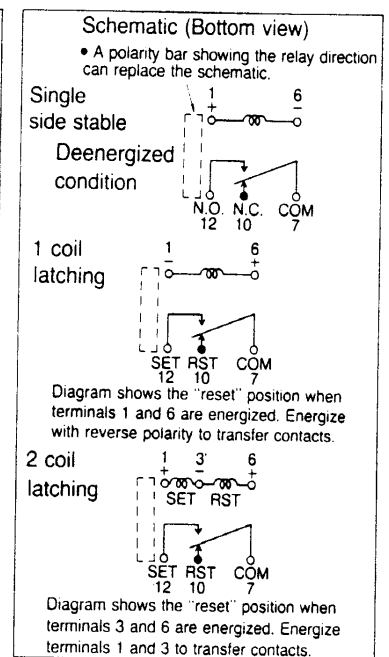
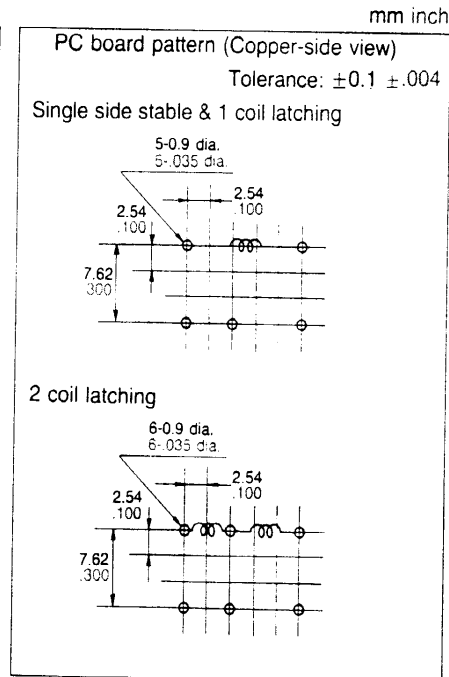
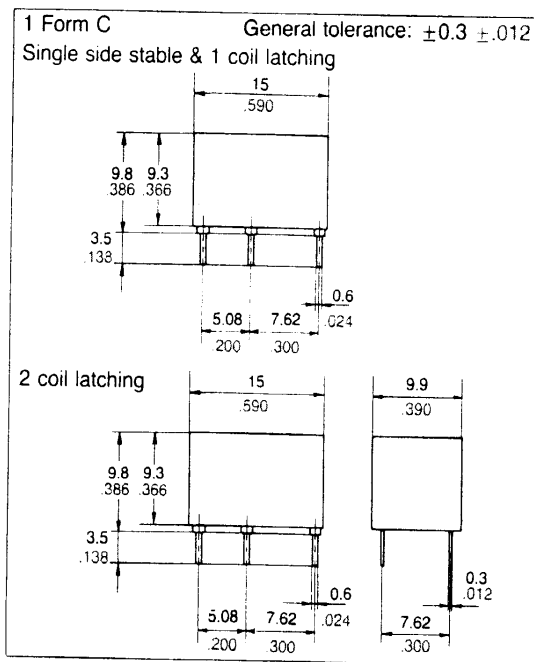
	Nominal voltage, V DC	*Reset Set, V DC (max.)	*Maximum allowable, V DC (at 50°C 122°F)	Coil resistance, Ω (±10%)
"M" type	1.5	1.05	1.8 2.25	12.5
	3	2.1	3.6 4.5	50
	5	3.5	6 7.5	139
	6	4.2	7.2 9	200
	9	6.3	10.8 13.5	450
	12	8.4	14.4 18	800
	24	16.8	28.8 36	3200
	48	33.6	57.6 72	12800
"S" type	1.5	1.2 1.05	2.4 3	25
	3	2.4 2.1	4.8 6	100
	5	4.0 3.5	8.0 10	278
	6	4.8 4.2	9.6 12	400
	9	7.2 6.3	14.4 18	900
	12	9.6 8.4	19.2 24	1600
	24	19.2 16.8	38.4 48	6400
	48	38.4 33.6	76.8 96	25600

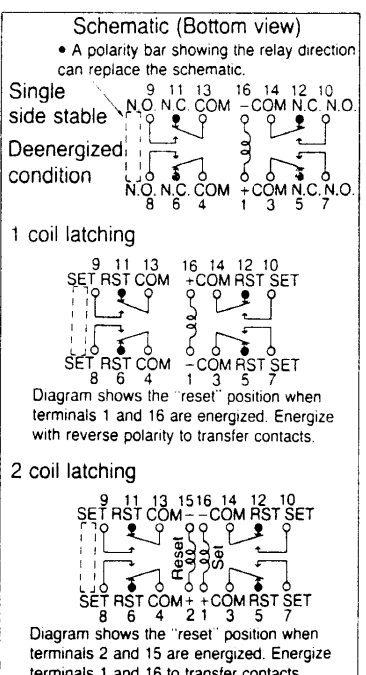
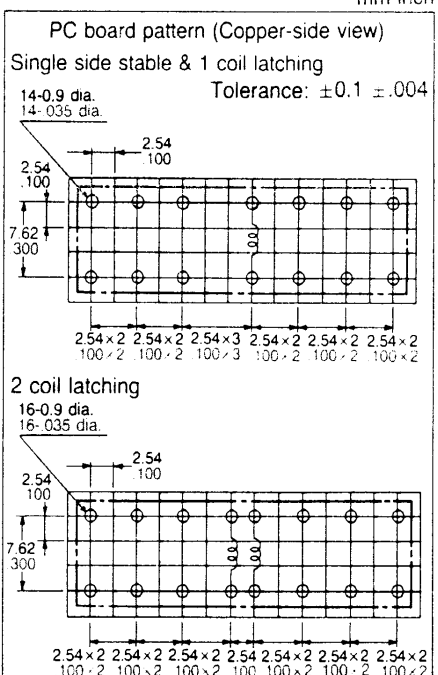
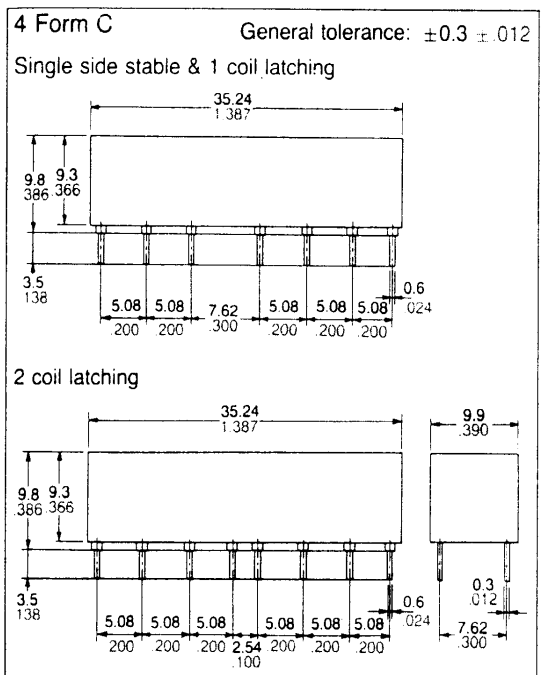
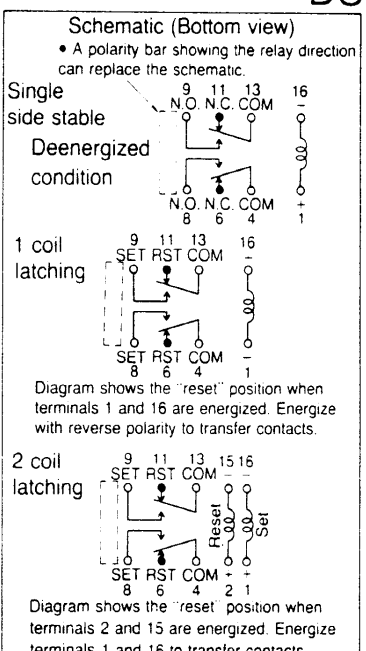
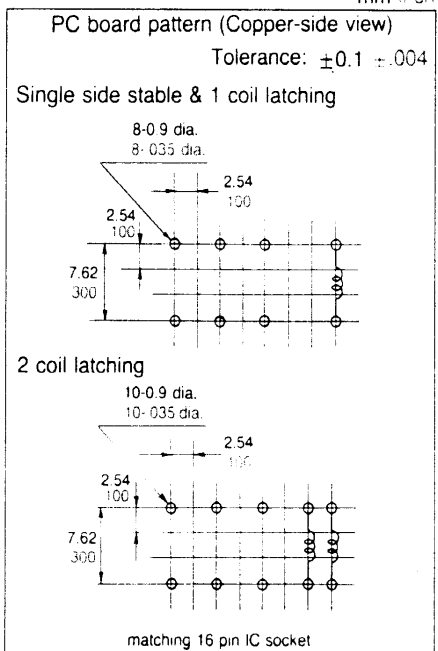
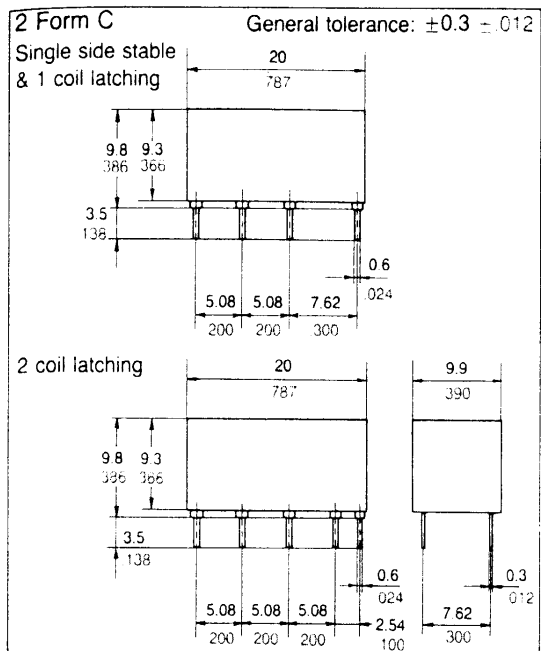
2 coil latching

	Nominal voltage, V DC	*Reset Set, V DC (max.)	*Maximum allowable, V DC (at 50°C 122°F)	Coil resistance, Ω (±10%)	
				Coil I	Coil II
"M" type	1.5	1.05	1.8 2.25	6.25	
	3	2.1	3.6 4.5	25	
	5	3.5	6 7.5	69.4	
	6	4.2	7.2 9	100	
	9	6.3	10.8 13.5	225	
	12	8.4	14.4 18	400	
	24	16.8	28.8 36	1600	
	48	33.6	57.6 72	6400	
"S" type	1.5	1.2 1.05	2.4 3	12.5	
	3	2.4 2.1	4.8 6	50	
	5	4.0 3.5	8.0 10	139	
	6	4.8 4.2	9.6 12	200	
	9	7.2 6.3	14.4 18	450	
	12	9.6 8.4	19.2 24	800	
	24	19.2 16.8	38.4 48	3200	
	48	38.4 33.6	76.8 96	12800	

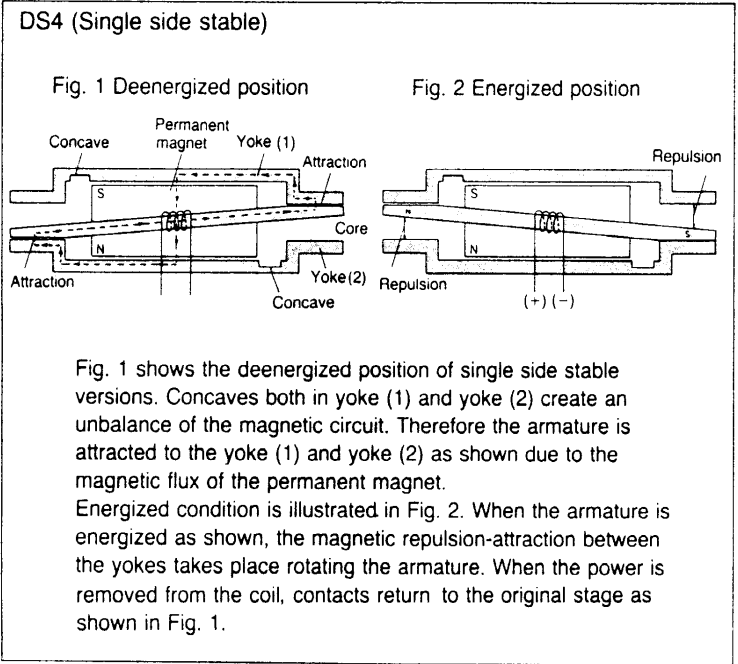
*Top: 1 Form C
Bottom: 2, 4 Form C

DIMENSIONS

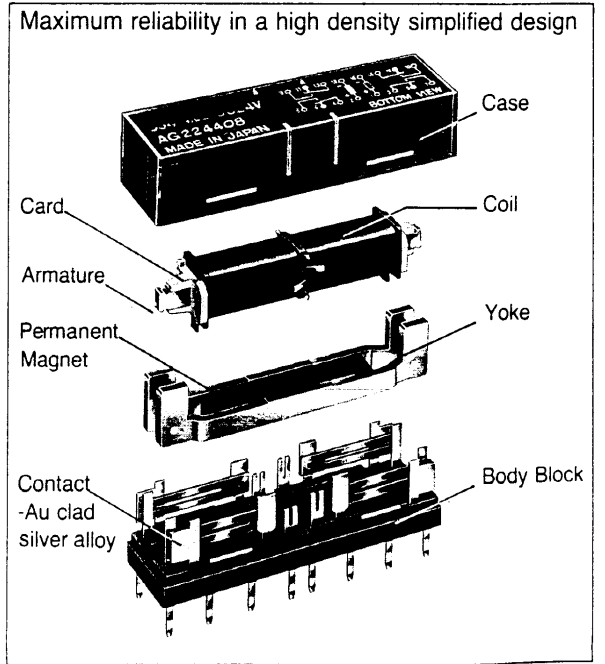




OPERATING PRINCIPLE - 4 Form C

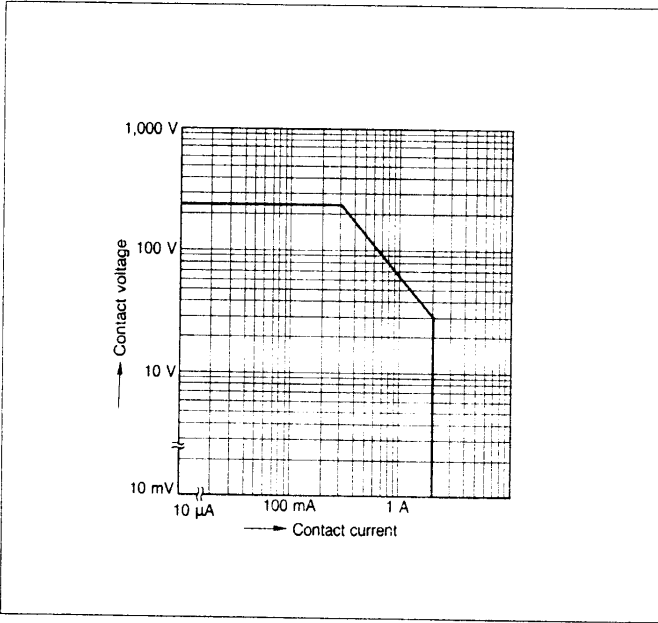


CONSTRUCTION - 4 Form C

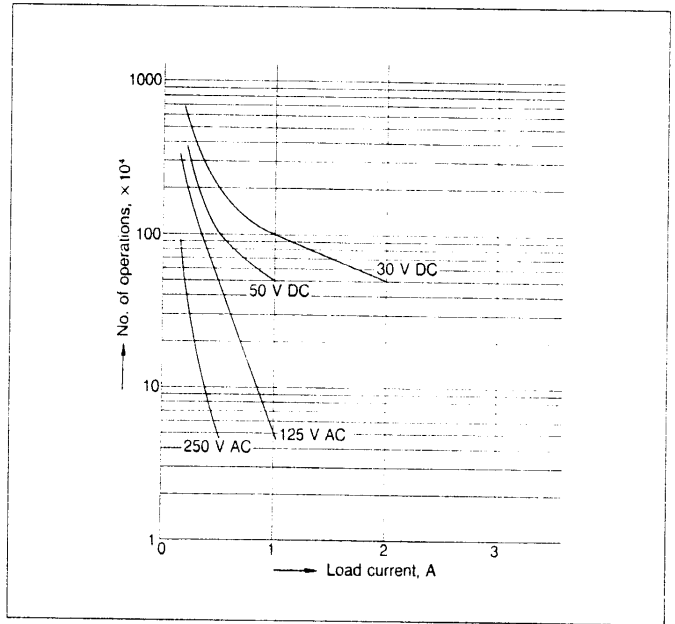


DATA

Maximum switching power

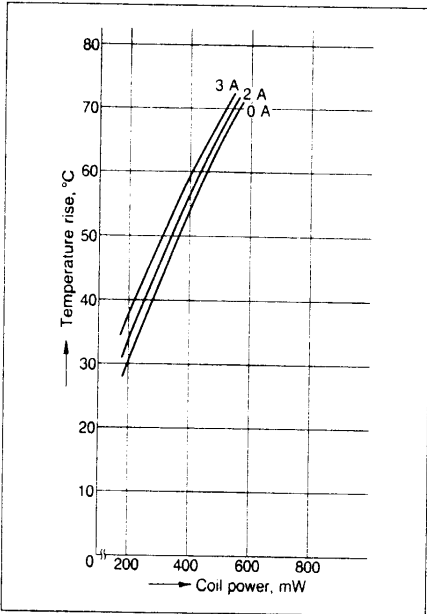


Life curve (Resistive load)

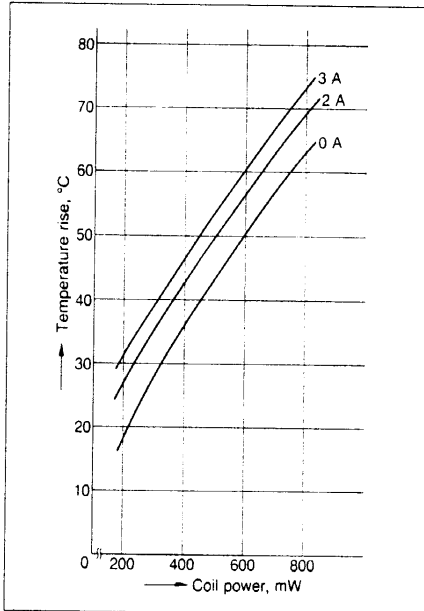


Coil temperature rise (at 20°C 68°F)

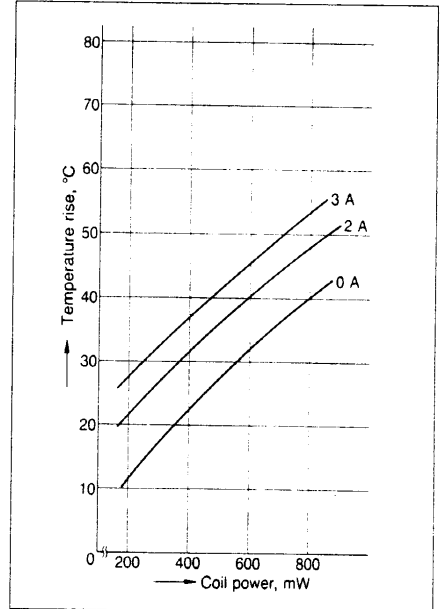
DS1 type



DS2 type

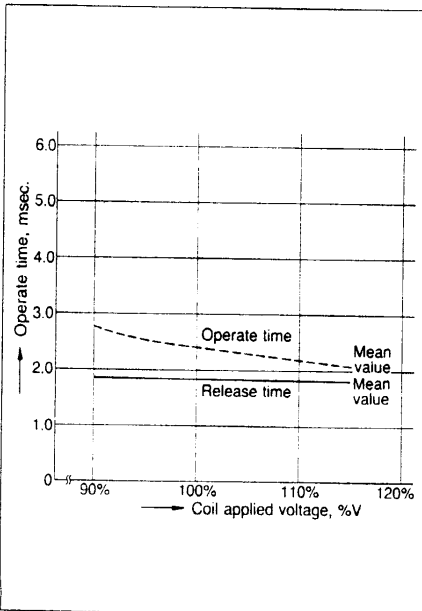


DS4 type

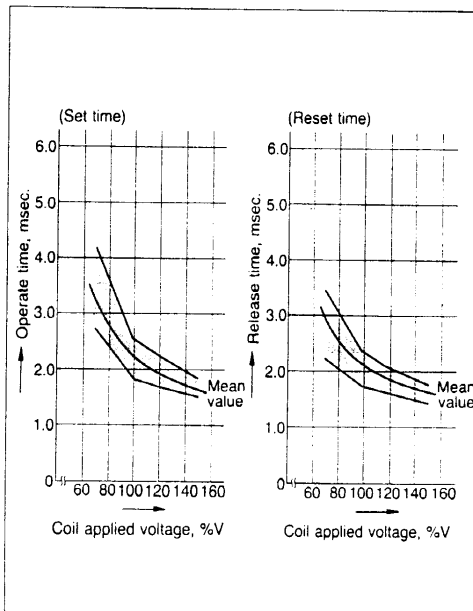


Operate/release time for single side stable (at 20°C 68°F, excluding bounce)

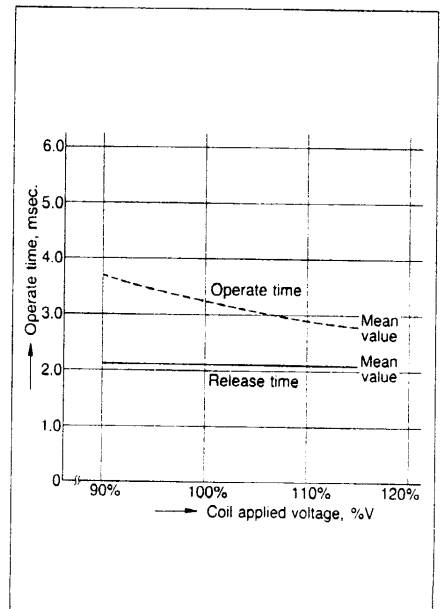
Sample: DS1-M-DC12V



Sample: DS2-ML2-DC12V



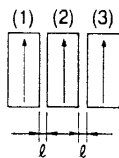
Sample: DS4-M-DC12V



Influence of adjacent mounting

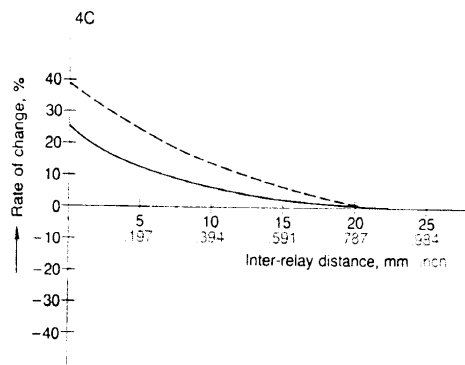
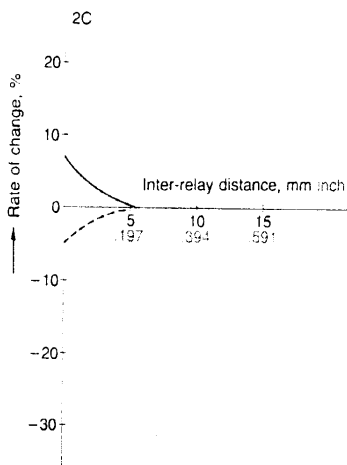
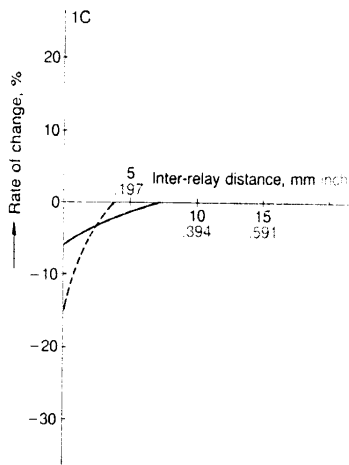
TEST METHOD

1. Apply nominal voltage to No. (1), and (3) DS relays.
2. Measure pick-up voltage and drop-out voltage of No. (2) relay when inter-relay distance (ℓ) changes.



Sample: DS1-M-DC24V
DS2-M-DC24V
DS4-M-DC24V

— Pick-up voltage
- - - Drop-out voltage



Notes on usage:

1. Although mounting 2 Form C DS relays side-by-side (zero space between the relay cases) will not cause misoperation to occur, the relays should be separated by approximately 5 mm (.197 inches) to completely eliminate the influence of the external magnetic field.
2. In mounting 4 Form C DS relays, care should be exercised to mount them towards the same direction.
3. Under worst-case conditions, mounting 4 Form C DS relays side-by-side (zero space between the relay cases) could cause them to remain in the energized stage. Therefore, the relays should be separated by 5 mm (.197 inches) minimum to assure correct operation.

Weibull probability data

Contact reliability for AC loads

Sample: DS2-M-DC24V

TEST CONDITION

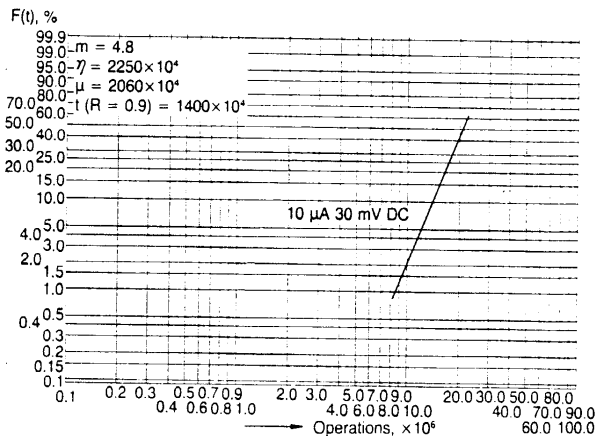
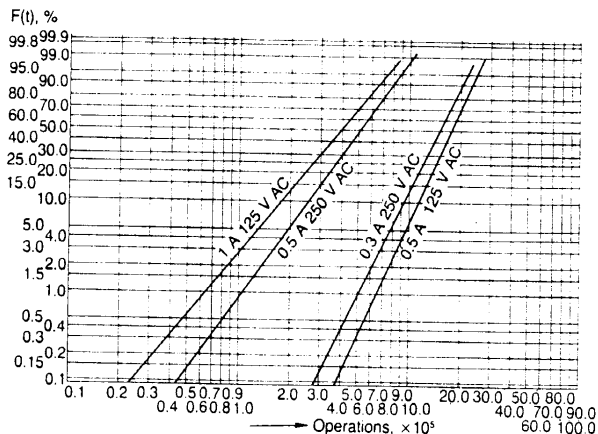
1. Cycle rate: 20 cpm.
2. Load (resistive): 1 A 125 V AC, 0.5 A 250 V AC, 0.3 A 250 V AC, 0.5 A 125 V AC
3. Rejection level: 200 mΩ

Low-level load test

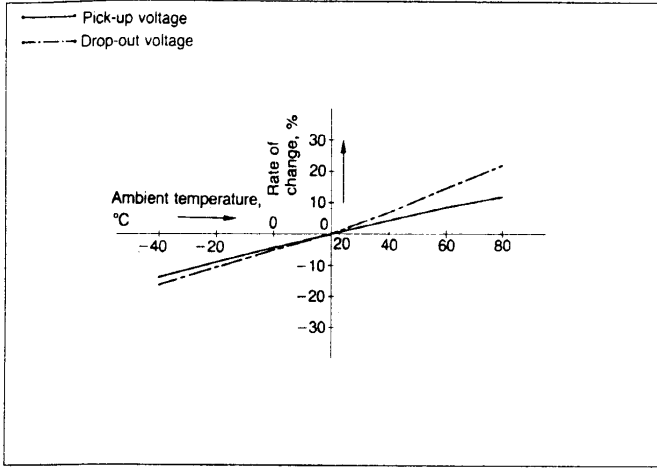
Sample: DS2-M-DC24V

TEST CONDITION

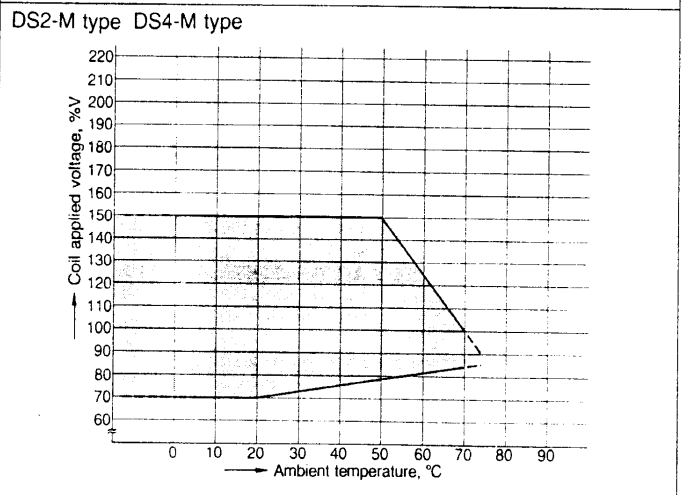
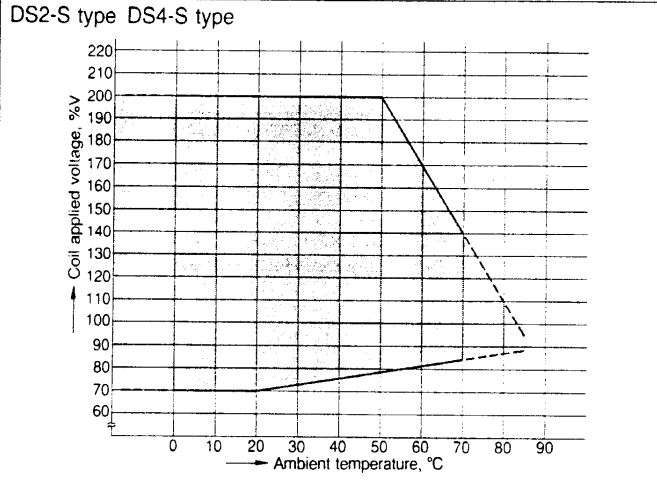
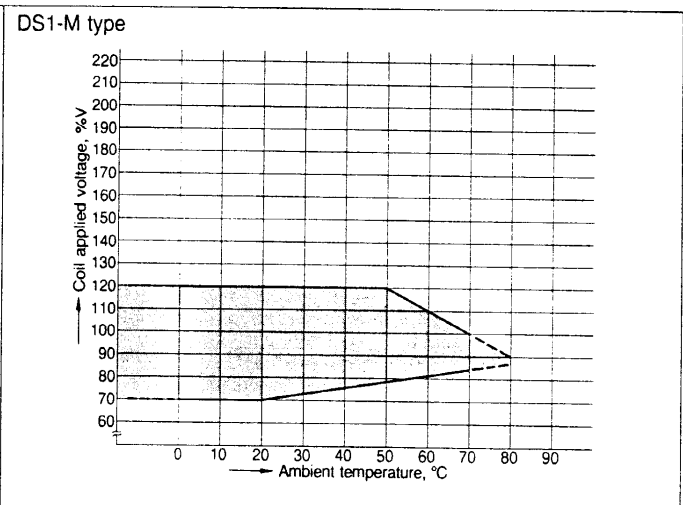
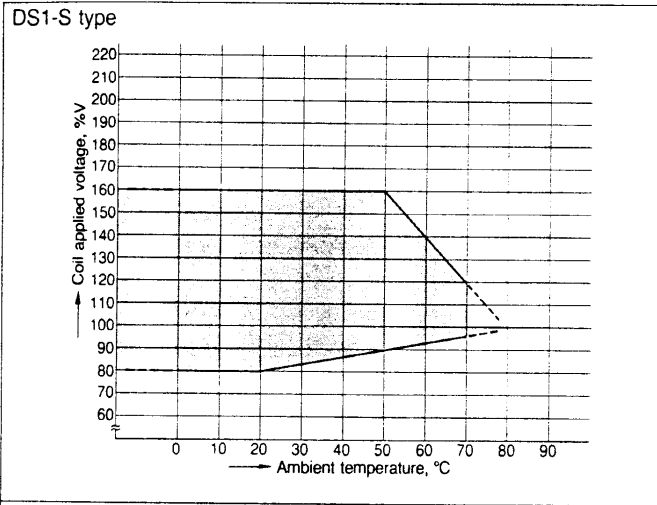
1. Test equipment: Low-level load contact reliability measuring machine
2. Load: Voltage: 30 mV DC; Current: 10 μA; Kind: Resistance (Metal-grades)
3. Detection level: 200 Ω (1 contact)
4. Detection time: 3 msec.



Change of rate of pick-up and drop-out voltage
(Single side stable)



Ambient temperature and operating voltage range



Note: Data assumes that the maximum allowable temperature is 120°C, and is not applicable to hot start.