

JIS

JAPANESE INDUSTRIAL STANDARD

Hinge type electromagnetic relays

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Hinge type electromagnetic relays

C 4530-1996

1. Scope This Japanese Industrial Standard specifies hinge type electromagnetic relays ⁽¹⁾ for use in an electric circuit of a voltage not exceeding 250 V a.c. at a frequency 50 Hz or 60 Hz or d.c., and of a current 30 A or under, designed mainly for signal transmission of electronic appliance or industrial control (hereafter referred to as "relays").

Note ⁽¹⁾ Hinge type electromagnetic relay means a relay of a mechanism in which the armature of the electromagnet turns about its fulcrum by application or removal of the operating input to its coil, and this motion opens or closes the contacts directly or indirectly.

Remarks 1. The following standards are cited in this Standard.

- JIS C 0040 Basic environmental testing procedures Part 2: Tests Test Fc and guidance: Vibration (sinusoidal)
- JIS C 0041 Basic environmental testing procedures Part 2: Tests Test Ea and guidance: Shock
- JIS C 0704 Insulation test for control gear
- JIS C 1302 Insulation resistance testers
- JIS C 1303 High insulation resistance meters
- JIS C 3301 Rubber insulated flexible cords
- JIS C 3306 Polyvinyl chloride insulated flexible cords
- JIS C 3307 600 V Polyvinyl chloride insulated wires
- JIS C 5442 Test methods of low power electromagnetic relays for industrial control circuits

2. The International Standards corresponding to this Standard are given below.

- IEC 255-1-00 Electrical relays. All-or-nothing electrical relays
- IEC 255-7 Electrical relays. Part 7: Test and measurement procedures for electromechanical all-or-nothing relays
- IEC 255-23 Electrical relays. Part 23: Contact performance

2. Definitions For the purposes of this Standard, the following definitions apply:

(1) Terms related with classification and function

- (a) monostable relay (single stable relay) A relay which operates when the exciting input is applied to the coil and returns when the exciting input is removed.
- (b) bistable relay (ratching relay) A relay which operates or returns when the exciting input is applied to the coil and remains in that condition after the exciting input is removed. There are single-coil type and double-coil type.

- (c) operation The action whereby the relay goes from the reset condition to the operated condition.
- (d) return The action whereby the relay goes from the operated condition to the reset condition.
- (e) operated condition The mechanically stable condition in which all the "b" contacts are in open position or the condition in which all the "a" contacts are in closed position.
- (f) hold condition The condition after a relay has been operated, in which no contact returns under a coil voltage or current within a specified fluctuation range.
- (g) reset condition The mechanically stable condition in which all the "a" contacts are in open position and/or all the "b" contacts are in closed position.

(2) Terms related with relay element

- (a) contact Electric contact having the function of connecting or switching the electric circuit.
- (b) coil A part of the relay for supplying electromagnetic force to make the relay into the operated condition or to keep it in the holding condition. It consists mainly of a winding of wire.
- (c) armature A movable magnetic piece which drives the contacts due to the exciting input to the coil.
- (d) switching device The entire conducting part of the relay which opens and closes the external electric circuits. It is composed of contacts, contact springs, internal wiring, terminations, etc.
- (e) number of poles Number of circuit changeover parts capable of carrying out changeover by one operation.
- (f) "a" contact A contact which is open in the reset condition and closed in the operated condition and the hold condition. It is also called "make contact".
- (g) "b" contact A contact which is closed in the reset condition and open in the operated condition and the hold condition. It is also called "break contact".
- (h) insulation distance The minimum distance between the parts which are to be insulated each other. The insulation distance consists of clearance and creepage distance.
- (i) clearance The minimum distance through air between two bare live parts insulated each other.
- (j) creepage distance The minimum distance between two bare live parts along the surface of an insulating material.

(3) Terms related with relay characteristics

- (a) operating voltage The minimum voltage to operate the relay. It is also called "sensitive voltage".
- (b) operating current The minimum current to operate the relay. It is also called "sensitive current".

- (c) return voltage A maximum voltage at which the relay returns when the voltage is dropped rapidly or gradually. It is also called "release voltage".
- (d) switching frequency The number of operations of the relay per unit time.
- (e) rated voltage The standard voltage to be applied on the coil in ordinary use of the relay.
- (f) rated current The standard current to be applied on the coil in ordinary use of the relay.
- (g) rated contact voltage The standard voltage of the load which is capable of being opened and closed by the contact of a relay in its normal service.
- (h) rated contact current The standard current of the load which is capable of being opened and closed by the contact of a relay in its normal service.
- (i) rated thermal current Current which can be passed continuously through the switching part without exceeding the temperature rise limit with the contacts closed.
- (j) rated insulation voltage The voltage used as the standard for insulation design, which satisfies the prescribed insulation distance and dielectric withstand voltage.
- (k) service factor The ratio of total duration during one hour of the current to one hour. It is expressed in percent (%).

3. Standard service conditions The standard service conditions shall be as follows, provided that it does not freeze up the relay nor cause dew condensation on the relay.

- (1) Ambient temperature - 5°C to + 40°C
- (2) Relative humidity 45 % to 85 %
- (3) Altitude 2000 m or under

4. Classification The relays shall be classified by the dimensions as follows:

- (1) Type A relay
- (2) Type B-I relay
- (3) Type B-II relay
- (4) Type C relay
- (5) Type D relay
- (6) Type E relay
- (7) Type F relay
- (8) Type G relay
- (9) Type H-I relay
- (10) Type H-II relay

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5. Ratings

5.1 Rated voltage The rated voltage of coil shall be as given in Table 1.

Table 1. Rated voltage

Unit: V

Rated voltage														
1.5	3	4.5	5	6	9	12	18	24	48	50	60	100	110	200 220

5.2 Rated insulation voltage The rated insulation voltage shall be as given in Table 2.

Table 2. Rated insulation voltage

Unit: V

Rated insulation voltage			
30	60	125	250

5.3 Rated contact voltage The rated contact voltage shall be as given in Table 3.

Table 3. Rated contact voltage

Unit: V

Distinction between a.c. and d.c.	Rated contact voltage							
A.C.	50	100	110	120	200	220	240	250
D.C.	24	30	48	100	200			

5.4 Rated frequency The rated frequency of a.c. relay shall be as given in Table 4.

Table 4. Rated frequency

Unit: Hz

Rated frequency	
50	60

Remarks: This may be used
for 50 Hz · 60 Hz
in common.

5.5 Rated thermal current The rated thermal current shall be as given in Table 5.

Table 5. Rated thermal current

Unit: A

Rated thermal current											
0.5	1	2	3	5	7	10	15	20	25	30	

5.6 Rated contact current The rated contact current shall be as given in Table 6.

Table 6. Rated contact current

Unit: A

Rated contact current															
0.1	0.3	0.5	0.7	1	2	3	4	5	7	8	10	15	20	25	30

6. Performances

6.1 Operation and return When the test of 8.2.2 is carried out, the operation and return shall be excellent at every part.

6.2 Contact resistance When the test of 8.2.3 is carried out, the contact resistance shall be not more than 100 mΩ.

If the resistance of the conductor itself excluding the contact is large, it shall be subtracted from the resistance measured in the said test.

6.3 Insulation resistance When the test of 8.2.4 is carried out, the insulation resistance shall be not less than 20 MΩ.

6.4 Dielectric withstand voltage When the test of 8.2.5 is carried out, the relay shall withstand the test voltage.

6.5 Temperature rise When the test of 8.2.6 is carried out, the temperature rise of the individual parts shall not exceed the appropriate value of temperature rise limits given in Table 7 and Table 8. The limit of reference ambient temperature shall be 30°C.

Table 7. Temperature rise limit

Part	Temperature rise limit (thermometer method)
Contact part in air (including contact)	A temperature which does not damage adjacent part
Metal part which performs spring action	A temperature which does not destroy elasticity of materials
Metal part which is in contact with insulating material	A temperature which does not damage insulating material
Termination used for connection with external insulated conductor	A temperature which does not damage external insulated conductor

Table 8. Temperature rise limit of coil

Unit: °C

Insulation class		Temperature rise limit (resistance method)
In air	Class A insulated coil	100
	Class E insulated coil	115
	Class B insulated coil	125

- 6.6 Resistance to cold Resistance to cold shall comply with the following:
- (1) Operation at cold When the relay is tested by the method of 8.2.7 (1), its individual parts shall operate without any trouble.
 - (2) Storage at cold When the relay is tested by the method of 8.2.7 (2), it shall satisfy the provisions of 6.1, 6.4 and 7.1, and further, the insulation resistance shall be not less than 5 MΩ.
- 6.7 Resistance to heat Resistance to heat shall comply with the following:
- (1) Operation at dry heat When the relay is tested by the method of 8.2.8 (1), its individual parts shall operate without any trouble.
 - (2) Storage at dry heat When the relay is tested by the method of 8.2.8 (2), it shall satisfy the provisions of 6.1, 6.4 and 7.1, and further, the insulation resistance shall be not less than 5 MΩ.
- 6.8 Resistance to damp heat When the relay is tested by the method of 8.2.9, it shall satisfy the provisions of 6.1, 6.4 and 7.1, and further, the insulation resistance shall be not less than 5 MΩ.
- 6.9 Resistance to vibration Resistance to vibration shall comply with the following:
- (1) Misoperation due to vibration When the relay is tested by the method of 8.2.10 (1), there shall be no harmful effect due to resonance, and the opening time of the contact shall be not more than 1 ms.
 - (2) Endurance to vibration When the relay is tested by the method of 8.2.10 (2), there shall be no damage in any part, and also the provisions of 6.1 shall be satisfied.
- 6.10 Resistance to shock Resistance to shock shall comply with the following:
- (1) Misoperation due to shock When the relay is tested by the method of 8.2.11 (1), the opening time of contact shall be not more than 1 ms.
 - (2) Endurance to shock When the relay is tested by the method of 8.2.11 (2), there shall be no damage in any part, and it shall satisfy the provisions of 6.1.

6.11 Endurance The endurance of relay shall comply with the following:

- (1) Mechanical endurance When the relay is tested by the method of 8.2.12 (1), there shall be no harmful degradation of performance and also it shall satisfy the provisions of 6.1.
- (2) Electrical endurance When the relay is tested by the method of 8.2.12 (2), there shall be no damage such as mal-separation of the contacts in any part, it shall satisfy the provisions of 6.1, and the insulation resistance shall be not less than 2 MΩ.

7. Construction

7.1 Construction in general The relay shall be constructed using materials of superior quality and shall satisfy the following requirements:

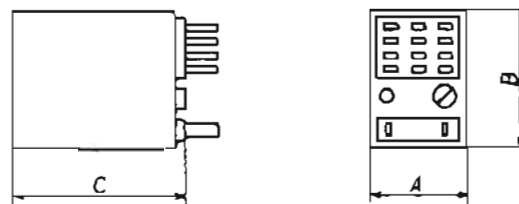
- (1) Operation is smooth and electrical contacts are good.
- (2) The electromagnet produces little noise.
- (3) Parts which are liable to become loose shall be prevented from loosening by some suitable means.
- (4) Iron or steel parts which are liable to rust shall be put to a treatment deterrent to rusting by metal coating, painting or other suitable means. However, portions to which the rust preventive treatment is difficult because of its structure may be exempted from the above requirement if the rusting does not adversely affect the performance.

7.2 Dimensions and internal connections

7.2.1 Type A relay

- (1) The external dimensions shall be as given in Fig. 1.

Fig. 1. External dimensions



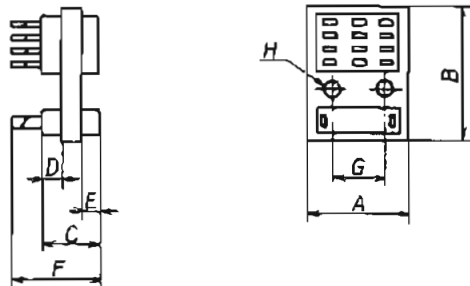
Unit: mm

Class		A	B	C
Dimensions	2-pole	20 max.	21 max.	41 max.
	4-pole		31 max.	
	6-pole		36 max.	

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- (2) The external dimensions of relay socket shall be as given in Fig. 2.

Fig. 2. External dimensions of relay socket

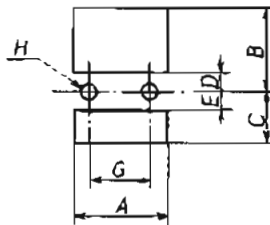


Unit: mm

Class		A	B	C	D	E	F	G	H
Dimen- sions	2-pole	20 max.	25 max.	11 max.	4 max.	4 max.	17 max.	9 ± 0.3	$\phi 3$
	4-pole		31 max.						
	6-pole		36 max.						

- (3) Machining dimensions of mounting hole for relay socket shall be as given in Fig. 3.

Fig. 3. Machining dimensions of mounting hole for relay socket



Unit: mm

Class		A	B	C	D	E	G	H
Dimen- sions	2-pole	$16.4^{+0.5}_0$	$25.4^{+0.5}_0$	$10.5^{+0.6}_0$	4 max.	3.6 max.	9 ± 0.3	$\phi 3$ or M2.5
	4-pole		$18.2^{+0.5}_0$					
	6-pole		$23.4^{+0.5}_0$					

- (4) The number of poles and internal connection viewed from terminal side shall be as given in Fig. 4.