

JIS

JAPANESE INDUSTRIAL STANDARD

Ground relay set for
6.6 kV consumer

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1. Scope This Japanese Industrial Standard specifies the ground relay sets composed of a zero-phase-sequence current transformer and a ground fault relay (hereafter referred to as "relay") which are designed for a one-line ground fault current less than 30 A and are mainly installed at the receiving point of 6.6 kV consumer.

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

JIS C 0911 Vibration testing procedure for electric machines and equipment

JIS C 0912 Shock testing procedure for electric machines and equipment

JIS C 3611 Insulated wires for cubicle type unit substation for 6.6 kV receiving

2. Definitions For the purpose of this Standard, the following principal definitions shall apply:

- (1) operating current The primary zero-phase-sequence current at which the relay operates.
- (2) setting Determination of the reference point of operation by means of a prescribed device
- (3) operation This means such a behavior that a relay accomplishes the prescribed duty completely.
- (4) reset This means such a behavior that a relay returns to the prescribed function at the original position.

3. Service conditions

3.1 Normal service conditions The normal service conditions shall be as prescribed below, and ground relay sets shall be used under these conditions unless otherwise specified.

- (1) The ambient temperature shall be -20°C to $+50^{\circ}\text{C}$. However, there shall be neither dew condensation nor freezing.
- (2) The storage temperature shall be -20°C to $+60^{\circ}\text{C}$.
- (3) The relative humidity shall be 30 % to 80 % in daily average.
- (4) The altitude shall be not more than 2000 m.
- (5) The circumstances shall be free from abnormal vibration or shock.
- (6) The location shall be free from explosive dust, inflammable dust, or any other highly concentrated dust, inflammable gases, corrosive gases, inflammable vapors, salt mist, or water droplets.

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3.2 Special service condition If a relay set is used under conditions other than those specified in 3.1, the conditions shall be considered as special service conditions. In such a case, it is sometimes necessary that the relay set have a special construction and functions, therefore particular attention shall be paid to the manufacture and application of the relay set.

4. Ratings The ratings of relays and zero-phase-sequence current transformers used in combination with relays shall be as follows:

(1) **Relay** The ratings shall be as given in Table 1.

Table 1. Ratings of relays

Rated control supply voltage	V	A.C. 110
Rated frequency	Hz	50 or 60
Rated operating current	mA	200

(2) **Zero-phase-sequence current transformer** The ratings shall be as given in Table 2.

Table 2. Ratings of zero-phase-sequence current transformer

Highest voltage	kV	6.9
Rated primary current	A	100 200 300 400 600 1000
Rated frequency	Hz	50 or 60

5. Performance

5.1 Operating current characteristic When the test of 7.3 is carried out, the difference of operating current from the set current shall fall within a range $\pm 10\%$ of the latter.

5.2 Operating time characteristic When the test of 7.4 is carried out, the operating time shall fall within the range of values shown in Table 3.

Table 3. Operating time characteristic

Test current (%)	Operating time (s)
130 of set current	0.1 to 0.3
400 of set current	0.1 to 0.2

5.3 Heavy ground fault current characteristic When the test of 7.5 is carried out, the relay shall operate surely.

5.4 Inertia characteristic When the test of 7.6 is carried out, the relay shall not operate in any case.

5.5 Effect of load current When the test of 7.7 is carried out, the operating range of the relay shall fall within the range of values given in Table 4.

Table 4. Effect of load current

Rated primary current A	Operating range of relay when a zero-phase-sequence current is superimposed on the rated primary current %
Up to and incl. 200	80 to 120 of set current value
Over 200 up to and incl. 600	70 to 130 of set current value
Over 600	50 to 150 of set current value

5.6 Effect of control supply voltage When the test of 7.8 is carried out, no operating current shall deviate from the operating current at the rated control supply voltage by exceeding $\pm 10\%$.

5.7 Effect of temperature When the test of 7.9 is carried out, the operating current shall not deviate from the operating current at 20°C by exceeding the appropriate value given in Table 5.

Table 5. Effect of temperature

Ambient temperature $^{\circ}\text{C}$	Permissible deviation from operating current at 20°C %
-10 or over up to and incl. 50	± 15
-20 or over to and excl. -10 Over 50 up to and incl. 60	± 20

5.8 Burden of control power supply When the test of 7.10 is carried out, the burden of control supply circuit shall not exceed 110% of the value declared by the manufacturer.

5.9 Switching of control power supply when the test of 7.11 is carried out, the relay shall not operate.

5.10 Resistance to noise when the test of 7.12 is carried out, the relay shall not operate.

5.11 Insulation resistance When the test of 7.13 is carried out, the insulation resistance shall be not less than $20\text{ M}\Omega$ at the high voltage part (the part to be measured with an insulation resistance tester of rated voltage 1000 V) and not less than $5\text{ M}\Omega$ at the low voltage part (the part to be measured with an insulation resistance tester of 500 V).

5.12 Power frequency withstand voltage When the test of 7.14 is carried out, no abnormality shall appear at any part.

5.13 Lightning impulse withstand voltage When the test of 7.15 is carried out, no abnormality detrimental to service shall appear at any part.

5.14 Temperature rise When the test of 7.16 is carried out, the temperature rise at various parts of the relay shall not exceed the appropriate value given in Table 6, and the relay shall show no abnormality detrimental to service.

Table 6. Limits of temperature rise

Unit: °C

Measurement position		Temperature rise (limit of standard ambient temperature, 40°C)	
		Resistance method	Thermometer method
Winding		55	50
Resistor	Internally mounted	—	80
	Externally mounted	—	150

5.15 Durability

- (1) Mechanism When the test of 7.17 (1) is carried out, the relay and zero-phase-sequence current transformer shall not cause any abnormality detrimental to service.
- (2) Contacts When the test of 7.17 (2) is carried out, the contacts shall not cause any abnormality detrimental to service.

5.16 Vibration When the test of 7.18 is carried out, the relay shall not operate. The difference of the operating current from the set current shall fall within the range of $\pm 10 \%$ of the latter.

5.17 Shock When the test of 7.19 is carried out, the relay shall not cause any abnormality detrimental to service. The difference of the operating current from the set current shall fall within the range of $\pm 10 \%$ of the latter.

5.18 Overcurrent strength When the test of 7.20 is carried out, the zero-phase-sequence current transformer shall not be damaged mechanically or thermally. The difference of the operating current from the set current shall fall within the range of $\pm 10 \%$ of the latter.

6. Construction and terminal symbols

6.1 Construction

6.1.1 Relay The construction of relays shall comply with the following:

- (1) The case for housing the internal elements of a relay shall be so designed that no dust can enter into the case.