

NEW INDUCTION-DISC TYPE RELAYS

Improvement of the performance of a protective relay is a prerequisite to promote rational operation of transmission and distribution lines and of electrical apparatus; it is a necessary condition for reduction in size of the relay panel and increase of its utility to make the protective relay as compact and lightweight as possible. Particularly, current—and voltage—relays, which are finding widest application in protection of transmission and distribution lines and of electrical apparatus, constitute a major portion of any protective relay system. Accordingly, development of this type relay is strongly urged.

By way of meeting such a demand, the Company has entered into production of new induction-disc type current and voltage relays which have many improved features such as smaller range between the operation and resetting values; better temperature and frequency characteristics; reduced dimensions and lighter weight.

I. INDUCTION-DISC TYPE OVER-CURRENT RELAYS, TYPE AI 3

These are shading-coil; induction-disc type over-current relays with inverse-definite time characteristics. They are intended for over-current protection of electric circuits such as transmission or distribution lines.

1. Features

- a) With an L frame in the center, there is on the upper level of front a control unit composed of control springs, control gears and holding coil; on the lower level, another control unit; and at the back, operation elements. These units make a lightweight, solid, simple and balanced and stabilized construction ease of adjustment and inspection.
- b) With a narrow range of operation and resetting values, it is susceptible of practice adjustment.

The operation elements are so efficiently and rationally designed that there is a large working torque produced; moreover, a special torque compensating spring is used for preventing the disc from being floated, rendering it unnecessary to make additional machining such as grooving of disc. Thus, maximum efficiency of working elements is secured for any position of the disc.

- c) The floating range of the disc is narrowed and to that extent the possibility of the disc coming to a halt while in motion is lessened.

This is because that ill effect of the frictional torque is limited on account of a strong working torque and a stable control torque, the advantages gained from adoption of the mechanism described under b).

- d) Variation of characteristics with the change of temperature is extremely reduced and the characteristics are assured to remain unchanged throughout all seasons.

- e) The characteristics are also little affected by frequency changes. By nature, this type of current relay is liable to have a large error due to frequency change; such error in the Company's product is controlled well under a negligible value through appropriate design of operation elements.

- f) This relay can be relied upon to operate at the prescribed working values, with a narrow range of the scattering of working values.

It is because fine adjustment is made possible on account of a large rotating angle, and external factors, such as friction affects little.

- g) There is almost no miss operation due to the inertia.

The braking magnet employs MK magnet made by the Company and is twice as strong as a conventional magnet used for the relay of this kind, also having stable characteristics, which eliminates a possibility of miss operation by keeping the rotation even if there is no input to the operation element.

- h) It has stable characteristics and practically no effect by aging. That is, there is nothing in the operation element or control unit that may be subject to aging; the control magnet is highly stabilized in characteristics and can be guaranteed to be free from aging.

2. Specifications

The specifications of standard products are given in Table 1. Fig. 2 shows its performance characteristics. The power consumption is 4.5 VA; The contacts in the standard design have holding coils and can close 10 A.

For the purpose of smart appearance of the switch-board, the relay box is made a little too big for the size of relay elements; but the conventional small standard relay box is also available.

The Company is ready to supply whatever type preferred by the customer, such as a draw-out type, ordinary type, surface type or flush type.

II. SMALL-ENERGY INDUCTION-DISC TYPE OVER-CURRENT RELAYS, TYPE AI 2

These relays are almost identical in construction with Type AI 3. The only difference is that some modifications are made in the control unit to adapt it to small energy uses; the operation elements are designed for high efficiency with particularly small leakage of magnetic flux.

1. Specifications

The standard specifications are as given in Table 1. with performance characteristics as shown in Fig. 3. The power consumption is less than 0.2 VA.

One closed circuit contact with a holding coil, can close 5 A, is standard. Outer dimensions are same as AI 3 Type. Draw-out, ordinary, surface, or flush—any type to suit your purpose will be available.

III. INDUCTION-DISC TYPE OVER-VOLTAGE RELAYS, TYPE VI 3

Practically the same construction as AI 3 Type is used in this model.

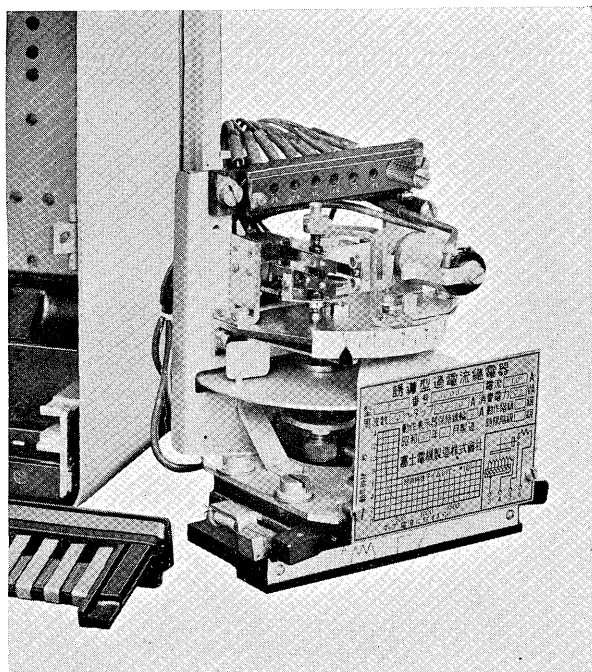


Fig. 1. Element of low energy over-current relay type AI2.

Every feature of AI 3 is taken over by this model; specially it excels in frequency characteristics.

1. Specifications

The standard specifications are given in Table 1.

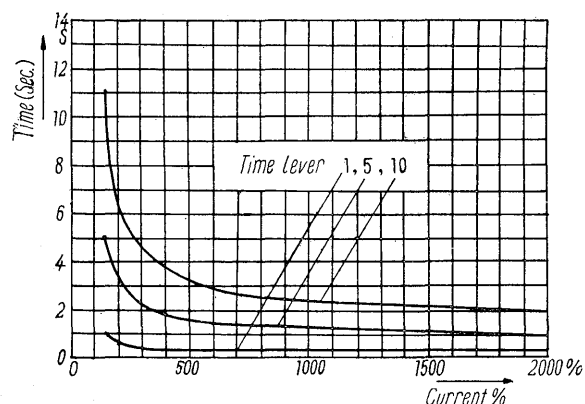


Fig. 2. Time-current curves of type AI 3 over-current relay

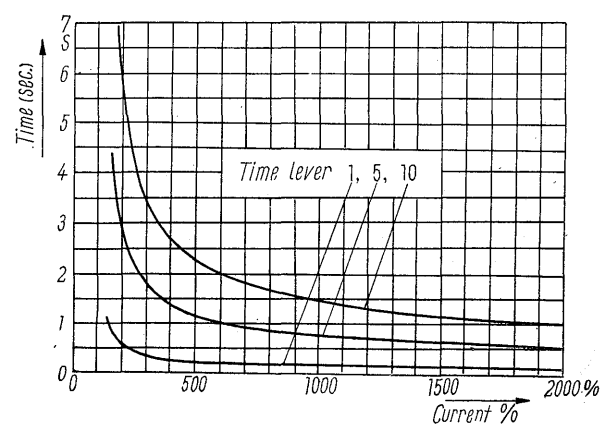


Fig. 3. Time-current curves of type AI 2 low energy over-current relay

Table 1. Standard Specifications of New Induction-Disc Type Relays

| Name | Type | Frequency | Rated current or voltage | Tap | Contact | Holding coil |
|---|-------------------------|-------------------------|--------------------------|------------------------------|-------------------------|----------------|
| Induction-disc type over-current relay | AI 3-M 1 AI 3-MO 1 | 50 c/s and 60 c/s | 6 A | 4-5-6-7-8-10-12A | with holding coil | 1 A 4 A |
| | | | 1.2 A | 0.8-1-1.2-1.4-1.6-2-2.4A | | |
| Small-energy induction-disc type over-current relay | AI 2-M 1 AI 2-MO 1 | | 1 A | 0.5-0.75-1-1.25-1.5-1.75-2A | | |
| Induction-disc type over-voltage relay | VI 3-M 1 VI 3-MO 1 | | 110 V | 90-100-110-120-130-140-150V | | |
| | | | 220 V | 180-200-220-240-260-280-300V | | |
| Induction-disc type under-voltage relay | UVI 3-M 1 UVI 3-MO 1 | | 110 V | 65-70-75-80-85V | | |
| | | | 220 V | 130-140-150-160-170V | | |

Remarks: 1. M denotes that the holding coil is attached and O that operation indicator is attached.
2. Draw-out type is indicated by P fixed after type name: for instance, Draw-out type of AI 3-M 1 will be represented as AI 3 P-M 1.

which also indicates that it has inverse-time characteristics. The power consumption is 5 VA in tap value; the contacts are the same with AI 3. The relay box and its types are also patterned after AI 3.

IV. INDUCTION-DISC TYPE UNDER-VOLTAGE RELAYS, TYPE UVI 3

These are constructed nearly the same as the over-voltage relay VI 3; only, the torque direction

of operation elements and that of control spring are reversed to adapt it for use as under-voltage relay. They have similar features as VI 3.

1. Specifications

The standard specifications are given in Table 1. They have an inverse-time characteristics. The power consumption is about 10 VA when rated voltage is impressed, with minimum tap used. Contacts are the same with AI 3. The relay box and its kinds are also similar to AI 3.

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