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Electrical relays - Part 11: Interruptions to and alternating component (ripple) in d.c. auxiliary energizing quantity of measuring relays

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Relais électriques - Onzième partie: Interruptions et composante alternative des grandeurs d'alimentation auxiliaires à courant continu pour relais de mesure

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL RELAYS

Part 11: Interruptions to and alternating component (ripple) in d.c. auxiliary energizing quantity of measuring relays

FOREWORD

1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.

2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.

3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

PREFACE

This standard has been prepared by Sub-Committee 41B: Measuring Relays, of IEC Technical Committee No. 41: Electrical Relays.

Drafts were discussed at the meeting held in Milan in 1977. A draft, Document 41B(Central Office)11, was submitted to the National Committees for approval under the Six Months' Rule in May 1978.

The following countries voted explicitly in favour of publication:

Australia	Norway
Austria	Poland
Belgium	South Africa (Republic of)
Canada	Spain
Egypt	Sweden
France	Switzerland
Germany	Turkey
Italy	United Kingdom
Japan	United States of America

This standard is a second-level publication applicable to measuring relays as specified in the scope.

Other IEC publications quoted in this standard:

Publications Nos. 50(131): International Electrotechnical Vocabulary (I.E.V.) Chapter 131: Electric and Magnetic Circuits.

255-3: Electrical Relays — Part 3: Single Input Energizing Quantity Measuring Relays with Non-specified Time or with Independent Specified Time.

255-4: Part 4: Single Input Energizing Quantity Measuring Relays with Dependent Specified Time.

ELECTRICAL RELAYS

Part 11: Interruptions to and alternating component (ripple) in d.c. auxiliary energizing quantity of measuring relays

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SECTION ONE — GENERAL

1. Scope

This standard specifies the additional requirements to be met, and the additional parameters whose values are to be declared by the manufacturer, in respect of interruptions to, and alternating components (ripple) in the d.c. auxiliary energizing quantities of static measuring relays.

The requirements of this standard may also apply to certain electromagnetic relays having a d.c. auxiliary energizing quantity.

SECTION TWO — REQUIREMENTS CONCERNING INTERRUPTIONS TO D.C. AUXILIARY ENERGIZING QUANTITY

This section deals with interruptions to the d.c. auxiliary energizing quantity which are considered as an influencing quantity having a standard reference value but no nominal range.

2. Interruption

An interruption is defined as either a break in, or a short circuit in, the auxiliary energizing quantity supply*. Only single interruptions are considered. Separate tests may be needed to establish the effects of a break in the supply and a short circuit in the supply. Test conditions shall be specified.

3. Standard reference conditions and test tolerances of influencing quantities and factors

TABLE I

Influencing quantity or factor		Reference condition	Test tolerances
Auxiliary energizing quantities	Interruption	0 ms	No test tolerance

* It may be necessary to add additional series impedance into the supply circuit to enable the short-circuit condition to be removed; the effect, if any, on the relay performance due to the addition of this impedance should be declared by the manufacturer.

4. Standard values of the limits of the nominal range of influencing quantities and factors

TABLE II

Influencing quantity or factor		Nominal range
Auxiliary energizing quantities	Interruption	Not specified

5. Effects of interruptions to d.c. auxiliary energizing quantity

The effects shall be determined for an interruption having a duration selected from the following values and declared by the manufacturer: 2 — 5 — 10 — 20 — 50 — 100 — 200 ms.

The interruption shall be sudden, i.e. the auxiliary energizing quantity shall be changed from rated value to 0 or vice versa. The manufacturer shall declare the test conditions.

Note. — In special cases, additional data may be required to show the effects of the rate of change of auxiliary voltage, e.g. the effects on d.c/d.c. converters.

The manufacturer shall declare the effects (if any) of the interruptions on:

- the accuracy;
- the operating time;
- the resetting performance;
- any other characteristics, if significant.

The relay shall not change its output state in a faulty manner when the auxiliary energizing quantity is switched on or off.

Note. — See Appendix A.

SECTION THREE — REQUIREMENTS CONCERNING ALTERNATING COMPONENT (RIPPLE) IN THE D.C. AUXILIARY ENERGIZING QUANTITY UNDER STEADY-STATE CONDITIONS

This section deals with the alternating component (ripple) in the d.c. auxiliary energizing quantity which is considered as an influencing quantity with a standard reference value and limits of nominal range.

6. Definition of alternating component

In this standard the definition of the alternating component in d.c. is:

$$100\ \frac{U_{mm} - U_v}{U_0}$$

where:

U_{mm} = maximum instantaneous voltage
U_v = minimum instantaneous voltage
U_0 = d.c. component

(See I.E.V. 131-03-14.)

7. Conditions for determination of effects due to ripple

For static relays it is important that the effects of the alternating component should be assessed at the maximum and minimum values of the d.c. voltage (e.g. 110% and 80% respectively of rated value).

The ripple waveform shall be sinusoidal (or a full wave rectified sine wave) and have a frequency of twice the power system frequency, unless otherwise declared by the manufacturer.

Note. — See Appendix A.

8. Standard values of the limits of the nominal range

TABLE III

Influencing quantity or factor		Nominal range
Auxiliary energizing quantities	A.C. component in d.c. (ripple)	0 to 12% of rated d.c. value

APPENDIX A

EXPLANATORY NOTES ON AUXILIARY POWER SUPPLIES FOR STATIC MEASURING RELAYS

The specification requirements relating to the two influencing quantities "interruptions" and "a.c. component in d.c." when applied to auxiliary power supplies, are given in Tables I, II et III. Although these are influencing quantities which are applicable to all measuring relays requiring an auxiliary supply, generally they are most applicable to static relays. Due to the many different ways in which an auxiliary supply may be derived and connected to static measuring relays, this appendix provides supplementary information to assist in determining the point of application of the above influencing quantities when determining their effects on relay performance. Additional comments are also given to explain the reasons for the choice of test conditions.

Although in some cases static measuring relays are self-energized, i.e. derive their internal d.c. supplies from their input energizing quantities (current or voltage transformer signals), a large proportion of static relays require some form of separate external voltage source for correct operation. This may take the form of either an a.c. or d.c. source. Almost invariably, some form of interposing unit is required as part of the measuring relay, acting as an "interface" between the external "non-dedicated" supply voltage and the internal "dedicated" supply voltage energizing the static circuitry. This unit is conventionally the relay power supply which may be either a simple regulator/stabilizer unit or an a.c. to d.c. or d.c. to d.c. conversion unit. This power supply unit generally performs three main functions:

a) It reduces the level of the external voltage source to a level suitable for static circuitry.

b) It reduces the variation of the external voltage source to provide an internal stabilized supply voltage (the "dedicated" voltage).

c) It provides an insulation barrier and filter between the dedicated and non-dedicated voltages, so that any noise or interference voltage signals present in the latter (typically represented by the impulse voltage withstand and high-frequency disturbance tests – see Appendix E, Publication 255-4: Part 4: Single Input Energizing Quantity Measuring Relays with Dependent Specified Time) are not impressed on sensitive static circuitry. Note that the tests specified in Appendix E are also intended to cover high frequency being impressed on to the non-dedicated supply from d.c./d.c. converters.

The power supply unit thus acts as an "input interface" between the external non-dedicated and internal dedicated supply voltages.

When required, power supplies for static measuring relays are obtained from an external voltage source, either a.c. or d.c. Unless provided for a specific range of protection equipment, this external voltage source is likely to be located centrally in a typical power or sub-station layout and will not be under the control of the manufacturer of the protection equipment. This voltage source will generally supply other equipment in the station and, as a result, will be subjected to considerable voltage variations and will have general noise, high-frequency interference, ripple etc. voltages impressed on it. A typical example of such a source is the station tripping battery supplying switchgear trip coils, protection relays etc. It is recognized that multiple interruptions to supply may occur in practice and the resultant source impedance seen by the measuring relay input terminals may also vary from zero to infinity. However for practical testing considerations the test conditions specified in this standard have been restricted to single interruptions being either short-circuit or