



SLOVENSKI STANDARD

SIST IEC 60255-22-4:1995

01-avgust-1995

Electrical relays - Part 22: Electrical disturbance tests for measuring relays and protection equipment - Section 4: Fast transient disturbance test

Measuring relays and protection equipment - Part 22-4: Electrical disturbance tests - Electrical fast transient/burst immunity test

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Relais de mesure et dispositifs de protection - Partie 22-4: Essais d'influence électrique - Essai d'immunité aux transitoires électriques rapides en salves

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Ta slovenski standard je istoveten z: **IEC 60255-22-4**

ICS:

19.080	Električno in elektronsko preskušanje	Electrical and electronic testing
29.120.70	Releji	Relays

SIST IEC 60255-22-4:1995

en

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NORME
INTERNATIONALE
INTERNATIONAL
STANDARD

CEI
IEC
255-22-4

Première édition
First edition
1992-03

Relais électriques

Partie 22:

Essais d'influence électrique

concernant les relais de mesure et dispositifs
de protection

Section 4: Essai de susceptibilité aux
perturbations transitoires rapides

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Electrical relays

Part 22:

Electrical disturbance tests for measuring relays
and protection equipment

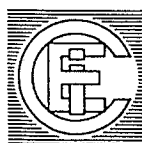
Section 4: Fast transient disturbance test

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL RELAYS

Part 22: Electrical disturbance tests for measuring relays
and protection equipment

Section 4: Fast transient disturbance test

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.

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This section of International Standard IEC 255-22 has been prepared by Sub-Committee 41B: Measuring relays and protection equipment, of IEC Technical Committee No. 41: Electrical relays.

The text of this section is based on the following documents:

DIS	Report on Voting
41B(CO)53	41B(CO)55

Full information on the voting for the approval of this section can be found in the Voting Report indicated in the above table.

Annexes A and B form an integral part of this section.

ELECTRICAL RELAYS

Part 22: Electrical disturbance tests for measuring relays and protection equipment

Section 4: Fast transient disturbance test

1 Scope and object

This section of IEC 255-22 is based on IEC 801-4 and refers to that publication where applicable.

This section specifies general requirements for fast transient disturbance tests of static measuring relays and protection equipment with or without output contacts.

The object of the test is to confirm that the equipment under test will not maloperate when energized and subjected to fast transients such as those originating from interruption of inductive loads, relay contact bounce, etc. The requirements are applicable only to relays and protection equipment in new condition.

The test specified in this section is a type test.

NOTE - The test may also, where appropriate, be applied to electromechanical relays, for example high speed or high sensitivity electromechanical relays.

The object of this section is to state: [SIST IEC 60255-22-4:1995](https://standards.iteh.ai/catalog/standards/sist/5b9d446f-c039-43bd-ba48-a7c6d1394e39/sist-iec-60255-22-4-1995)

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- definitions of terms used;
- standard test severity classes;
- test conditions;
- test procedure;
- criteria for acceptance.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this section of IEC 255-22. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this section of IEC 255-22 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 50: *International Electrotechnical Vocabulary (IEV)*.

IEC 255-6: 1988, *Electrical relays – Part 6: Measuring relays and protection equipment*.

IEC 801-4: 1988, *Electromagnetic compatibility for industrial-process measurement and control equipment – Part 4: Electrical fast transient/burst requirements*.

3 Definitions

For definitions of general terms, reference should be made to the International Electrotechnical Vocabulary (IEV)[IEC 50]. For special terms used, reference is made to clause 4 of IEC 801-4.

4 Fast transient disturbance test

4.1 Test severity classes

To cover different environmental conditions, this section of IEC 255-22 includes different severity classes.

General guidance for the selection of a severity class is given in annex B.

The test severity class shall be chosen from the following table. In this section, the severity is expressed as the open circuit output voltage of the test generator.

Class	Test voltage
0	-
I	0,5 kV \pm 10 %
II	1 kV \pm 10 %
III	2 kV \pm 10 %
IV	4 kV \pm 10 %

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Class III is the preferred class for measuring relays and protection equipment for normal use in power plants, substations and industrial plants.

A relay or protection equipment may have different test severity classes for different input and output circuits.

4.2 Test generator

The fast transient generator is defined in 6.1 of IEC 801-4.

4.3 Coupling/decoupling network

The application of the fast transient test voltage to the equipment under test via coupling/decoupling networks, as defined in 6.2 of IEC 801-4, is the preferred test method. The test voltage shall be applied in common mode to all input and output circuits of the relay or protection equipment, unless otherwise specified by the manufacturer (see 4.4 below).

4.4 Capacitive coupling clamp

For the application of the fast transient test voltage to circuits where a direct connection to the terminals is not possible, or where the insertion of a coupling/decoupling network itself would upset the operation of the equipment under test, a capacitive coupling clamp, as defined in 6.3 of IEC 801-4, shall be used.

NOTE - An example of such an application is where the fast transient test voltage would be applied to a connection between separate units belonging to the same protection equipment or system.

4.5 Test procedure

The test shall be carried out with the equipment under the reference conditions stated in the applicable standard (e.g. IEC 255-6).

The tests shall be carried out with the following values of energizing quantities (auxiliary and input) and loading applied to the appropriate circuits (for examples, see annex A):

- auxiliary energizing quantity(ies): rated value(s);
- input energizing quantity(ies): value(s) equal to the operating value adjusted both above and below by an amount equal to the claimed variation due to the disturbance voltage, or rated values where appropriate (e.g. frequency relays);
- output circuit loading: circuit characteristics as specified by the manufacturer.

The equipment shall be tested in as close to installed conditions as possible. The wiring shall be consistent with the manufacturer's recommended procedures, and the equipment shall be tested in its case. When there are no recommendations given by the manufacturer, all parts to be earthed shall be earthed with copper straps of at least 20 mm width.

A ground reference plane shall be used to get reproducible conditions regarding the capacitive coupling. The plane shall consist of a metallic sheet with conductivity of at least that of aluminium, and with at least 0,3 mm thickness and a minimum of 1 m² size. The size is also determined by the fact that the ground reference plane shall project beyond the equipment under test by at least 0,1 m on all sides. The ground reference plane shall be connected to the earthing system of the test room.

The equipment shall be placed on the ground reference plane, but distanced from it by means of at least 0,1 m thick insulating supports. The distance to walls and metallic structures shall be at least 1 m.

Cables interconnecting the various parts of the equipment under test shall be kept at a distance of at least 0,1 m from the ground plane.

The test voltage shall be applied in common mode, and the effect checked, to one circuit at a time and with a test duration of at least 1 min for each polarity.

For relays with an operating time greater than 1 min, it is recommended that the test is carried out with a minimum time setting. In such cases, the period of application of the disturbing signal may be extended by agreement between the manufacturer and the user to cover the minimum time.

The variations due to fast transient tests shall be declared by the manufacturer.

4.5.1 Application of fast transient test voltage via coupling/decoupling network

An example of the test set-up for a rack-mounted relay is shown in figure 1.

The length of leads between the fast transient generator and the coupling/decoupling network should be as short as possible; the use of a single assembly for the generator and coupling/decoupling network is preferred. The leads to the relay under test should be no longer than 1 m.

Apart from the circuit under test, all other circuits shall be arranged to provide a high impedance path to earth for the fast transient. This may be provided by open circuits (where the circuit is not subject to supply or monitoring) or leads longer than 2 m. Where necessary for the supply or monitoring equipment, decoupling circuits may be added in the leads, connected as shown in figure 1.

4.5.2 Application of the fast transient voltage via capacitive coupling clamp

An example of the test set-up for an equipment in a cubicle is shown in figure 2.

The circuit under test shall be connected, using the type of cable and method of termination and connections recommended by the manufacturer. The cable between the capacitive coupling clamp and the equipment under test shall be no longer than 1 m. The cable shall extend at least 10 m (or the maximum length permitted by the manufacturer if less than 10 m) from the clamp. Excess cable should be loosely coiled, maintaining a distance of at least 0,1 m from any ground plane or metallic structure.

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Circuits other than the circuit under test should be connected as specified in 4.5.1.

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4.6 Criteria for acceptance

When the characteristic quantity is set at a value equal to the claimed variation below the operating value of the characteristic quantity for maximum measuring relays (above for minimum measuring relays), the relay shall not operate during the period of disturbance.

When the characteristic quantity is set at a value equal to the claimed variation above the operating value of the characteristic quantity for maximum measuring relays (below for minimum measuring relays), the relay shall comply with the declared performance specification and shall not disengage during the period of disturbance.

Transient false information given by indicating devices on the equipment under test, such as LEDs, flags, etc., shall be tolerated.

After the tests, the relay or equipment shall still comply with the relevant performance specification.

In addition, for static relays without output contacts, the effectively non-conducting output current (off-state current) in the output circuit shall not exceed the value declared by the manufacturer when measured at 110 % of the rated voltage for that circuit. However, depending on the nature of the output circuits, the manufacturer may declare other criteria which adequately identify changes in the output due to the tests.