



SLOVENSKI STANDARD

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Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section 2: Shock and bump tests

Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section Two: Shock and bump tests

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Relais électriques - Vingt et unième partie: Essais de vibrations, de chocs, de secousses et de tenue aux séismes applicables aux relais de mesure et aux dispositifs de protection - Section deux: Essais de chocs et de secousses

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Partie 21:

**Essais de vibrations, de chocs, de secousses et
de tenue aux séismes applicables aux relais de
mesure et aux dispositifs de protection**

Section deux – Essais de chocs et de secousses

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Electrical relays

Part 21:

**Vibration, shock, bump and seismic tests on
measuring relays and protection equipment
Section Two – Shock and bump tests**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL RELAYS

Part 21: Vibration, shock, bump and seismic tests
on measuring relays and
protection equipment

Section Two - Shock and bump tests

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 standard has been prepared by Sub-Committee 41B: Measuring relays and protection equipment, of IEC Technical Committee No. 41: Electrical relays.

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

Six Months' Rule	Report on Voting
41B(CO)38	41B(CO)41

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

The following IEC publications are quoted in this standard:

- Publications Nos. 68-2-27 (1987): Basic environmental testing procedures, Part 2: Tests - Test Ea and guidance: Shock.
- 68-2-29 (1987): Test Eb and guidance: Bump.
- 255-7 (1978): Electrical relays, Part 7: Test and measurement procedures for electromechanical all-or-nothing relays.
- 255-21-1 (1988): Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section One: Vibration tests (sinusoidal). (Being printed.)

Other publication quoted:

- ISO Standard 2041 (1975): Vibration and shock - Vocabulary.

ELECTRICAL RELAYS

**Part 21: Vibration, shock, bump and seismic tests
on measuring relays and
protection equipment**

SECTION TWO - SHOCK AND BUMP TESTS

1. Scope

This standard is part of a series specifying the vibration, shock, bump and seismic requirements applicable to electromechanical and static measuring relays and protection equipment with or without output contacts.

This standard includes two types of test:

- the shock test (on energized and non-energized specimen);
- the bump test (on non-energized specimen),

and is generally based on IEC 68-2-27 and 68-2-29.

The requirements of this standard are applicable only to measuring relays and protection equipment in new condition. The tests specified in this standard are type tests.

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2. Object

The object of this standard is to state:

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

3. Definitions

For definitions of general terms not defined in this standard, reference should be made to:

- International Electrotechnical Vocabulary (IEV) [IEC 50];
- IEC 68-2-27 and 68-2-29;
- relay standards published in the IEC 255 series;
- ISO 2041;
- Section One: Vibration tests (sinusoidal) [IEC 255-21-1].

For the purpose of this standard the following definitions shall apply:

3.1 Shock test

A test during which a specimen, non-energized or energized under specified conditions, is subjected to a limited number of single shocks, in the three different axes of the specimen in turn, to determine its capability to withstand the effects of shocks.

Note.- The term "specimen" includes any auxiliary part which is an integral functional feature of the measuring relay or protection equipment under test.

3.2 Shock response test

A shock test carried out on a measuring relay or protection equipment, energized under specified conditions, to determine its response to shocks likely to be occasionally encountered in service.

3.3 Shock withstand test

A high level shock test carried out on a non-energized measuring relay or protection equipment to determine its capability to withstand shocks likely to be occasionally encountered during transportation and handling.

3.4 Bump test iTeh STANDARD PREVIEW

A test during which a non-energized measuring relay or protection equipment is subjected to a limited number of bumps, in three different axes of the specimen in turn, to determine its capability to withstand the effects of bumps likely to be encountered during transportation.

4. Requirements for shock and bump tests

The main parameters of the shock and bump tests are the following:

- acceleration;
- duration of the nominal pulse;
- number of pulses applied.

In this standard the pulse shape used is one half-cycle of a sine wave.

4.1 Test apparatus and mounting

The required characteristics of the shock and bump generators and fixtures together with the mounting requirements shall be as specified in the following sub-clauses.

The characteristics shall apply when the specimen is mounted on the generator.

4.1.1 Acceleration tolerances

The nominal pulse shape for shock and bump tests shall be one half-cycle of a sine wave, as indicated by the dotted line shown in Figure 1.

The true value of the actual acceleration shall be within the tolerance limits indicated by the solid lines shown in Figure 1.

4.1.2 Pulse duration tolerances

The actual pulse duration shall be the nominal value within a tolerance of ± 2 ms.

4.1.3 Transverse motion

The positive or negative peak acceleration at the monitoring point, perpendicular to the intended shock or bump direction, shall not exceed, at any time, 30% of the value of the peak acceleration of the nominal pulse in the intended direction, when determined by a measuring system in accordance with Sub-clause 4.1.5.

4.1.4 Repetition rate

During shock and bump tests, the repetition rate shall be such that between applied pulses the relative motion within the specimen shall be substantially zero and the value of acceleration at the reference point shall be within the limits shown in Figure 1.

Note. - For the bump test a rate of one to three pulses per second is usually adequate.

4.1.5 Measuring system

The shock and bump pulse shall be measured by an accelerometer placed at the reference point, which shall be declared by the manufacturer.

The characteristics of the measuring system shall be such that it can be determined that the true value of the actual pulse, as measured in the intended direction at the reference point, is within the tolerances required by the Sub-clauses 4.1.1 and 4.1.2.

The frequency response of the overall measuring system, including the accelerometer, can have a significant effect on the accuracy and shall be within the limits shown in Figure 2 for shock and bump tests.

4.1.6 Mounting

The specimen shall be fastened to the shock or bump generator or fixture by its normal means of attachment in service, such that the gravitational force acts on it in the same relative direction as it would in normal use.

During the shock response test, cable connections to the specimen shall be so arranged that they impose no more restraint or mass than they would when the specimen is installed in its operating position.

Note. - Care should be taken to ensure that the specimen under test is not significantly affected by any magnetic field generated by the test system.

4.2 Shock test severity classes

This standard includes two types of shock tests:

- shock response test on an energized relay or protection equipment;
- shock withstand test on a non-energized relay or protection equipment.

Both shock response test and shock withstand test include three different severity classes (0, 1, 2) the main parameters of which are referred to in Sub-clauses 4.2.1 and 4.2.2 below.

For particular types of measuring relays or protection equipment, the manufacturer may declare different severity classes for shock response test and shock withstand test.

When Class 0 is declared, no shock tests apply.

4.2.1 Shock response test

This test is applied to an energized measuring relay or protection equipment.

The parameters for the test are given in Table I for the different severity classes.

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TABLE I
Shock response test parameters for different severity classes
 (see Appendix A, Item a))

Class	Peak acceleration A (gn)	Duration D of the pulse (ms)	Number of pulses in each direction
0	-	-	-
1	5	11	3*
2	10	11	3*

* Three pulses in each direction correspond to six pulses in each axis.

4.2.2 Shock withstand test

This test is applied to a non-energized measuring relay or protection equipment.