



SLOVENSKI STANDARD

SIST IEC 60624:2005

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Izražanje lastnosti impulznih generatorjev

Expression of the performance of pulse generators

Expression des qualités de fonctionnement des générateurs d'impulsions

Ta slovenski standard je istoveten z: **IEC 60624**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**EXPRESSION OF THE PERFORMANCE
OF PULSE GENERATORS**

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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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PREFACE

This standard has been prepared by Sub-Committee 66A, Generators, of IEC Technical Committee No. 66, Electronic Measuring Equipment.

A first draft was discussed at the meeting held in The Hague in 1973. As a result of this meeting, a draft, Document 66A(Central Office)28, was submitted to the National Committees for approval under the Six Months' Rule in September 1975.

The following countries voted explicitly in favour of publication:

Belgium	Netherlands
Denmark	Poland
Finland	Spain
France	Sweden
Germany	Switzerland
Hungary	Union of Soviet
Italy	Socialist Republics
Japan	United Kingdom
	United States of America

Other IEC publications quoted in this standard:

- Publications Nos. 359: Expression of the Functional Performance of Electronic Measuring Equipment.
 469: Pulse Techniques and Apparatus.
 469-1: Part 1: Pulse Terms and Definitions
 469-2: Part 2: Pulse Measurement and Analysis, General Considerations.

At first reading, this standard may appear to differ significantly from previous IEC publications on electronic measuring equipment. This is not the case; the differences are superficial and stem from the wide diversity in form, functional capability, and means for control which are found in pulse generators.

The object of this preface is to state the following assumptions:

- The standard is intended to be used by a pulse generator manufacturer who, to conform, must make a complete statement of performance. A user, depending on his point of view or salient interests, may wish to verify performance to varying degrees, ranging from one performance characteristic to a verification that is as complete as the manufacturer's.
- The manufacturer has read and is familiar with the entire standard.
- Finally, the manufacturer has a new pulse generator which he wishes to characterize in accordance with this standard. He wishes to proceed in an efficient manner which will ensure clarity and completeness.

Table I in Section Five is, in effect, a plan or guide for the handling of each performance characteristic and it may be helpful to refer to Table I for the sequence of operations given below. Bearing in mind that the following is merely an example, subject to many variations, the manufacturer would carry out the following steps:

- 1) Make a list of all performance characteristics which are found in the pulse generator. Here, reference to Section Three (which lists categories of performance characteristics) may be helpful, bearing in mind that the categories listed in Section Three are merely representative and are not exhaustive.
- 2) Next to each performance characteristic in the list from Item 1) above, list the type of control which is provided for that performance characteristic (types of control are listed in the left-hand column of Table I and are specified in Section Four).
- 3) Repeat Item 2) above, for each performance characteristic which is subject to multiple control (see Clause 19).
- 4) Repeat Item 2) and possibly Item 3) above, for each performance characteristic which is subject to dual control (see Clause 20).

Note. -At this point, all pairings of performance characteristics with types of control will have been exhaustively listed.

- 5) To each pairing of performance characteristic with type of control in the list, add the type(s) of error(s) which will be specified for each pairing (types of error are listed in the top row of Table I and are defined in Section Two).

Note. -At this point, each performance characteristic is grouped with at least one type of control and at least one type of error to be specified. Multiple combinations involving one performance characteristic and different types of control and/or different types of error may also exist. In any event, each such grouping, at least conceptually, is dealt with separately.

- 6) For each grouping of performance characteristic with type of control and type of error:
 - a) the nature of the specification which shall be made will be found in Section Five;
 - b) the applicable general test conditions will be found in Section Six; and
 - c) the applicable specific test conditions will be found in Section Seven;
 all at the sub-clauses listed in Table I.

Nothing in the above shall be construed to modify the requirements of the standard itself and, useful though it is, Table I should be used only as a guide. The user should bear in mind:

- a) that the sequence described above applies also to accessories and modular pulse generators (Sub-clauses 5.2 and 5.3);
- b) the pulse generator nomenclature defined in Clause 9; and
- c) the requirements for the specification of dual-controlled quantities in Clause 27.

EXPRESSION OF THE PERFORMANCE OF PULSE GENERATORS

SECTION ONE – GENERAL

1. Scope

This standard applies to the specification of pulse generators and to accessories used with generators. Specifically excluded from the scope of this standard are generators with continuous or pulsed sinusoidal outputs, television pattern generators, complex function generators, and generators for insulation resistance testing.

2. Object

Within its scope, this standard establishes:

- 1) the definitions related to generators;
- 2) the terminology for describing the functional performance of generators;
- 3) a listing of performance characteristics on which a statement of the performance of generators may be based;
- 4) the criteria for evaluating the performance of generators; and
- 5) the tests necessary to verify the performance of generators.

SECTION TWO – DEFINITIONS

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

3. Definition of pulse terms

The pulse terms used throughout this standard are defined in IEC Publication 469-1, Pulse Techniques and Apparatus, Part 1; Pulse Terms and Definitions.

4. Pulse measurement and analysis

Definitions of pulse measurement terms used and descriptions of pulse measurement techniques referred to in this standard are provided in IEC Publication 469-2, Part 2; Pulse Measurement and Analysis, General Considerations.

5. Pulse generator terms

5.1 Pulse generator

An apparatus which supplies electrical energy in pulse form at an accessible output.

Note. – Throughout this standard “generator” is used in place of “pulse generator”.

5.2 Generator accessory

A device or apparatus which is or may be a part of a generator, associated with a generator, or associated with another generator accessory to modify or establish in a specified manner one or more characteristics of a generator. Throughout the remainder of this standard “generator accessory” is included in “generator”.

5.2.1 Permanent (non-permanent) generator accessory

A generator accessory which is permanently (occasionally) associated with a generator and which is (is not) essential to its operation.

5.2.2 Interchangeable generator accessory

A non-permanent generator accessory which has its own properties which are independent of any generator with which it may be associated.

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5.2.3 Partially interchangeable generator accessory

An interchangeable generator accessory which may be associated with a limited and specified set of generators or generator accessories.

5.2.4 Non-interchangeable generator accessory

A generator accessory which is associated with one particular generator. A non-interchangeable generator accessory and the generator with which it is associated have mutually interacting adjustments or characteristics. When such mutual interaction exists, this standard applies to the combination of the generator and the non-interchangeable generator accessory.

5.3 Modular generator

A generator which is a combination of two or more generator accessories.

5.3.1 Generator main frame

A partially interchangeable generator accessory which provides common services and/or facilities (e.g. mechanical mounting, a.c. and/or d.c. power, analogue and/or digital signal paths, cooling, etc.) for itself and for one or more associated generator accessories. Typically, in the absence of other generator accessories, a generator main frame cannot function as a generator.

5.3.2 *Generator plug-in unit*

A partially interchangeable generator accessory which, typically:

- 1) may be associated with one or more specified generator main frames;
- 2) is adapted by plug and socket connections and its construction to use the services and/or facilities provided by the associated generator main frame; and
- 3) performs specified generator functions.

In the absence of a generator main frame, a generator plug-in unit cannot function as a generator.

6. Terms related to the performance of generators

6.1 *Performance*

The degree to which the intended functions of a generator are accomplished.

6.2. *Performance characteristic*

One of the quantities assigned to a generator in order to define by values, tolerances, ranges, etc., the performance of the generator.

Note. –The term “performance characteristic” does not include influence quantities (see note of Sub-clause 6.3).

6.3 *Influence quantity*

Any quantity, generally external to a generator, which may affect the performance of the generator.

Note. –Where a change of a performance characteristic affects another performance characteristic, it is referred to as an influencing characteristic (see Sub-clauses 6.4 and 8.3).

6.4 *Influencing characteristic*

A performance characteristic which, when altered in value or state, produces a change in the value or state of one or more other performance characteristics (influenced characteristics).

6.5 *Terms related to values and ranges*

6.5.1 *Rated value*

The value (or one of the values) of a quantity to be measured, observed, supplied or set, which the manufacturer has assigned to the apparatus (I.E.V. 151-04-03).

6.5.2 *Rated range*

The range of a quantity to be measured, observed, supplied or set, which the manufacturer has assigned to the apparatus.

6.5.3 *Effective range*

That part of the rated range where measurements can be made or quantities be supplied within the stated limits of error (I.E.V. 20-40-035).

6.6 Terms related to error

6.6.1 Fiducial value

A value to which reference is made in order to specify the relative error, for example the upper limit of the effective range, or another clearly stated value.

6.6.2 Absolute error

The error expressed algebraically, in the unit of the measured or supplied quantity.

- a) for measuring apparatus, the error is the indicated value of the measured quantity minus its true value;
- b) for a supply apparatus, the error is the true value of the quantity supplied minus its rated, indicated or pre-set value.

Note. –The true value of a quantity is the value that would be measured by a measuring process having no error.

In practice, since this true value cannot be determined by measurement, a conventionally true value, approaching the true value as closely as necessary (having regard to the error to be determined), is used in place of the true value. This value may be traced to standards agreed upon by the manufacturer and the user, or to national standards. In both cases, the uncertainty of the conventionally true value shall be stated.

6.6.3 Relative error

The ratio of the absolute error to a stated value.

6.6.4 Percentage error

The relative error, expressed as a percentage, such as per cent of full scale (the maximum value of the effective range), per cent of the indicated or pre-set value or of the rated value.

6.7 Terms related to stability

6.7.1 Stability

The ability of the generator to maintain its indicated or supplied value during a specified time, other conditions remaining constant.

7. Terms related to the conditions of testing operation, transport and storage

7.1. Rates range of use

The range of values for an influence quantity within which the requirements concerning operating error are satisfied.

7.2. Rated operating conditions

The whole of the effective ranges for performance characteristics, and rated ranges of use for influence quantities, within which the performance of the generator is specified.

7.3 Reference conditions

A set of values with tolerances or a set of restricted ranges, fixed for influence quantities and for influencing characteristics if any, specified for making comparison and calibration tests.

7.4 *Limit conditions of operation*

The whole of the ranges of values for influence quantities and performance characteristics (beyond the rated ranges of use and effective ranges respectively) within which a generator can function without resulting in damage or degradation of performance when it is afterwards operated under rated operating conditions.

Note. –The limit conditions will, in general, include overload.

7.5 *Conditions of storage and transport*

The whole of the conditions of temperature, humidity, air pressure, vibration, shock, etc., within which the generator may be stored or transported in an inoperative condition, without resulting in damage or degradation of performance when it is afterwards operated under rated operating conditions.

8. **Limits of error**

The maximum values of error assigned by the manufacturer to a measured or supplied quantity of a generator operating under specified conditions.

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8.1 *Operating error*

The error determined under rated operating conditions.

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8.2. *Intrinsic error*

The error determined under reference conditions.

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8.3 *Influence error*

The error determined when one influence quantity assumes any value within its rated range of use (or an influencing characteristic assumes any value within its effective range) all others being at reference conditions.

Note. –When over the whole rated range of use a substantially linear relationship exists between the influence error and the effect causing it, the relationship may be conveniently expressed in coefficient form.

8.4 *Stability error*

The error which occurs in the indicated or supplied value of a generator during a specified time, other conditions remaining constant.

8.5 *Variation*

The difference between the values of a parameter when one influence quantity assumes successively two specified values within its nominal range of use, the others being at reference conditions.

Note. –The “nominal range of use” corresponds here to the “rated range of use” appearing in this standard.