



# SLOVENSKI STANDARD

## SIST EN 60038:2011

01-december-2011

Nadomešča:

SIST HD 472 S1:1996

SIST HD 472 S1:1996/A1:2002

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**Standardne napetosti CENELEC (IEC 60038:2009, spremenjen)**

CENELEC standard voltages

CENELEC-Normspannungen

Tensions normales du CENELEC

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**Ta slovenski standard je istoveten z: EN 60038:2011**

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**ICS:**

27.100

Elektrarne na splošno

Power stations in general

**SIST EN 60038:2011**

**en**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 60038**

October 2011

ICS 29.020

Supersedes HD 472 S1:1989 + corr. Feb.2002 + A1:1995

English version

**CENELEC standard voltages**  
(IEC 60038:2009, modified)

Tensions normales du CENELEC  
(CEI 60038:2009, modifiée)

CENELEC-Normspannungen  
(IEC 60038:2009, modifiziert)

This European Standard was approved by CENELEC on 2011-09-05. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

**CENELEC**

European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

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## Contents

|   |    |
|---|----|
| Foreword .....  | 3  |
| 1 Scope .....   | 4  |
| 2 Normative references .....  | 4  |
| 3 Terms and definitions .....   | 5  |
| 4 Standard voltages .....   | 6  |
| 4.1 AC systems having a nominal voltage between 100 V and 1 000 V inclusive and related equipment .....                                 | 6  |
| 4.2 DC and a.c. traction systems .....  | 6  |
| 4.3 AC three-phase systems having a nominal voltage above 1 kV and not exceeding 35 kV and related equipment .....                      | 7  |
| 4.4 AC three-phase systems having a nominal voltage above 35 kV and not exceeding 230 kV and related equipment .....                    | 8  |
| 4.5 AC three-phase systems having a highest voltage for equipment exceeding 245 kV .....  | 9  |
| 4.6 Equipment having a nominal voltage below 120 V a.c. or below 750 V d.c. ....  | 10 |
| Annex ZB (informative) A-deviations .....   | 11 |
| Bibliography .....  | 12 |
| Tables  |    |
| Table 1 – AC systems having a nominal voltage between 100 V and 1 000 V inclusive and related equipment <sup>a</sup> .....              | 6  |
| Table 2 – DC and a.c. traction systems <sup>a</sup> .....   | 7  |
| Table 3 – AC three-phase systems having a nominal voltage above 1 kV and not exceeding 35 kV and related equipment <sup>a</sup> .....   | 7  |
| Table 4 – AC three-phase systems having a nominal voltage above 35 kV and not exceeding 230 kV and related equipment <sup>a</sup> ..... | 8  |
| Table 5 – AC three-phase systems having a highest voltage for equipment exceeding 245 kV <sup>a</sup> .....                             | 9  |
| Table 6 – Equipment having a nominal voltage below 120 V a.c. or below 750 V d.c. ....  | 10 |

## Foreword

This document (EN 60038:2011) consists of the text of IEC 60038:2009 prepared by IEC/TC 8, "Systems aspects for electrical energy supply", together with the common modifications prepared by CLC Technical Body 8X, "System aspects of electrical energy supply".

The following dates are fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2012-09-05
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2014-09-05

This European Standard supersedes HD 472 S1:1989 + corrigendum February 2002 + A1:1995.

In this standard, the common modifications to the International Standard are indicated by a vertical line in the left margin of the text.

The main common modifications to IEC 60038:2009 are the following.

- All references to 60 Hz are removed in the European Standard (reason: 60 Hz is not used in Europe for a.c. electric systems).
- The "in some countries" notes related to non-CENELEC countries are removed.
- The value of 100 kV as highest voltage for equipment corresponding to the value of 90 kV as nominal system voltage is added to Table 4 (reason: this value already exists in EN 62271-1 and is widely used in French transmission systems).
- Sentences containing recommendations are generally put in notes.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

## CENELEC STANDARD VOLTAGES

### 1 Scope

This publication applies to

- a.c. transmission, distribution and utilization systems and equipment for use in such systems with a standard frequency of 50 Hz having a nominal voltage above 100 V;
- a.c. and d.c. traction systems;
- a.c. and d.c. equipment having nominal voltages below 120 V a.c. or below 750 V d.c., the a.c. voltages being intended (but not exclusively) for 50 Hz applications; such equipment covers batteries (from primary or secondary cells), other power supply devices (a.c. or d.c.), electrical equipment (including industrial and communication), and appliances.

NOTE Z1 Only standard frequency 50 Hz is used in Europe for public a.c. transmission and distribution systems. For systems and equipment at 60 Hz, see IEC 60038.

This publication does not apply to voltages representing or transmitting signals or measured values.

This publication does not apply to standard voltages of components and parts used within electrical devices or items of equipment.

This publication specifies standard voltage values which are intended to serve

- as preferential values for the nominal voltage of electrical supply systems, and
- as reference values for equipment and system design.

NOTE 1 Two main reasons have led to the values specified in this standard.

The values of nominal voltage (or highest voltage for equipment) specified in this standard are mainly based on the historical development of electrical supply systems throughout the world, since these values turned out to be the most common ones, and have achieved worldwide recognition;

The voltage ranges mentioned in this standard have been recognized to be the most appropriate ones as a basis for design and testing of electrical equipment and systems.

NOTE 2 It is nevertheless the task of system and product standards to define appropriate testing values, testing conditions and acceptance criteria.

### 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

HD 60364-5-52, *Low voltage electrical installations – Part 5-52: Selection and erection of electrical equipment – Wiring systems* (IEC 60364-5-52)

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

For alternating voltages, the voltages stated below are r.m.s. values.

#### 3.1

##### **nominal system voltage**

a suitable approximate value of voltage used to designate or identify a system

[IEV 601-01-21, modified]

#### 3.2

##### **highest voltage of a system (excluding transient or abnormal conditions)**

the highest value of operating voltage which occurs under normal operating conditions at any time and at any point on the system

NOTE It excludes transient overvoltages, such as those due to switching operations, and temporary variations of voltage.

[IEV 601-01-23, modified]

#### 3.3

##### **lowest voltage of a system (excluding transient or abnormal conditions)**

the lowest value of operating voltage which occurs under normal operating conditions at any time and at any point on the system

NOTE It excludes transient voltages, such as those due to switching operations, and temporary variations of voltage.

[IEV 601-01-24, modified]

#### 3.4

##### **supply terminals**

point in a transmission or distribution network designated as such and contractually fixed, at which electrical energy is exchanged between contractual partners

#### 3.5

##### **supply voltage**

the phase-to-phase or phase-to-neutral voltage at the supply terminals

NOTE An equivalent definition is: the line-to-line or line-to-neutral voltage at the supply terminals.

#### 3.6

##### **supply voltage range**

the voltage range at the supply terminals

#### 3.7

##### **utilization voltage**

the phase-to-phase or phase-to-neutral voltage at the outlets or at the points where utilization equipment is intended to be connected to the fixed installation

NOTE An equivalent definition is: the line-to-line or line-to-neutral voltage at the outlets or at the points where utilization equipment is intended to be connected to the fixed installation.

#### 3.8

##### **utilization voltage range**

the voltage range at the outlets or at the points where utilization equipment is intended to be connected to the fixed installation

NOTE Attention is drawn to the fact that in some equipment standards (for example, EN 60335-1 and EN 60071), the term "voltage range" has a different meaning.

**3.9****highest voltage for equipment**

highest voltage for which the equipment is specified regarding:

- a) the insulation;
- b) other characteristics which may be linked to this highest voltage in the relevant equipment recommendations.

NOTE Equipment may only be used on systems having a highest system voltage less than or equal to its highest voltage for equipment.

**4 Standard voltages****4.1 AC systems having a nominal voltage between 100 V and 1 000 V inclusive and related equipment**

The nominal voltage of an a.c. system in the range from 100 V to 1 000 V should be selected from the values given in Table 1.

**Table 1 – AC systems having a nominal voltage between 100 V and 1 000 V inclusive and related equipment**

| Three-phase four-wire or three-wire systems <sup>a</sup> |   |
|--|---|
| Nominal voltage (at 50 Hz) <sup>b</sup>                  |   |
| V  |   |
|  | 230   |
|  | 230/400   |
|  | 400/690   |
|  | 1 000   |
| a  | The three-phase four-wire systems include single-phase circuits (extensions, services, etc.) connected to these systems.  |
| b  | The lower values are voltages to neutral and the higher values are voltages between phases. When one value only is indicated, it refers to three-wire systems and specifies the voltage between phases. |

Voltages in excess of 230/400 V are intended for heavy industrial applications and large commercial premises.

Concerning supply voltage range, under normal operating conditions, the supply voltage should not differ from the nominal voltage of the system by more than  $\pm 10\%$ .

For the utilization voltage range, in addition to the voltage variations at the supply terminals, voltage drops may occur within the consumer's installations. For more information, see HD 60364-5-52. This utilization voltage range should be taken into account by product committees.

**4.2 DC and a.c. traction systems**

The voltages of a d.c. or a.c. traction system should be selected from the values given in Table 2.



**Table 2 – DC and a.c. traction systems <sup>a</sup>**

|                         | Voltage                        |                                |   | Nominal frequency<br>of a.c. systems<br>Hz |
|-------------------------|--------------------------------|--------------------------------|---|--|
|                         | Lowest<br>V                    | Nominal<br>V                   | Highest<br>V                                |  |
| DC systems              | (400)<br>500<br>1 000<br>2 000 | (600)<br>750<br>1 500<br>3 000 | (720)<br>900<br>1 800<br>3 600 <sup>b</sup> |  |
| AC single-phase systems | (4 750)<br>12 000<br>19 000    | (6 250)<br>15 000<br>25 000    | (6 900)<br>17 250<br>27 500                 | 50<br>16 <sup>2</sup> / <sub>3</sub><br>50 |

a The values indicated in parentheses should be considered as non-preferred values. It is recommended that these values should not be used for new systems to be constructed in future. In particular for a.c. single-phase systems, the nominal voltage 6 250 V should be used only when local conditions make it impossible to adopt the nominal voltage 25 000 V.

The values indicated in the table above are the values agreed by the international mixed committee on electric traction equipment (C.M.T.) and by IEC technical committee 9, Electrical equipment and systems for railways.

b In certain European countries, this voltage may reach 4 000 V. The electrical equipment of vehicles operating international services in these countries shall be capable of withstanding this absolute maximal voltage for brief periods of up to 5 min.

#### 4.3 AC three-phase systems having a nominal voltage above 1 kV and not exceeding 35 kV and related equipment

The voltages for an a.c. three-phase system having a nominal voltage above 1 kV and not exceeding 35 kV should be selected from the values given in Table 3.

**Table 3 – AC three-phase systems having a nominal voltage above 1 kV and not exceeding 35 kV and related equipment <sup>a</sup>**

| Highest voltage<br>for equipment<br>kV | Nominal system<br>voltage<br>kV |                |
|--|---------------------------------|----------------|
| 3,6 <sup>b</sup>                       | 3,3 <sup>b</sup>                | 3 <sup>b</sup> |
| 7,2 <sup>b</sup>                       | 6,6 <sup>b</sup>                | 6 <sup>b</sup> |
| 12                                     | 11                              | 10             |
| (17,5)                                 | –                               | (15)           |
| 24                                     | 22                              | 20             |
| 36                                     | 33                              | 30             |
| 40,5                                   | –                               | 35             |

NOTE It is recommended that in any one country, the ratio between two adjacent nominal voltages should be not less than two.

<sup>a</sup> These systems are generally three-wire systems. The values indicated are voltages between phases.

The values indicated in parentheses should be considered as non-preferred values. It is recommended that these values should not be used for new systems to be constructed in future.

<sup>b</sup> These values should not be used for new public distribution systems.