

INTERNATIONAL STANDARD

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AMENDMENT 1
AMENDEMENT 1

IEC standard voltages

Tensions normales de l'IEC

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AMENDMENT 1

FOREWORD

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Amendment 1 to IEC 60038:2009 has been prepared by IEC technical committee 8: System aspects of electrical energy supply.

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

Draft	Report on voting
8/1600/FDIS	8/1603/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Amendment is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications/.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

Throughout the document, delete:

a.c., d.c. and r.m.s.

and replace with:

AC, DC and RMS.

FOREWORD

Add, under "The significant technical changes are:", the following new text:

- co-ordination of Table 1 of IEC 60850:2014 and Table 2 of IEC 60038;
- co-ordination of 60 Hz highest and lowest values with major national 60 Hz standards;
- co-ordination of Annex A with IEC 60364-5-52:2009;
- a new table covering single wire earth return systems for remote areas.

Add, before the scope, the following new Introduction:

INTRODUCTION

This publication has been prepared by TC 8, whose scope is to prepare and coordinate, in co-operation with other TC/SCs, the development of international standards and other deliverables with an emphasis on overall system aspects of electricity supply systems and an acceptable balance between the cost and quality for the users of electrical energy. The electricity supply system encompasses transmission and distribution networks and connected user installations (generators and loads including traction systems) with their network interfaces.

1 Scope

After the words "This publication does not apply to standard voltages of components and parts used within electrical devices or items of equipment.", delete

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.

and replace with

This publication has the status of a horizontal standard in accordance with IEC Guide 108. As such, this publication specifies standard voltage values which are intended to serve:

- as preferential values for the nominal voltage of electrical supply and utilization systems, and
- as maximum, nominal and minimum reference values for both equipment and power supply in both electricity supply and utilization systems so that product and power system committees can co-ordinate their documents.

Add, after Note 2, the following new Notes 3, 4 and 5:

NOTE 3 National Committees and individual systems can set values that differ from, but still comply with, the reference values in this document provided the values they set lie between the highest voltage for equipment and the lowest supply or utilization voltages in this document. Such variations can be required due to legacy or rating issues.

NOTE 4 To comply with this document neither the lowest supply or utilization voltage can be lower than the lowest voltage for equipment.

NOTE 5 Some National committees set different nominal values for supply and utilization.

3 Terms and definitions

Add, after 3.9, the following new definitions:

3.10 electric power system
electricity supply system (in a broad sense)
all installations and plant provided for the purpose of generating, transmitting and distributing electricity

[SOURCE: IEC 601-01-01]

3.11 lowest voltage for equipment

lowest voltage for which the equipment is specified regarding characteristics which may be linked to this lowest voltage in the relevant equipment recommendations

Note 1 to entry: Equipment should only be used on systems having a lowest supply or utilization voltage greater than or equal to its lowest voltage for equipment.

3.12 low voltage

LV

- 1) a set of voltage levels used for the distribution of electricity where the nominal voltage is generally accepted to be up to 1 000 V for alternating current and 1 500 V for direct current
- 2) the lowest of two or more voltages in an apparatus or installation

[SOURCE: IEC 601-01-26, modified and IEC 151-15-04]

**3.13
 high voltage**

HV

- 1) in a general sense, the set of voltage levels in excess of low voltage
- 2) in a restrictive sense, the set of upper voltage levels used in power systems for bulk transmission of electricity
- 3) the highest of two or more voltages in an apparatus or installation

[SOURCE: IEC 601-01-27 and IEC 151-15-06]

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

In the Note, replace IEC 60364-5-52:2001 with IEC 60364-5-52:2009.

4.2 DC and a.c traction systems

Delete the existing Table 2 and replace it with the following:

Table 2 – DC and AC traction systems^a

	Voltage			Nominal frequency of AC systems Hz
	Lowest V	Nominal V	Highest V	
DC systems	500 1 000 2 000	750 1 500 3 000	900 1 800 3 600	
AC single-phase systems	12 000 19 000	15 000 25 000	17 250 27 500	16 2/3 50 or 60

^a The values indicated in the table are the values agreed by IEC technical committee 9, Electrical equipment and systems for railways. See IEC 60850:2014, Table 1 and Table B.1 for duration details.

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

Add, under the sentence "It is also recommended that only one of the two series of nominal voltages given for series I should be used in any one country.", the following new text and Table 7:

The voltages in Table 7 have been derived from three-phase highest voltage for equipment voltages of 24 kV and 36 kV respectively. The highest voltage of the system and nominal voltages are based on the three-phase systems that supply 50 Hz SWER systems.

Table 7 – AC single wire earth return (SWER) systems

Highest voltage for equipment kV	Highest voltage of system kV	Nominal voltage of system kV
24	13,9	12,7
36	20,8	19,1

Annex A – Highest and lowest voltage values at supply and utilization terminals for a.c. systems having a nominal voltage between 100 V and 1 000 V

Delete the following text:

Table A.1 gives the highest and lowest voltage values at supply terminals and at utilization terminals, as they can be derived from the text related to Table 1 in Clause 4, and from the indications provided by IEC 60364-5-52:2009.

NOTE Values in Table A.1 are based on the note in IEC 60364-5-52:2001, Clause 525, which indicates that "In the absence of other considerations, it is recommended that in practice the voltage drop between the origin of consumer's installation and the equipment should not be greater than 4 % of the nominal voltage of the installation". Clause 525 of IEC 60364-5 is presently under consideration. Values for lowest utilization voltages should be modified in future in accordance with revisions of IEC 60364-5-52.

and replace it with:

Table A.1 gives the highest, nominal and lowest reference voltage values at supply terminals and at utilization terminals for 50 Hz and 60 Hz AC systems having a nominal voltage between 100 V and 1 000 V.

The values are derived from Table 1 in Clause 4, and from IEC 60364-5-52:2009.

NOTE Values in Table A.1 are based on 3 % (lighting) and 5 % (other) voltage drops in the consumer's premises (IEC 60364-5-52:2009) and a ± 10 % supply voltage range at 50 Hz on three-phase systems calculations. 60 Hz three-phase values are based on a supply voltage range of +6 % to –14 %, except for 230/400 V which is ± 10 %. Calculation of single-phase extreme values use the phase-phase value over $\sqrt{3}$ in order to maintain the $\sqrt{3}$ ratio after rounding.

Delete the existing Table A.1 and replace it with the following:

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Table A.1 – Highest and lowest voltage values at supply and utilization terminals for AC systems having a nominal voltage between 100 V and 1 000 V

Systems	Rated frequency Hz	Voltage V				
		Highest voltage for equipment (supply or utilization voltage)	Nominal voltage of system	Lowest supply voltage	Lowest utilization voltage	
					Lighting	Other
Three-phase four-wire, three-wire or single-phase two-wire systems	50	254	230 ^c	207	200	196
		254/440	230/400 ^a	207/360	200/348	196/340
		440/759	400/690 ^b	360/621	348/600	340/587
		1 100	1 000	900	870	850
	60	127/220	120/208	103/179	100/173	97/168
		254	240 ^c	206	199	194
		254/440	230/400 ^a	207/360	200/348	196/340
		294/509	277/480	238/413	230/398	224/391
		509	480	413	398	389
		368/636	347/600	298/516	288/498	281/486
Single-phase three-wire systems	60	636	600	516	498	486
		127/254	120/240 ^d	103/206	100/199	97/194

^a The value of 230/400 V is the result of the evolution of 220/380 V and 240/415 V systems which has been completed in Europe and many other countries. In some countries, 220/380 V and 240/415 V systems still exist.

^b The value of 400/690 V is the result of the evolution of 380/660 V systems which has been completed in Europe and many other countries. In some countries, 380/660 V systems still exist.

^c The value of 200 V or 220 V is also used in some countries.

^d The values of 100/200 V are also used in some countries on 50 Hz or 60 Hz systems.

Bibliography

Add the following documents to the existing list:

IEC 60050-151:2001, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices*

IEC 60850:2014, *Railway applications – Supply voltages of traction systems*

IEC GUIDE 108:2019, *Guidelines for ensuring the coherence of IEC publications – Horizontal functions, horizontal publications and their application*

Replace

IEC 60364-5-52:2001, *Electrical installations of buildings – Part 5-52: Selection and erection of electrical equipment – Wiring systems*

with

IEC 60364-5-52:2009, *Low-voltage electrical installations – Part 5-52: Selection and erection of electrical equipment – Wiring systems*

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