



BSI Standards Publication

Voltage characteristics of electricity supplied by public electricity networks

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National foreword

This British Standard is the UK implementation of EN 50160:2010+A3:2019, incorporating corrigendum December 2010. It supersedes BS EN 50160:2010+A1:2015, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CENELEC text carry the number of the CENELEC amendment. For example, text altered by CENELEC amendment A1 is indicated by A1 A1.

The UK participation in its preparation was entrusted to Technical Committee GEL/8, Systems Aspects for Electrical Energy Supply.

A list of organizations represented on this committee can be obtained on request to its secretary.

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© The British Standards Institution 2019
Published by BSI Standards Limited 2019

ISBN 978 0 580 51254 4

ICS 29.020; 29.240.01

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 August 2010.

Amendments/corrigenda issued since publication

Date	Text affected
31 March 2011	Modification of CENELEC foreword
31 July 2015	Implementation of CENELEC amendment A1:2015
31 October 2019	Implementation of CENELEC amendment A2:2019
31 October 2019	Implementation of CENELEC amendment A3:2019

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EUROPÄISCHE NORM

September 2019

ICS 29.020

Supersedes EN 50160:2007

English version

Voltage characteristics of electricity supplied by public electricity networks

Caractéristiques de la tension fournie
par les réseaux publics de distribution

Merkmale der Spannung in öffentlichen
Elektrizitätsversorgungsnetzen

This European Standard was approved by CENELEC on 2010-03-01. 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 Central Secretariat 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 Central Secretariat 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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Foreword

This European Standard was prepared by Working Group 1, Physical characteristics of electrical energy, of the Technical Committee CENELEC TC 8X, System aspects of electrical energy supply. It was submitted to the formal vote and was approved by CENELEC as EN 50160 on 2010-03-01.

This document is the result of an intensive cooperation between CENELEC and CEER, with involvement of CEER experts in TC 8X WG1 as well as in related Task Forces.

This document supersedes EN 50160:2007.

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.

The following dates were 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) | 2011-03-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2015-03-01 |

The main differences from EN 50160:2007 are:

- new organization of the document by grouping clauses related to events and continuous phenomena;
- modification of some definitions and completion by some new definitions;
- new Clause 6 relevant to voltage characteristics in high voltage networks.

This work has been deemed so important, that before submission for vote, a CENELEC enquiry has been made, where NCs had the opportunity to respond to the most essential questions resulting from the WG discussions. This enquiry resulted in an extensive number of valuable comments, which have been carefully examined for possible consideration either for the voting draft in particular or for further work within WG1 on some main issues. Following that, the draft has been revised in depth, considering in particular the comments received on:

- the subclauses relevant to supply voltage changes, where a new formulation (capable of encompassing the needs expressed by the vast majority of the NCs) has been introduced,
- the new Clause 6, relevant to voltage characteristics in high voltage networks, where limits for harmonics and unbalance have been changed into indicative values, as new measurement surveys are taking place in several European countries, and it has been recognized as appropriate to wait for the relevant results before considering the setting of limits.

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Table 1 — Values of individual harmonic voltages at the supply terminals for orders up to 25 given in percent of the fundamental voltage u_1

Table 2 — Classification of dips according to residual voltage and duration

Table 3 — Classification of swells according to maximum voltage and duration

A₂ Table 5 **A₂** — Values of individual harmonic voltages at the supply terminals for orders up to 25 given in percent of the fundamental voltage u_1

A₂ Table 6 **A₂** — Classification of dips according to residual voltage and duration

A₂ Table 7 **A₂** — Classification of swells according to maximum voltage and duration

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A₂ Table 9 **A₂** — Classification of dips according to residual voltage and duration

A₂ Table 10 **A₂** — Classification of swells according to maximum voltage and duration

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1 Scope and Object

1.1 Scope

This European Standard defines, describes and specifies the main characteristics of the voltage at a network user's supply terminals in public low voltage, medium and high voltage AC electricity networks under normal operating conditions. This standard describes the limits or values within which the voltage characteristics can be expected to remain at any supply terminal in public European electricity networks and does not describe the average situation usually experienced by an individual network user.

NOTE 1 For the definitions of low, medium and high voltage see 3 (Definitions).

This European Standard does not apply under abnormal operating conditions, including the following:

- a) a temporary supply arrangement to keep network users supplied during conditions arising as a result of a fault, maintenance and construction work, or to minimize the extent and duration of a loss of supply;
- b) in the case of non-compliance of a network user's installation or equipment with the relevant standards or with the technical requirements for connection, established either by the public authorities or the network operator, including the limits for the emission of conducted disturbances;

NOTE 2 A network user's installation may include load and generation.

- c) in exceptional situations, in particular,
 - 1) exceptional weather conditions and other natural disasters;
 - 2) third party interference;
 - 3) acts by public authorities;
 - 4) industrial actions (subject to legal requirements);
 - 5) force majeure;
 - 6) power shortages resulting from external events.

The voltage characteristics given in this standard are not intended to be used as electromagnetic compatibility (EMC) levels or user emission limits for conducted disturbances in public electricity networks.

The voltage characteristics given in this standard are not intended to be used to specify requirements in equipment product standards and in installation standards.

NOTE 3 The performance of equipment might be impaired if it is subjected to supply conditions which are not specified in the equipment product standard.

This standard may be superseded in total or in part by the terms of a contract between the individual network user and the network operator.

NOTE 4 The sharing of complaint management and problem mitigation costs between the involved parties is outside the scope of EN 50160.

Measurement methods to be applied in this standard are described in EN 61000-4-30.

1.2 Object

The object of this European Standard is to define, describe and specify the characteristics of the supply voltage concerning:

- a) frequency;
- b) magnitude;
- c) waveform;
- d) symmetry of the line voltages.