

Dit document mag slechts op een stand-alone PC worden geïnstalleerd. Gebruik op een netwerk is alleen toestaan als een aanvullende licentieovereenkomst voor netwerkgebruik met NEN is afgesloten.
This document may only be used on a stand-alone PC. Use in a network is only permitted when a supplementary license agreement for us in a network with NEN has been concluded.

Nederlandse norm

NEN-EN 50160

(en)

Spanningskarakteristieken in openbare
elektriciteitsnetten

Voltage characteristics of electricity supplied by
public electricity networks

Vervangt NEN-EN 50160:2007;
NEN-EN 50160:2008 Ontw.

ICS 29.020
augustus 2010

Als Nederlandse norm is aanvaard:
- EN 50160:2010, IDT

Nederlands Elektrotechnisch Comité

Apart from exceptions provided by the law, nothing from this publication may be duplicated and/or published by means of photocopy, microfilm, storage in computer files or otherwise, which also applies to full or partial processing, without the written consent of the Netherlands Standardization Institute.

The Netherlands Standardization Institute shall, with the exclusion of any other beneficiary, collect payments owed by third parties for duplication and/or act in and out of law, where this authority is not transferred or falls by right to the Reproduction Rights Foundation.

Auteursrecht voorbehouden. Behoudens uitzondering door de wet gesteld mag zonder schriftelijke toestemming van het Nederlands Normalisatie-instituut niets uit deze uitgave worden verveelvoudigd en/of openbaar gemaakt door middel van fotokopie, microfilm, opslag in computerbestanden of anderszins, hetgeen ook van toepassing is op gehele of gedeeltelijke bewerking.

Het Nederlands Normalisatie-instituut is met uitsluiting van ieder ander gerechtigd de door derden verschuldigde vergoedingen voor verveelvoudiging te innen en/of daartoe in en buiten rechte op te treden, voor zover deze bevoegdheid niet is overgedragen c.q. rechtens toekomt aan de Stichting Reprorecht.

Although the utmost care has been taken with this publication, errors and omissions cannot be entirely excluded. The Netherlands Standardization Institute and/or the members of the committees therefore accept no liability, not even for direct or indirect damage, occurring due to or in relation with the application of publications issued by the Netherlands Standardization Institute.

Hoewel bij deze uitgave de uiterste zorg is nagestreefd, kunnen fouten en onvolledigheden niet geheel worden uitgesloten. Het Nederlands Normalisatie-instituut en/of de leden van de commissies aanvaardden derhalve geen enkele aansprakelijkheid, ook niet voor directe of indirecte schade, ontstaan door of verband houdend met toepassing van door het Nederlands Normalisatie-instituut gepubliceerde uitgaven.

Nederlands voorwoord

Voor de in deze norm vermelde normatieve verwijzingen bestaan in Nederland de volgende equivalenten:

<u>vermelde norm</u>	<u>Nederlandse norm</u>	<u>titel</u>
EN 60664-1	NEN-EN-IEC 60664-1	Coördinatie van isolatie voor inrichtingen binnen laagspanningssystemen - Deel 1: Uitgangspunten, eisen en beproevingen
EN 61000-3-3	NEN-EN-IEC 61000-3-3	Elektromagnetische compatibiliteit (EMC) - Deel 3-3: Limietwaarden voor spanningswisselingen, spanningsschommelingen en flikkering in openbare laagspanningsnetten voor apparatuur met een ingangsstroom ≤ 16 A per fase en zonder voorwaardelijke aansluiting
EN 61000-4-30	NEN-EN-IEC 61000-4-30	Elektromagnetische compatibiliteit (EMC) - Deel 4-30: Beproeving en meettechnieken - Meetmethoden voor de kwaliteit van het elektriciteitsnet
IEC 60364-5-53	HD 60364-5-534	Laagspanningsinstallaties - Deel 5-534: Keuze en installatie van elektrisch materieel - Isolatie, schakeling en controle - Rubriek 534: Beveiligingstoestellen tegen overspanning
IEC/TR 61000-2-8		-
IEC/TR 61000-3-7	NFR-IEC/TR 61000-3-7	Elektromagnetische compatibiliteit (EMC) - Deel 3-7: Limietwaarden - Beoordeling van limieten voor de verbinding van wisselinstallaties by MV, HV and EHV elektriciteitssystemen

Voorbeeld
Preview

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

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.

Contents

1	Scope and object	4
1.1	Scope	4
1.2	Object	4
2	Normative references	5
3	Terms and definitions	5
4	Low-voltage supply characteristics	10
4.1	General	10
4.2	Continuous phenomena	11
4.3	Voltage events	14
5	Medium-voltage supply characteristics	16
5.1	General	16
5.2	Continuous phenomena	17
5.3	Voltage events	20
6	High-voltage supply characteristics	22
6.1	General	22
6.2	Continuous phenomena	23
6.3	Voltage events	25
Annex A	(informative) Special nature of electricity	28
Annex B	(informative) Indicative values for voltage events and single rapid voltage changes	30
B.1	Long interruptions of the supply voltage	30
B.2	Short interruptions of the supply voltage	30
B.3	Voltage dips and swells	30
B.4	Swells (temporary power frequency overvoltages) between live conductors and earth	32
B.5	Magnitude of rapid voltage changes	32
Bibliography	33
Figures		
Figure 1	— Voltage levels of signal frequencies in percent of U_n used in public LV networks	13
Figure 2	— Voltage levels of signal frequencies in percent of U_c used in public MV networks	20
Tables		
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	13
Table 2	— Classification of dips according to residual voltage and duration	15
Table 3	— Classification of swells according to maximum voltage and duration	16
Table 4	— Values of individual harmonic voltages at the supply terminals for orders up to 25 given in percent of the fundamental voltage U_1	19
Table 5	— Classification of dips according to residual voltage and duration	21
Table 6	— Classification of swells according to maximum voltage and duration	22
Table 7	— Indicative values of individual harmonic voltages at the supply terminals for orders up to 25 given in percent of the fundamental voltage U_1	24
Table 8	— Classification of dips according to residual voltage and duration	26
Table 9	— Classification of swells according to maximum voltage and duration	26

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.

These characteristics are subject to variations during the normal operation of a supply system due to changes of load, disturbances generated by certain equipment and the occurrence of faults which are mainly caused by external events.

The characteristics vary in a manner which is random in time, with reference to any specific supply terminal, and random in location, with reference to any given instant of time. Because of these variations, the values given in this standard for the characteristics can be expected to be exceeded on a small number of occasions.

Some of the phenomena affecting the voltage are particularly unpredictable, which make it very difficult to give useful definite values for the corresponding characteristics. The values given in this standard for the voltage characteristics associated with such phenomena, e.g. voltage dips and voltage interruptions, shall be interpreted accordingly.

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.

EN 60664-1	2007	Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests (IEC 60664-1:2007)
EN 61000-3-3	2008	Electromagnetic compatibility (EMC) – Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection (IEC 61000-3-3:2008)
EN 61000-4-30	2009	Electromagnetic compatibility (EMC) – Part 4-30: Testing and measurement techniques – Power quality measurement methods (IEC 61000-4-30:2008)
IEC 60364-5-53 + A1	2001 2002	Electrical installations of buildings – Part 5-53: Selection and erection of electrical equipment – Isolation, switching and control
IEC/TR 61000-2-8	2002	Electromagnetic compatibility (EMC) – Part 2-8: Environment – Voltage dips and short interruptions on public electric power supply systems with statistical measurement results
IEC/TR 61000-3-7	2008	Electromagnetic compatibility (EMC) – Part 3-7: Assessment of emission limits for fluctuating loads in MV and HV power systems

3 Terms and definitions

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

3.1

conducted disturbance

electromagnetic phenomenon propagated along the line conductors of a supply network

NOTE In some cases an electromagnetic phenomenon is propagated across transformer windings and hence between networks of different voltage levels. These disturbances may degrade the performance of a device, equipment or system or they may cause damage.

3.2

declared supply voltage

U_c

supply voltage U_c agreed by the network operator and the network user

NOTE Generally declared supply voltage U_c is the nominal voltage U_n but it may be different according to the agreement between the network operator and the network user.

Bestelformulier

Stuur naar:

NEN Standards Products & Services
t.a.v. afdeling Klantenservice
Antwoordnummer 10214
2600 WB Delft



NEN Standards Products & Services

Postbus 5059
2600 GB Delft

Vlinderweg 6
2623 AX Delft

T (015) 2 690 390
F (015) 2 690 271

www.nen.nl/normshop

Ja, ik bestel

__ ex. NEN-EN 50160:2010 en Spanningskarakteristieken in openbare elektriciteitsnetten

€ 62.00

Wilt u deze norm in PDF-formaat? Deze bestelt u eenvoudig via www.nen.nl/normshop

Gratis e-mailnieuwsbrieven

Wilt u op de hoogte blijven van de laatste ontwikkelingen op het gebied van normen, normalisatie en regelgeving? Neem dan een gratis abonnement op een van onze e-mailnieuwsbrieven. www.nen.nl/nieuwsbrieven

Gegevens

Bedrijf / Instelling

T.a.v. O M O V

E-mail

Klantnummer NEN

Uw ordernummer BTW nummer

Postbus / Adres

Postcode Plaats

Telefoon Fax

Factuuradres (indien dit afwijkt van bovenstaand adres)

Postbus / Adres

Postcode Plaats

Datum Handtekening

Retourneren

Fax: 015 2 690 271

E-mail: klantenservice@nen.nl

Post: NEN Standards Products & Services,

t.a.v. afdeling Klantenservice
Antwoordnummer 10214,
2600 WB Delft

(geen postzegel nodig).

Voorwaarden

- De prijzen zijn geldig tot 31 december 2018, tenzij anders aangegeven.
- Alle prijzen zijn excl. btw, verzend- en handelingskosten en onder voorbehoud bij o.m. ISO- en IEC-normen.
- Bestelt u via de normshop een pdf, dan betaalt u geen handeling en verzendkosten.
- Meer informatie: telefoon 015 2 690 391, dagelijks van 8.30 tot 17.00 uur.
- Wijzigingen en typfouten in teksten en prijsinformatie voorbehouden.
- U kunt onze algemene voorwaarden terugvinden op: www.nen.nl/leveringsvoorwaarden.