



BSI Standards Publication

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 61000-3-3:2013+A1:2017)

TRACKED CHANGES


This is a preview of "BS EN 61000-3-3:2013...". [Click here to purchase the full version from the ANSI store.](#)


IMPORTANT — PLEASE NOTE

This is a tracked changes copy and uses the following colour coding:

Text example 1 — indicates added text (in green)

~~Text example 2~~ — indicates removed text (in red)

 — indicates added graphic figure or table

 — indicates removed graphic figure or table

About Tracked Changes

This document is a PDF containing a Tracked Changes version of BS EN 61000-3-3, which compares BS EN 61000-3-3:2013+A1:2019 with BS EN 61000-3-3:2013.

The original version of BS EN 61000-3-3:2013+A1:2019, appended at the end of this document, should be considered the version of record for this publication.

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



ISBN 978 0 539 07045 3

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

This is a preview of "BS EN 61000-3-3:2013...". Click here to purchase the full version from the ANSI store.

This British Standard is the UK implementation of ~~EN 61000-3-3:2013~~ EN 61000-3-3:2013+A1:2019. It is identical to ~~IEC 61000-3-3:2013~~ IEC 61000-3-3:2013, incorporating amendment 1:2017. It supersedes ~~BS EN 61000-3-3:2008~~ BS EN 61000-3-3:2013, which will be withdrawn on ~~18 June 2016~~ 2 August 2022.

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

The UK participation in its preparation was entrusted by ~~to~~ Technical Committee ~~GEL/210~~ GEL/210/11, EMC ~~Policy committee, to Subcommittee GEL/210/12, EMC basic, generic and low frequency phenomena Standardization.~~ Standards Committee.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution ~~2013~~ 2019
Published by BSI Standards Limited ~~2013~~ 2019

ISBN ~~978 0 580 75782 2~~ 978 0 580 90146 1

ICS 33.100.10

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 30 September 2013.

Amendments/corrigenda issued since publication

Date	Text affected
31 August 2019	Implementation of IEC amendment 1:2017 with CENELEC endorsement A1:2019

This is a preview of "BS EN 61000-3-3:2013...". Click here to purchase the full version from the ANSI store.

NORME EUROPÉENNE

EUROPÄISCHE NORM

August 2013

ICS 33.100.10

August 2019

Supersedes EN 61000-3-3:2008

English version

**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 61000-3-3:2013)**

Compatibilité électromagnétique (CEM) -
Partie 3-3: Limites --Limitation des
variations de tension, des fluctuations de
tension et du papillotement dans les
réseaux publics d'alimentation basse
tension, pour les matériels ayant un
courant assigné ≤ 16 A par phase et non
soumis à un raccordement conditionnel
(CEI 61000-3-3:2013)

Elektromagnetische Verträglichkeit
(EMV) -
-Teil 3-3: Grenzwerte --Begrenzung von
Spannungsänderungen,
Spannungsschwankungen und Flicker in
öffentlichen Niederspannungs-
Versorgungsnetzen für Geräte mit einem
Bemessungsstrom ≤ 16 A je Leiter, die keiner
Sonderanschlussbedingung unterliegen
(IEC 61000-3-3:2013)

This European Standard was approved by CENELEC on 2013-06-18. 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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Rue de la Science 23, B-1040 Brussels

This is a preview of "BS EN 61000-3-3:2013...". [Click here to purchase the full version from the ANSI store.](#)

The text of document 77A/809/FDIS, future edition 3 of IEC 61000-3-3, prepared by SC 77A, "EMC - Low frequency phenomena", of IEC TC 77, "Electromagnetic compatibility" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61000-3-3:2013.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2014-03-18
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2016-06-18

This document supersedes EN 61000-3-3:2008.

EN 61000-3-3:2013 includes the following significant technical changes with respect to EN 61000-3-3:2008:

This edition takes account of the changes made in EN 61000-4-15:2011.

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

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s) see informative Annex ZZ, which is an integral part of this document.

Endorsement notice

The text of the International Standard IEC 61000-3-3:2013 was approved by CENELEC as a European Standard without any modification.

This is a preview of "BS EN 61000-3-3:2013...". Click here to purchase the full version from the ANSI store.

European foreword to amendment A1

The text of document 77A/952/FDIS, future IEC 61000-3-3:2013/A1, prepared by SC 77A, "EMC — Low-frequency phenomena", of IEC TC 77, "Electromagnetic compatibility" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61000-3-3:2013/A1:2019.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2020-02-02
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-08-02

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

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directives.

For the relationship with EU Directives see informative Annexes ZZA and ZZB, which are an integral part of this document.

Endorsement notice

The text of the International Standard IEC 61000-3-3:2013/A1:2017 was approved by CENELEC as a European Standard without any modification.

This is a preview of "BS EN 61000-3-3:2013...". Click here to purchase the full version from the ANSI store.

Normative references to international publications with their corresponding European publications

The following documents, ~~in whole or in part, are normatively referenced in this document and are indispensable for its application.~~ are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 ~~When~~ ~~Where~~ an ~~international publication~~ International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC/TR 60725	-	Consideration of reference impedances and public supply network impedances for use in determining disturbance characteristics of electrical equipment having a rated current ≤ 75 A per phase	-	-
IEC 60974-1	-	Arc welding equipment - Part 1: Welding power sources	EN 60974-1	-
IEC 61000-3-2	-	Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)	EN 61000-3-2	-
IEC 61000-3-11	-	Electromagnetic compatibility (EMC) - Part 3-11: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current ≤ 75 A and subject to conditional connection	EN 61000-3-11	-
IEC 61000-4-15 + corr. March	2010 2012	Electromagnetic compatibility (EMC) - Part 4-15: Testing and measurement techniques - Flickermeter - Functional and design specifications	EN 61000-4-15	2011

This is a preview of "BS EN 61000-3-3:2013...". Click here to purchase the full version from the ANSI store.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC/TR 60725	2005 ¹	Consideration of reference impedances and - public supply network impedances for use in determining disturbance characteristics of electrical equipment having a rated current ≤ 75 A per phase	-	-
IEC 60974-1	2017 ¹	Arc welding equipment - Part 1: Welding power sources	-	-
IEC 61000-3-2		Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)	EN 61000-3-2	2014
IEC 61000-3-11	2017 ¹	Electromagnetic compatibility (EMC) – Part 3-11: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems – Equipment with rated current ≤ 75 A and subject to conditional connection	-	-
IEC 61000-4-15	2010	Electromagnetic compatibility (EMC) -- Part 4-15: Testing and measurement techniques - Flickermeter - Functional and design specifications	EN 61000-4-15	2011

This is a preview of "BS EN 61000-3-3:2013...". [Click here to purchase the full version from the ANSI store.](#)

(informative)

Coverage of Essential Requirements of EU Directives

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and within its scope the standard covers protection requirements of Annex I Article 1(a) of the EU Directive 2004/108/EC and protection requirements of Article 3.1(b) (emissions only) of the EU Directive 1999/5/EC.

Compliance with this standard provides one means of conformity with the specified essential requirements of the Directives concerned.

WARNING: Other requirements and other EU Directives may be applicable to the products falling within the scope of this standard.

This is a preview of "BS EN 61000-3-3:2013...". Click here to purchase the full version from the ANSI store.

Table ZZA.1
 (informative)

Relationship between this European standard and the essential requirements of Directive 2014/30/EU [2014 OJ L96] aimed to be covered

This European standard has been prepared under the European Commission standardisation request C(2016) 7641 final of 30.11.2016², ('M/552'), as regards harmonised standards in support of Directive 2014/30/EU relating to electromagnetic compatibility, to provide one voluntary means of conforming to essential requirements of Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility [2014 OJ L96].

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table ZZA.1 – Correspondence between this European standard and the Essential Requirements set out in Directive 2014/30/EU [2014 OJ L96]

Essential requirements of Directive 2014/30/EU	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
Annex I. 1(a) (electromagnetic disturbances)	5 Limits	

WARNING 1: Presumption of conformity stays valid only as long as a reference to this European standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2: Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

² COMMISSION IMPLEMENTING DECISION C(2016) 7641 final of 30.11.2016 on a standardisation request to the European Committee for Standardisation, to the European Committee for Electrotechnical Standardisation and to the European Telecommunications Standards Institute as regards harmonised standards in support of Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

This is a preview of "BS EN 61000-3-3:2013...". Click here to purchase the full version from the ANSI store.

Relationship between this European standard and the essential requirements of Directive 2014/53/EU [2014 OJ L153] aimed to be covered and the standardisation request M/536

This European standard has been prepared under the European Commission standardisation request C(2015) 5376 final of 4.8.2015³ ('M/536'), as regards harmonised standards in support of Directive 2014/53/EU relating to radio equipment, to provide one voluntary means of conforming to essential requirements of Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [2014 OJ L153].

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZZB.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table ZZB.1 – Correspondence between this European standard and the Essential Requirements set out in Directive 2014/53/EU [2014 OJ L153]

Essential requirements of Directive 2014/53/EU	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
Article 3.1(b), relating to Annex 1.1(a) of Directive 2014/30/EU (electromagnetic disturbance)	5 limits	

WARNING 1: Presumption of conformity stays valid only as long as a reference to this European standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2: Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

³ COMMISSION IMPLEMENTING DECISION C(2015) 5376 final of 4.8.2015 on a standardisation request to the European Committee for Electrotechnical Standardisation and to the European Telecommunications Standards Institute as regards radio equipment in support of Directive 2014/53/EU of the European Parliament and of the Council

This is a preview of "BS EN 61000-3-3:2013...". [Click here to purchase the full version from the ANSI store.](#)

This is a preview of "BS EN 61000-3-3:2013...". Click here to purchase the full version from the ANSI store.

FOREWORD	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references.....	7
3 Terms and definitions	8
4 Assessment of voltage changes, voltage fluctuations and flicker	10
4.1 Assessment of a relative voltage change, $d(t)$	10
4.2 Assessment of the short-term flicker value, P_{st}	10
4.2.1 General.....	10
4.2.2 Flickermeter	11
4.2.3 Simulation method	11
4.2.4 Analytical method	11
4.2.5 Use of $P_{st} = 1$ curve	12
4.3 Assessment of long-term flicker value, P_{lt}	12
5 Limits.....	12
6 Test conditions	13
6.1 General.....	13
6.2 Measurement uncertainty.....	14
6.3 Test supply voltage.....	14
6.4 Reference impedance	14
6.5 Observation period.....	14
6.6 General test conditions.....	15
Annex A (normative) Application of limits and type test conditions for specific equipment.....	19
Annex B (normative) Test conditions and procedures for measuring d_{max} voltage changes caused by manual switching.....	27
Annex C (informative) Determination of steady state voltage and voltage change characteristics, as defined in IEC 61000-4-15:2010	28
Annex D (informative) Input relative voltage fluctuation $\Delta V/V$ for $P_{st} = 1,0$ at output [IEC/TR 61000-3-7:2008]	33
Bibliography.....	34
Figure 1 – Reference network for single-phase and three-phase supplies derived from a three-phase, four-wire supply.....	16
Figure 2 – Curve for $P_{st} = 1$ for rectangular equidistant voltage changes	17
Figure 3 – Shape factors F for double-step and ramp-voltage characteristics.....	17
Figure 4 – Shape factors F for rectangular and triangular voltage characteristics	18
Figure 5 – Shape factor F for motor-start voltage characteristics having various front times	18
Figure C.1 – Evaluation of $U_{hp}(t)$	32
Table 1 – Assessment method.....	11
Table A.1 – Test conditions for hotplates.....	19
Table A.2 – Electrode parameters	24

This is a preview of "BS EN 61000-3-3:2013...". [Click here to purchase the full version from the ANSI store.](#)

Table A.3 – Frequency factor R related to repetition rate " r "	25
Table C.1 – Test specification for dC – dmax – td(t) >3,3 % (from Table 12 of IEC 61000-4-15: 2010)	31
Table C.2 – Test specification for dC – dmax – td(t) >3,3 % (from Table 13 of IEC 61000-4-15: 2010)	31
Table D.1 – Input relative voltage fluctuation $\Delta V/V$ for Pst = 1,0 at output.....	33

This is a preview of "BS EN 61000-3-3:2013...". Click here to purchase the full version from the ANSI store.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61000-3-3 has been prepared by subcommittee 77A: EMC – Low frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

This standard forms part 3-3 of IEC 61000 series of standards. It has the status of a product family standard.

This third edition cancels and replaces the second edition published in 2008. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) This edition takes account of the changes made in IEC 61000-4-15:2010.

This is a preview of "BS EN 61000-3-3:2013...". Click here to purchase the full version from the ANSI store.

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

FDIS	Report on voting
77A/809/FDIS	77A/816/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61000 series, published under the general title *Electromagnetic compatibility (EMC)*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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

This is a preview of "BS EN 61000-3-3:2013...". Click here to purchase the full version from the ANSI store.

INTRODUCTION

IEC 61000 is published in separate parts according to the following structure: Part 1: Part

Part 1: General

General considerations (introduction, fundamental principles) Definitions,
terminology

Part 2: Environment

Description of the environment
Classification of the environment
Compatibility levels

Part 3: Limits

Emission limits
Immunity limits (in so far as they do not fall under the responsibility of product committees)

Part 4: Testing and measurement techniques

Measurement techniques
Testing techniques

Part 5: Installation and mitigation guidelines Installation

guidelines
Mitigation methods and devices Part 9:

Part 9: Miscellaneous

Each part is further subdivided into sections which are to be published either as International Standards or as Technical Reports.

These standards and reports will be published in chronological order and numbered accordingly.

This is a preview of "BS EN 61000-3-3:2013...". Click here to purchase the full version from the ANSI store.

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

1 Scope

This part of IEC 61000 is concerned with the limitation of voltage fluctuations and flicker impressed on the public low-voltage system.

It specifies limits of voltage changes which may be produced by an equipment tested under specified conditions and gives guidance on methods of assessment.

This part of IEC 61000 is applicable to electrical and electronic equipment having an input current equal to or less than 16 A per phase, intended to be connected to public low-voltage distribution systems of between 220 V and 250 V line to neutral at 50 Hz, and not subject to conditional connection.

Equipment which does not comply with the limits of this part of IEC 61000 when tested with the reference impedance Z_{ref} of 6.4, and which therefore cannot be declared compliant with this part, may be retested or evaluated to show conformity with IEC 61000-3-11. Part 3-11 is applicable to equipment with rated input current ≤ 75 A per phase and subject to conditional connection.

The tests according to this part are type tests. Particular test conditions are given in Annex A and the test circuit is shown in Figure 1.

NOTE 1 The limits in this standard relate to the voltage changes experienced by consumers connected at the interface between the public supply low-voltage network and the equipment user's installation. Consequently, if the actual impedance of the supply at the supply terminals of equipment connected within the equipment user's installation exceeds the test impedance, it is possible that supply disturbance exceeding the limits could occur.

NOTE 2 The limits in this standard are based mainly on the subjective severity of flicker imposed on the light from 230 V 60 W coiled-coil filament lamps by fluctuations of the supply voltage. For systems with nominal voltage less than 220 V line to neutral and/or frequency of 60 Hz, the limits and reference circuit values are under consideration.

2 Normative references

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

IEC/TR 60725, *Consideration of reference impedances and public supply impedances for use in determining disturbance characteristics of electrical equipment having a rated current ≤ 75 A per phase*

IEC 60974-1, *Arc welding equipment – Part 1: Welding power sources*

IEC 61000-3-2, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*