SVENSK STANDARD SS-EN 60146-1-1

Fastställd	Utgåva	Sida	Ansvarig kommitté
2010-11-22	2	1 (1+96)	SEK TK 22

Halvledarströmriktare – Allmänna fordringar och nätkommuterade strömriktare – Del 1-1: Grundläggande fordringar

Semiconductor convertors – General requirements and line commutated convertors – Part 1-1: Specification of basic requirements

Som svensk standard gäller europastandarden EN 60146-1-1:2010. Den svenska standarden innehåller den officiella engelska språkversionen av EN 60146-1-1:2010.

Nationellt förord

Europastandarden EN 60146-1-1:2010

består av:

– **europastandardens ikraftsättningsdokument,** utarbetat inom CENELEC
– **IEC 60146-1-1, Fourth edition, 2009 - Semiconductor convertors - General requirements and line commutated convertors - Part 1-1: Specification of basic requirements**

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare fastställd svensk standard SS-EN 60146-1-1, utgåva 1, 1993 och SS-EN 60146-1-1/A1, utgåva 1, 1998, gäller ej fr o m 2013-07-01.

ICS 29.200; 29.045

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60146-1-1

July 2010

ICS 29.200;29.045

Supersedes EN 60146-1-1:1993 + A1:1997

English version

Semiconductor converters - General requirements and line commutated converters - Part 1-1: Specification of basic requirements

(IEC 60146-1-1:2009)

Convertisseurs à semiconducteurs - Exigences générales et convertisseurs commutés par le réseau - Partie 1-1: Spécification des exigences de base (CEI 60146-1-1:2009)

Halbleiter-Stromrichter - Allgemeine Anforderungen und netzgeführte Stromrichter - Teil 1-1: Festlegung der Grundanforderungen (IEC 60146-1-1:2009)

CENELEC

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 60146-1-1:2010 E

SEK Svensk Elstandard

Foreword

The text of document 22/146/FDIS, future edition 4 of IEC 60146-1-1, prepared by IEC TC 22, Power electronic systems and equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60146-1-1 on 2010-07-01.

This European Standard supersedes EN 60146-1-1:1993 + A1:1997.

This EN 60146-1-1:200X introduces five main changes:

a) re-edition of the whole standard according to the current directives;

b) correction of definitions and addition of new terms, especially terms concerning EMC, harmonic distortion and insulation co-ordination;

c) the service condition tolerances have been revised according to the EN 61000 series;

d) the insulation tests have been revised considering the insulation co-ordination;

e) addition of three annexes.

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)	2011-04-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2013-07-01

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 60146-1-1:2009 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60071-1	NOTE	Harmonized as EN 60071-1.
IEC 60071-2	NOTE	Harmonized as EN 60071-2.
IEC 60076-1	NOTE	Harmonized as EN 60076-1.
IEC 60146-1-3	NOTE	Harmonized as EN 60146-1-3.
IEC 60146-2	NOTE	Harmonized as EN 60146-2.
IEC 60664-3	NOTE	Harmonized as EN 60664-3.
IEC 60664-4	NOTE	Harmonized as EN 60664-4.
IEC 60664-5	NOTE	Harmonized as EN 60664-5.
IEC 61287-1	NOTE	Harmonized as EN 61287-1.
IEC 61378-1	NOTE	Harmonized as EN 61378-1.

IEC 61378-2	NOTE Harmonized as EN 61378-2.
IEC 61439-1	NOTE Harmonized as EN 61439-1.
IEC/TR 61800-6	NOTE Harmonized as CLC/TR 61800-6.
IEC 62068-1	NOTE Harmonized as EN 62068-1.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

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

Publication	Year	Title	EN/HD	Year
IEC 60050-101	1998	International Electrotechnical Vocabulary (IEV) - Part 101: Mathematics	-	-
IEC 60050-551	1998	International Electrotechnical Vocabulary (IEV) - Part 551: Power electronics	-	-
IEC 60050-551-20	2001	International Electrotechnical Vocabulary - Part 551-20: Power electronics - Harmonic analysis	-	-
IEC 60364-1	-	Low-voltage electrical installations - Part 1: Fundamental principles, assessment of general characteristics, definitions	HD 60364-1	-
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	EN 60529	-
IEC 60664-1	2007	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests	EN 60664-1	2007
IEC 60700-1	-	Thyristor valves for high voltage direct current (HVDC) power transmission - Part 1: Electrical testing	EN 60700-1	-
IEC 61000	Series	Electromagnetic compatibility (EMC)	EN 61000	Series
IEC 61000-2-2	2002	Electromagnetic compatibility (EMC) - Part 2-2: Environment - Compatibility levels for low-frequency conducted disturbances and signalling in public low-voltage power supply systems	EN 61000-2-2	2002
IEC 61000-2-4	2002	Electromagnetic compatibility (EMC) - Part 2-4: Environment - Compatibility levels in industrial plants for low-frequency conducted disturbances	EN 61000-2-4	2002
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	-

Publication	Year	Title	EN/HD	Year
IEC 61000-3-3	-	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	EN 61000-3-3	-
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 61000-3-12	2004	Electromagnetic compatibility (EMC) - Part 3-12: Limits - Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and ≤ 75 A per phase	EN 61000-3-12	2005
IEC 61000-4-7	-	Electromagnetic compatibility (EMC) - Part 4-7: Testing and measurement techniques - General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto	EN 61000-4-7	-
IEC 61000-6-1	-	Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments	EN 61000-6-1	-
IEC 61000-6-2	-	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments	EN 61000-6-2	-
IEC 61000-6-3	-	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments	EN 61000-6-3	-
IEC 61000-6-4	-	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments	EN 61000-6-4	-
IEC 61140	-	Protection against electric shock - Common aspects for installation and equipment	EN 61140	-
IEC 61180-1	1992	High-voltage test techniques for low-voltage equipment - Part 1: Definitions, test and procedure requirements	EN 61180-1	1994
IEC 61204-3	-	Low-voltage power supplies, d.c. output - Part 3: Product EMC standard	EN 61204-3	-
IEC 61204-7	-	Low voltage power supplies, d.c. output - Part 7: Safety requirements	EN 61204-7	-
IEC 61800-3	-	Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods	EN 61800-3	-

Publication	Year	Title	EN/HD	Year
IEC 61800-5-1	-	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy	EN 61800-5-1	-
IEC 61954	-	Power electronics for electrical transmission and distribution systems - Testing of thyristor valves for static VAR compensators	EN 61954	-
IEC/PAS 61975	-	System tests for high-voltage direct current (HVDC) installations	-	-
IEC 62040-1	-	Uninterruptible Power Systems (UPS) - Part 1: General and safety requirements for UPS	EN 62040-1	-
IEC 62040-2	-	Uninterruptible power systems (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements	EN 62040-2	-
IEC 62103	-	Electronic equipment for use in power installations	-	-
IEC 62310-1	-	Static transfer systems (STS) - Part 1: General and safety requirements	EN 62310-1	-
IEC 62310-2	-	Static transfer systems (STS) - Part 2: Electromagnetic compatibility (EMC) requirements	EN 62310-2	-

CONTENTS

SEMICONDUCTOR CONVERTERS – GENERAL REQUIREMENTS AND LINE COMMUTATED CONVERTERS –

Part 1-1: Specification of basic requirements

1 Scope and object

This International Standard specifies the requirements for the performance of all semiconductor power converters and semiconductor power switches using controllable and/or non-controllable electronic valve devices.

The electronic valve devices mainly comprise semiconductor devices, either not controllable (i.e. rectifier diodes) or controllable (i.e. thyristors, triacs, turn-off thyristors and power transistors). The controllable devices may be reverse blocking or reverse conducting and controlled by means of current, voltage or light. Non-bistable devices are assumed to be operated in the switched mode.

This standard is primarily intended to specify the basic requirements for converters in general and the requirements applicable to line commutated converters for conversion of a.c. power to d.c. power or vice versa. Parts of this standard are also applicable to other types of electronic power converter provided that they do not have their own product standards.

These specific equipment requirements are applicable to semiconductor power converters that either implement power conversion or use commutation (for example semiconductor self-commutated converters) or involve particular applications (for example semiconductor converters for d.c. motor drives) or include a combination of said characteristics (for example direct d.c. converters for electric rolling stock).

This standard is applicable to all power converters not covered by a dedicated product standard, or if special features are not covered by the dedicated product standard. Dedicated product standards for power converters should refer to this International Standard.

NOTE 1 This standard is not intended to define EMC requirements. It covers all phenomena and therefore introduces references to dedicated standards which are applicable according to their scope.

NOTE 2 A large part of this standard, particularly for power transformers, is covered in IEC 61378-1.

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.

IEC 60050-101:1998, *International Electrotechnical Vocabulary – Part 101: Mathematics*

IEC 60050-551:1998, *International Electrotechnical Vocabulary – Part 551: Power electronics*

IEC 60050-551-20:2001, *International Electrotechnical Vocabulary – Part 551-20: Power electronics – Harmonic analysis*

IEC 60364-1, *Low-voltage electrical installations – Part 1: Fundamental principles, assessment of general characteristics, definitions*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60664-1:2007*, Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60700-1, *Thyristor valves for high voltage direct current (HVDC) power transmission – Part 1: Electrical testing*

IEC 61000 (all parts), *Electromagnetic compatibility (EMC)*

IEC 61000-2-2:2002, *Electromagnetic compatibility (EMC) – Part 2-2: Environment – Compatibility levels for low-frequency conducted disturbances and signalling in public low-voltage power supply systems*

IEC 61000-2-4:2002, *Electromagnetic compatibility (EMC) – Part 2-4: Environment – Compatibility levels in industrial plants for low-frequency conducted disturbances*

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

IEC 61000-3-3, *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 61000-3-11, *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*

IEC 61000-3-12:2004, *Electromagnetic compatibility (EMC) – Part 3-12: Limits – Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and ≤ 75 A per phase*

IEC 61000-4-7, *Electromagnetic compatibility (EMC) – Part 4-7: Testing and measurement techniques – General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto*

IEC 61000-6-1, *Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity for residential, commercial and light-industrial environments*

IEC 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*

IEC 61000-6-3, *Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments*

IEC 61000-6-4, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61180-1:1992, *High-voltage test techniques for low voltage equipment – Part 1: Definitions, test and procedure requirements*

IEC 61204-3, *Low-voltage power supplies, d.c. output – Part 3: Electromagnetic compatibility (EMC)*

IEC 61204-7, *Low voltage power supplies, d.c. output – Part 7: Safety requirements*

IEC 61800-3, *Adjustable speed electrical power drive systems – Part 3: EMC requirements and specific test methods*

IEC 61800-5-1, *Adjustable speed electrical power drive systems – Part 5-1: Safety requirements – Electrical, thermal and energy*

IEC 61954, *Power electronics for electrical transmission and distribution systems – Testing of thyristor valves for static VAR compensators*

IEC/PAS 61975, *Guide to the specification and design evaluation of a.c. filters for HVDC systems*

IEC 62040-1, *Uninterruptible power systems (UPS) – Part 1: General and safety requirements for UPS*

IEC 62040-2, *Uninterruptible power systems (UPS) – Part 2: Electromagnetic compatibility (EMC) requirements*

IEC 62103, *Electronic equipment for use in power installations*

IEC 62310-1, *Static transfer systems (STS) – Part 1: General and safety requirements*

IEC 62310-2, *Static transfer systems (STS) – Part 2: Electromagnetic compatibility (EMC) requirements*

NOTE Some other IEC publications are quoted for information in the Bibliography.