



**SLOVENSKI STANDARD**  
**SIST EN 60146-1-1:2001**  
**01-junij-2001**

**Semiconductor convertors - General requirements and line commutated convertors - Part 1-1: Specifications of basic requirements (IEC 60146-1-1:1991)**

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

Halbleiter-Stromrichter - Allgemeine Anforderungen und netzgeführte Stromrichter -- Teil 1-1: Festlegung der Grundanforderungen

Convertisseurs à semiconducteurs - Spécifications communes et convertisseurs commutés par le réseau -- Partie 1-1: Spécifications des clauses techniques de base

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**Ta slovenski standard je istoveten z: EN 60146-1-1:1993**

**ICS:**

29.200	W{ ^!} ä äÜ! ^ç[ !] ä ä Ücè ãä äæ [ Á ^ \ d ä ] } ä ä ä b	Rectifiers. Convertors. Stabilized power supply
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**SIST EN 60146-1-1:2001** **en**

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EUROPEAN STANDARD

EN 60146-1-1

NORME EUROPEENNE

EUROPÄISCHE NORM

February 1993

UDC 621.314.57/.63:621.382:620.1

Descriptors: Electronics, convertor, semiconductor convertor, electronic switch, performance requirement, specification, test

## ENGLISH VERSION

Semiconductor convertors  
 General requirements and line commutated convertors  
 Part 1-1: Specifications of basic requirements  
 (IEC 146-1-1:1991)

Convertisseurs à semiconducteurs  
 Spécifications communes et  
 convertisseurs commutés par le  
 réseau  
 Partie 1-1: Spécifications des  
 clauses techniques de base  
 (CEI 146-1-1:1991)

Halbleiter-Stromrichter  
 Allgemeine Anforderungen und  
 netzgeführte Stromrichter  
 Teil 1-1: Festlegung der  
 Grundanforderungen  
 (IEC 146-1-1:1991)

ITIH STANDARD PREVIEW  
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This European Standard was approved by CENELEC on 1992-12-09.  
 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, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

## CENELEC

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

Central Secretariat: rue de Stassart 35, B-1050 Brussels

### FOREWORD

The CENELEC questionnaire procedure, performed for finding out whether or not the International Standard IEC 146-1-1:1991 could be accepted without textual changes, has shown that no common modifications were necessary for the acceptance as European Standard.

The reference document was submitted to the CENELEC members for formal vote and was approved by CENELEC as EN 60146-1-1 on 9 December 1992.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1993-12-01
- latest date of withdrawal of conflicting national standards (dow) 1993-12-01

For products which have complied with the relevant national standard before 1993-12-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1998-12-01.

## iTeh STANDARD PREVIEW

Annexes designated "normative" are part of the body of the standard. Annexes designated "informative" are given only for information. In this standard, annexes A and B are informative, annex ZA is normative.

[SIST EN 60146-1-1:2001](https://standards.iteh.ai/catalog/standards/sist/7104826a-fa02-4bd4-8e28-cb03d831cbfc/sist-en-60146-1-1-2001)

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ENDORSEMENT NOTICE

The text of the International Standard IEC 146-1-1:1991 was approved by CENELEC as a European Standard without any modification.

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## ANNEX ZA (normative)

OTHER INTERNATIONAL PUBLICATIONS QUOTED IN THIS STANDARD  
WITH THE REFERENCES OF THE RELEVANT EUROPEAN PUBLICATIONS

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

IEC Publication -----	Date -----	Title -----	EN/HD -----	Date -----
50(151)	1978	International Electrotechnical Vocabulary (IEV) Chapter 151: Electrical and magnetic devices	-	-
50(441)	1984	Chapter 441: Switchgear, controlgear and fuses	-	-
50(551)	1982	Chapter 551: Power electronics	-	-
50(601)	1985	Chapter 601: Generation, transmission and distribution of electricity General	-	-
76	series	Power transformers	HD 398	series
555-1	1982	Disturbances in supply systems caused by household appliances and similar electrical equipment Part 1: Definitions	EN 60555-1	1987
664	1980	Insulation co-ordination within low-voltage systems including clearances and creepage distances for equipment	-	-
725	1981	Considerations on reference impedance for use in determining the disturbance characteristics of household appliances and similar electrical equipment	-	-

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NORME  
INTERNATIONALE  
INTERNATIONAL  
STANDARD

CEI  
IEC  
146-1-1

Troisième édition  
Third edition  
1991-03

**Convertisseurs à semiconducteurs**

**Spécifications communes et  
convertisseurs commutés par le réseau**

iTeh STANDARD PREVIEW

**Partie 1-1:**

**Spécifications des clauses techniques de base**

[SIST EN 60146-1-1:2001](https://standards.iteh.ai/catalog/standards/sist/7104826a-fa02-4bd4-8e28-)

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**Semiconductor convertors**

**General requirements and  
line commutated convertors**

**Part 1-1:**

**Specifications of basic requirements**

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Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

CODE PRIX  
PRICE CODE XB

For price, voir catalogue en vigueur  
For price, see current catalogue

Publication 146-1-1 de la CEI  
(3<sup>e</sup> édition - 1991)

IEC Publication 146-1-1  
(3rd edition - 1991)

Convertisseurs à semi-conducteurs –  
Spécifications communes et  
convertisseurs commutés par le réseau

Semiconductor convertors –  
General requirements and  
line commutated convertors

Partie 1-1: Spécifications des  
clauses techniques de base

Part 1-1: Specifications of basic  
requirements

## C O R R I G E N D U M

Page 114

Remplacer le tableau 6 existant par le nouveau tableau 6 suivant:

Tableau 6 – Tensions d'essai, moyenne tension

Tension réseau kV	Tension de choc (1,2 μs/50 μs) kV (crête)	Tension alternative (fréquence industrielle) kV (valeur efficace)
$0,5 < U_{LN} \leq 1,1$	non applicable	$1 + 2 U_M \sqrt{2}$
$1,1 < U_{LN} \leq 3,6$	non applicable	$3 U_M \sqrt{2}$
$3,6 < U_{LN} \leq 38$	$15 + 3 U_M \sqrt{2}$	$4 + 1,8 U_M \sqrt{2}$

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Page 115

Replace existing table 6 with new table 6 below:

Table 6 – Test voltages, medium voltage

Line voltage kV	Impulse voltage (1,2 μs/50 μs) kV (peak)	A.C. voltage (power frequency) kV r.m.s.
$0,5 < U_{LN} \leq 1,1$	non applicable	$1 + 2 U_M \sqrt{2}$
$1,1 < U_{LN} \leq 3,6$	non applicable	$3 U_M \sqrt{2}$
$3,6 < U_{LN} \leq 38$	$15 + 3 U_M \sqrt{2}$	$4 + 1,8 U_M \sqrt{2}$



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## SEMICONDUCTOR CONVERTORS

General requirements and line commutated convertors  
Part 1-1: Specifications of basic requirements

## FOREWORD

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subject dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

## iTeh STANDARD PREVIEW

This standard has been prepared by Sub-Committee 22B: Semiconductor Convertors, of IEC Technical Committee No. 22: Power electronics. It constitutes Part 1 of IEC 146 and partly replaces IEC 146 (1973) and its Amendment No. 1 (1975).

SIST EN 60146-1-1:2001

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

Six Months' Rule	Report on the Voting	Two Months' Procedure	Report on the Voting
22B(CO)50	22B(CO)54	22B(CO)55	22B(CO)57

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

## SEMICONDUCTOR CONVERTORS

### General requirements and line commutated convertors Part 1-1: Specifications of basic requirements

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#### Section 1 - General

##### 1.1 Scope and object

This International Standard specifies the requirements for the performance of all electronic power convertors and electronic power switches using controllable and/or non-controllable electronic valves.

The electronic valves mainly comprise semiconductor devices, i.e. diodes and various types of thyristors and transistors, such as reverse blocking or conducting thyristors, turn-off thyristors, triacs and power transistors. The devices may be controlled by means of current, voltage or light. Non-bistable devices are assumed to be operated in the switched mode.

### iTeh STANDARD PREVIEW

This standard is primarily intended to specify the requirements applicable to line commutated convertors for conversion of a.c. power to d.c. power or vice versa. Parts of this standard are applicable also to other types of electronic power convertors and should be regarded as a standard for them in so far as it is not in contradiction to additional IEC Standards for particular types of semiconductor convertors given in existing or future IEC Publications.

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

The main purposes of this standard are as follows:

#### Part 1-1, IEC 146-1-1, Specifications of basic requirements.

- to establish basic terms and definitions;
- to specify service conditions which influence the basis of rating;
- to specify test requirements for complete convertor equipment and assemblies, standard design, (for special design see IEC 146-1-2);
- to specify basic performance requirements;
- to give application oriented requirements for semiconductor power convertors.

## Part 1-2, IEC 146-1-2, Application guide

- to give additional information on test conditions and components, (for example: semiconductor devices), when required for their use in semiconductor power converters, in addition to or as a modification on existing standards;
- to provide useful reference, calculation factors, formulae and diagrams pertaining to power convertor practice.

## Part 1-3, IEC 146-1-3, Transformers and reactors

- to give additional information on characteristics wherein convertor transformers differ from ordinary power transformers. In all other respects, the rules specified in IEC 76, shall apply to convertor transformers, as far as they are not in contradiction with this standard.

## 1.2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

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IEC 50(151): 1978, *International Electrotechnical Vocabulary (IEV)* - Chapter 151: Electrical and magnetic devices.

IEC 50(441): 1984, *International Electrotechnical Vocabulary (IEV)* - Chapter 441: Switchgear, controlgear and fuses.

IEC 50(551): 1982, *International Electrotechnical Vocabulary (IEV)* - Chapter 551: Power Electronics.

IEC 50(601): 1985, *International Electrotechnical Vocabulary (IEV)* - Chapter 601: Generation, transmission and distribution of electricity. General.

IEC 76: 1976, *Power transformers*.

IEC 555-1: 1982, *Disturbances in supply systems caused by household appliances and similar electrical equipment* - Part 1: Definitions.

IEC 664: 1980, *Insulation co-ordination within low-voltage systems including clearances and creepage distances for equipment*.

IEC 725: 1981, *Considerations on reference impedance for use in determining the disturbance characteristics of household appliances and similar electrical equipment*.

Some other IEC publications are quoted for information in Annex B: Bibliography.