



# SLOVENSKI STANDARD

## SIST EN 60146-1-3:2001

01-junij-2001

---

### Semiconductor convertors - General requirements and line commutated convertors - Part 1-3: Transformers and reactors (IEC 60146-1-3:1991)

Semiconductor convertors - General requirements and line commutated convertors -- Part 1-3: Transformers and reactors

Halbleiter-Stromrichter - Allgemeine Anforderungen und netzgeführte Stromrichter -- Teil 1-3: Transformatoren und Drosselspulen

Convertisseurs à semiconducteurs - Spécifications communes et convertisseurs commutés par le réseau -- Partie 1-3: Transformateurs et bobines d'inductance

<https://standards.iteh.ai/catalog/standards/sist/8196a7b3-344d-4bbf-b01c-5984bdf7c62f/sist-en-60146-1-3-2001>

Ta slovenski standard je istoveten z: EN 60146-1-3:1993

---

#### ICS:

29.180            Transformatorji. Dušilke            Transformers. Reactors

**SIST EN 60146-1-3:2001**

**en**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN 60146-1-3:2001](https://standards.iteh.ai/catalog/standards/sist/8196a7b3-344d-4bbf-b01c-5984bdf7c62f/sist-en-60146-1-3-2001)

<https://standards.iteh.ai/catalog/standards/sist/8196a7b3-344d-4bbf-b01c-5984bdf7c62f/sist-en-60146-1-3-2001>

UDC 621.314.21:621.315.59:621.318

Descriptors: Electronics, convertors, semiconductor convertors, transformers, reactors, characteristics, specifications, test

### ENGLISH VERSION

Semiconductor convertors  
General requirements and line commutated convertors  
Part 1-3: Transformers and reactors  
(IEC 146-1-3:1991)

Convertisseurs à semiconducteurs  
Spécifications communes et  
convertisseurs commutés par le  
réseau  
Partie 1-3: Transformateurs et  
bobines d'inductance  
(CEI 146-1-3:1991)

Halbleiter-Stromrichter  
Allgemeine Anforderungen und  
netzgeführte Stromrichter  
Teil 1-3: Transformatoren und  
Drosselspulen  
(IEC 146-1-3:1991)

**iTeh STANDARD PREVIEW**  
(standards.itech.ai)

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 146-1-3:1991 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 60146-1-3 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**

**(standards.iteh.ai)**

Annexes designated "normative" are part of the body of the standard. In this standard, annexes A and ZA are normative.

SIST EN 60146-1-3:2001

[https://standards.iteh.ai/catalog/standards/sist/8196a7b3-344d-4bbf-b01c-](https://standards.iteh.ai/catalog/standards/sist/8196a7b3-344d-4bbf-b01c-5984bd7c628/sist-en-60146-1-3-2001)

5984bd7c628/sist-en-60146-1-3-2001

### ENDORSEMENT NOTICE

The text of the International Standard IEC 146-1-3:1991 was approved by CENELEC as a European Standard without any modification.

-----

## 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
-----	----	-----	-----	----
76		series Power transformers	HD 398	series
146-1-1	1991	Semiconductor convertors General requirements and line commutated convertors - Part 1-1: Specifications of basic requirements	EN 60146-1-1	1993
146-1-2	1991	Part 1-2: Application guide	-	-

-----

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 60146-1-3:2001

<https://standards.iteh.ai/catalog/standards/sist/8196a7b3-344d-4bbf-b01c-5984bdf7c62f/sist-en-60146-1-3-2001>

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN 60146-1-3:2001](https://standards.iteh.ai/catalog/standards/sist/8196a7b3-344d-4bbf-b01c-5984bdf7c62f/sist-en-60146-1-3-2001)

<https://standards.iteh.ai/catalog/standards/sist/8196a7b3-344d-4bbf-b01c-5984bdf7c62f/sist-en-60146-1-3-2001>

**NORME  
INTERNATIONALE  
INTERNATIONAL  
STANDARD**

**CEI  
IEC  
146-1-3**

Troisième édition  
Third edition  
1991-03

---



---

**Convertisseurs à semiconducteurs**

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

**STANDARD PREVIEW**

**Partie 1-3:**

**Transformateurs et bobines d'inductance**

[SIST EN 60146-1-3:2001](https://standards.iteh.ai/catalog/standards/sist/8196a7b3-344d-4bbf-b01c-3984bd17c021/sist-en-60146-1-3-2001)

<https://standards.iteh.ai/catalog/standards/sist/8196a7b3-344d-4bbf-b01c-3984bd17c021/sist-en-60146-1-3-2001>

**Semiconductor convertors**

**General requirements and  
line commutated convertors**

**Part 1-3:**

**Transformers and reactors**

© CEI 1991 Droits de reproduction réservés — Copyright - all rights reserved

Aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'éditeur.

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Bureau Central de la Commission Electrotechnique Internationale 3, rue de Varembe Genève, Suisse



Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

**CODE PRIX  
PRICE CODE**

**M**

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

## CONTENTS

	Page
FOREWORD .....	5
Clause	
1 Scope .....	7
2 Normative references .....	7
3 Rated values for convertor transformers .....	9
3.1 Rated current values .....	9
3.2 Temperature limits of cooling media .....	9
4 Losses and voltage drops in transformers and reactors .....	11
4.1 Losses in the transformer windings .....	11
4.2 Losses in interphase transformers, current balancing reactors, series-smoothing reactors, transducers and other current regulating accessories .....	11
4.3 Voltage drops in transformers and reactors .....	13
5 Tests for convertor transformers .....	13
5.1 Measurement of commutating reactance and determination of inductive voltage drop (type test) .....	13
5.2 Short-circuit test (type test and routine test) .....	15
5.3 Temperature rise test (type test) .....	17
Annex A (normative) .....	25
Corrections to be applied when cooling medium temperature is higher than standard .....	25
<p>Tables</p>	
1 - Temperature rise limits .....	19
2 - Connections and calculation factors .....	21

THIS STANDARD PREVIEW  
 (standards.iteh.ai)  
 SIST EN 60146-1-3:2001  
<https://standards.iteh.ai/catalog/standards/sist/8196a7b5-344d-4bbf-b01c-5984bdf7c62f/sist-en-60146-1-3-2001>



## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## SEMICONDUCTOR CONVERTORS

General requirements and line commutated convertors  
Part 1-3: Transformers and reactors

## 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  
(standards.iteh.ai)

This standard has been prepared by Sub-Committee 22B: Semiconductor Convertors, IEC Technical Committee No. 22: Power Electronics.

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)17	22B(CO)19	22B(CO)22	22B(CO)23,23A

Full information on the voting for the approval of this standard can be found in the Voting Reports indicated in the above table. It constitutes Part 1-3 of the new edition of IEC 146 and partly replaces IEC 146 (1973) and its Amendment No. 1 (1975).

IEC 146 (1973) has been superseded by Publications 146-1-1 and 146-1-2 except for the specification regarding transformers and reactors in Chapter III. This chapter is now printed in this part with the cross references suitably adjusted. For completeness, table 2 (which is table 1 in IEC 146-1-2 and was table II in the previous issue) and also Annex A (Appendix C in the previous issue) have been included in this part 1-3.

*NOTE* - A completely revised convertor transformer specification is being prepared by IEC Technical Committee No. 14: Power transformers.