

Semiconductor power convertors – Adjustable speed electric drive systems – General requirements – Part 1: Rating specifications, particularly for d.c. motor drives (IEC 61136-1:1992 Modified)

Semiconductor power convertors - Adjustable speed electric drive systems - General requirements -- Part 1: Rating specifications, particularly for d.c. motor drives

Halbleiter-Stromrichter - Regelbare elektrische Antriebssysteme - Allgemeine Anforderungen -- Teil 1: Nennwerte, insbesondere für Gleichstromantriebe

Convertisseurs de puissance à semiconducteurs - Entraînements électriques à vitesse variable - Prescriptions générales -- Partie 1: Specifications de dimensionnement, en particulier pour les entraînements à moteurs à courant continu

Ta slovenski standard je istoveten z: EN 61136-1:1995

ICS:

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EUROPEAN STANDARD
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EUROPÄISCHE NORM

EN 61136-1

May 1995

ICS 29.200

Descriptors: Semiconductor power convertor, adjustable speed, electric drive system, d.c. motor drives, rated values, tests

English version

**Semiconductor power converters
Adjustable speed electric drive systems
General requirements - Part 1: Rating specifications,
particularly for d.c. motor drives
(IEC 1136-1:1992, modified)**

Convertisseurs de puissance à
semiconducteurs
Entraînements électriques à vitesse
variable - Prescriptions générales
Partie 1: Spécifications de
dimensionnement, en particulier
pour les entraînements à moteurs
à courant continu
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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.

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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 text of the International Standard IEC 1136-1:1992, prepared by SC 22G: Semiconductor power convertors for adjustable speed electric drive systems, of IEC TC 22, Power electronics, together with the common modifications prepared by the German National Committee was submitted to the formal vote and approved by CENELEC as EN 61136-1 on 1994-10-04.

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) 1995-10-15
- latest date by which national standards conflicting with the EN have to be withdrawn (dow) 1995-10-15

For products which have complied with the relevant national standard before 1995-10-15, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2000-10-15.

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

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Endorsement notice

The text of the International Standard IEC 1136-1:1992 was approved by CENELEC as a European Standard with agreed common modifications as given below.

COMMON MODIFICATIONS**1 General****1.2 Normative references**

Replace the text of this subclause by:

NOTE: Normative references to international publications are listed in annex ZA (normative).

3 Rated values**3.8.1.1 A.C. line voltage variations (short-term variations)**

Add after the title:

Electromagnetic compatibility levels at industrial plants for low-frequency conducted disturbances are contained in EN 61000-2-4, Electromagnetic compatibility (EMC) - Part 2: Environment - Section 4: Compatibility levels in industrial plants for low-frequency conducted disturbances.

In item 3), replace "5 %" by "3 %".

Add to the notes after item 3):

3 For converters only used in public low voltage and similar networks the negative sequence components shall not exceed 2 % according to EN 61000-2-4.

3.8.4 Storage of equipment

Item a) General

Add "Unless otherwise specified" at the beginning of the first line.

Annex ZA (normative)**Normative references to international publications
with their corresponding European publications**

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 146	series	Semiconductor convertors	EN 60146	series
IEC 721	series	Classification of environmental conditions	EN 60721	series
IEC 1000-2-4	1994	Electromagnetic compatibility (EMC) Part 2: Environment Section 4: Compatibility levels in industrial plants for low-frequency conducted disturbances	EN 61000-2-4	1994

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**Convertisseurs de puissance à semiconducteurs –
Entraînements électriques à vitesse variable –
Prescriptions générales**

Partie 1:

Spécifications de dimensionnement,
en particulier pour les entraînements à moteurs
à courant continu

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**Semiconductor power convertors –
Adjustable speed electric drive systems –
General requirements**

Part 1:

Rating specifications, particularly
for d.c. motor drives

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CONTENTS

	Page
FOREWORD	5
Clause	
1 General	7
1.1 Scope and object	7
1.2 Normative references	7
2 Definitions	7
3 Rated values	19
3.1 General	19
3.2 Rated direct voltage	21
3.3 Rated temperature values	23
3.4 System of establishing rated current-time values for semiconductor assemblies and equipments	25
3.5 Rated currents for equipments and sections	27
3.6 Overload and surge current capability	37
3.7 D.C. power rating (converter equipment)	39
3.8 Service conditions	39
4 Duty classes for non-repetitive load duty	45
5 Tests for thyristor assemblies	45
Annexes	
A Calculation method for equivalent repetitive load duty curves shown in figure 10	47
B Basis for the equivalent repetitive load duty method	53

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SEMICONDUCTOR POWER CONVERTORS –
ADJUSTABLE SPEED ELECTRIC DRIVE SYSTEMS –
GENERAL REQUIREMENTS**

**Part 1: Rating specifications, particularly
for d.c. motor drives**

FOREWORD

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects 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.

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This International Standard has been prepared by Sub-Committee 22G: Semiconductor power convertors for adjustable speed electric drive systems, of IEC Technical Committee No. 22: Power electronics.

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

Six Months' Rule	Report on Voting	Two Months' Procedure	Report on Voting
22G(CO)3	22G(CO)5	22G(CO)6	22G(CO)7

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

Annexes A and B are for information only.

SEMICONDUCTOR POWER CONVERTORS – ADJUSTABLE SPEED ELECTRIC DRIVE SYSTEMS – GENERAL REQUIREMENTS

Part 1: Rating specifications, particularly for d.c. motor drives

1 General

1.1 *Scope and object*

This International Standard provides alternative methods for specifying ratings for semiconductor power convertors for adjustable speed electric drive systems, particularly for d.c. motor drives.

It has been established with respect to, but is not restricted to, convertors of line- or machine-commutated type. It is not intended to cover adjustable speed drives for traction purposes.

This standard is an extension of, and an addition to, IEC 146. General information on convertors for adjustable speed d.c. motor drives is contained in IEC 146.

The term semiconductor, as used in this standard, principally means reverse blocking triode thyristor. When applicable, this standard also applies to convertors with other types of semiconductor devices (e.g. bi-directional thyristors).

1.2 *Normative references*

The following normative documents 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 normative documents 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 normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 146, *Semiconductor convertors*.

IEC 721, *Classification of environmental conditions*.

2 Definitions

For the purpose of this standard the relevant definitions given in IEC 146 apply. The following are additional definitions.

2.1 semiconductor convertor equipment (thyristor convertor unit or thyristor convertor): Functional unit for power conversion comprising one or more semiconductor assemblies together with convertor transformers, essential switching devices and other auxiliary equipment, if any. It may include the gating equipment.

2.2 Classification of semiconductor convertors

The following designations are intended to describe the functional characteristics of convertors, but not necessarily the circuits or components used.

NOTE - The figures refer only to the convertors. The rotational direction of motors may be changed by field or armature reversal.

2.3 reversible convertor: Convertor in which the flow of d.c. power is reversible.

2.4 non-reversible convertor: Convertor in which the flow of d.c. power is not reversible.

2.5 semi-convertor (one quadrant convertor): Non-reversible convertor for connection to a d.c. circuit in which there is only one possible voltage polarity and current direction (see figure 1).

2.6 single convertor: Reversible convertor connected to a d.c. circuit such that the direct current supplied by the convertor can only flow in one direction (see figure 2).

2.7 double convertor: Reversible convertor connected to a d.c. circuit such that energy can be accepted from or returned to the a.c. supply system and the direct current supplied by the convertor can flow in either direction (see figure 3).

A double convertor usually consists of two sections, one for each direction of current flow.

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NOTE - The convertor sections may be supplied from common windings, from separate windings on a common transformer, or from separate transformers.

2.8 semiconductor convertor section: Those parts of a semiconductor convertor unit, containing the power semiconductors together with their auxiliaries (including individual fuses, individual transformers or windings and individual circulating current reactors if any), in which the main direct current when viewed from the convertor unit d.c. terminals always flows in the same direction.

A semiconductor convertor section is capable of operating as an independent unit but components such as fuses, reactors, snubbers and/or heat sinks may be common to the two sections.

2.8.1 forward section (of a double convertor unit): That portion of a semiconductor convertor which operates in voltage-current quadrants 1 and 4 (see figure 2).

2.8.2 reverse section (of a double convertor unit): That portion of a semiconductor convertor which operates in voltage-current quadrants 2 and 3 (see figure 3).

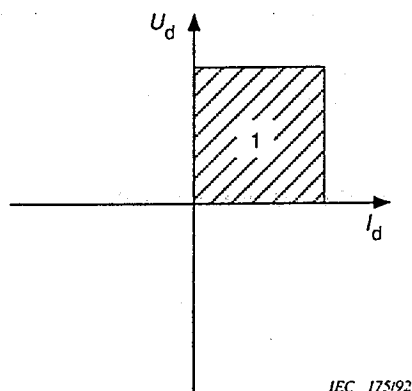


Figure 1 – Semi-converter in which the direct current can flow in one direction only and which is not capable of returning energy from the load to the alternating current supply. This form of converter operates in quadrant 1 only.

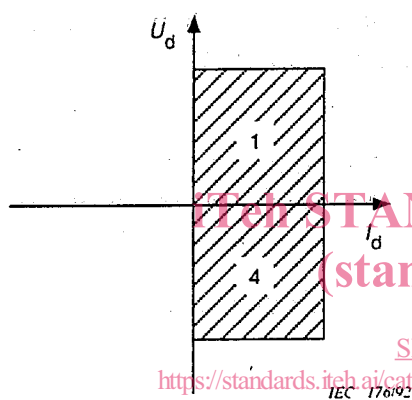


Figure 2 – Single converter in which the direct current can flow in one direction only and which is capable of returning energy from the load to the alternating current supply. This form of converter operates in quadrants 1 and 4 only.

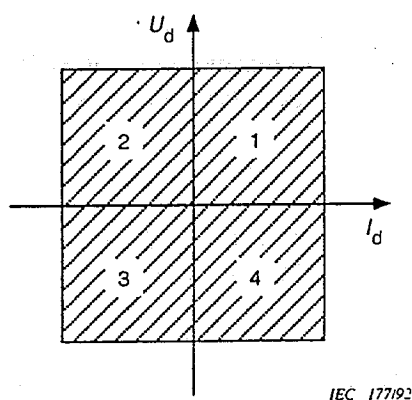


Figure 3 – Double converter in which the direct current can flow in either direction and which is capable of returning energy from the load to the alternating current supply. This form of converter operates in quadrants 1, 2, 3 and 4.

NOTE - Quadrant 1 implies motoring torque in the agreed forward direction of motor rotation.

2.9 converter transformer: Main transformer equipment of a semiconductor converter including one or more transformers or transformer windings, used to provide the desired a.c. voltages and converter circuit configuration together with all the transformer auxiliary equipment.

2.10 common convertor transformer: Common transformer feeding two or more individual convertor assemblies which may be individually or simultaneously energized through common or separate windings.

2.11 equilibrium temperature: Steady-state temperature reached by a component of a convertor under specified conditions of load and cooling.

NOTE - Steady-state temperatures are in general different for different components. The times necessary to establish the steady state are also different and proportional to thermal time constants.

2.12 rated direct current (I_{dN}): Mean value of the direct current specified by the manufacturer for specified load and service conditions. It may be referred to as the base value to which other values of direct current are compared.

NOTE - Rated continuous direct current (I_{dNM}) as defined in IEC 146 is not always applicable to convertors for adjustable speed drives.

2.13 rated direct voltage: Specified value at rated direct current of the direct voltage between the d.c. terminals of the assembly or equipment. This is the mean value of the d.c. voltage.

2.14 rated a.c. voltage: The rated r.m.s. value of the a.c. supply voltage at the supply terminals of the convertor equipment, including the transformer if one is supplied. It may be referred to as the base value to which other values of a.c. supply voltage are compared.

2.15 current-time load chart: Record of load current with respect to time.

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2.16 uniform load duty: Duty for which a convertor equipment carries a direct current of fixed value for an interval sufficiently long for the components of the convertor to reach equilibrium temperatures corresponding to the said value of current. Figure 4 illustrates this kind of duty.

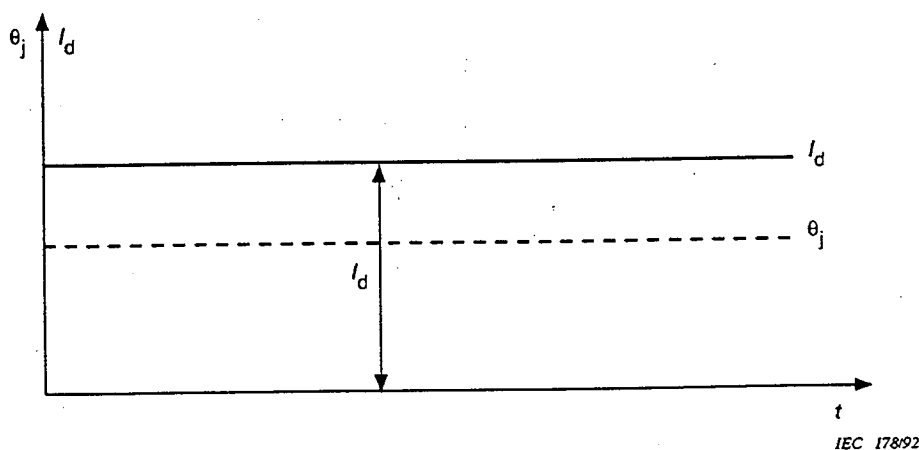


Figure 4 – Typical current-time chart for uniform load duty