# SLOVENSKI STANDARD
# SIST EN 61800-1:2001

**01-junij-2001**

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**Adjustable speed electrical power drive systems - Part 1: General requirements - Rating specifications for low voltage adjustable speed d.c. power drive systems (IEC 61800-1:1997)**

Adjustable speed electrical power drive systems -- Part 1: General requirements - Rating specifications for low voltage adjustable speed d.c. power drive systems

Drehzahlveränderbare elektrische Antriebe -- Teil 1: Allgemeine Anforderungen - Festlegungen für die Bemessung von Niederspannungs-Gleichstrom-Antriebssystemen



Entraînements électriques de puissance à vitesse variable -- Partie 1: Exigences générales - Spécifications de dimensionnement pour systèmes d'entraînement de puissance à vitesse variable en courant continu et basse tension



**Ta slovenski standard je istoveten z: EN 61800-1:1998**

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**ICS:**

| | | |
|---|---|---|
| 29.200 | Usmerniki. Pretvorniki. Stabilizirano električno napajanje | Rectifiers. Convertors. Stabilized power supply |

**SIST EN 61800-1:2001 en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 61800-1

February 1998

ICS 29.200

English version

# Adjustable speed electrical power drive systems
## Part 1: General requirements
## Rating specifications for low voltage adjustable speed d.c. power drive systems
(IEC 61800-1:1997)

Entraînements électriques de puissance à vitesse variable
Partie 1: Exigences générales
Spécifications de dimensionnement pour systèmes d'entraînement de puissance à vitesse variable en courant continu et basse tension
(CEI 61800-1:1997)

Drehzahl veränderbare elektrische Antriebe
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Festlegungen für die Bemessung von Niederspannungs-Gleichstrom-Antriebssystemen
(IEC 61800-1:1997)



This European Standard was approved by CENELEC on 1998-01-01. 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, Czech Republic, 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**



Ref. No. EN 61800-1:1998 E

## Foreword

The text of document 22G/39/FDIS, future edition 1 of IEC 61800-1, prepared by SC 22G, Semiconductor power converters for adjustable speed electric drive systems, of IEC TC 22, Power electronics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61800-1 on 1998-01-01.

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) 1998-10-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1998-10-01

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, B, C, D, E, F and G are informative.
Annex ZA has been added by CENELEC.

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## Endorsement notice



The text of the International Standard IEC 61800-1:1997 was approved by CENELEC as a European Standard without any modification.

## 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.

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| IEC 60034-1<br>+ corr. December | 1994<br>1994 | Rotating electrical machines<br>Part 1: Rating and performance | EN 60034-1 | 1995 |
| IEC 60034-2 | 1972 | Part 2: Methods for determining losses and efficiency of rotating electrical machinery from tests (excluding machines for traction vehicles) | EN 60034-2[1] | 1996 |
| IEC 60034-9 | 1990 | Part 9: Noise limits | EN 60034-9[2] | 1993 |
| IEC 60038 | 1983 | IEC standard voltages[3] | HD 472 S1 | 1989 |
| IEC 60050(111) | 1996 | International Electrotechnical Vocabulary<br>Chapter 111: Physics and chemistry | - | - |
| IEC 60050(151) | 1978 | Chapter 151: Electrical and magnetic devices | - | - |
| IEC 60050(441) | 1984 | Chapter 441: Switchgear, controlgear and fuses | - | - |
| IEC 60050(551) | -[4] | Chapter 551: Power electronics | - | - |
| IEC 60050(601) | 1985 | Chapter 601: Generation, transmission and distribution of electricity - General | - | - |
| IEC 60076 | series | Power transformers | EN 60076<br>HD 398 | series<br>series |



1) EN 60034-2 includes supplement A:1974 to IEC 60034-2.

2) EN 60034-9 is superseded by EN 60034-9:1997 which is based on IEC 60034-9:1997.

3) The title of HD 472 S1 is: *Nominal voltages for low voltage public electricity supply systems.*

4) Second edition, to be published.

| Publikation | Jahr | Titel | EN/HD | Jahr |
|---|---|---|---|---|
| IEC 60146-1-1 | 1991 | Semiconductor convertors<br>Common specifications and line commutated convertors<br>Part 1-1: Specifications of basic requirements | EN 60146-1-1 | 1993 |
| IEC 60146-1-2 | 1991 | Part 1-2: Application guide | - | - |
| IEC 60146-1-3 | 1991 | Part 1-3: Transformers and reactors | EN 60146-1-3 | 1993 |
| IEC 60204-1 (mod) | 1992 | Safety of machinery - Electrical equipment of machines<br>Part 1: General requirements | EN 60204-1[5] | 1992 |
| IEC 60364-4-41 (mod) | 1992 | Electrical installations of buildings<br>Part 4: Protection for safety<br>Chapter 41: Protection against electric shock | HD 384.4.41 S2 | 1996 |
| IEC 60529 | 1989 | Degrees of protection provided by enclosures (IP Code) | EN 60529 | 1991 |
| IEC 60664-1 | 1992 | Insulation coordination for equipment within low-voltage systems<br>Part 1: Principles, requirements and tests | HD 625.1 S1 | 1996 |
| IEC 60721-3-1 | 1987 | Classification of environmental conditions<br>Part 3: Classification of groups of environmental parameters and their severities<br>Section 1: Storage | EN 60721-3-1[6] | 1993 |
| IEC 60721-3-2 | 1997 | Section 2: Transportation | EN 60721-3-2 | 1997 |
| IEC 60721-3-3 | 1994 | Section 3: Stationary use at weather protected locations | EN 60721-3-3 | 1995 |
| IEC 61000-2-4 + corr. August | 1994 1994 | Electromagnetic compatibility (EMC)<br>Part 2: Environment<br>Section 4: Compatibility levels in industrial plants for low frequency conducted disturbances | EN 61000-2-4 | 1994 |



5) EN 60204-1 is superseded by EN 60204-1:1997 which is based on IEC 60204-1:1997.

6) EN 60721-3-1 is superseded by EN 60721-3-1:1997 which is based on IEC 60721-3-1:1997.

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| IEC 61000-4-7 | 1991 | Part 4: Testing and measurement techniques<br>Section 7: General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto | EN 61000-4-7 | 1993 |
| IEC 61136-1 (mod) | 1992 | Semiconductor power convertors<br>Adjustable speed electric drive systems<br>General requirements<br>Part 1: Rating specifications, particularly for d.c. motor drives | EN 61136-1 | 1995 |
| IEC 61800-3 | 1996 | Adjustable speed electrical power drive systems<br>Part 3: EMC product standard including specific test methods | EN 61800-3 | 1996 |
| IEC Guide 106 | 1989 | Guide for specifying environmental conditions for equipment performance rating | - | - |

# NORME INTERNATIONALE

# INTERNATIONAL STANDARD

**CEI**
**IEC**
**61800-1**

Première édition
First edition
1997-12

## Entraînements électriques de puissance à vitesse variable –

## Partie 1: Exigences générales – Spécifications de dimensionnement pour systèmes d'entraînement de puissance à vitesse variable en courant continu et basse tension



## Adjustable speed electrical power drive systems –

## Part 1: General requirements – Rating specifications for low voltage adjustable speed d.c. power drive systems



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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE XD

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

# CONTENTS

Clause Page





Annexes

INTERNATIONAL ELECTROTECHNICAL COMMISSION

# ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

## Part 1: General requirements – Rating specifications for low voltage adjustable speed d.c. power drive systems

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.

3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.

4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity in one of its standards.

6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.



International Standard IEC 61800-1 has been prepared by subcommittee 22G: Semiconductor power converters for adjustable speed electric drive systems, of IEC technical committee 22: Power electronics.

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

| FDIS | Report on voting |
|---|---|
| 22G/39/FDIS | 22G/42/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.

Annexes A, B, C, D, E, F, and G are for information only.

# ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

## Part 1: General requirements – Rating specifications for low voltage adjustable speed d.c. power drive systems

## 1 General

### 1.1 Scope and object

This part of IEC 61800 applies to general purpose adjustable speed d.c. drive systems which include the power conversion, control equipment, and also a motor or motors. Excluded are traction and electrical vehicle drives.

It applies to power drive systems (PDS) connected to line voltages up to 1 kV a.c., 50 Hz or 60 Hz.

EMC aspects are covered in IEC 61800-3.

This part of IEC 61800 gives the characteristics of the converters and their relationship with the complete d.c. drive system. It also states their performance requirements with respect to ratings, normal operating conditions, overload conditions, surge withstand capabilities, stability, protection, a.c. line earthing, and testing. Furthermore, it deals with application guidelines, such as control strategies, diagnostics, and topologies.



This part of IEC 61800 is intended to define a complete d.c. PDS in terms of its performance and not in terms of individual subsystem functional units.



### 1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61800. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 61800 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 60034-1: 1994, *Rotating electrical machines – Part 1: Rating and performance*

IEC 60034-2: 1972, *Rotating electrical machines – Part 2: Methods for determining losses and efficiency of rotating electrical machinery from tests (excluding machines for traction vehicles)*

IEC 60034-9: 1990, *Rotating electrical machines – Part 9: Noise limits*

IEC 60038: 1983, *IEC standard voltages*

IEC 60050 (111): 1996, *International electrotechnical vocabulary (IEV) – Chapter 111: Physics and chemistry*

IEC 60050 (151): 1978, *International electrotechnical vocabulary (IEV) – Chapter 151: Electrical and magnetic devices*

IEC 60050 (441): 1984, *International electrotechnical vocabulary (IEV) – Chapter 441: Switchgear, controlgear and fuses*

IEC 60050 (551): *International electrotechnical vocabulary (IEV) – Chapter 551: Power electronics*[1)]

IEC 60050 (601): 1985, *International electrotechnical vocabulary (IEV) – Chapter 601: Generation, transmission and distribution of electricity – General*

IEC 60076, *Power transformers*

IEC 60146-1-1: 1991, *Semiconductor convertors. Common specifications and line commutated convertors – Part 1-1: Specification of basic requirements*

IEC 60146-1-2: 1991, *Semiconductor convertors. Common specifications and line commutated convertors – Part 1-2: Application guide*

IEC 60146-1-3: 1991, *Semiconductor convertors. Common specifications and line commutated convertors – Part 1-3: Transformers and reactors*

IEC 60204-1: 1992, *Electrical equipment of industrial machines – Part 1: General requirements*

IEC 60364-4-41: 1992, *Electrical installations of buildings of buildings – Part 4: Protection for safety – Chapter 41: Protection against electric shock*

IEC 60529: 1989, *Degrees of protection provided by enclosures (IP code)*

IEC 60664-1: 1992, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*



IEC 60721-3-1: 1987, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities. Storage*



IEC 60721-3-2: 1997, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities. Transportation*

IEC 60721-3-3: 1994, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 3: Stationary use at weather protected locations*

IEC 61000-2-4: 1994, *Electromagnetic compatibility (EMC) – Part 2: Environment – Section 4: Compatibility levels in industrial plants for low frequency conducted disturbances*

IEC 61000-4-7: 1991, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 7: General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto*

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

IEC 61800-3: 1996, *Adjustable speed electrical power drive systems – Part 3: EMC product standard including specific test methods*

IEC guide 106: 1989, *Guide for specifying environmental conditions for equipment performance rating*

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1) Second edition, to be published.

### 1.3 Symbols

Table 1 lists symbols defined and/or used in this part of IEC 61800.

Table 2 lists symbols and units for motor parameters.

**Table 1 – Symbols**

| Parameter | Symbol | Unit | Definition |
|---|---|---|---|
| Rated system voltage | $U_{LN}$ | V | 2.4.1 |
| Rated system frequency | $f_{LN}$ | Hz | 2.4.2 |
| Line-side converter rated a.c. voltage | $U_{VN}$ | V | 2.4.3 |
| Line-side rated a.c. current of the CDM/BDM | $I_{LN}$ | A | 2.4.4 |
| Rated input current of the converter | $I_{VN}$ | A | 2.4.5 |
| Line-side harmonic content | $H_L$ | V ou A | 2.4.6 |
| Line-side total harmonic distortion | THD | % | 2.4.8 |
| Converter input displacement factor | $\cos \varphi_{V1}$ | | 2.4.9 |
| Line-side displacement factor | $\cos \varphi_{L1}$ | | 2.4.10 |
| Input total power factor | $\lambda_L$ | | 2.4.11 |
| Maximum a.c. system, symmetrical short-circuit current | $I_{SCM}$ | A | 2.4.12 |
| Short-circuit ratio | $R_{SC}$ | | 2.4.12 |
| DC current | $I_d$ | A | 2.5.1 |
| Rated continuous output current | $I_{dN}$ | A | 2.5.2 |
| Overload output current (overload capability) | $I_{dM}$ | A | 2.5.3 |
| Rated output voltage | $U_{dN}$ | V | 2.5.5 |
| Voltage ripple content | $U_{pp}$ | V | 2.5.6 |
| Current ripple content | $I_{pp}$ | A | 2.5.6 |
| Efficiency of drive system | $\eta_D$ | % | 2.5.8 |
| Efficiency of CDM | $\eta_C$ | % | 2.5.8 |
| Base speed | $N_0$ | r/min | 2.7.3 |
| Maximum operating speed | $N_M$ | r/min | |
| Minimum operating speed | $N_{min}$ | r/min | |
| Maximum safe motor speed | $N_{smax}$ | r/min | 2.7.4 |
| Torque | $M$ | Nm | |
| Inertia | $J$ | kgm$^2$ or Nms$^2$ | |