IEC

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

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Adjustable speed electrical power drive systems – Part 1: General requirements – Rating specifications for low voltage adjustable speed DC power drive systems

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

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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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CONTENTS

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ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

Part 1: General requirements – Rating specifications for low voltage adjustable speed DC power drive systems

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61800-1 has been prepared by subcommittee 22G: Adjustable speed electric power drive systems (PDS), of IEC technical committee 22: Power electronic systems and equipment.

This second edition cancels and replaces the first edition published in 1997. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) the clause structure has been harmonized with IEC 61800-2;
b) Clause 2 has been updated;
c) Clause 3 has been updated including fundamental definitions to be used across IEC 61800 (all parts);
d) Clause 4 has been updated with respect to:

1) description of the basic topology for *BDM/CDM/PDS* (4.2);
2) ratings and performance (4.3 and 4.4);
3) reference to applicable standards within the IEC 61800 series with respect to EMC (IEC 61800-3), general safety (IEC 61800-5-1), functional safety (IEC 61800-5-2), load duty aspects (IEC TR 61800-6), communication profiles (IEC 61800-7 series), *power interface* voltage (IEC TS 61800-8), and ecodesign energy efficiency standards (IEC 61800-9) to avoid conflicting requirements (4.5, 4.6, 4.7, 4.10, 4.11, 4.12);
4) update of requirement for ecodesign (4.8);
5) update of requirement for environmental evaluation (4.9);
6) implementation of requirement for explosive atmosphere (4.13);

e) Clause 5 has been updated with test requirement in order to provide a clear link between design requirement and test requirement;

f) Clause 6 has been updated to harmonize the marking and documentation requirement within IEC 61800 (all parts);

g) the Annexes have been updated.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
22G/430/FDIS	22G/433/RVD

Full information on the voting for the approval of this document can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61800 series, published under the general title *Adjustable speed electrical power drive systems*, can be found on the IEC website.

In this document, the terms in *italics* are defined in Clause 3.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

0.1 General

This document is part of the IEC 61800 series specifying requirements for adjustable *speed* electrical *power drive systems* (*PDS*s). Since the publication of the first edition of IEC 61800-1, several documents of the IEC 61800 series have been developed and maintained, which has resulted in outdated references and conflicting requirements across the IEC 61800 series.

This document contains general requirements for *PDS*s intended to feed DC *motors* and with rated *converter* input voltages (line-to-line voltage) up to and including 1 000 V AC.

0.2 Consistency of requirement

This document specifies requirements for *PDS*s under its scope for the identified topics not covered by any other of the standards in the IEC 61800 series.

The following requirements are covered by other standards in the IEC 61800 series:

- AC *PDS* requirements are covered by IEC 61800-2;
- EMC requirements are covered by IEC 61800-3;
- general safety requirements are covered by IEC 61800-5-1;
- functional safety requirements are covered by IEC 61800-5-2;
- type of load duty guidance is covered by IEC TR 61800-6;
- interface and use profiles requirements are covered by IEC 61800-7 (all parts);
- *power interface* voltage specification is covered by IEC TS 61800-8;
- ecodesign energy *efficiency* requirements of drive system are covered by IEC 61800-9 (all parts).

NOTE IEC 61800-9 series only provides requirements for AC PDS. Requirements for the Energy *Efficiency* classification, the set of power losses limits and measurement methods from IEC 61800-9-2 cannot be directly applicable to DC PDS. The Extended product approach (EPA) and Semi analytic Model (SMA) from IEC 61800-9-1 are in principle applicable to DC PDS.

Generally, this document provides a basic description of topics and refers to the relevant standard for specific requirement. This is done in order to ensure consistency and avoid conflicting requirement within IEC 61800 (all parts) as well as minimize future maintenance of the documents.

As a result of the development of the IEC 61800 series of standards, the need to reference documents outside the series has decreased.

0.3 Tool for agreement between *customer* and *manufacturer*

This document is intended to be used to create a comprehensive list of requirements to be used as a specification between *customer* and *manufacturer*. The requirement in this document is in itself not applicable for the *BDM/CDM/PDS*. Instead, each topic should be specified by the *customer* as a compliance requirement.

The document may be useful as a specification tool, when *BDM/CDM/PDS*s are built into a final *installation* or application applied as a component. The following applications are considered relevant: lift and hoist, machinery, conveyor, industrial switchgears applications, heating and ventilation, pump, excitation systems, tidal and marine applications.

In every application, an identification of the environmental conditions under which the product is stored, transported and operated is essential for the proper specification of the *BDM/CDM/PDS*s. The environmental conditions considered should include electrical, mechanical, thermal, pollution, explosive environmental conditions and humidity environmental condition.

ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

Part 1: General requirements – Rating specifications for low voltage adjustable speed DC power drive systems

1 Scope

This part of IEC 61800 applies to adjustable *speed* electric *DC power drive systems*, which include semiconductor power conversion and the means for their control, protection, monitoring, measurement and the *DC motor*s.

It applies to adjustable *speed* electric *power drive systems* intended to feed *DC motor*s from a *BDM/CDM* connected to line-to-line voltages up to and including 1 kV AC 50 Hz or 60 Hz and/or voltages up to and including 1,5 kV DC input side.

NOTE 1 Adjustable *speed* electric AC *power drive systems* intended to feed AC *motor*s are covered by IEC 61800-2.

NOTE 2 This document can be used as a reference for adjustable speed electric *power drive system*s, intended to feed *DC motor*s from a *BDM/CDM* connected to line-to-line voltages up to and including 1,5 kV AC, 50 Hz or 60 Hz and/or voltages up to and including 2,25 kV DC input side.

Traction applications and electric vehicles are excluded from the scope of this document.

This document is intended to define the following aspects of a *DC power drive system* (*PDS*):

- principal parts of the *PDS*;
- ratings and performance;
- specifications for the environment in which the *PDS* is intended to be installed and operated;
- other specifications which might be applicable when specifying a complete *PDS*.

This document provides minimum requirements, which may be used for the development of a specification between *customer* and *manufacturer*.

Compliance with this document is possible only when each topic of this document is individually specified by the *customer* developing specifications or by product standard committees developing product standards.

For some aspects which are covered by specific *PDS* product standards in the IEC 61800 series, this document provides a short introduction and reference to detailed requirements in these product standards.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60034 (all parts), *Rotating electrical machines*

IEC 60034-1:2017, *Rotating electrical machines – Part 1: Rating and performance*

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

IEC TS 60034-25, *Rotating electrical machines – Part 25: AC electrical machines used in power drive systems – Application guide*

IEC 60038, *IEC standard voltages*

IEC 60068 (all parts), *Environmental testing*

IEC 60068-2-27:2008, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60076 (all parts), *Power transformers*

IEC 60076-1, *Power transformers – Part 1: General*

IEC 60076-6, *Power transformers – Part 6: Reactors*

IEC 60079 (all parts), *Explosive atmospheres*

IEC TS 60079-42, *Explosive atmospheres – Part 42: Electrical safety devices for the control of potential ignition sources for Ex-Equipment*

IEC 60146-1-1:2009, *Semiconductor converters – General requirement and line commutated converters – Part 1-1: Specification of basic requirements*

IEC 60364 (all parts), *Low voltage electrical installations*

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

IEC 60721-2-6, *Classification of environmental conditions – Part 2: Environmental conditions appearing in nature – Earthquake vibration and shock*

IEC 60721-3-1:1997, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 1: Storage*

IEC 60721-3-2:1997, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 2: 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 weatherprotected locations*
IEC 60721-3-3:1994/AMD1:1995
IEC 60721-3-3:1994/AMD2:1996

IEC 60721-3-4:1995 *Classification of environmental conditions – Part 3-4: Classification of groups of environmental parameters and their severities – Stationary use at non-weatherprotected locations*
IEC 60721-3-4:1995/AMD1:1996

IEC 61158 (all parts), *Industrial communication networks – Fieldbus specifications*

IEC 61378 (all parts), *Converter transformers*

IEC 61800-2, *Adjustable speed electrical power drive systems – Part 2: General requirements – Rating specifications for low voltage adjustable speed a.c. power drive systems*