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Adjustable Speed Electrical Power Drive Systems

Part 9-2: Ecodesign for power drive systems, motor starters, power electronics and their driven applications - Energy efficiency indicators for power drive systems and motor starters

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

Part 9-2: Ecodesign for power drive systems, motor starters, power electronics and their driven applications – Energy efficiency indicators for power drive systems and motor starters

FOREWORD

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International Standard IEC 61800-9-2 has been prepared by subcommittee 22G: Adjustable speed electric drive systems incorporating semiconductor power converters, of IEC technical committee 22: Power electronic systems and equipment.

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

FDIS	Report on voting
22G/349/FDIS	22G/352/RVD

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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 publication 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.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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INTRODUCTION

This part of IEC 61800 has been developed to allow evaluation of power losses of CDMs (complete drive modules) and PDSs (power drive systems).

The requirements for measuring energy efficiency of motors with non-sinusoidal supply are under the responsibility of IEC/TC 2 and will be published under the IEC 60034 series.

IEC SC 22G includes the standardization task force for dealing with this topic. It has close collaboration with several other technical committees (for example, IEC TC 2, IEC SC 121A).

IEC SC 22G maintains responsibility for all relevant aspects in the field of energy efficiency and ecodesign requirements for power electronics, switchgear, control gear and power drive systems and their industrial applications.

The core requirements of energy efficiency standardization are illustrated in Figure 1. The work has been agreed to provide the reasonable target as a best compromise.

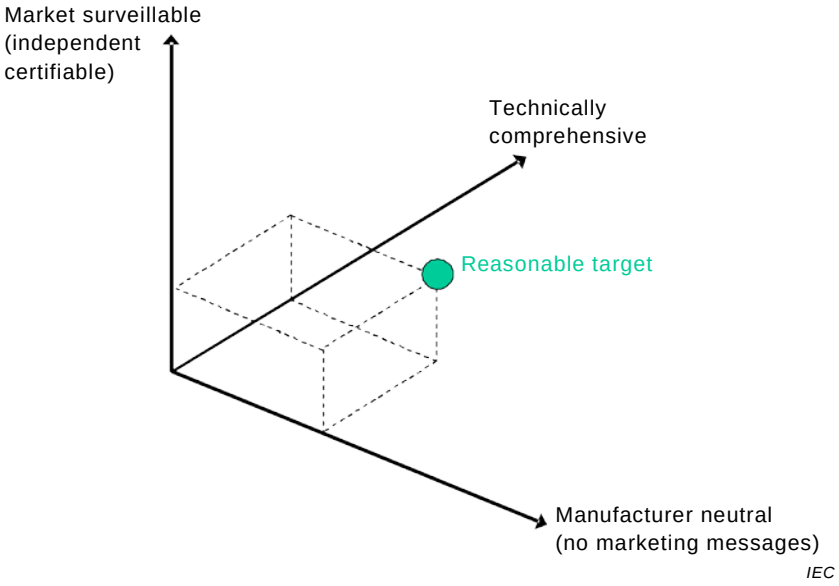

Figure 1 – Illustration of core requirements of energy efficiency standardization

IEC 61800 (all parts) does not deal with mechanical engineering components.

NOTE Geared motors (motors with directly adapted gearboxes) are treated like power drive systems (converter plus motor). See IEC 60034-30-1 for classification of the losses of a geared motor. The efficiency classes of gearboxes as individual components are under consideration.

IEC 61800-9-2 is a subpart of the IEC 61800 series, which has the following structure:

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

– *Part 2: General requirements – Rating specifications for low voltage adjustable speed AC power drive systems*

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– *Part 3: EMC requirements and specific test methods*
– *Part 4: General requirements – Rating specifications for AC power drive systems above 1 000 V AC and not exceeding 35 kV*
– *Part 5: Safety requirements*
– *Part 6: Guide for determination of types of load duty and corresponding current ratings*
– *Part 7: Generic interface and use of profiles for power drive systems*
– *Part 8: Specification of voltage on the power interface*
– *Part 9: Ecodesign for power drive systems, motor starters, power electronics and their driven applications*

Each part is further subdivided into several subparts, published either as International Standards or as Technical Specifications or Technical Reports, some of which have already been published. Other will be published with the part number followed by a dash and a second number identifying the subdivision (example: IEC 61800-9-2).

It considers basic requirements from the EN 50598-2 CENELEC standard published on 2014-12-19 and considers also the following key points in cooperation with relevant technical committees.

It has been developed in close collaboration with other technical committees (IEC TC 2, IEC SC 121A) and with a customer's stakeholder committee CEN/TC 197 in order to provide a comprehensive standard for energy efficiency and ecodesign requirements.

Key points:

- Requirements for energy-efficient design of electric drive systems in accordance with the driven load
- Requirements and IE-classification of complete drive modules (CDM)
- Requirements and IES-classification of power drive systems (PDS)
- Determination of PDS losses and requirements for the link to the driven equipment for the determination of energy efficiency classification/evaluation of the extended product
- Requirements for an environmentally conscious system design and environmental declaration of a motor system

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ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

Part 9-2: Ecodesign for power drive systems, motor starters, power electronics and their driven applications – Energy efficiency indicators for power drive systems and motor starters

1 Scope

This part of IEC 61800 specifies energy efficiency indicators of power electronics (complete drive modules, CDM), power drive systems (PDS) and motor starters, all used for motor driven equipment.

It specifies the methodology for the determination of losses of the complete drive module (CDM), the power drive system (PDS) and the motor system.

It defines IE and IES-classes, their limit values and provides test procedures for the classification of the overall losses of the motor system.

Furthermore, this document proposes a methodology for the implementation of the best energy efficiency solution of drive systems. This depends on the architecture of the motor driven system, on the speed/load profile and on the operating points over time of the driven equipment.

The methodology of the extended product approach and the semi analytical models are defined in IEC 61800-9-1.

The structure of this document is as follows:

- the losses of standardized reference PDS (RPDS), standardized reference CDM (RCDM) and the mathematical model for their calculation are given and classified;
- the reference motor (RM) and the reference CDM (RCDM) are defined and can be used to determine the efficiency class of a motor system when one of its constituents is unknown;
- the requirements for the determination of the losses of a real PDS and a real CDM are given and compared to the reference RPDS and RCDM;
- the requirements for type testing and user documentation are given;
- some exemplary losses of an overall system are illustrated in annexes;
- information about system and drive topologies are given in annexes.

Specific data for power losses of RCDM, RM, RPDS and IE/IES-classes are given for low voltage (100 V up to and equal to 1 000 V), single axis AC/AC power drive systems with three-phase motors. Geared motors are treated as standard motors when motor and gearbox can be separated.

All provided reference data is derived from PDS with induction motors. It may be used for all types of PDS with other types of motors as well.

The application of this document to the following equipment may be technically possible but is not mandatory:

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