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Adjustable speed electrical power drive systems -
Part 9-1: Ecodesign for ~~power drive~~ motor systems~~, motor starters, power electronics and their driven applications~~ -
General requirements for setting energy efficiency standards ~~for power driven equipment using the extended~~

ICS 29.200; 29.130.01; 29.160.30

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Adjustable speed electrical power drive systems - Part 9-1: Ecodesign for ~~power drive~~ motor systems~~, motor starters, power electronics and their driven applications~~ - General requirements for setting energy efficiency standards ~~for power driven equipment using the extended~~

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 61800-9-1:2017. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 61800-9-1 has been prepared by subcommittee 22G: Adjustable speed electric drive systems (PDS), of IEC technical committee 22: Power electronic systems and equipment. It is an International Standard.

It has the status of a group energy efficiency publication in accordance with IEC Guide 118.

This second edition cancels and replaces the first edition published in 2017. This edition constitutes a technical revision.

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

a) addition of Annex D - Examples of indexing and evaluation of energy consumption;

b) correction of errors of symbols in several formulas and tables.

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

Draft	Report on voting
22G/525/CDV	22G/536/RVC

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

Words **in bold** in the text are defined in Clause 3.

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 document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,

– withdrawn, or

– revised.

INTRODUCTION

IEC SC 22G includes the standardization task force for dealing with energy efficiency of **motor systems**. 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 a reasonable target as a best compromise.

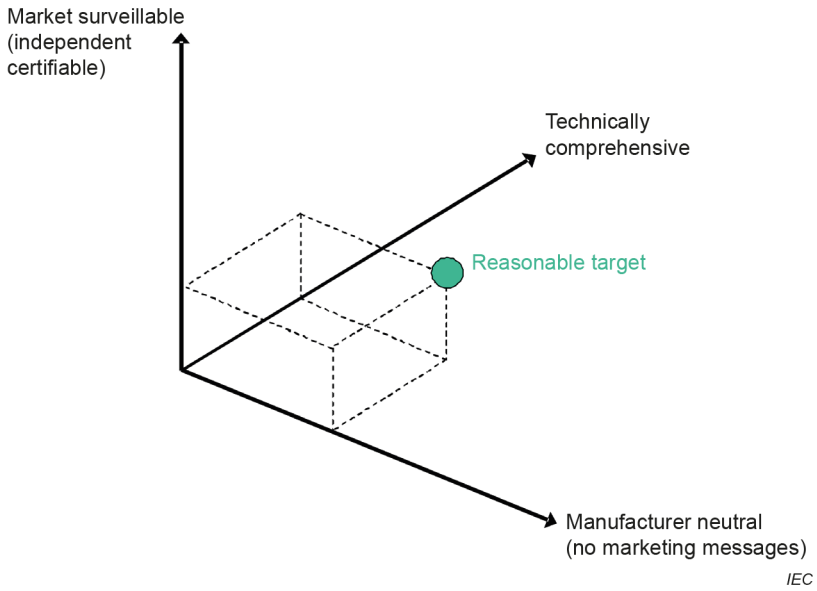


Figure 1 – Illustration of core requirements of energy efficiency standardization

The IEC 61800 series 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 61800-9-1 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
– Part 3: EMC requirements and specific test methods for PDS and machine tools
– ~~Part 4: General requirements – Rating specifications for a.c. power drive systems above 1 000 V a.c. 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~~ motor systems

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

This part of IEC 61800-9 is an International Standard for characterizing the energy efficiency of **motor systems** when supplied by a motor starter or by a variable voltage/frequency converter. The goal of this document is to establish a clear and simple system for the comparison of the energy performance of **motor systems** that can help manufacturers to improve their products, to give users the necessary transparency and information and to provide a robust reference base for regulators and minimum energy performance standards.

The IEC 61800-9 series (ecodesign for ~~power drive~~ **motor systems**~~, motor starters, power electronics and their driven applications~~) consists of the following subparts:

– Subpart 9-1: *General requirements for setting energy efficiency standards* ~~*for power driven equipment using the extended product approach (EPA) and semi analytic model (SAM)*~~

– Subpart 9-2: *Energy efficiency* ~~*indicators for power drive systems and motor starters*~~ *determination and classification*

1 Scope

This part of IEC 61800 specifies the general methodology to energy efficiency standardization for any **extended product** by using the guidance of the **extended product approach** (**EPA**).

It enables product committees for driven equipment connected to **motor systems** (so called **extended products**) to interface with the relative power losses of the connected **motor system** (e.g. power drive system) in order to calculate the system energy efficiency for the whole application.

This is based on specified calculation models for speed/load profiles, the **duty profile**s and relative power losses of appropriate torque versus speed operating points.

~~This document specifies the methodology of determination of losses of the extended product and its sub-parts.~~

This document is applicable to **motor systems** operated by a motor starter or by a converter (power drive system).

This document does not specify requirements for environmental impact declarations.

Power drive systems designed to drive DC motors are not included in the scope of this document.

This document is a group energy efficiency publication as defined in IEC Guide 118 with the energy efficiency function to establish a clear and simple system methodology for the comparison of the energy performance of **motor systems** to help product and system improvement.

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 60050-161, *International Electrotechnical Vocabulary - Part 161: Electromagnetic compatibility* (available at www.electropedia.org)

~~IEC 60034-2-1:2014, *Rotating electrical machines – Part 2-1: Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles)*~~

IEC ~~TS~~ 60034-2-3:2024, *Rotating electrical machines - Part 2-3: Specific test methods for determining losses and efficiency of converter-fed AC ~~induction~~ motors*

~~IEC 61800-9-2:2016, *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*~~

IEC 61800-9-2:2023, *Adjustable speed electrical power drive systems (PDS) - Part 9-2: Ecodesign for motor systems - Energy efficiency determination and classification*
IEC 61800-9-2:2023/AMD1:2025

IEC Guide 118, *Preparation of basic and group energy efficiency publications including energy efficiency aspects*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-161 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

– IEC Electropedia: available at https://www.electropedia.org/

– ISO Online browsing platform: available at https://www.iso.org/obp

3.1.1
duty profile
~~load-time **profile**~~
annual distribution load points with associated time fraction

Note 1 to entry: The **duty profile** may consist of only one operating point.

3.1.2
energy efficiency ~~index~~ indicator
EEI
generic value describing the energy efficiency of an ~~application, resulting from the **extended product** approach (EPA)~~ **extended product** operating with a specified **duty profile**

Note 1 to entry: Examples of EEI include the energy efficiency index defined by the pump industry to characterize pump systems, or the weighted average electrical power described in Annex B.

3.1.3
extended product
EP
driven equipment together with its connected **motor system** (e.g. a PDS)

Note 1 to entry: See Figure 2.

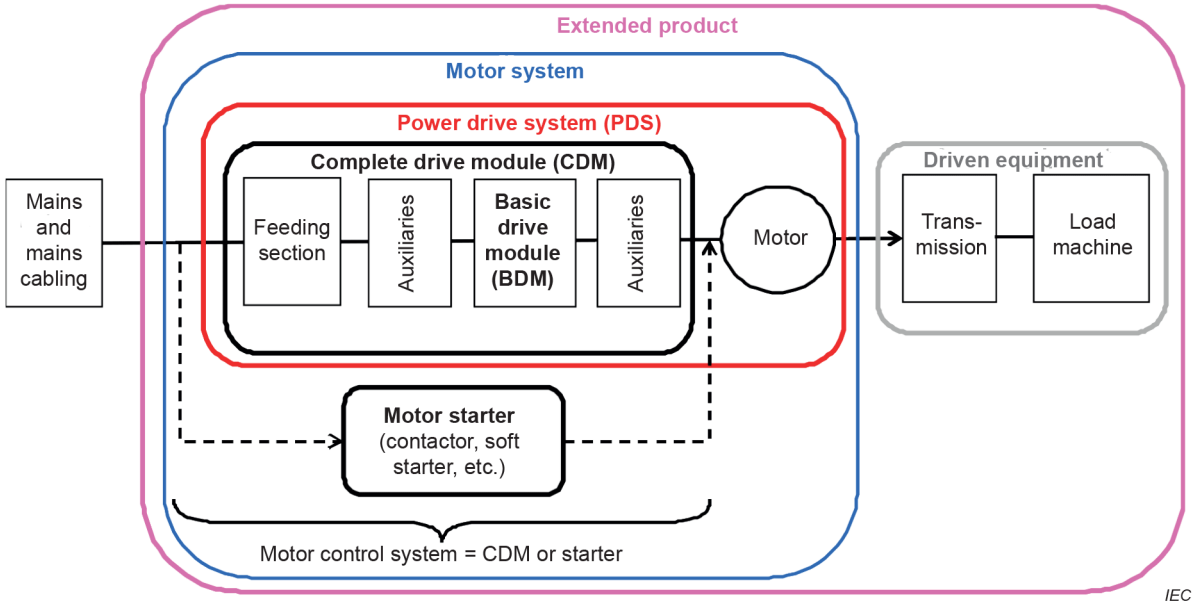


Figure 2 – Illustration of the extended product with embedded motor system