IEC 61800-9-1

Edition 2.0 2026-11

INTERNATIONAL STANDARD

REDLINE VERSION

HORIZONTAL PUBLICATION

GROUP ENERGY EFFICIENCY PUBLICATION

Sample Document
any full document from standards.iteh.ai

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

ISBN 978-2-8327-1604-5

IEC 61800-9-1:2026-11(en)

IEC 61800-9-1:2026 • https://standards.iteh.ai/catalog/standards/iec/6af4e577-8fd1-4c5c-b9ec-987964cd7d1b/iec-61800-9-1-2026

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2026 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

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

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

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

Sample Document
get full document from standards.iteh.ai

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD 3
INTRODUCTION 5
1 Scope 7
2 Normative references 7
3 Terms, definitions and symbols 8
3.1 Terms and definitions 8
3.2 Symbols 9
4 Requirements for the development of energy efficiency standards for extended products 11
4.1 General 11
4.2 Responsibility of the extended product standard or technical committee 12
4.3 Elements to achieve the extended product approach 13
5 ~~Requirements for~~ The semi analytic model (SAM) of the extended product 14
6 Requirements for the semi analytic model (SAM) of the motor system 15
6.1 General 15
6.2 Operating points of the PDS 16
6.3 Requirements if the motor system contains no CDM 16
7 Merging the semi analytic models (SAMs) to the extended product approach 17
7.1 General 17
7.2 Speed versus torque loss points of a motor system 19
7.3 How to determine intermediate speed versus torque loss points of a motor system 20
7.3.1 General 20
7.3.2 Loss determination by maximum losses of neighbouring loss points 21
7.3.3 Loss determination by two-dimensional interpolation of losses of neighbouring loss points 21
7.3.4 PDS loss calculation in the field weakening range up to 200 % of rated speed 22
Annex A (informative) Example of how to apply the SAM in the EPA for pump systems with a required speed versus torque loss points using the PDS 23
Annex B (informative) Calculation of the energy consumption based on the duty profile 25
Annex C (informative) Basic torque and power versus speed profiles, operating points over time 26
C.1 General 26
C.2 Basic torque and power versus speed profiles 26
C.3 Operating points over time 27
C.4 Definition of the operating points over time 27
C.4.1 General 27
C.4.2 Calculation of the energy consumption based on the operating points over time 28
C.4.3 Example of loss calculation for different operating points over time 29
Annex D (informative) Examples of indexing and evaluation of energy consumption 32
D.1 Indices 32
D.2 Evaluation of the energy consumption 32
Bibliography 35

Figure 1 – Illustration of core requirements of energy efficiency standardization 5

Sample Document

IEC 61800-9-1:2026 • https://standards.iteh.ai/catalog/standards/iec/6af4e577-8fd1-4c5c-b9ec-987964cd7d1b/iec-61800-9-1-2026

Figure 2 – Illustration of the extended product with embedded motor system 8
Figure 3 – Stakeholders and responsibilities for determination of the energy efficiency indicator for an extended product 12
Figure 4 – Illustration of the operating points (shaft speed, torque) for the determination of relative losses of the power drive system (PDS) 16
Figure 5 – Speed versus torque relative power loss operating points to determine the motor starter or ~~switchgear~~ soft starter losses 17
Figure 6 – Responsibilities and workflow to derive the energy efficiency ~~index~~ indicator (EEI) of an extended product 19
Figure 7 – Four segments of deviating operating points of a PDS 20
Figure 8 – Two-dimensional interpolation for deviating operating points 21
Figure A.1 – Three points of relative losses and shaded area of interest for the pump manufacturers while defining their EEI (energy efficiency index) 23
Figure A.2 – Example – How the SAMs of the PDS and the pump system ~~shall~~ interact with the resulting efficiency index of a pump system 24
Figure C.1 – Typical basic torque and power vs. speed profiles 27
Figure C.2 – Example of operating points over time 28

Table 1 – Illustration of how to combine essential elements of the efficiency contributions 14
Table C.1 – Operating points over time for the investigated examples 29
Table C.2 – Losses in the specified operating points for configuration 1 29
Table C.3 – Losses in the specified operating points for configuration 2 30
Table D.1 – Example of avoided emissions with a pump 33

Sample Document
get full document from standards.iteh.ai

IEC 61800-9-1:2026 • https://standards.iteh.ai/catalog/standards/iec/6af4e577-8fd1-4c5c-b9ec-987964cd7d1b/iec-61800-9-1-2026

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

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

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.
2) The formal decisions or agreements of 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 IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

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.

Sample Document

IEC 61800-9-1:2026 • https://standards.iteh.ai/catalog/standards/iec/6af4e577-8fd1-4c5c-b9ec-987964cd7d1b/iec-61800-9-1-2026

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.

Sample Document

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.

get full document from standards.iteh.ai

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.

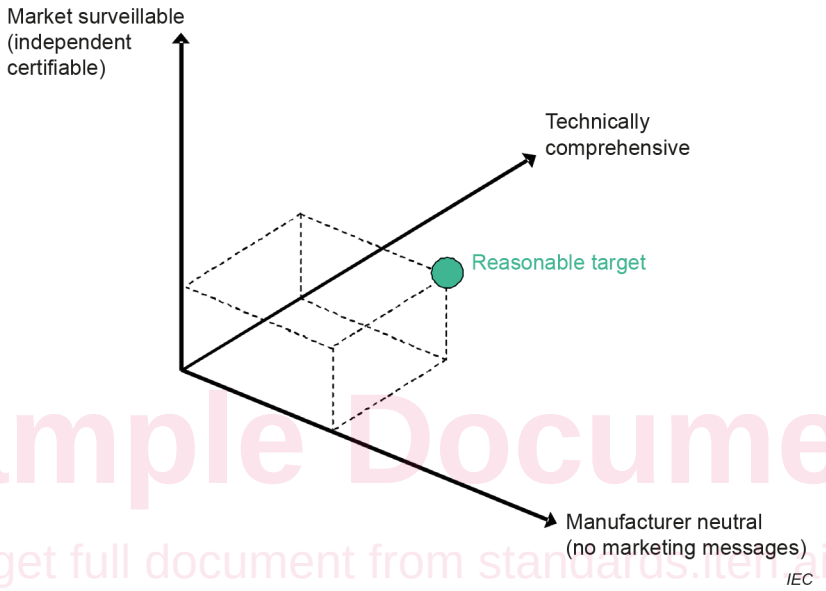
IEC 61800-9-1:2026 • https://standards.iteh.ai/catalog/standards/iec/6af4e577-8fd1-4c5c-b9ec-987964cd7d1b/iec-61800-9-1-2026

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.



Sample Document
get full document from standards.iteh.ai

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

IEC 61800-9-1:2026 • https://standards.iteh.ai/catalog/standards/iec/6af4e577-8fd1-4c5c-b9ec-987964cd7d1b/iec-61800-9-1-2026

~~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*

Sample Document

get full document from standards.iteh.ai

IEC 61800-9-1:2026 • https://standards.iteh.ai/catalog/standards/iec/6af4e577-8fd1-4c5c-b9ec-987964cd7d1b/iec-61800-9-1-2026

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.

Sample Document
get full document from standards.iteh.ai

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*

IEC 61800-9-1:2026 • https://standards.iteh.ai/catalog/standards/iec/6af4e577-8fd1-4c5c-b9ec-987964cd7d1b/iec-61800-9-1-2026

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.

Sample Document
get full document from standards.iteh.ai

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.

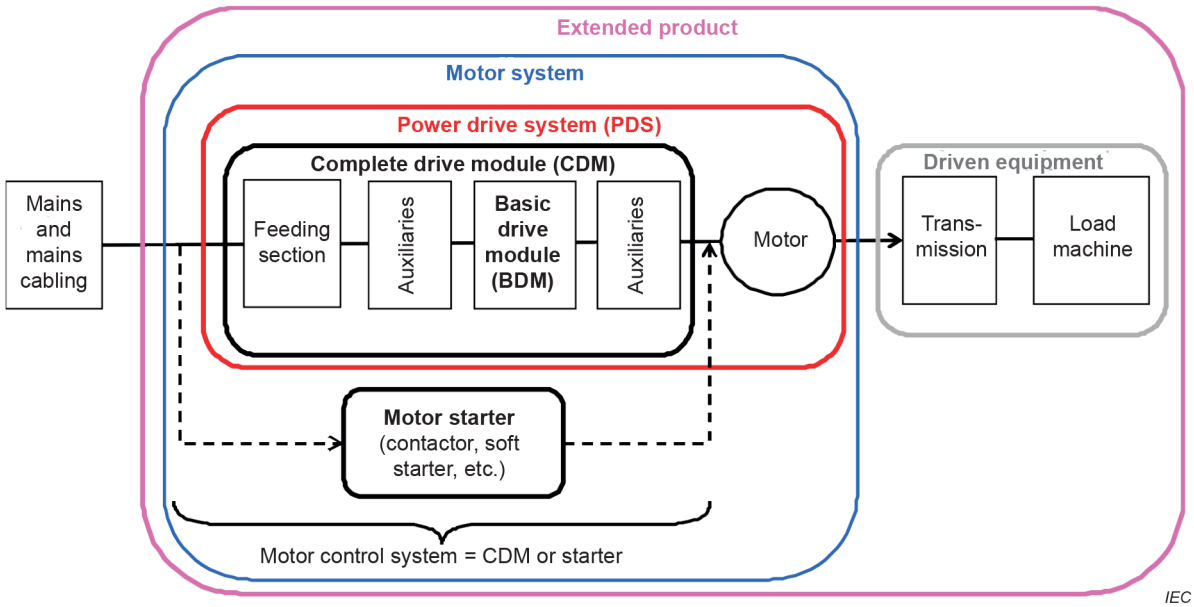


Figure 2 – Illustration of the extended product with embedded motor system

IEC 61800-9-1:2026 • https://standards.iteh.ai/catalog/standards/iec/6af4e577-8fd1-4c5c-b9ec-987964cd7d1b/iec-61800-9-1-2026

3.1.4
extended product approach
EPA
methodology to determine the **energy** ~~eficiency index~~ **efficiency indicator** (**EEI**) of the **extended product** (**EP**) using the speed torque profiles of the driven equipment, the ~~relative~~ power losses of the **motor system** and the **duty profile** of the application

Note 1 to entry: The fan energy index (FEI) is used as the energy index for the fan industry.

3.1.5
extended product standard committee
body in charge of the standardization of the **energy efficiency indicator**s for a given **extended product**

Note 1 to entry: **Extended product** committees can be ISO or IEC technical committees, or other relevant bodies.

3.1.6
load-time profile
fraction of time spent at each operating point during the total operating time or a complete cycle of operation of the **extended product**

Note 1 to entry: Typically, a **load-time profile** is represented by a histogram.

Note 2 to entry: The standby mode can be included in the **load-time profile**.

3.1.7
motor control equipment
complete drive module (CDM) or motor starter

Sample Document

3.1.8
motor system
motor control equipment and motor

get full document from standards.iteh.ai

3.1.9
semi analytic model
SAM
determination model for the losses of a **motor system** or driven equipment

Note 1 to entry: **SAMs** include physical and mathematical parameters and calculation algorithms of the subparts of an EP. **SAMs** are necessary to determine the typical relative power losses of the subparts of an EP in order to determine its overall losses.

3.1.10
transmission
~~any~~ component ~~(coupling, Gear box, etc.)~~ which connects the motor shaft to the load machine ~~(~~e.g. fan, pump~~): coupling, gearbox~~ or compressor

Note 1 to entry: A component can be for example a coupling or a gear box.

3.2 Symbols

3.2.1
$E_{\text{electrical}}$
electrical energy [kWh] consumption of an application during a certain runtime period

3.2.2
k_{P}
ratio of the weighted average electrical power consumption $P_{\text{electrical}}$ of an application to the reference power consumption $P_{\text{reference}}$

IEC 61800-9-1:2026 • https://standards.iteh.ai/catalog/standards/iec/6af4e577-8fd1-4c5c-b9ec-987964cd7d1b/iec-61800-9-1-2026

3.2.3
$P_{electrical}$
power consumption [kW] of an application ~~over time~~

3.2.4
$P_{electrical\ Max}$
power consumption [kW] at 100 % speed and 100 % load

3.2.5
P_i
power consumption [kW] at operating point i

3.2.6
$P_{L,control}$
power losses [kW] of the **motor control equipment**

3.2.7
P_n
nominal power of an equipment which is typical for its population of the same rating

Note 1 to entry: See IEC 60034-1 for motors.

3.2.8
$P_{out,CDM}$
output power [kW] of CDM obtained from the power loss measurement

Sample Document

3.2.9
$P_{out,PDS}$
output power [kW] of a PDS obtained from the power loss measurement

get full document from standards.iteh.ai

3.2.10
P_r
rated power of equipment which is assigned by its manufacturer

3.2.11
$P_{reference}$
power consumption used for reference, defined by the **extended product** committee

3.2.12
P_L
electrical power losses

Note 1 to entry: In $P_{L,CDM}$, $P_{L,Mot}$ and $P_{L,Aux}$, the index "CDM" refers to the complete drive module, "Mot" refers to the motor, and "Aux" refers to the auxiliary devices like cables, transformers or filters. The relative power losses are the per unit losses relative to the nominal power of the device.

3.2.13
$P_{L,CDM}$
power losses of a CDM

3.2.14
$P_{L,CDM,determined}$
power losses of a CDM from the power loss determination method

IEC 61800-9-1:2026 • https://standards.iteh.ai/catalog/standards/iec/6af4e577-8fd1-4c5c-b9ec-987964cd7d1b/iec-61800-9-1-2026

3.2.15
$P_{L,CDM,relative}$
power losses of a CDM, with reference to its rated apparent power

3.2.16
$P_{L,inverter}$
power losses in the inverter section of a CDM

3.2.17
$P_{L,PDS,determined}$
power losses of PDS from the power loss determination method

3.2.18
$P_{L,Mot}$
total losses of a motor according to ~~IEC 60034-2-1:2014, method 2-1-1B~~ IEC 60034-2-3 when supplied by a converter (non-sinusoidal power supply)

3.2.19
t_W
working time of an equipment

3.2.20
T_i
torque [Nm] at operating point i

Sample Document

3.2.21
$TimeFraction_i$
TF_i
percentage of time (time fraction) an **extended product** is operated at one specific operating point i

get full document from standards.iteh.ai

4 Requirements for the development of energy efficiency standards for extended products

4.1 General

This document specifies a methodology to determine the **energy efficiency** ~~index~~ **indicator** of an application, based on the concept of **semi analytic models** (**SAMs**). The methodology shall be referred to as an **extended product approach** (**EPA**).

The responsibilities and tasks of the different stakeholders creating or using these **extended products** standards, as well as the data flows in-between, are specified as follows.

a) Specific information about the equipment shall be considered:
   1) The torque versus speed profile of the driven load as specified by the load manufacturer or other pertinent entity (e.g. regulatory authority, other specified organization).
   2) The losses of the **motor system** or its constituents (motor, CDM or motor starter) at reference part-load operating points. These shall be provided by the different manufacturers as specified in IEC 61800-9-2.

b) Information about the ~~driven equipment~~ application shall be considered:
   1) The **duty profile** of the driven equipment. Pertinent entities can for example define typical applications of their **extended product**s, each associated with a typical **duty profile**.

IEC 61800-9-1:2026 • https://standards.iteh.ai/catalog/standards/iec/6af4e577-8fd1-4c5c-b9ec-987964cd7d1b/iec-61800-9-1-2026

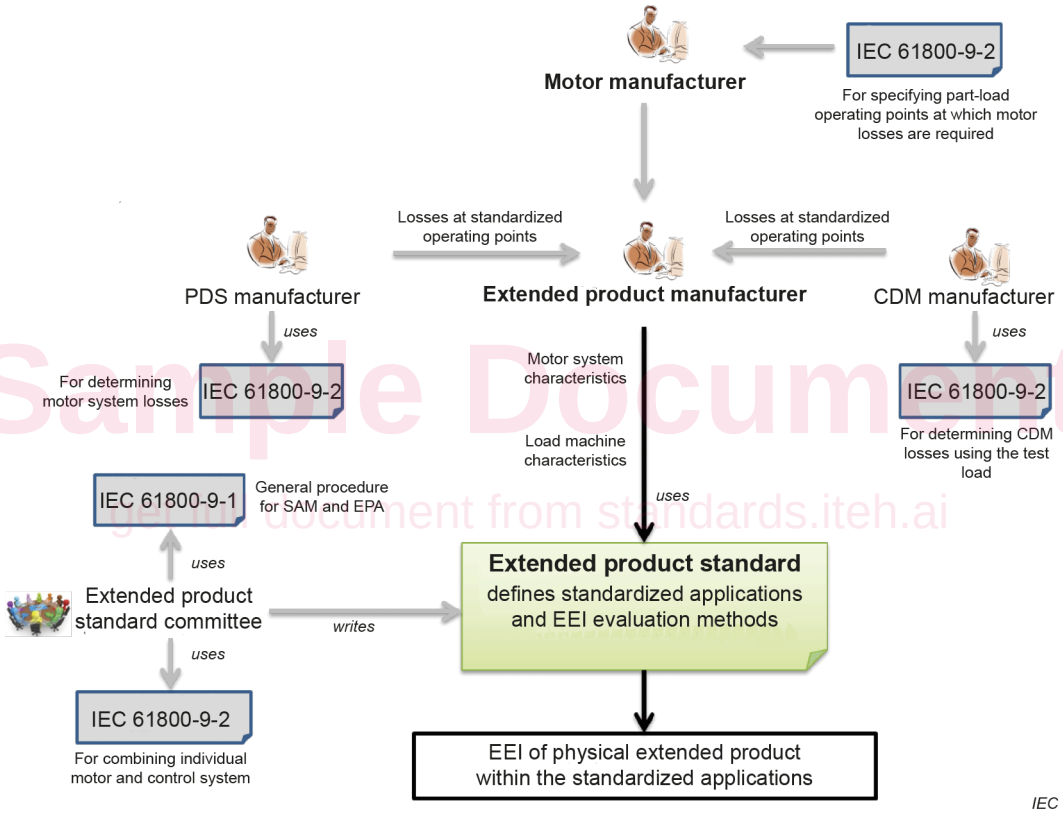
c) The **extended product approach** ~~shall be used to determine~~ permits the determination of an **energy efficiency indicator** (losses, efficiency, energy consumption, etc.):

~~– IEC 61800-9-2 specifies the methods for the determination of losses of the motor system using measurement and/or calculations.~~

1) Other pertinent entity(ies) (e.g. regulatory authority, other specified organization) shall define how to combine the losses of the **motor system** and the losses of the load, to obtain an overall **energy efficiency** ~~index~~ **indicator** for the **extended product** within the defined application.

2) IEC TR 62837 suggests the definition and use of key performance indicators (KPIs) for energy efficiency through automation systems that are in accordance with the principle of this document.

The interactions between the different stakeholders are shown in Figure 3.



Sample Document
get the document from standards.iteh.ai

NOTE 1 Motor and CDM manufacturers can provide data directly to the **motor system** manufacturer.

NOTE 2 If the **motor system** is based on a starter, then only the motor losses are needed as input to the **EPA**.

Figure 3 – Stakeholders and responsibilities for determination of the energy efficiency indicator for an extended product

4.2 Responsibility of the extended product standard or technical committee

Based on the general principles described in this document, it shall be the responsibility of the entity(ies) dealing with a type of **extended product** (e.g. regulatory authority, other specified organization) to specify the **semi analytic model** of the driven load and of the **extended product** for the product-specific application(s).

Pertinent entity(ies) (e.g. regulatory authority, other specified organization) ~~shall~~ can specify and standardize

IEC 61800-9-1:2026 • https://standards.iteh.ai/catalog/standards/iec/6af4e577-8fd1-4c5c-b9ec-987964cd7d1b/iec-61800-9-1-2026

– one or more torque versus speed profiles (load profiles) as described in Annex C considering typical loads,
– one or more **duty profile**s as described in Annex C considering typical service conditions,
– an appropriate method for determining the losses at intermediate operating points based on the data from the motor, CDM and PDS (see 7.3),
– a **semi analytic model** for the **extended product** considering the **extended product approach** (**EPA**) as described in Clause 7, using the part-load operating points of the **motor system** as determined according to IEC 61800-9-2: ~~2016~~2023, Annex E, and
– a method for determining an **energy efficiency indicator** for the **extended product** under their responsibility (see Annex B for example).

The **extended product standard** or technical **committee** shall ~~apply~~ consider the permissible tolerances for the part-load losses of the **motor system** as defined in IEC 61800-9-2.

NOTE The **motor system** data can consist of PDS data as well as individual data for CDM and motor. IEC 61800-9-2 provides information about the determination of PDS data based on individual motor and CDM data.

~~The number of part-load operating pointsused by The **semi analytic model** of the **extended product** shall be limited to an appropriate choice out of maximum eight points.~~

The document specifies eight part-load operating points, defined according to speed and torque, that can be used as reference points for the **semi analytic model**. The **semi analytic model** of the **extended product** shall not require more than this information. If more operating points are required, those values shall be determined by interpolation or extrapolation. The **semi analytic model** of the **extended product** may also use less than eight operating points.

Annex A provides a demonstration of a pump system application with a quadratic torque load.

Sample Document

4.3 Elements to achieve the extended product approach

The **semi analytic model** (**SAM**) model of the **extended product** allows combining the losses at the reference operating points to derive the losses at any other operating point. Elements required for the **extended product approach** are described in Table 1 and Figure 6.

To determine the overall losses or efficiency of an **extended product** implemented in an application, it is required to go through several steps.

Several elements shall be combined.

a) The **SAM** of the **motor system**, specified in IEC 61800-9-2, giving its relative losses at several normalized operating points. The **motor system** can be a power drive system (PDS) or can consist of a motor and a motor starter (contactor, soft starter, etc.).
   1) When the **motor system** is a PDS, the **SAM** of the **motor system** is based on the concept of reference ~~PDS (RPDS)~~ CDM (RCDM) and reference motor (RM). It is a "typical" PDS to which the physical PDS under consideration is compared in terms of energy efficiency.
   2) When the **motor system** is based on a motor starter, the calculation of the losses is simpler; there is no need to use any reference motor starter.
b) The **SAM** of the driven equipment (pump, compressor, fan, etc.), giving the losses or efficiency of the load machine at ~~typical operation~~ specified operating points. It is the responsibility of the equipment manufacturer or the associated product committee.
c) The **extended product approach**, combining the **SAM** of the **motor system** and the **SAM** of the driven equipment (and also if necessary efficiency values for the **transmission**). It is the responsibility of the manufacturer of the **extended product** or the associated pertinent entity.

IEC 61800-9-1:2026 • https://standards.iteh.ai/catalog/standards/iec/6af4e577-8fd1-4c5c-b9ec-987964cd7d1b/iec-61800-9-1-2026