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BSI Standards Publication

Ecodesign for power drive systems, motor starters, power electronics & their driven applications

Part 2: Energy efficiency indicators for power drive systems and motor starters

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National foreword

This British Standard is the UK implementation of EN 50598-2:2014.

The UK participation in its preparation was entrusted to Technical Committee PEL/22, Power electronics.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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English Version

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

Ecoconception des entraînements électriques de puissance, des démarreurs de moteur, de l'électronique de puissance et de leurs applications entraînées - Partie 2: Indicateurs d'efficacité énergétique pour les entraînements électriques de puissance (PDS) et les démarreurs de moteur

Ökodesign für Antriebssysteme, Motorstarter, Leistungselektronik und deren angetriebene Einrichtungen - Teil 2: Indikatoren für die Energieeffizienz von Antriebssystemen und Motorstartern

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Contents

Page

Foreword

This document (EN 50598-2:2014) has been prepared by CLC/TC 22X "Power electronics".

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2015-11-17
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2017-11-17

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

EN 50598, *Ecodesign for power drive systems, motor starters, power electronics & their driven applications*, will consist of the following parts:

- *Part 1: General requirements for setting energy efficiency standards for power driven equipment using the extended product approach (EPA), and semi analytical model (SAM)*;
- *Part 2: Energy efficiency indicators for power drive systems and motor starters*;
- *Part 3: Quantitative ecodesign approach through life cycle assessment including product category rules and the content of environmental declarations*.

The CLC/TC 22X/WG 06 is the enabled task force for dealing with the mandate M/476 from European Commission for the standardization in the field of variable speed drives and/or power drive system products.

It has been set a close collaboration with several other technical committees (i.e. CLC/TC 2; CLC/TC 17B) in order to provide a comprehensive standard for energy efficiency and ecodesign requirements together with a pilot stakeholder committee CEN/TC 197 from the customers side.

Key points:

- Clear requirements how to achieve an energy efficient driven equipment using a motor system;
- Requirements and limits for IE-classes for power electronic converters;
- Requirements and limits for IES-classes for power drive systems (PDS);
- Loss determination of the PDS and requirements for the link to the driven equipment in order to determine the energy efficiency classification/evaluation of the extended product;

- Requirements how to achieve the environmentally conscious design and environmental declaration of a motor system.

It is the intention of the working group that this document, once finalized as a European Standard series, will be further processed to an international consensus in IEC according to the UAP procedure agreement between CENELEC and IEC.

Introduction

The Technical Committee CLC/TC 22X has circulated on 2010-03-31 the document CLC/TC22X/Sec0100/DC including the mandate M/476 from the European Commission for standardization in the field of variable speed drives and/or power drive system products.

As the PDS contains converter driven motors, the requirements for measuring of the energy efficiency of motors with non-sinusoidal supply is under the responsibility of CLC/TC 2 covering the requirement from mandate M/470.

The document is based on the CENELEC technical board document referenced BT137/DG8058/INF also reproducing this EC-mandate.

The CLC/TC22X working group 6 as being the standardization task force for dealing with this Mandate has close collaboration with several other technical committees (i.e. CLC/TC2; CLC/TC17B).

Therefore CLC/TC 22X committee has been enabled responsible to clarify 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 sometimes controversial requirements are illustrated in Figure 1. The work has been agreed to provide the reasonable target as a best compromise.

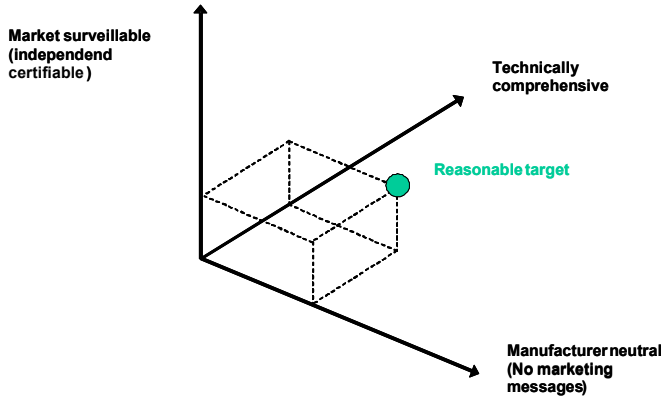

Figure 1 — Illustration of controversial requirements for the energy related product (ErP) standardization

EN 50598 is developed under the CENELEC projects number 24602 to 24604 for compliance with requirements from the horizontal mandate M/495.

Its three parts are together directly related to the mandates M/470 and M/476.

For the other mandates listed in Table 1, this standard could be applied if the future product standards developed will make reference to it.

Table 1 — Mandates of the European Commission given to CEN, CENELEC and ETSI and how they are contributed by these standard series parts

Mandates	Part 1	Part 2	Part 3
M/470 Motors		✓	✓
M/476 PDS		✓	✓
M/495 Horizontal all future Applications	✓	✓	✓
M/488 HVAC comfort fans	✓	✓	(✓)
M/498 Pumps	✓	✓	(✓)
M/500 Compressors	✓	✓	(✓)

In according with its Scope, this standard series does not deal with mechanical engineering components.

NOTE Geared motors (motor plus gearbox) needs to be treated for efficiency classes like a power drive system (converter plus motor). See EN 60034-30-1 for classification of the losses of a geared motor. The efficiency classes of gearboxes as indiviual components are under consideration.

1 Scope

This European Standard specifies the energy efficiency indicators for power electronics (e.g. complete drive modules, CDM), power drive systems and motor starters, all used for motor driven equipment in the power range of 0,12 kW up to 1 000 kW.

It specifies the methodology for determination of losses of the complete drive module (CDM), the power drive system (PDS) and the complete 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 part of EN 50598 proposes a methodology for characterization of the best energy efficiency solution to be implemented. This depends on the motor driven system architecture, the speed/load profile and the operating points over time of the driven equipment.

The methodology of the extended product approach and the semianalytical models are defined in Part 1 of the series.

The structure of this EN 50598 contains the following:

- the losses of a standardized reference PDS (RPDS) and the mathematical model for their calculation are given and classified;
- the reference load/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 determining the losses of a real PDS are given and are classified in comparison to the RPDS;
- the requirements for the type testing and the content of user documentation;
- some illustrations of losses in an overall system as an example are given 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 voltages (100 V up and equal to 1 000 V), single axis AC/AC power drive systems with three phase induction motors. Geared motors need to be treated as standard motors.

All provided reference data is derived from PDS with induction motors, but valid for all types of PDS with other types of motors.

High voltage equipment does not need to be assessed in this edition of the document.

In EN 50598-3, the methodology for eco-design for environmental impact is defined.

NOTE The 50598 series does not cover energy efficiency classification of driven equipment, but provides input for the assessment of extended product approach.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE As it is intended by the working group to process this document, once finalized, as an IEC Standard, some normative references are given even in case if no European harmonized document exists.