ICS 29.160.30 SLOVENSKÁ TECHNICKÁ NORMA Október 2015

STN	**Ekodizajn systémov výkonových pohonov, spúšťačov motorov, výkonovej elektroniky a nimi ovládaných aplikácií. Časť 2: Indikátory energetickej účinnosti systémov výkonových pohonov a spúšťačov motorov.**	**STN EN 50598-2** 35 1725

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

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 09/15

Obsahuje: EN 50598-2:2014

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 50598-2

December 2014

ICS 29.160.30

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

This European Standard was approved by CENELEC on 2014-11-17. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 50598-2:2014 E

EN 50598-2:2014 (E)

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.

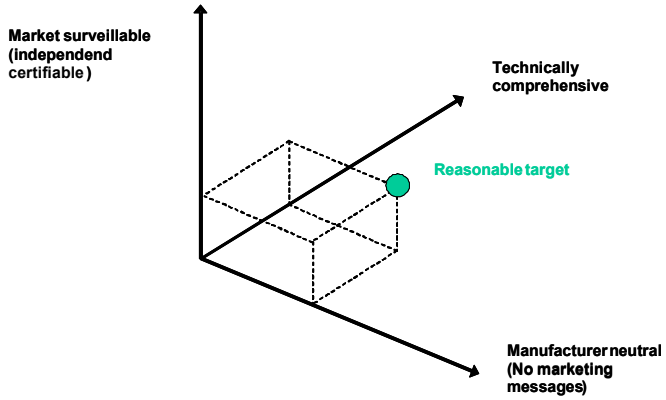

Figure 1 — Illustration of controversial requirements for the energy related product (ErP) standardization

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.

EN 50347, *General purpose three-phase induction motors having standard dimensions and outputs — Frame numbers 56 to 315 and flange numbers 65 to 740*

EN 60034-1, *Rotating electrical machines — Part 1: Rating and performance (IEC 60034-1)*

EN 60034-2-1:2007, *Rotating electrical machines — Part 2-1: Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles) (IEC 60034-2-1:2007)*

EN 60034-6, *Rotating electrical machines — Part 6: Methods of cooling (IC Code) (IEC 60034-6)*

EN 60034-30-1, *Rotating electrical machines — Part 30-1: Efficiency classes of line operated AC motors (IE code) (IEC 60034-30-1)*

CLC/TS 60034-31, *Rotating electrical machines — Part 31: Selection of energy-efficient motors including variable speed applications — Application guide (IEC/TS 60034-31)*

EN 60947-4-1, *Low voltage switchgear and controlgear — Part 4-1: Contactors and motor starters — Electromechanical contactors and motor-starters (IEC 60947-4-1)*

EN 60947-4-2, *Low voltage switchgear and controlgear — Part 4-2: Contactors and motor starters — AC semiconductor motor controllers and starters (IEC 60947-4-2)*

EN 61800-5-1, *Adjustable speed electrical power drive systems — Part 5-1: Safety requirements — Electrical, thermal and energy (IEC 61800-5-1)*

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

IEC 60038:2009, *IEC standard voltages*

IEC 60050-161, *International Electrotechnical Vocabulary. Chapter 161: Electromagnetic compatibility*

IEC 60072-1, *Dimensions and output series for rotating electrical machines — Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1080*

IEC/TS 62578, *Power electronics systems and equipment — Operation conditions and characteristics of active infeed converter applications*