

SLOVENSKI STANDARD
oSIST prEN 50598-1:2014
01-januar-2014

Ekološko snovanje (Ecodesign) motornih pogonskih sistemov, motornih zaganjalnikov, močnostne elektronike in njihove aplikacije, ki jih ti poganjajo - 1. del: Splošne zahteve za določitev standardov energijske učinkovitosti motorno gnane opreme z uporabo razširjenega proizvodnega pristopa (EPA) in polanalitičnega modela (SAM)

Ecodesign for power drive systems, motor starters, power electronics & their driven applications - Part 1: General requirements for setting energy efficiency standards for power driven equipment using the extended product approach (EPA), and semi analytic model (SAM)

[SIST EN 50598-1:2015](#)

Ökodesign für Antriebssysteme, Motorstarter, Leistungselektronik und deren angetriebene Einrichtungen -- Teil 1: Allgemeine Anforderungen für die Erstellung von Normen zur Energieeffizienz von Ausrüstungen mit Elektroantrieb nach dem erweiterten Produktansatz (EPA) und semi-analytischen Modellen (SAM)

Ecoconception des entraînements électriques de puissance, des démarreurs de moteur, de l'électronique de puissance et de leurs applications entraînées -- Partie 1: Exigences générales pour définir les normes d'efficacité énergétique d'un équipement entraîné via l'approche produit étendu (EPA) et par le modèle semi-analytique (SAM)

Ta slovenski standard je istoveten z: prEN 50598-1:2013

ICS:

13.020.99	Drugi standardi v zvezi z varstvom okolja	Other standards related to environmental protection
31.020	Elektronske komponente na splošno	Electronic components in general

oSIST prEN 50598-1:2014

en

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

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September 2013

ICS

English version

**Ecodesign for power drive systems, motor starters, power electronics & their driven applications -
Part 1: General requirements for setting energy efficiency standards for power driven equipment using the extended product approach (EPA), and semi analytic model (SAM)**

Ecoconception des entraînements électriques de puissance, des démarreurs de moteur, de l'électronique de puissance et de leurs applications entraînées -
Partie 1: Exigences générales pour définir les normes d'efficacité énergétique d'un équipement entraîné via l'approche produit étendu (EPA) et par le modèle semi-analytique (SAM)

To be completed

This draft European Standard is submitted to CENELEC members for CENELEC enquiry.
Deadline for CENELEC: 2014-02-21.

It has been drawn up by CLC/TC 22X.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CENELEC 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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CENELEC

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

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30 Foreword

31 This document [prEN 50598-1:2013] has been prepared by CLC/TC 22X "Power electronics".

32 This document is currently submitted to the Enquiry.

33 This document has been prepared under a mandate given to CENELEC by the European Commission
34 and the European Free Trade Association, and supports essential requirements of EU Directive(s).

35 The TC22X Working Group 6 as being the standardization Task Force for dealing with the Mandate
36 M/476 from European Commission for standardization in the field of variable speed drives and/or
37 Power Drive System products has been set a close collaboration with several other technical
38 committees (i.e. CLC/TC2; CLC/TC17B; CEN TC 197) in order to provide a comprehensive standard
39 for energy efficiency and eco design requirements.

40 Key points:

41 — Requirements how to achieve technical requirements for energy efficiency of any kind of driven
42 equipment with an embedded motor system

43 — Requirements for the link from the motor system to the driven equipment in order to determine the
44 Energy Efficiency Index (EEI) of the extended product

45 — Requirements for the Semi Analytical Model (SAM) of the driven equipment

46 The Cenelec TC22X Technical Committee has circulated on last 2010-03-31 for a short period of time
47 the CLC/TC22X/Sec0100/DC document including the Mandate M/476 from European Commission for
48 standardization in the field of variable speed drives and/or Power Drive System products.

49 As the PDS contains also converter driven motors, the additional requirements for setting the energy
50 efficiency for those motors with non sinusoidal fed and the labelling for the whole PDS are also
51 included. This covers the requirements coming from the Mandate M/470.

52 The document is based on the Cenelec Technical board document referenced BT137/DG8058/INF
53 also reproducing this EC Mandate.

54 The TC22X Working Group 6 as being the standardization Task Force for dealing with this Mandate
55 has anticipated that a close collaboration with several other technical committees being involved in the
56 driven system (i.e. CEN TC 197: CLC/TC2; CLC/TC17B) is beneficial and follows the system wise
57 progress.

prEN 50598-1:2013 (E)**58 1 Scope**

59 This part of EN 50598 provides the general requirements to energy efficiency standardization for any
60 extended product by using the guidance of the extended product approach (EPA).

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

64 This shall be based on specified calculation models for speed/load profiles, the duty profiles and
65 relative power losses of appropriate torque versus speed operating points.

66 This part of EN 50598 specifies the methodology of determination of losses of the extended product
67 and its sub-parts.

68 This part of EN 50598 does not specify requirements for environmental impact declarations.

69 2 Normative references

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

73 prEN 50598-2:2013, *Ecodesign for power drive systems, motor starters, power electronics & their*
74 *driven applications -- Part 2: Energy efficiency indicators for power drive systems and motor starters*

75 IEC EN 60034-1, *Rotating electrical machines: Rating and specifications*

76 IEC EN 60034-2, *Rotating electrical machines: Efficiency determination*

77 IEC EN 61800-2, *Adjustable speed electrical power drive systems - Part 2: General requirements -*
78 *Rating specifications for low voltage adjustable frequency a.c. power drive systems*

79 3 Terms, definitions, symbols, units and abbreviated terms

80 For the purposes of this document, the terms and definitions given in IEC 60050(161) and the
81 following apply.

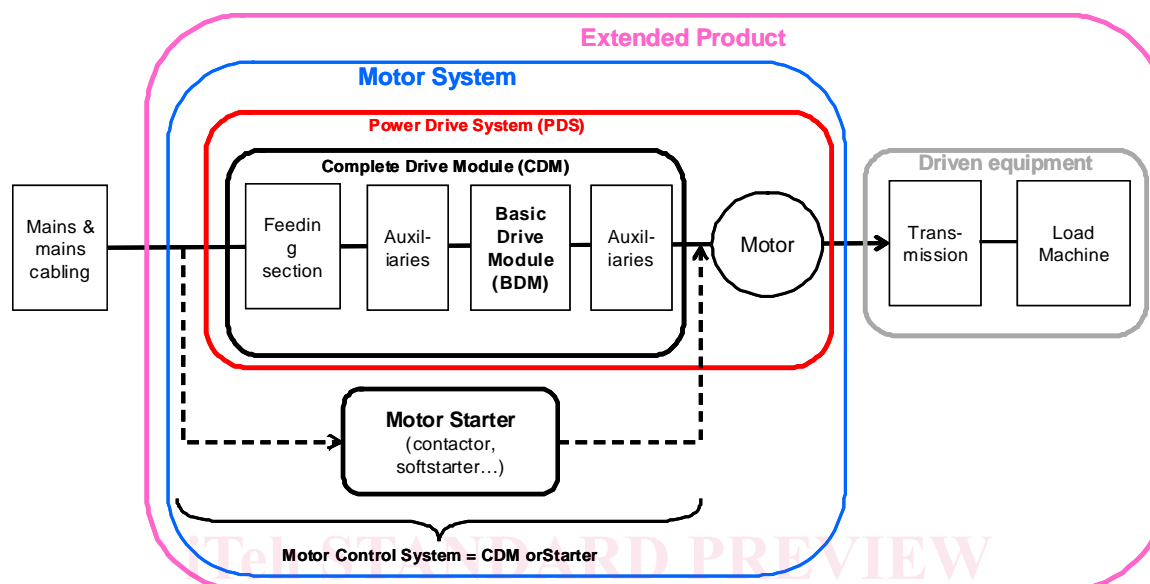
82 3.1**83 Energy Efficiency Index****84 EEI**

85 value describing the energy efficiency of an application, resulting from the Extended Product Approach
86 (EPA)

87 Note 1 to entry; If the extended product is a pump system, the EEI is the ratio of the demanded energy (actual plus
88 losses) to the theoretical energy required for the application.

89 **3.2**90 **Extended Product**91 **EP**

92 driven equipment together with its embedded motor system (e.g a PDS) is defined as the extended
 93 product, see Figure 1.



94

95

Figure 1 — Illustration of the Extended Product with embedded Motor System

96 **3.3**97 **Extended Product Approach**98 **EPA**

99 methodology to determine the Energy Efficiency Index (EEI) of the Extended Product (EP) using the
 100 speed torque profiles of the driven equipment, the relative power losses of the motor system and the
 101 duty profile of the application.

102 **3.4**103 $P_{\text{Electrical}}$

104 Power consumption [kW] of an application over time

105 **3.5**106 $P_{\text{Electrical Max}}$

107 Power consumption [kW] at 100 % speed and 100 % load

108 **3.6**109 P_i 110 Power consumption [kW] at operating point i 111 **3.7**112 $P_{\text{in,CDM}}$

113 Input power of the CDM from the power loss measurement

114 **3.8**115 $P_{\text{in,PDS}}$

116 Input power of the PDS from the power loss measurement

117 **3.9**118 $P_{\text{L,control}}$

119 Power losses of the control

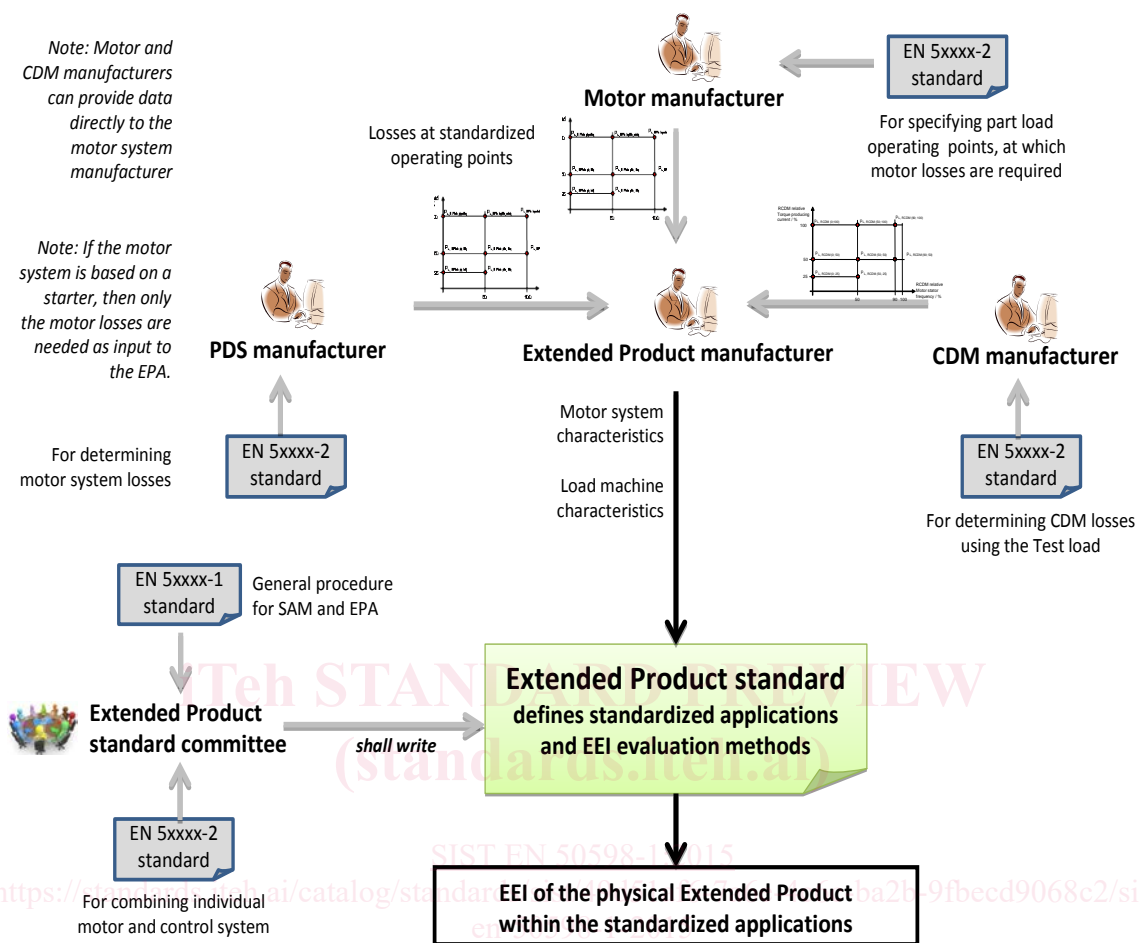
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- 120 **3.10**
 121 **P_n**
 122 Nominal Power of an equipment which is typical for its population of the same rating (see IEC 60034-1
 123 for motors)
- 124 **3.11**
 125 **$P_{out,CDM}$**
 126 Output power of CDM from the power loss measurement
- 127 **3.12**
 128 **$P_{out,PDS}$**
 129 Output power of PDS from the power loss measurement
- 130 **3.13**
 131 **P_r**
 132 Rated Power of equipment which is assigned by its manufacturer
- 133 **3.14**
 134 **$P_{Reference}$**
 135 power consumption used for reference, defined by the extended product committee
- 136 **3.15**
 137 **P_L**
 138 Electrical power losses with the indices CDM dedicates it to the complete drive module, Mot dedicates
 139 it to the motor, Aux dedicates it to the auxiliary devices like cables, transformers or filters. The relative
 140 power losses are the per unit losses relative to the nominal power of the device
- 141 **3.16**
 142 **$P_{L,CDM}$**
 143 Power losses of a CDM
- 144 **3.17**
 145 **$P_{L,CDM,determined}$**
 146 Power losses of CDM from the power loss determination method
- 147 **3.18**
 148 **$p_{L,CDM,relative}$**
 149 Power losses of the CDM, referred to its rated apparent power
- 150 **3.19**
 151 **$P_{L,inverter}$**
 152 Power losses in the inverter section of a CDM
- 153 **3.20**
 154 **$P_{L,PDS,determined}$**
 155 Power losses of PDS from the power loss determination method
- 156 **3.21**
 157 **$P_{LT,Mot}$**
 158 Total losses of a motor according to EN 60034-2-1 (edition 2), method 2-1-1B when supplied by a
 159 converter (non sinusoidal power supply)

- 160 **3.22**
 161 **Semianalytical model**
 162 **SAM**
 163 determination model for the losses of a motor system or a driven equipment
- 164 Note 1 to entry; SAMs include physical and mathematical parameters and calculation algorithm of the subparts of
 165 an EP. SAMs are necessary to determine the typical relative power losses of the subparts of an EP in order to
 166 determine its overall losses.
- 167 **3.23**
 168 t_w
 169 Working time of an equipment
- 170 **3.24**
 171 T_i
 172 Torque [Nm] at operating point i
- 173 **3.25**
 174 **Timefraction_i**
 175 Percentage of time an extended product is operated at one specific operating point i
- 176 **4 Requirements for the development of energy efficiency standards for**
 177 **extended products**
- 178 **4.1 General**
- 179 This document specifies a methodology to determine the Energy Efficiency Index of an application,
 180 based on the concept of Semi Analytical Models (SAM). The methodology shall be referred to as the
 181 Extended Product Approach (EPA).
- 182 The responsibilities and tasks of the different stakeholders creating or using these Extended Products
 183 standards, as well as the data flows in-between are required.
- 184 a) Specific information about the equipment shall be considered:
- 185 — The torque versus speed profile of the driven load as specified by the load manufacturer or
 186 Extended Product technical committee.
- 187 — The losses of the Motor System or its constituents (Motor, CDM or starter) at reference part-
 188 load operating points. These shall be provided by the different manufacturers as specified in
 189 EN 50598-2.
- 190 b) Information about the driven equipment shall be considered:
- 191 — The duty profile of the driven equipment. The Extended product standards committee can for
 192 example define typical applications of their Extended Products, each associated with a typical
 193 duty profile
- 194 c) Extended Product Approach shall be used to determine an energy efficiency indicator (losses,
 195 efficiency, energy consumption...):
- 196 — EN 50598-2 specifies the methods for the determination of losses of the Motor System using
 197 measurement and/or calculations.
- 198 — Extended Product standards committees shall define how to combine the losses of the Motor
 199 System and the losses of the load to obtain an overall energy efficiency related indicator for
 200 the Extended Product within the defined application.

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201 The interactions between the different stakeholders are shown in Figure 2 .



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203

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Figure 2 — Stakeholders and responsibilities for determination of the energy efficiency indicator for an Extended Product

205 **4.2 Responsibility of the Extended Product technical committee**

206 Based on the general principles described in this standard it shall be the responsibility of the Extended
 207 Product standard committee to specify the Semi Analytical Model of the driven load and of the
 208 Extended Product for the product-specific application(s).

209 The product committee shall specify and standardize:

- 210 — Permissible tolerances for the part-load losses of the Motor System as defined in
 211 prEN 50598-2:2013, Clause 4.
- 212 — One or more Torque versus speed profiles (load profiles) as described in 5.2 considering typical
 213 loads.
- 214 — One or more duty profiles as described in 5.3 considering typical service conditions.
- 215 — An appropriate method for determining the losses at intermediate operating points based on the
 216 data from the motor, CDM and PDS. See 7.3
- 217 — A Semi-analytic model for the Extended Product considering the Extended Product Approach
 218 (EPA) as described in Clause 7, using the part-load operating points of the Motor System as
 219 determined according to prEN 50598-2:2013, Clause 9.