

BS EN 50598-2:2014



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# **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.

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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

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.

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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**

**EN 50598-2:2014 (E)****Contents**

	Page
Foreword.....	8
Introduction.....	10
1 Scope .....	12
2 Normative references .....	12
3 Terms, definitions, symbols and abbreviations .....	13
3.1 Terms and definitions.....	13
3.2 Symbols and abbreviations.....	16
4 Concept of the reference PDS (RPDS), the reference CDM (RCDM) and the reference motor (RM) .....	22
4.1 General .....	22
4.2 Predefinition of the speed versus torque loss points of a RPDS, a RCDM, a RM and the associated power losses.....	23
4.3 Combining the PDS losses with the driven equipment.....	25
4.4 IE Classes of a line fed motor (IE1 up to IE9).....	27
4.5 IE Classes of a converter fed motor (IE1 up to IE9).....	27
4.6 IE Classes of a converter (complete drive module, CDM) (IE0 up to IE9) .....	27
4.7 IES Classes of a PDS (IES0 up to IES9).....	28
4.8 Consistency of IE, IES classes .....	28
4.9 Determination of the IES class of a resulting PDS by application of "reference" and "test" devices and guidance for the manufacturers .....	29
5 Mathematical model of the CDM, motor and PDS .....	30
5.1 General .....	30
5.2 CDM.....	31
5.3 Reference motor (RM) .....	43
5.4 Reference PDS (RPDS).....	49
5.5 PDS losses for regenerative operation .....	52
6 Power losses of motor starters.....	52
7 Limits for IE and IES classes.....	53
7.1 General .....	53
7.2 CDM.....	53
7.3 Motor .....	55
7.4 PDS.....	56
8 Requirements for the user's documentation .....	58
8.1 General .....	58
8.2 Information for selection.....	60
8.3 Information for determination of energy efficiency classes.....	60
8.4 Information on the determination of additional energy losses and part load conditions.....	60
9 Type testing.....	61

**EN 50598-2:2014 (E)**

9.1	General .....	61
9.2	Type testing of CDM for IE classification .....	61
9.3	Type testing of PDS for IES classification .....	62
9.4	Determination procedures for CDM and PDS losses in part load operation .....	63
9.5	Power loss calculations for CDM .....	63
9.6	Power loss calculations for PDS .....	63
9.7	Input-output measurement method .....	64
9.8	Calorimetric measurement of CDM losses .....	67
9.9	Testing conditions for CDM testing .....	68
9.10	Testing conditions for PDS testing .....	69
Annex A (informative) Losses of the RCDM, RM and RPDS .....		70
Annex B (informative) Description of the elements of an extended product using PDS with regard to their impact on losses .....		74
B.1	General .....	74
B.2	Losses in the mains cabling and feeding section .....	74
B.3	Input filter .....	76
	B.3.1 High frequency EMI filter .....	76
	B.3.2 Low frequency line harmonics filter .....	76
B.4	Input converter .....	77
	B.4.1 Diode rectifier .....	77
	B.4.2 Active infeed converter .....	77
	B.4.3 Power factor of the input converter .....	79
B.5	DC link .....	80
B.6	Output inverter .....	81
B.7	Output filter and motor cables .....	82
	B.7.1 General .....	82
	B.7.2 Sine wave filters .....	83
	B.7.3 dV/dt filters and motor chokes .....	84
	B.7.4 High frequency EMI motor filters .....	84
	B.7.5 Motor cables .....	84
B.8	Motor .....	84
B.9	Mechanical load .....	84
B.10	Control and standby losses .....	84
B.11	Cooling losses .....	85
	B.11.1 Primary cooling losses .....	85
	B.11.2 Secondary cooling losses .....	85
Annex C (informative) Converter topology .....		86
C.1	General .....	86
C.2	Voltage source output inverter topologies different from those mathematically described in 5.2.2 .....	86
C.3	Voltage source input converter topologies different from those mathematically described in 5.2.3 .....	86
C.4	CDM topologies different from voltage source type .....	86
Annex D (informative) Basic Torque and Power vs. speed profiles, operating points over time .....		88
D.1	General .....	88

**EN 50598-2:2014 (E)**

D.2	Basic Torque and Power vs. Speed Profile .....	88
D.3	Operating points over time .....	89
D.4	Definition of the operating points over time .....	89
D.4.1	General .....	89
D.4.2	Calculation of the energy consumption based on the duty profile.....	90
D.4.3	Example of loss calculation for different operating points over time .....	91
Annex E (informative)	Typical standardized servo application.....	94
E.1	General .....	94
E.2	Cycle .....	95
E.3	Calculation of motor losses .....	98
E.4	Losses of the servo CDM.....	100
E.5	Losses of the servo PDS .....	100
Annex F (informative)	Additional information to 5.3 .....	101
Annex G (informative)	Application example for loss calculations of a CDM and a PDS.....	120
G.1	General .....	120
G.2	CDM loss determination.....	120
G.2.1	General .....	120
G.2.2	Loss determination by maximum losses of neighbouring loss points .....	121
G.2.3	Loss determination by two-dimensional interpolation of losses of neighbouring loss points .....	121
G.2.4	Loss determination by the mathematical model described in 5.2.....	124
G.3	Loss determination of the motor .....	127
G.4	Loss determination of the PDS .....	128
Annex H (informative)	Uncertainty of loss determination method .....	129
H.1	General .....	129
H.2	Calculation of uncertainty at randomly occurring errors .....	129
H.3	Typical uncertainties for loss determination methods .....	129
Annex I (informative)	Calorimetric measurement for CDM losses .....	131
I.1	General .....	131
I.2	Calorimeter with two chambers with air as a cooling medium .....	131
I.3	Calorimeter with one chamber with air as a cooling medium .....	132
I.4	Calorimeter with liquid as a cooling medium .....	133
Annex J (informative)	Flowchart of determination of IE/IES classification for CDM/PDS and loss determination for part load operating points .....	134
Bibliography	.....	136
Figure 1	— Illustration of controversial requirements for the energy related product (ErP) standardization .....	10
Figure 2	— Illustration of the extended product with included motor system.....	14
Figure 3	— Illustration of the operating points for speed versus torque to determine the relative power losses of the power drive system (RPDS).....	23
Figure 4	— Illustration of the operating points for speed versus torque to determine the relative power losses of the reference motor (RM).....	24

**EN 50598-2:2014 (E)**

Figure 5 — Illustration of the operating points of the RCDM depending on the relative torque-producing current and the relative motor stator frequency, to determine the losses of reference complete drive module (RCDM) .....	24
Figure 6 — Illustration of the workflow to determine the energy efficiency index (EEI) of an extended product .....	25
Figure 7 — Illustration how to combine different data sources to determine the energy efficiency index (EEI) of an extended product .....	26
Figure 8 — Three points of relative losses and shaded area of interest for the pump manufactures while defining the EEI (Energy Efficiency Index) of a pump unit .....	26
Figure 9 — Metrical relation of IE, IES classes .....	29
Figure 10 — Guidance for CDM and Motor manufacturers for the usage of "test" and "reference" devices to determine the IE-/IES classes .....	30
Figure 11 — Illustration of the CDM and the test load .....	31
Figure 12 — Relative losses $p_{L,CDM}$ of the 9,95kVA RCDM .....	42
Figure 13 — Example of the relative power losses of PDS as function of speed and torque .....	51
Figure 14 — Example of the relative power losses versus switching frequency .....	52
Figure 15 — Example of CDM with resistor for dissipating generated power .....	52
Figure 16 — Illustration of IE classes for a CDM .....	55
Figure 17 — Illustration of IES classes for a PDS .....	56
Figure 18 — Power loss of CDM is a sum of determined loss value and an uncertainty of the used determination method .....	62
Figure 19 — Input-output measurement setup for CDM losses .....	64
Figure 20 — Input-output measurement setup for PDS losses .....	65
Figure 21 — Order in which measurements shall be made for CDM: (1) to (8) .....	66
Figure 22 — Order in which measurements shall be made for PDS: (1) to (8) .....	67
Figure 23 — Calorimetric measurement setup for determining CDM losses .....	68
Figure B.1 — Overview of the extended product and energy flow .....	74
Figure B.2 — Equivalent circuit of the mains and mains cabling .....	75
Figure B.3 — Illustration of a single phase line harmonics filter .....	76
Figure B.4 — PDS with a diode rectifier input converter .....	77
Figure B.5 — PDS with a standard AIC input converter .....	78
Figure B.6 — PDS with a F3E-AIC input converter without line choke .....	78
Figure B.7 — Typical waveform of a diode rectifier line current .....	79
Figure B.8 — DC link circuit .....	80
Figure B.9 — DC link circuit with additional DC chokes .....	81
Figure B.10 — Output inverter of the PDS .....	82
Figure B.11 — Motor cable and optional output filter of the PDS .....	82
Figure B.12 — Typical waveform of inverter output voltage and motor voltage when using a sine wave output filter .....	83
Figure D.1 — Typical basic torque and power vs. speed profiles .....	89
Figure D.2 — Example of operating points over time .....	90
Figure E.1 — Sample of a typical torque - speed characteristic .....	94

**EN 50598-2:2014 (E)**

Figure E.2 — Speed and torque for a medium dynamic application cycle (sample) .....	96
Figure E.3 — Speed and torque for a high dynamic application cycle (sample) .....	97
Figure E.4 — Graphic chart of power and losses for medium dynamic application.....	99
Figure F.1 — Relative losses versus relative torque, converter operation (parameter speed).....	102
Figure F.2 — Relative losses versus relative speed, converter operation (parameter torque).....	102
Figure F.3 — Determination of total losses at a running point .....	103
Figure G.1 — Segments of operating points .....	120
Figure G.2 — Two-dimensional interpolation .....	122
Figure H.1 — Typical standard uncertainties with normal distribution for different CDM and PDS power loss determination methods .....	130
Figure I.1 — One-step calorimetric measurement setup for comparative loss measurement (CDM and heating resistor are loaded simultaneously) .....	132
Figure I.2 — Two-step calorimetric measurement setup for comparative loss measurement (CDM and heating resistor are not loaded simultaneously) .....	133
Figure I.3 — Liquid cooled calorimetric measurement setup for CDM loss measurement.....	133
Figure J.1 — Determination of IE classification for CDM and loss determination for part load operating points .....	134
Figure J.2 — Determination of IES classification for PDS and loss determination for part load operating points .....	135
Table 1 — Mandates of the European Commission given to CEN, CENELEC and ETSI and how they are contributed by these standard series parts.....	11
Table 2 — Minimum test load currents at different points of operation.....	32
Table 3 — Test load displacement factor between fundamental output current and fundamental output voltage at different points of operation .....	32
Table 4 — Reference parameters for Formula (6) .....	34
Table 5 — Variables for Formula (6) .....	34
Table 6 — Reference parameters for Formula (7) .....	35
Table 7 — Reference parameters for Formula (8) .....	36
Table 8 — Reference parameters for Formula (9) .....	36
Table 9 — Reference parameters for Formula (11) .....	38
Table 10 — Variables for Formula (11) .....	38
Table 11 — Reference parameters for Formula (12) .....	39
Table 12 — Reference parameters for Formula (13) .....	40
Table 13 — Reference parameters for Formula (14) .....	40
Table 14 — Reference parameter for Formula (17) .....	41
Table 15 — Reference parameter for Formula (15) .....	41
Table 16 — Relative losses of the 400V/9,95kVA reference CDM at the operating points described in Figure 5 .....	42
Table 17 — Reference motor losses .....	48
Table 18 — Reference parameter for Formula (28) .....	50
Table 19 — Relative losses of the 400V/7,5kW RPDS .....	51



**EN 50598-2:2014 (E)**

Table 20 — Reference CDM losses for IE class 1 definition .....	54
Table 21 — Reference PDS losses for IES class 1 definition.....	57
Table 22 — Information requirements.....	59
Table A.1 — Relative losses (%) of the reference CDM's, based on 400V RCDM of different power ratings at the operating points described in Figure 5 .....	71
Table A.2 — Relative losses (%) of 50Hz-4-pole reference motors (IE2) for different power ratings at the operating points described in Figure 4 .....	72
Table A.3 — Relative losses (%) for a reference PDS, based on a 400V RCDM and 4-pole reference motors (IE2) at different power ratings and at the operating points described in Figure 3.....	73
Table B.1 — Typical values of $\lambda$ for different input converter topologies .....	80
Table D.1 — Duty cycles of the investigated examples .....	91
Table D.2 — Losses in the specified operating points of Configuration 1 .....	91
Table D.3 — Losses in the specified operating points of configuration 2 .....	92
Table E.1 — Parameters of an example servo motor .....	95
Table E.2 — Typical operating cycles for a servo motor.....	95
Table F.1 — Coefficients for motors 4 pole (IE2) as a function of relative torque .....	104
Table F.2 — Coefficients for motors 4 pole (IE2) as a function of relative speed.....	108
Table F.3 — Coefficients for motors 2 pole (IE2) as a function of relative torque .....	112
Table F.4 — Coefficients for motors 2 pole (IE2) as a function of relative speed.....	116
Table G.1 — Relative losses of a 400V/9,95kVA example CDM at the predefined operating points .....	121
Table G.2 — Parameters of the example CDM.....	125
Table G.3 — Results of the CDM calculation according to the mathematical model.....	127
Table G.4 — Comparison of different loss evaluation methods.....	127
Table G.5 — Loss data of the 7,5kW reference motor.....	128

## EN 50598-2:2014 (E)

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

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;

**EN 50598-2:2014 (E)**

- 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.

**EN 50598-2:2014 (E)****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.

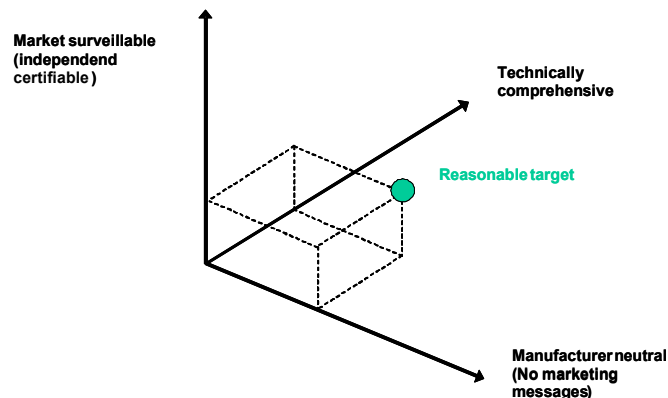
As the PDS contains converter driven motors, the requirements for measuring of the energy efficiency of motors with non-sinusoidal supply is under the responsibility of CLC/TC 2 covering the requirement from mandate M/470.

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.

## EN 50598-2:2014 (E)

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

<b>Mandates</b>	<b>Part 1</b>	<b>Part 2</b>	<b>Part 3</b>
<b>M/470</b> Motors		✓	✓
<b>M/476</b> PDS		✓	✓
<b>M/495</b> Horizontal all future Applications	✓	✓	✓
<b>M/488</b> HVAC comfort fans	✓	✓	(✓)
<b>M/498</b> Pumps	✓	✓	(✓)
<b>M/500</b> 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 individual components are under consideration.

**EN 50598-2:2014 (E)****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.