

BS EN 61800-2:2015



BSI Standards Publication

Adjustable speed electrical power drive systems

Part 2: General requirements — Rating specifications for low voltage adjustable speed a.c. power drive systems

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National foreword

This British Standard is the UK implementation of EN 61800-2:2015. It is identical to IEC 61800-2:2015. It supersedes BS EN 61800-2:1998 which will be withdrawn on 26 August 2018.

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

**Adjustable speed electrical power drive systems -
Part 2: General requirements - Rating specifications for low
voltage adjustable speed a.c. power drive systems
(IEC 61800-2:2015)**

Entraînements électriques de puissance à vitesse variable -
Partie 2: Exigences générales - Spécifications de
dimensionnement pour systèmes d'entraînement de
puissance à vitesse variable en courant alternatif et basse
tension
(IEC 61800-2:2015)

Drehzahlveränderbare elektrische Antriebe -
Teil 2: Allgemeine Anforderungen - Festlegungen für die
Bemessung von Niederspannungs-Wechselstrom-
Antriebssystemen mit einstellbarer Frequenz
(IEC 61800-2:2015)

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Europäisches Komitee für Elektrotechnische Normung

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

European foreword

The text of document 22G/303/FDIS, future edition 2 of IEC 61800-2, prepared by SC 22G “Adjustable speed electric drive systems incorporating semiconductor power converters” of IEC/TC 22 “Power electronic systems and equipment” was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61800-2:2015.

The following dates are fixed:

- latest date by which the document has to be (dop) 2016-05-26
implemented at national level by
publication of an identical national
standard or by endorsement
- latest date by which the national (dow) 2018-08-26
standards conflicting with the
document have to be withdrawn

This document supersedes EN 61800-2:1998.

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In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60027-3	NOTE	Harmonized as EN 60027-3.
IEC 60034-1	NOTE	Harmonized as EN 60034-1.
IEC 60204-1	NOTE	Harmonized as EN 60204-1.
IEC 60364 Series	NOTE	Harmonized as HD 60364 Series.
IEC 61131-2	NOTE	Harmonized as EN 61131-2.
IEC 61158 Series	NOTE	Harmonized as EN 61158 Series.
IEC 61158-1	NOTE	Harmonized as EN 61158-1.
IEC 61158-2	NOTE	Harmonized as EN 61158-2.
IEC 61378-1	NOTE	Harmonized as EN 61378-1.
IEC 61439-1	NOTE	Harmonized as EN 61439-1.
IEC 61800-1	NOTE	Harmonized as EN 61800-1.
IEC 61800-4	NOTE	Harmonized as EN 61800-4.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60034-9	-	Rotating electrical machines - Part 9: Noise limits	EN 60034-9	-
IEC 60038	-	IEC standard voltages	EN 60038	-
IEC 60050	Series	International Electrotechnical Vocabulary	-	-
IEC 60068	series	Environmental testing	EN 60068	Series
IEC 60068-2-2	2007	Environmental testing - Part 2-2: Tests - Test B: Dry heat	EN 60068-2-2	2007
IEC 60068-2-6	2007	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	2008
IEC 60068-2-27	2008	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	EN 60068-2-27	2009
IEC 60068-2-52	1996	Environmental testing - Part 2-52: Tests - Test Kb: Salt mist, cyclic (sodium chloride solution)	EN 60068-2-52	1996
IEC 60068-2-68	1994	Environmental testing - Part 2-68: Tests - Test L: Dust and sand	EN 60068-2-68	1996
IEC 60068-2-78	2012	Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state	EN 60068-2-78	2013
IEC 60079	Series	Explosive atmospheres	EN 60079	Series
IEC 60146-1-1	-	Semiconductor converters - General requirements and line commutated converters - Part 1-1: Specification of basic requirements	EN 60146-1-1	-
IEC/TR 60146-1-2	-	Semiconductor converters - General requirements and line commutated converters - Part 1-2: Application guide	-	-
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	EN 60529	-

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60664-1	-	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests	EN 60664-1	-
IEC 60721-3-1	1997	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 1: Storage	EN 60721-3-1	1997
IEC 60721-3-2	1997	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities -- Section 2: Transportation	EN 60721-3-2	1997
IEC 60721-3-3	1994	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 3: Stationary use at weatherprotected locations	EN 60721-3-3	1995
+A1	1995			
+A2	1996		+A2	1997
IEC 60721-3-4	1995	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 4: Stationary use at non-weatherprotected locations	EN 60721-3-4	1995
+A1	1996		+A1	1997
IEC 61800-3	-	Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods	EN 61800-3	-
IEC 61800-5-1	2007	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy	EN 61800-5-1	2007
IEC 61800-5-2	2007	Adjustable speed electrical power drive systems - Part 5-2: Safety requirements - Functional	EN 61800-5-2	2007
IEC/TR 61800-6	-	Adjustable speed electrical power drive systems - Part 6: Guide for determination of types of load duty and corresponding current ratings	CLC/TR 61800-6	-
IEC 61800-7	Series	Adjustable speed electrical power drive systems - Part 7: Generic interface and use of profiles for power drive systems	EN 61800-7	Series
IEC 61800-7-1	-	Adjustable speed electrical power drive systems - Part 7-1: Generic interface and use of profiles for power drive systems - Interface definition	EN 61800-7-1	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ADJUSTABLE SPEED ELECTRICAL
POWER DRIVE SYSTEMS –****Part 2: General requirements –
Rating specifications for low voltage
adjustable speed a.c. power drive systems**

FOREWORD

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International Standard IEC 61800-2 has been prepared by subcommittee 22G: Adjustable speed electric drive systems incorporating semiconductor power converters, of IEC technical committee 22: Power electronic systems and equipment.

This second edition cancels and replaces the first edition published in 1998. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition.

- a) Clause 1 (Scope) has been updated
- b) Clause 2 (Normative references) has been updated

- c) Clause 3 (Definitions) has been updated including fundamental definitions to be used across the IEC 61800 series of standards.
- d) Clause 4 has been updated with respect to:
- 1) description of the basic topology for *BDM/CDM/PDS* (4.2);
 - 2) ratings and performance (4.3 and 4.4);
 - 3) reference to applicable standards within the IEC 61800 series with respect to EMC (IEC 61800-3), Electrical safety (IEC 61800-5-1), Functional safety (IEC 61800-5-2), Load duty aspects (IEC TR 61800-6), Communication profiles (IEC 61800-7 series) and *Power interface* voltage (IEC TS 61800-8) to avoid conflicting requirements. (4.5, 4.6, 4.7, 4.10, 4.11, 4.12,);
 - 4) update of requirement for ECO design (4.8);
 - 5) update of requirement for environmental evaluation. (4.9);
 - 6) implementation of requirement for explosive atmosphere (4.13).
- e) Clause 5 has been updated with test requirement in order to provide a clear link between design requirement and test requirement.
- f) Clause 6 has been updated to harmonize the marking and documentation requirement within the IEC 61800 series.
- g) Existing Annexes A to G have been deleted and replaced with new Annexes A to C.

The text of this standard is based on the following documents:

FDIS	Report on voting
22G/303/FDIS	22G/305/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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.

In this standard, the terms in *italics* are defined in Clause 3.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

0.1 General

This document is part of the IEC 61800 series specifying requirements for adjustable speed electric drive systems (*PDS*). Since the publication of the first edition of IEC 61800-2 several documents of the IEC 61800 have been developed and maintained, which has resulted in outdated references and conflicting requirements across the IEC 61800 series.

This document contains general requirements for *PDSs* intended to feed a.c. *motors* and with rated *converter* input voltages (line-to-line voltage) up to 1 000 V a.c.

PDSs intended to feed a.c. *motors* with rated *converter input* voltages above 1 000 V a.c. are covered by IEC 61800-4.

PDSs intended to feed d.c. *motors* are covered by IEC 61800-1.

0.2 Consistency of requirement

This document specifies requirements for *PDSs* under its scope for the identified topics not covered by any other of the standards in the IEC 61800 series.

The following requirements are covered by other standards in the IEC 61800 series:

- EMC requirements are covered in IEC 61800-3;
- electrical safety requirements are covered in IEC 61800-5-1;
- functional safety requirements are covered in IEC 61800-5-2;
- type of load duty requirements are covered by IEC TR 61800-6;
- communication profiles aspects which are covered by IEC 61800-7 series;
- *power interface* voltage specification is specified in IEC TS 61800-8.

Generally this document provides a basic description of topics and refers to the relevant standard for specific requirement. This is done in order to ensure consistency and avoid conflicting requirement within the IEC 61800 series as well as minimize future maintenance of the documents.

As part of the work inside SC22G MT9 this edition of IEC61800-2 defines basic definition as used across the IEC 61800 series of standards.

For issues related to *active infeed converters*, IEC TS 62578 has been considered.

At the time of writing IEC SC 22G is developing a standard to provide requirement for energy *efficiency* for *BDM/CDM/PDS*. The next edition of IEC 61800-2 will reference this standard similar to the approach taken with the other IEC 61800 series standards.

As a result of the development of the IEC 61800 series of standards the need to reference documents outside the series has decreased and especially the need to reference the IEC 60146 series of standards has decreased dramatically.

0.3 Tool for agreement between *customer* and *manufacturer*

This document is intended to be used to create a comprehensive list of requirements to be used as a specification between *customer* and *manufacturer*. The requirement in this document is in itself not applicable for the *BDM/CDM/PDS*. Instead each topic should be specified by the *customer* as a compliance requirement.

The document may be useful as a specification tool, when *BDM/CDM/PDSs* are built into a final *installation* or application applied as a component. The following applications are considered relevant: lift and hoist, machinery, conveyor, switchgears, heating and ventilation, pump, wind, tidal and marine propulsion applications.

In every application, an identification of the environmental conditions under which the product is stored, transported and operated is essential for the proper specification of the *BDM/CDM/PDSs*. The environmental conditions considered should include electrical, mechanical, thermal, pollution and humidity environmental condition.

ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

Part 2: General requirements – Rating specifications for low voltage adjustable speed a.c. power drive systems

1 Scope

This part of IEC 61800 applies to adjustable speed electric a.c. power drive systems, which include semiconductor power conversion and the means for their control, protection, monitoring, measurement and the a.c. *motors*.

It applies to adjustable speed electric power drive systems intended to feed a.c. *motors* from a *BDM* connected to line-to-line voltages up to and including 1 kV a.c. 50 Hz or 60 Hz and/or voltages up to and including 1,5 kV d.c. input side.

NOTE 1 Adjustable speed electric a.c. power drive systems intended to feed a.c. *motors*, and with rated *converter* input voltages above 1 000 V a.c. are covered by IEC 61800-4.

NOTE 2 Adjustable speed electric d.c. power drive systems intended to feed d.c. *motors* are covered by IEC 61800-1.

NOTE 3 For adjustable speed electric a.c. power drive systems having series-connected electronic power *converter* sections, the line-to-line voltage is the sum of the series connected input voltages.

Traction applications and electric vehicles are excluded from the scope of this standard.

This part of IEC 61800 is intended to define the following aspects of an a.c. power drive system (*PDS*):

- principal parts of the *PDS*;
- ratings and performance;
- specifications for the environment in which the *PDS* is intended to be installed and operated;
- other specifications which might be applicable when specifying a complete *PDS*.

This standard provides minimum requirements, which may be used for the development of a specification between *customer* and *manufacturer*.

Compliance with this standard is possible only when each topic of this standard is individually specified by the *customer* developing specifications or by product standard committees developing product standards.

For some aspects which are covered by specific *PDS* product standards in the IEC 61800 series, this document provides a short introduction and reference to detailed requirements in these product standards.

This applies to the following aspects:

- EMC which is covered in IEC 61800-3;
- electrical safety which is covered in IEC 61800-5-1;
- functional safety which is covered in IEC 61800-5-2;
- type of load duty which are covered by IEC TR 61800-6;
- communication profiles which are covered by IEC 61800-7 series;
- *power interface* voltage specification which is covered by IEC TS 61800-8.

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.

IEC 60034-9, *Rotating electrical machines – Part 9: Noise limits*

IEC 60038, *IEC standard voltages*

IEC 60068 (all parts), *Environmental testing*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-6:2007, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-27:2008, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-52:1996, *Environmental testing – Part 2: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)*

IEC 60068-2-68:1994, *Environmental testing – Part 2-68: Tests – Test L: Dust and sand*

IEC 60068-2-78:2012, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60050 (all parts): *International Electrotechnical Vocabulary* (available at <<http://www.electropedia.org>>)

IEC 60079 (all parts), *Explosive atmospheres*

IEC 60146-1-1, *Semiconductor convertors – General requirement and line commutated convertors – Part 1-1: Specification of basic requirements*

IEC TR 60146-1-2, *Semiconductor convertors – General requirement and line commutated convertors – Part 1-2: Application guide*

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IEC 60664-1, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60721-3-1:1997, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 1: Storage*

IEC 60721-3-2:1997, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 2: Transportation*

IEC 60721-3-3:1994, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 3: Stationary use at weatherprotected locations*

IEC 60721-3-3:1994/AMD1:1995

IEC 60721-3-3:1994/AMD2:1996

IEC 60721-3-4:1995, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 4: Stationary use at non-weatherprotected locations*

IEC 60721-3-4:1995/AMD1:1996

IEC 61800-3, *Adjustable speed electrical power drive systems – Part 3: EMC requirements and specific test methods*

IEC 61800-5-1:2007, *Adjustable speed electrical power drive systems – Part 5-1: Safety requirements – Electrical, thermal and energy*

IEC 61800-5-2:2007, *Adjustable speed electrical power drive systems – Part 5-2: Safety requirements – Functional*

IEC TR 61800-6, *Adjustable speed electrical power drive systems – Part 6: Guide for determination of types of load duty and corresponding current ratings*

IEC 61800-7 (all parts), *Adjustable speed electrical power drive systems – Part 7: Generic interface and use of profiles for power drive systems*

IEC 61800-7-1, *Adjustable speed electrical power drive systems – Part 7-1: Generic interface and use of profiles for power drive systems – Interface definition*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-111, IEC 60050-151, IEC 60050-161, IEC 60050-191, IEC 60050-441, IEC 60050-442, IEC 60050-551, IEC 60050-601, IEC 60146-1-1, IEC TR 60146-1-2, and the following apply

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3.16	end user <professional> ^a				
^a Definitions used in several standards of the IEC 61800 series.					
^b Fundamental definition across IEC 61800 series.					

NOTE This document contains the fundamental definitions used across the IEC 61800 series in a way that they can be used in future revisions of all IEC 61800 standards.

Table 2 – List of input ratings of *BDM/CDM/PDS*

3.20	input active power <BDM> (P_V)	3.28	input current <BDM> (I_V)	3.36	input voltage <BDM> (U_V)
3.21	rated input active power <BDM> (P_{VN})	3.29	rated input current <BDM> (I_{VN})	3.37	rated input voltage <BDM> (U_{VN})
3.22	input active power <CDM/PDS> (P_L)	3.30	input current <CDM/PDS> (I_L)	3.38	input voltage <CDM/PDS> (U_L)
3.23	rated input active power <CDM/PDS> (P_{LN})	3.31	rated input current <CDM/PDS> (I_{LN})	3.39	rated input voltage <CDM/PDS> (U_{LN})
3.24	input apparent power <BDM> (S_V)	3.32	input frequency <BDM> (f_V)		
3.25	rated input apparent power <BDM> (S_{VN})	3.33	rated input frequency <BDM> (f_{VN})		
3.26	input apparent power <CDM/PDS> (S_L)	3.34	input frequency <CDM/PDS> (f_L)		
3.27	rated input apparent power <CDM/PDS> (S_{LN})	3.35	rated input frequency <CDM/PDS> (f_{LN})		

NOTE Subscriptions follow the concept of IEC 60146-1-1.

Table 3 – List of output ratings of *BDM/CDM/PDS*

3.52	output current <BDM> (I_a)	3.60	output voltage <BDM> (U_{a1})	3.68	output apparent power <BDM> (S_a)
3.53	rated output current <BDM> (I_{aN})	3.61	rated output voltage <BDM> (U_{aN1})	3.69	rated output apparent power <BDM> (S_{aN})
3.54	output current <CDM> (I_A)	3.62	output voltage <CDM> (U_{A1})	3.70	output apparent power <CDM> (S_A)
3.55	rated output current <CDM> (I_{AN})	3.63	rated output voltage <CDM> (U_{AN1})	3.71	rated output apparent power <CDM> (S_{AN})
3.56	output frequency <BDM> (f_a)	3.64	Output active power <BDM> (P_a)	3.72	output power <PDS> (P_s)
3.57	rated output frequency <BDM> (f_{aN})	3.65	rated output active power <BDM> (P_{aN})	3.73	rated output power <PDS> (P_{SN})
3.58	output frequency <CDM> (f_A)	3.66	output active power <CDM> (P_A)		
3.59	rated output frequency <CDM> (f_{AN})	3.67	rated output active power <CDM> (P_{AN})		

NOTE Subscriptions follows the concept of IEC 60146-1-1

Table 4 – List of motor speed and torque ratings

3.44	speed <of a motor> (N)	3.47	minimum speed <of a motor> (N_{Min})	3.82	torque <of a motor> (M)
3.45	maximum rated safe speed <of a motor> (N_{sNMax})	3.48	minimum rated speed <of a motor> (N_{NMin})	3.83	rated torque <of a motor> (M_N)
3.46	maximum rated speed <of a motor> (N_{NMax})	3.49	rated speed <of a motor> (N_N)		

NOTE 1 Subscriptions follows the concept of IEC 60146-1-1.

NOTE 2 See also Figure 8, 4.3.3.2.

3.1

acceptance test

contractual test to prove to the *customer* that the device meets certain conditions of its specification

[SOURCE: IEC 60050-151:2001, 151.16.23, modified — The word "item" is replaced by the word "device"]

3.2

a.c. mains power port

power port which feeds the *PDS* for only the power which, after electrical power conversion, is converted by the *motor* into mechanical power

3.3

active infeed converter

AIC

self-commutated electronic power *converters* of all technologies, topologies, voltages and sizes which are connected between the a.c. power supply system (lines) and a stiff d.c.-side (current source or voltage source) and which can convert electric power in both directions (generative or regenerative) and which can control the reactive power or the *power factor*

Note 1 to entry: Some of them can additionally control the harmonics to reduce the distortion of an applied voltage or current.

Note 2 to entry: Basic topologies may be realized as a Voltage Source *Converter* (VSC) or a Current Source *Converter* (CSC).

Note 3 to entry: In IEC 60050, these terms (VSC and CSC) are defined as voltage stiff a.c./d.c. *converter* [551-12-03] and current stiff a.c./d.c. *converter* [551-12-04]. Most of the AICs are bi-directional *converters* and have sources on the d.c. side

Note 4 to entry: In some literature *active infeed converters* are also known as active front end (AFE).

Note 5 to entry: This note applies to the French language only.

[SOURCE: IEC TS 62578:2009, 3.1 modified]

3.4

basic drive module

BDM

electronic power *converter* and related control, connected between an electric supply and a *motor*

Note 1 to entry: The BDM is capable of transmitting power from the electric supply to the *motor* and may be capable of transmitting power from the *motor* to the electric supply.

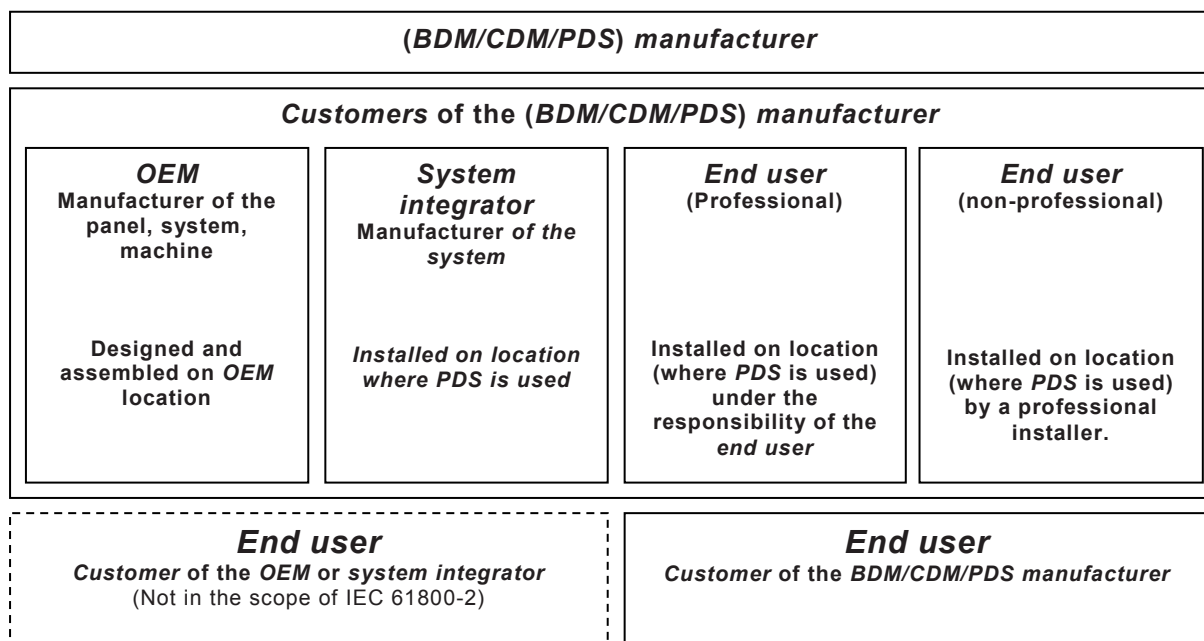
Note 2 to entry: The BDM controls some or all of the following aspects of power transmitted to the *motor* and *motor* output: current, frequency, voltage, speed, torque, force

Note 3 to entry: This note applies to the French language only.

3.5

(BDM/CDM/PDS) customer

OEM, *system integrator* or *end user* (professional/non-professional) specifying and purchasing a *BDM/CDM/PDS* from the *BDM/CDM/PDS manufacturer*



IEC

Figure 1 – (BDM/CDM/PDS) manufacturer/customer relationship

3.6

(BDM/CDM/PDS) manufacturer

entity which designs and *manufactures* all or part of a *BDM/CDM/PDS*

SEE: Figure 1.

3.7

commissioning test

test on a device or equipment carried out on site, to prove the correctness of *installation* and operation

[SOURCE: IEC 60050-151:2001, 151.16.24 and IEC 60050-411:1984, 411.53.06 modified — Both the definitions have been combined here.]

3.8

complete drive module

CDM

drive module consisting of, but not limited to, the *BDM* and extensions such as protection devices, transformers and auxiliaries, but excluding the *motor* and the sensors which are mechanically coupled to the *motor* shaft

Note 1 to entry: This note applies to the French language only.

3.9

converter, <of the *BDM*>

unit which changes the form of electrical power supplied by the main to the form fed to the *motor(s)* by changing one or more of the voltage, current and/or frequency

SEE: Figure 1.

Note 1 to entry: The *converter* comprises electronic commutating devices and their associated commutation circuits. It is controlled by transistors or thyristors or any other power switching semiconductor devices.

Note 2 to entry: The *converter* can be line-commutated or self-commutated and can consist for example of one or more *rectifiers*.

3.10

d.c. braking

process of converting the rotational energy of the rotor and connected inertial load to electrical energy dissipated in the rotor by injection of d.c. current into the stator

3.11

d.c. link

power d.c. circuit linking the input *converter* and the output *converter* of an indirect *converter*, consisting of capacitors and/or reactors to reduce d.c. voltage ripple or d.c. current ripple

3.12

dynamic braking

process of converting the rotational energy of the rotor and connected inertial load to electrical energy dissipated in a resistance

3.13

efficiency <of the *CDM*>

ratio of the total electrical power at the *CDM power interface* at the *motor* terminals to the total power at the *a.c. mains power port*

Note 1 to entry: See feeding line in Figure 2

Note 2 to entry: *Efficiency* is usually expressed as a percentage.

3.14

efficiency <of the *PDS*>

the ratio of the mechanical power at the *motor* shaft to the total electrical power at the *a.c. mains power port*

Note 1 to entry: See feeding line in Figure 2.

Note 2 to entry: *Efficiency* is usually expressed as a percentage.

3.15

end user <non-professional>

entity who does not have technical knowledge about operating a *PDS* in the performance of his profession and has little or no relevant formal instruction

3.16

end user <professional>

entity who is skilled or instructed for machines or systems provided by an *OEM*, *system integrator* or the *PDS manufacturer* for the application operation

3.17

four quadrant operation

converter operation of a machine as a *motor* or a generator in either direction of machine rotation

Note 1 to entry: Four quadrant operation involves operation in quadrants I, II, III and IV as shown in Figure 3.

3.18

total harmonic distortion

THD

ratio of the r.m.s. value of the harmonic content of an alternating quantity to the r.m.s. value of the fundamental component of the quantity

Note 1 to entry: This note applies to the French language only.

[SOURCE: IEC 60050-551:1998, 555.17.06]

3.19

high-voltage PDS <for a.c. *motor*>

power drive system with a *BDM converter* section of which the rated *input voltage* is above 1 kV a.c. and not exceeding 35 kV a.c. 50 Hz or 60 Hz or above 1,5 kV d.c.

Note 1 to entry: This *PDS* is covered by the scope of IEC 61800-4.

Note 2 to entry: For *PDS* having series-connected *converter* sections, a sum of the series-connected *input voltages* is used as the equivalent *input voltage* of the *converter* sections (see Annex B).

3.20

input active power <BDM>

P_V

power determined by the fundamental components of voltage and current at the supply terminals of the *BDM* (valve side)

3.21

rated input active power <BDM>

P_{VN}

rated power determined by the fundamental components of voltage and current at the supply terminals of the *BDM* (valve side)

3.22

input active power <CDM/PDS>

P_L

power determined by the fundamental components of voltage and current at the supply terminals of the *CDM/PDS* (*installation* side)

3.23**rated input active power** <CDM/PDS> P_{LN}

rated power determined by the fundamental components of voltage and current at the supply terminals of the *CDM/PDS* (*installation* side)

3.24**input apparent power** <BDM> S_V

power determined by the r.m.s values of voltage and current at the supply terminals of the *BDM* (valve side)

3.25**rated input apparent power** <BDM> S_{VN}

rated power determined by the r.m.s values of voltage and current at the supply terminals of the *BDM* (valve side)

3.26**input apparent power** <CDM/PDS> S_L

power determined by the r.m.s values of voltage and current at the supply terminals of *CDM/PDS* (*installation* side)

3.27**rated input apparent power** <CDM/PDS> S_{LN}

rated power determined by the r.m.s values of voltage and current at the supply terminals of the *CDM/PDS* (*installation* side)

3.28**input current** <BDM> I_V

r.m.s. value of current at the supply terminals of the *BDM* (valve side)

3.29**rated input current** <BDM> I_{VN}

maximum r.m.s. value of current at the supply terminals of the *BDM* (valve side) under rated conditions

Note 1 to entry: It takes into account rated load and the most onerous combination of all other conditions within their specified ranges, e.g. line voltage and frequency deviations.

3.30**input current** <CDM/PDS> I_L

r.m.s. value of current at the supply terminals of the *CDM/PDS* (*installation* side)

3.31**rated input current** <CDM/PDS> I_{LN}

maximum r.m.s. value of current at the supply terminals of the *CDM/PDS* (*installation* side) under rated conditions

Note 1 to entry: It takes into account rated load and the most onerous combination of all other conditions within their specified ranges, e.g. line voltage and frequency deviations.

3.32**input frequency <BDM>** f_v frequency of the power input system at the supply terminals of the *BDM* (valve side)**3.33****rated input frequency <BDM>** f_{vN} rated value of the frequency at the supply terminals of the *BDM* (valve side)**3.34****input frequency <CDM/PDS>** f_L frequency of the supply terminals of the *CDM/PDS* (*installation* side)**3.35****rated input frequency <CDM/PDS>** f_{LN} rated value of the frequency at the supply terminals of the *CDM/PDS* (*installation* side)**3.36****input voltage <BDM>** U_v r.m.s. input line-to-line voltage at the supply terminals of the *BDM* (valve side)**3.37****rated input voltage <BDM>** U_{vN} r.m.s. value of the rated input line-to-line voltage at the supply terminals of the *BDM* (valve side)**3.38****input voltage <CDM/PDS>** U_L r.m.s. input line-to-line voltage at the supply terminals of the *CDM/PDS* (*installation* side)**3.39****rated input voltage <CDM/PDS>** U_{LN} r.m.s. value of the rated input line-to-line voltage at the supply terminals of the *CDM/PDS* (*installation* side)**3.40****installation**equipment or equipments which include at least both the *PDS* and the driven equipment

Note 1 to entry: The words “act of installing” are used in this international standard to denote the process of installing a *PDS*.

3.41**integrated PDS***PDS* where *motor* and *BDM/CDM* are mechanically integrated into a single unit**3.42****inverter**electric energy *converter* that changes direct electric current to single-phase or polyphase alternating current

[SOURCE: IEC 60050-151:2001, 151.13.46]

3.43

low-voltage PDS <for a.c. *motor*>

power drive system with a *BDM converter* section of which the rated *input voltage* is below or equal to 1 kV a.c. 50 Hz or 60 Hz or 1,5 kV d.c.

Note 1 to entry: This *PDS* is covered by the scope of IEC 61800-2.

Note 2 to entry: For *PDS* having series-connected *converter* sections, a sum of the series-connected *input voltages* is used as the equivalent *input voltage* of the *converter* sections (see Annex B).

3.44

speed <of a *motor*>

N

rotational velocity of the *motor*

[SOURCE: IEC 60050-811:1991, 811.13.03, modified]

3.45

maximum rated safe speed <of a *motor*>

N_{SNMax}

maximum speed, at which the *motor* may be operated continuously

Note 1 to entry: Operation above the maximum rated safe speed could lead to a hazard.

Note 2 to entry: See also Figure 8 and 4.3.3.2

3.46

maximum rated speed <of a *motor*>

N_{NMax}

maximum speed specified by the *PDS manufacturer*

Note 1 to entry: This might include operation in the field weakening mode, at a speed higher than the *rated speed*, but with torque lower than *rated torque* (constant power region).

Note 2 to entry: When operating a *motor* at speeds above *rated speed*, the mechanical stress increases and the expected lifetime of the bearings may be reduced. Fine balance of the *motor* as well as service of the *motor* should be considered. See also IEC 60034-1.

Note 3 to entry: See also Figure 8 and 4.3.3.2

3.47

minimum speed <of a *motor*>

N_{Min}

minimum allowed speed of the *motor*, at which the *motor* is able to continuously deliver torque, without overheating the *motor*

Note 1 to entry: See also Figure 8 and 4.3.3.2.

Note 2 to entry: Operating at minimum speed may also include operation with reduced torque.

3.48

minimum rated speed <of a *motor*>

N_{NMin}

minimum allowed speed, at which the *motor* is able to continuously deliver *rated torque*, without overheating the *motor*

Note 1 to entry: See also Figure 8 and 4.3.3.2.

3.49**rated speed** <of a *motor*> N_N

maximum speed, at which the *motor* is able to continuously deliver *rated torque* (M_N), at *rated output voltage* (U_{aN1}/U_{AN1}), *current* (I_{aN}/I_{AN}) and *frequency* (f_{aN}/f_{AN}) conditions

Note 1 to entry: See also Figure 8 and 4.3.3.2.

3.50**electric motor**

electric machine intended to transform electric energy into mechanical energy

Note 1 to entry: For the purposes of this standard, the *motor* includes all sensors which are mounted on it and which are relevant for supporting the operating mode and interacting with a *CDM*.

3.51**Original Equipment Manufacturer OEM**

entity which designs and manufactures series of machines, panels or systems incorporating one or more *PDSs*

Note 1 to entry: This note applies to the French language only.

3.52**output current** <*BDM*> I_a

r.m.s. value of the current at the *motor* side of the *BDM*

3.53**rated output current** <*BDM*> I_{aN}

maximum r.m.s. value of the current at the *motor* side of the *BDM* which can be supplied continuously without exceeding established limitations, under rated operating conditions

3.54**output current** <*CDM*> I_A

r.m.s. value of the current at the *motor* side of the *CDM*

3.55**rated output current** <*CDM*> I_{AN}

maximum r.m.s. value of the current at the *motor* side of the *CDM* which can be supplied continuously without exceeding established limitations, under rated operating conditions

3.56**output frequency** <*BDM*> f_a

fundamental frequency at the *motor* side of the *BDM*

Note 1 to entry: The frequency is usually specified as the operating range by the *manufacturer*.

3.57**rated output frequency** <*BDM*> f_{aN}

range of fundamental frequency at the *motor* side of the *BDM*

3.58**output frequency** <CDM> f_A fundamental frequency at the *motor* side of the CDM

Note 1 to entry: The frequency is usually specified as the operating range by the *manufacturer*.

3.59**rated output frequency** <CDM> f_{AN} range of fundamental frequency at the *motor* side of the CDM**3.60****output voltage** <BDM> U_{a1} r.m.s. value of the rated fundamental voltage at the *motor* side of the BDM**3.61****rated output voltage** <BDM> U_{aN1} r.m.s. value of the rated fundamental voltage at the *motor* side of the BDM**3.62****output voltage** <CDM> U_{A1} r.m.s. value of the rated fundamental voltage at the *motor* side of the CDM**3.63****rated output voltage** <CDM> U_{AN1} r.m.s. value of the rated fundamental voltage at the *motor* side of the CDM**3.64****output active power** <BDM> P_a power determined by the fundamental components of voltage and current at the *motor* side of the BDM**3.65****rated output active power** <BDM> P_{aN} rated power determined by the fundamental components of voltage and current at the *motor* side of the BDM**3.66****output active power** <CDM> P_A power determined by the fundamental components of voltage and current at the *motor* side of the CDM**3.67****rated output active power** <CDM> P_{AN} rated power determined by the fundamental components of voltage and current at the *motor* side of the CDM

3.68**output apparent power <BDM>** S_a power determined by the r.m.s values of voltage and current at the *motor* side of the *BDM***3.69****rated output apparent power <BDM>** S_{aN} rated power determined by the r.m.s values of voltage and current at the *motor* side of the *BDM***3.70****output apparent power <CDM>** S_A power determined by the r.m.s values of voltage and current at the *motor* side of the *CDM***3.71****rated output apparent power <CDM>** S_{AN} rated power determined by the r.m.s values of voltage and current at the *motor* side of the *CDM***3.72****output power <PDS>** P_s (mechanical) power of the *PDS* determined by the torque and speed at the *motor* shaft**3.73****rated output power <PDS>** P_{sN} rated (mechanical) power of the *PDS* determined by the torque and speed at the *motor* shaft**3.74****output overload capability**maximum *output current* which can be supplied, for a specified period of time, without exceeding established limitations under prescribed operating conditions**3.75****port**

access to a device or network where electromagnetic energy or signals may be supplied or received or where the device or network variables may be observed or measured

3.76**port for process measurement and control**input/output (I/O) *port* for conductor or cable which connects the process to the *PDS***3.77****power port***port* which connects the *PDS* to the power supply which also feeds other equipment**3.78****power interface**connections needed for the distribution of electrical power within the *PDS*

3.79**power drive system****PDS**

system consisting of one or more *complete drive module(s)* (*CDM*) and a *motor* or *motors*; any sensors which are mechanically coupled to the *motor* shaft are also part of the *PDS*, however the driven equipment is not included

SEE: Figure 2.

Note 1 to entry: This note applies to the French language only.

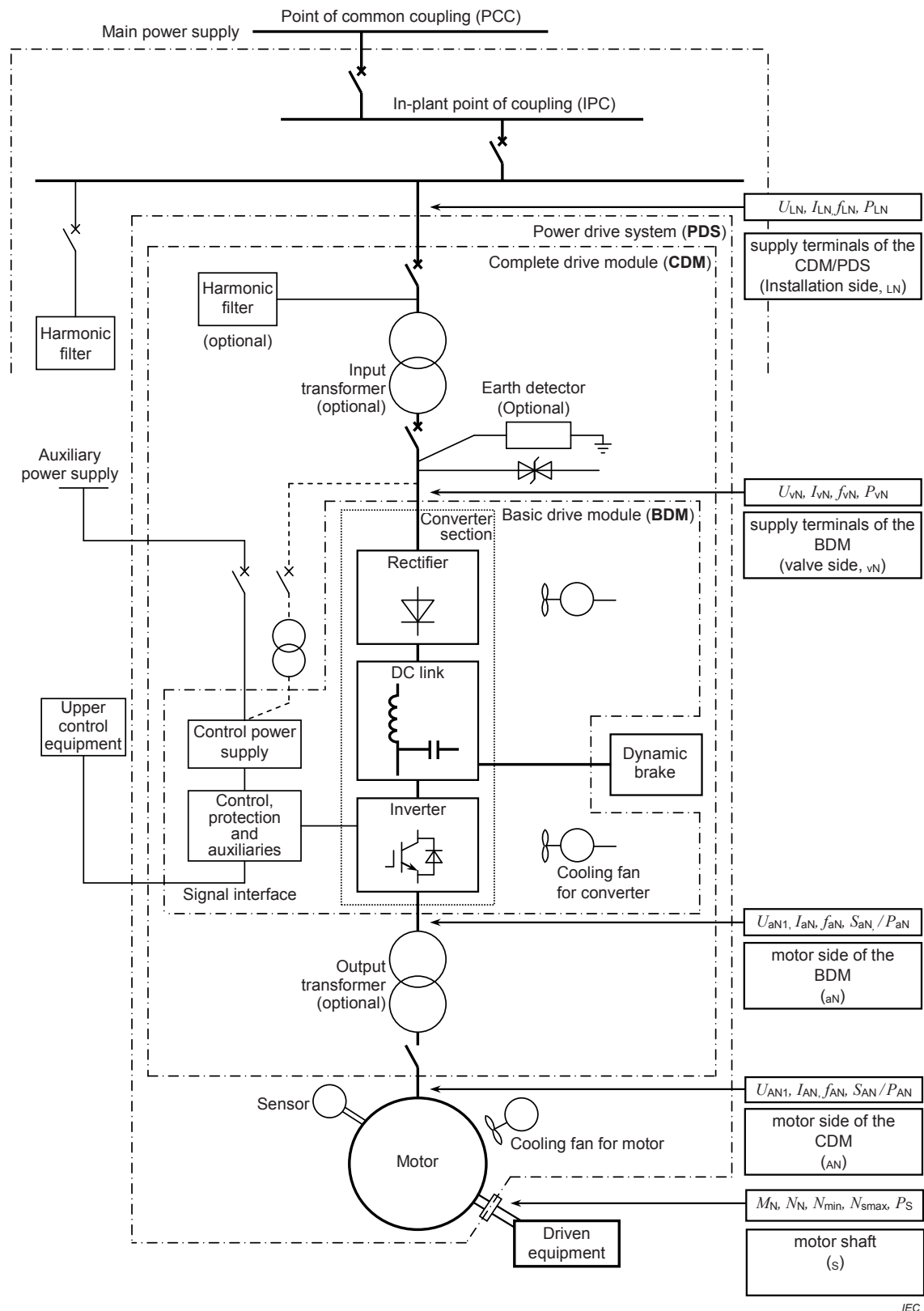


Figure 2 – Example of a power drive system