



BSI Standards Publication

Adjustable speed electrical power drive systems

Part 2: General requirements — Rating specifications
for adjustable speed AC power drive systems

National foreword

This British Standard is the UK implementation of EN IEC 61800-2:2021. It is identical to IEC 61800-2:2021. It supersedes [BS EN 61800-2:2015](#), which is withdrawn.

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 committee manager.

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Amendments/corrigenda issued since publication

Date	Text affected
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English Version

Adjustable speed electrical power drive systems - Part 2:
General requirements - Rating specifications for adjustable
speed AC power drive systems
(IEC 61800-2:2021)

Entraînements électriques de puissance à vitesse variable -
Partie 2: Exigences générales - Spécifications de
dimensionnement pour entraînements électriques de
puissance à vitesse variable en courant alternatif
(IEC 61800-2:2021)

Drehzahlveränderbare elektrische Antriebe - Teil 2:
Allgemeine Anforderungen - Festlegungen für die
Bemessung von Niederspannungs-Wechselstrom-
Antriebssystemen mit einstellbarer Frequenz
(IEC 61800-2:2021)

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 22G/432/FDIS, future edition 3 of IEC 61800-2, prepared by SC 22G "Adjustable speed electric power drive systems (PDS)" of IEC/TC 22 "Power electronic systems and equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61800-2:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2022-01-07
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2024-04-07

This document supersedes EN 61800-2:2015 and all of its amendments and corrigenda (if any).

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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 60034-14	NOTE	Harmonized as EN IEC 60034-14
IEC 60034-18-31	NOTE	Harmonized as EN 60034-18-31
IEC/TS 60034-25	NOTE	Harmonized as CLC/TS 60034-25
IEC 60034-30 (series)	NOTE	Harmonized as EN 60034-30 (series)
IEC 60068-2-6	NOTE	Harmonized as EN 60068-2-6
IEC 60068-2-52	NOTE	Harmonized as EN IEC 60068-2-52
IEC 60068-2-68	NOTE	Harmonized as EN 60068-2-68
IEC 60068-2-78	NOTE	Harmonized as EN 60068-2-78
IEC 60076-1	NOTE	Harmonized as EN 60076-1

IEC 60146 (series)	NOTE	Harmonized as EN 60146 (series)
IEC 60204-1	NOTE	Harmonized as EN 60204-1
IEC 60364 (series)	NOTE	Harmonized as HD 60364 (series)
IEC 60529	NOTE	Harmonized as EN 60529
IEC 60664-1	NOTE	Harmonized as EN IEC 60664-1
IEC 60721 (series)	NOTE	Harmonized as EN 60721 (series)
IEC 60721-2-6	NOTE	Harmonized as HD 478.2.6 S1
IEC 61131-2	NOTE	Harmonized as EN 61131-2
IEC 61158 (series)	NOTE	Harmonized as EN 61158 (series)
IEC 61378 (series)	NOTE	Harmonized as EN 61378 (series)
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 IEC 61800-1
IEC 61800-4:2002	NOTE	Harmonized as EN 61800-4:2003 (not modified)

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 Where 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	series	Rotating electrical machines	EN IEC 60034	series
IEC 60038	-	IEC standard voltages	EN 60038	-
IEC 60050-112	-	International Electrotechnical Vocabulary - Part 112: Quantities and units	-	-
IEC 60050-113	2011	International Electrotechnical Vocabulary - Part 113: Physics for electrotechnology	-	-
IEC 60050-114	-	International Electrotechnical Vocabulary - Part 114: Electrochemistry	-	-
IEC 60050-151	-	International Electrotechnical Vocabulary - Part 151: Electrical and magnetic devices	-	-
IEC 60050-161	-	International Electrotechnical Vocabulary. Chapter 161: Electromagnetic compatibility	-	-
IEC 60050-192	-	International electrotechnical vocabulary - Part 192: Dependability	-	-
IEC 60050-441	-	International Electrotechnical Vocabulary. Switchgear, controlgear and fuses	-	-
IEC 60050-442	-	International Electrotechnical Vocabulary - Part 442: Electrical accessories	-	-
IEC 60050-551	-	International Electrotechnical Vocabulary - Part 551: Power electronics	-	-

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-601	-	International Electrotechnical Vocabulary. Chapter 601: Generation, transmission and distribution of electricity - General	-	-
IEC 60068	series	Environmental testing	EN 60068	series
IEC 60068-2-27	2008	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	EN 60068-2-27	2009
IEC 60076	series	Power transformers	EN 60076	series
IEC 60076-11	-	Power transformers - Part 11: Dry-type transformers	EN IEC 60076-11	-
IEC 60079	series	Explosive atmospheres	-	-
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 convertors - General requirements and line commutated convertors - Part 1-2: Application guide	-	-
IEC 60721-3-0	-	Classification of environmental conditions - Part 3-0: Classification of groups of environmental parameters and their severities - Introduction	EN IEC 60721-3-0	-
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

EN IEC 61800-2:2021 (E)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
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 IEC 61800-3	-
IEC 61800-5-1	-	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy	EN 61800-5-1	-
IEC 61800-5-2	2016	Adjustable speed electrical power drive systems - Part 5-2: Safety requirements - Functional	EN 61800-5-2	2017
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	-
IEC/TS 61800-8	-	Adjustable speed electrical power drive systems - Part 8: Specification of voltage on the power interface	-	-
IEC 61800-9-1	-	Adjustable speed electrical power drive systems - Part 9-1: Ecodesign for power drive systems, motor starters, power electronics and their driven applications - General requirements for setting energy efficiency standards for power driven equipment using the extended product approach (EPA) and semi analytic model (SAM)	EN 61800-9-1	-
IEC 61800-9-2	-	Adjustable speed electrical power drive systems - Part 9-2: Ecodesign for power drive systems, motor starters, power electronics and their driven applications - Energy efficiency indicators for power drive systems and motor starters	EN 61800-9-2	-

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC/TS 62578	2015	Power electronics systems and equipment - Operation conditions and characteristics of active infeed converter (AIC) applications including design recommendations for their emission values below 150 kHz	-	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –**Part 2: General requirements –
Rating specifications for adjustable
speed AC power drive systems**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61800-2 has been prepared by subcommittee 22G: Adjustable speed electric power drive systems (PDS), of IEC technical committee 22: Power electronic systems and equipment.

This third edition cancels and replaces the second edition published in 2015. This edition constitutes a technical revision.

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

- a) the requirements from IEC 61800-4 for high-voltage PDS are now merged with requirements from IEC 61800-2:2015, and IEC 61800-4:2002 will be withdrawn upon release of this document;
- b) Clause 1 has been updated to introduce the new concept of Clause 4;

- c) terms and definitions in Table 1 to Table 4 have been classified in logical order; classification in low voltage and high voltage has been considered in Table 5, and Figure 3 clarifies boundaries within *BDM/CDM/PDS*.
- d) Clause 4 is new and creates the methods for evaluating a product to this document;
- e) Clause 5 has been updated with respect to:
 - 1) specific content for high-voltage *BDM/CDM/PDS*;
 - 2) description of the basic topology for *BDM/CDM/PDS* (5.2);
 - 3) ratings and performance (5.3 and 5.4);
 - 4) 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), *power interface* voltage (IEC TS 61800-8), and ecodesign (IEC 61800-9 series) to avoid conflicting requirements (5.5, 5.6, 5.7, 5.10, 5.11, 5.12);
 - 5) update of requirement for ecodesign (5.8);
 - 6) update of requirement for environmental evaluation (5.9);
 - 7) implementation of requirement for explosive atmosphere (5.14);
- f) Clause 6 has been updated with test requirement in order to provide a clear link between design requirement and test requirement;
- g) Clause 7 has been updated to harmonize the marking and documentation requirement within IEC 61800 (all parts);
- h) existing Annex A and Annex B have been updated to include specific detail pertaining to *high voltage BDM/CDM/PDS*.

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

FDIS	Report on voting
22G/432/FDIS	22G/435/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 document, 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 electrical power drive systems (PDS)*. Since the publication of the second edition of IEC 61800-2, several documents of the IEC 61800 series 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 AC *motors* and with rated *converter* input voltages (line-to-line voltage) up to 35 000 V AC.

PDSs intended to feed DC *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:

- DC *PDS* requirements are covered by IEC 61800-1;
- EMC requirements are covered by IEC 61800-3;
- general safety requirements are covered by IEC 61800-5-1;
- functional safety requirements are covered by IEC 61800-5-2;
- type of load duty guidance is covered by IEC TR 61800-6;
- interface and use of profiles requirements are covered by IEC 61800-7 (all parts);
- *power interface* voltage specification is covered by IEC TS 61800-8;
- ecodesign energy *efficiency* requirements of drive system are covered by IEC 61800-9 (all parts).

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, to avoid conflicting requirement within IEC 61800 (all parts) and to optimize future maintenance of the documents.

As part of the work inside SC 22G MT9, this document defines basic definitions used across the IEC 61800 series. For issues related to *active infeed converters*, IEC TS 62578 has been considered.

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 (all parts) has decreased dramatically.

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

This document provides a non-exhaustive list of requirements to aid in the development of a functional specification between responsible parties. Each topic should be individually specified by the *responsible party(ies)* as a compliance requirement where appropriate for the intended application. When the *manufacturer* is the only *responsible party*, for any reason, the *manufacturer* may choose to select the specific sections of this document which are relevant for the intended application.

BDM/CDM/PDS may be built into a final installation or imbedded into an extended product as a component. The following are example applications: 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/PDS*. The environmental conditions considered should include at least those defined in IEC 60721 (all parts) and EMC.

ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

Part 2: General requirements – Rating specifications for adjustable speed AC power drive systems

1 Scope

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

It applies to adjustable *speed* electric *power drive systems* intended to feed AC *motors* from a *BDM* or *CDM* connected to line-to-line voltages up to and including 35 kV AC 50 Hz or 60 Hz and/or voltages up to and including 1,5 kV DC input side.

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

This documents defines and describes a non-exhaustive list of criteria for the selection of *BDM/CDM/PDS* performance and functional attributes. This list is reviewed by the responsible parties to determine considerations for the design of device(s), equipment or system(s) with related testing specification. It also suggests a selection of performance and functional attributes for driven equipment and extended products. The performance and functional attributes focus on the following categories:

- principal parts topology and classification of the *PDS*;
- ratings, performance and functionality;
- 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*.

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

This document provides a non-exhaustive list from which minimum requirements can be used for the development of a specification between *customer* and *manufacturer* based on the application requirements. This same non-exhaustive list can be used by a *manufacturer* to determine the minimum requirements for a commoditised *BDM/CDM/PDS* without *customer* interaction based on the specified application of that *BDM/CDM/PDS*.

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 requirements are covered by IEC 61800-3;
- general safety requirements are covered by IEC 61800-5-1;
- functional safety requirements are covered by IEC 61800-5-2;
- type of load duty guidance is covered by IEC TR 61800-6;
- interface and use of profiles requirements are covered by IEC 61800-7 (all parts);
- power interface voltage specification is covered by IEC TS 61800-8;

- ecodesign energy efficiency requirements of drive system are covered by IEC 61800-9 (all parts).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60034 (all parts), *Rotating electrical machines*

IEC 60038, *IEC standard voltages*

IEC 60050-112, *International Electrotechnical Vocabulary (IEV) – Part 112: Quantities and units* (available at www.electropedia.org)

IEC 60050-113:2011, *International Electrotechnical Vocabulary (IEV) – Part 113: Physics for electrotechnology* (available at www.electropedia.org)

IEC 60050-114, *International Electrotechnical Vocabulary (IEV) – Part 114: Electrochemistry* (available at www.electropedia.org)

IEC 60050-151, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices* (available at www.electropedia.org)

IEC 60050-161, *International Electrotechnical Vocabulary (IEV) – Part 161: Electromagnetic compatibility* (available at www.electropedia.org)

IEC 60050-192, *International Electrotechnical Vocabulary (IEV) – Part 191: Dependability* (available at www.electropedia.org)

IEC 60050-441, *International Electrotechnical Vocabulary (IEV) – Part 441: Switchgear, controlgear and fuses* (available at www.electropedia.org)

IEC 60050-442, *International Electrotechnical Vocabulary (IEV) – Part 442: Electrical accessories* (available at www.electropedia.org)

IEC 60050-551, *International Electrotechnical Vocabulary (IEV) – Part 551: Power electronics* (available at www.electropedia.org)

IEC 60050-601, *International Electrotechnical Vocabulary (IEV) – Part 601: Generation, transmission and distribution of electricity – General* (available at www.electropedia.org)

IEC 60068 (all parts), *Environmental testing*

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

IEC 60076 (all parts), *Power transformers*

IEC 60076-11, *Power transformers – Part 11: Dry-type transformers*

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 guidelines*

IEC 60721-3-0, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Introduction*

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

IEC 61800-5-2:2016, *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*

IEC TS 61800-8, *Adjustable speed electrical power drive systems – Part 8: Specification of voltage on the power interface*

IEC 61800-9-1, *Adjustable speed electrical power drive systems – Part 9-1: Ecodesign for power drive systems, motor starters, power electronics and their driven applications – General requirements for setting energy efficiency standards for power driven equipment using the extended product approach (EPA) and semi analytic model (SAM)*

IEC 61800-9-2, *Adjustable speed electrical power drive systems – Part 9-2: Ecodesign for power drive systems, motor starters, power electronics and their driven applications – Energy efficiency indicators for power drive systems and motor starters*

IEC TS 62578:2015, *Power electronics systems and equipment – Operation conditions and characteristics of active infeed converter (AIC) applications including design recommendations for their emission values below 150 kHz*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-112, IEC 60050-113, IEC 60050-114, 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.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

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Table 1 – List of general terms

3.4	basic drive module (BDM)	3.2	mains supply	3.96	type test
3.6	complete drive module (CDM)	3.51	port for process measurement and control	3.84	routine test
3.29	inverter	3.54	power interface	3.85	sample test
3.7	converter, <of the BDM>	3.88	signal interface	3.1	acceptance test
3.80	rectifier <of the BDM>	3.56	product packaging	3.97	witness test
3.10	DC link	3.86	shipping packaging	3.5	commissioning test
3.3	active infeed converter (AIC)	3.81	regeneration	3.89	special test
3.52	power drive system (PDS)			3.82	resolution
3.30	low-voltage BDM/CMD/PDS <for AC motor>	3.53	power factor (λ)	3.83	responsible party
3.16	high-voltage BDM/CMD/PDS <for AC motor>	3.94	total harmonic distortion (THD)	3.8	customer, <of the BDM/CDM/PDS>
3.28	integrated PDS	3.87	short circuit ratio (R_{SC})	3.14	end user
3.36	motor electric motor	3.12	efficiency <of the CDM>	3.31	manufacturer, <of the BDM/CDM/PDS>
3.27	installation	3.13	efficiency <of the PDS>	3.37	original equipment manufacturer (OEM)
3.50	port	3.46	output overload capability	3.92	system integrator
3.55	power port	3.91	stimulus		

NOTE This document contains the fundamental definitions used across IEC 61800 (all parts) 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*

3.21	input current <BDM> (I_v)	3.66	rated input voltage <CDM/PDS> (U_{LN})	3.58	rated input active power <CDM/PDS> (P_{LN})
3.61	rated input current <BDM> (I_{vN})	3.17	input active power <BDM> (P_v)	3.60	rated input apparent power <CDM/PDS> (S_{LN})
3.22	input current <CDM/PDS> (I_L)	3.19	input apparent power <BDM> (S_v)	3.23	input frequency <BDM> (f_v)
3.62	rated input current <CDM/PDS> (I_{LN})	3.18	input active power <CDM/PDS> (P_L)	3.63	rated input frequency <BDM> (f_{vN})
3.25	input voltage <BDM> (U_v)	3.20	input apparent power <CDM/PDS> (S_L)	3.24	input frequency <CDM/PDS> (f_L)
3.65	rated input voltage <BDM> (U_{vN})	3.57	rated input active power <BDM> (P_{vN})	3.64	rated input frequency <CDM/PDS> (f_{LN})
3.26	input voltage <CDM/PDS> (U_L)	3.59	rated input apparent power <BDM> (S_{vN})		

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

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

3.42	output current <BDM> (I_a)	3.38	Output active power <BDM> (P_a)	3.41	output apparent power <CDM> (S_a)
3.71	rated output current <BDM> (I_{aN})	3.67	rated output active power <BDM> (P_{aN})	3.70	rated output apparent power <CDM> (S_{aN})
3.43	output current <CDM> (I_A)	3.39	output active power <CDM> (P_A)	3.44	output frequency <BDM> (f_a)
3.72	rated output current <CDM> (I_{AN})	3.68	rated output active power <CDM> (P_{AN})	3.73	rated output frequency <BDM> (f_{aN})
3.48	output voltage <BDM> (U_{a1})	3.47	output power <PDS> (P_s)	3.45	output frequency <CDM> (f_A)
3.76	rated output voltage <BDM> (U_{aN1})	3.75	rated output power <PDS> (P_{sN})	3.74	rated output frequency <CDM> (f_{AN})
3.49	output voltage <CDM> (U_{A1})	3.40	output apparent power <BDM> (S_a)	3.46	output overload capability
3.77	rated output voltage <CDM> (U_{AN1})	3.69	rated output apparent power <BDM> (S_{aN})		

NOTE Subscripts follow the concept of IEC 60146-1-1

Table 4 – List of *motor speed and torque ratings*

3.95	two quadrant operation ^b	3.35	minimum speed <of a motor> (N_{Min})	3.93	torque <of a motor> (M)
3.15	four quadrant operation ^b	3.34	minimum rated speed <of a motor> (N_{NMin})	3.79	rated torque <of a motor> (M_N)
3.90	speed <of a motor> (N)	3.32	maximum rated safe speed <of a motor> (N_{SNMax})	3.9	DC braking
3.78	rated speed <of a motor> (N_N)	3.33	maximum rated speed <of a motor> (N_{NMax})	3.11	dynamic braking

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

NOTE 2 See also Figure 10, 5.3.3.2.

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" has been replaced by the word "device".]

3.2

mains supply

low or high-voltage power distribution system for supplying power to a *BDM/CDM/PDS*

SEE Figure 3.

3.3

active infeed converter

AIC

self-commutated power electronic *converter* which can convert electric power in both directions and which can control the reactive power or the *power factor*

Note 1 to entry: An active infeed *converter* can be of any technology, topology, voltage and size containing either current or voltage source DC side which work in generation and regeneration.

Note 2 to entry: Some of them can additionally control the harmonics to reduce the distortion of an applied voltage or current.

Note 3 to entry: Basic topologies may be realized as a Voltage Source *Converter* (VSC) or a Current Source *Converter* (CSC).

Note 4 to entry: In IEC 60050-551, these terms (VSC and CSC) are defined as voltage stiff AC / DC *converter* [551-12-03] and current stiff AC / DC *converter* [551-12-04]. Most of the AICs are bi-directional *converters* and have sources on the DC side

Note 5 to entry: In some literature *active infeed converters* are also known as active front end (AFE) *converters*.

[SOURCE: IEC TS 62578:2015, 3.5, modified – Some words in the definition have been moved to Note 1 to entry.]

3.4

basic drive module

BDM

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

SEE Figure 3.

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.

3.5

commissioning test

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

[SOURCE: IEC 60050-411:1996, 411-53-06, modified – The word "machine" has been replaced by "device".]

3.6

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

SEE Figure 3.

3.7

converter

<of the *BDM*> unit which changes the form of electrical power supplied from the *mains supply* to the form required by the *motor(s)* by changing one or more of the following; voltage, current and/or frequency

SEE Figure 3.

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*.

3.8

customer

<of the *BDM/CDM/PDS*> *original equipment manufacturer (OEM)*, *system integrator* or *end user* specifying and purchasing a *BDM/CDM/PDS* from the *BDM/CDM/PDS manufacturer*

See Figure 1.

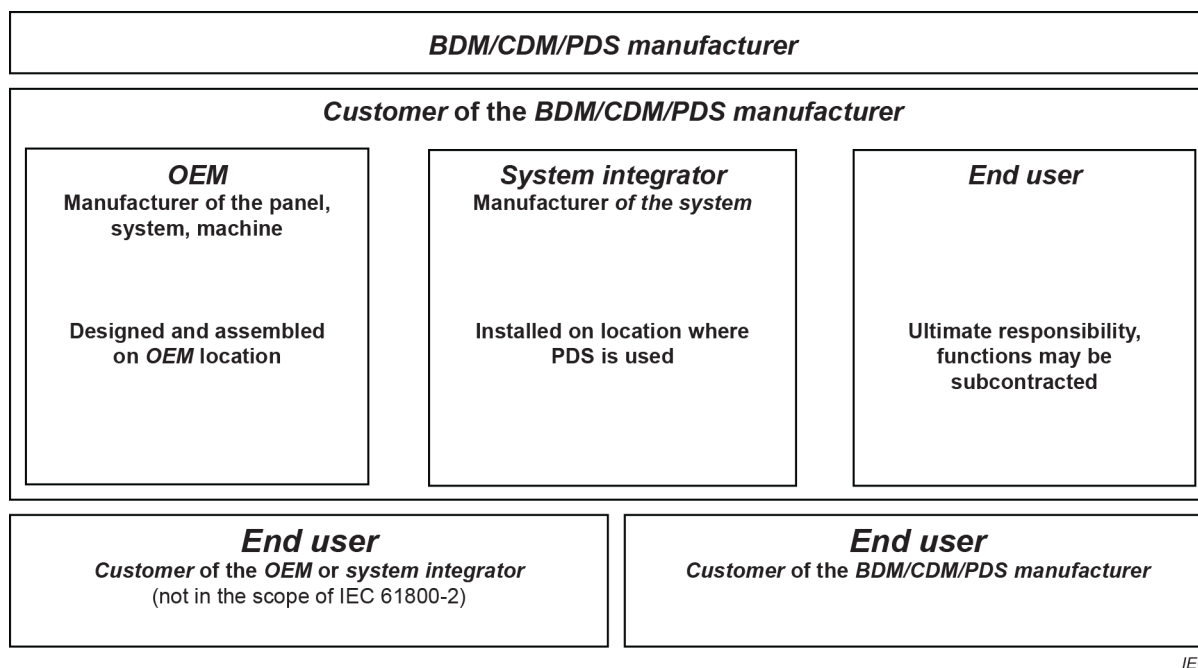


Figure 1 – BDM/CDM/PDS manufacturer/customer relationship

3.9

DC braking

process of converting the rotational energy of the load to electrical energy dissipated in the rotor by injection of DC current into the stator

3.10

DC link

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

See Figure 3.

3.11

dynamic braking

method used to transfer energy generated when the load controlled by a PDS is slowed or stopped

Note 1 to entry: *Dynamic braking* includes resistive braking, regenerative braking, etc.

3.12

efficiency

<of the CDM> ratio of the total electrical power at the CDM power interface of the motor terminals to the total power at the mains supply port

Note 1 to entry: See feeding line in Figure 3.

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

Note 3 to entry: IEC 61800-9-1 and IEC 61800-9-2 define power losses of the CDM and PDS. This document will change in the next edition to consider only power losses for the BDM/CDM/PDS, not efficiency. IEC 61800-9-1 and IEC 61800-9-2 should be used for power losses consideration of CDM/PDS. Because the BDM is a portion of the CDM, it is correct to calculate power losses for the BDM as well.

3.13

efficiency

<of the PDS> ratio of the mechanical power at the motor shaft to the total electrical power at the mains supply port

Note 1 to entry: See feeding line in Figure 3.

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

Note 3 to entry: IEC 61800-9-1 and IEC 61800-9-2 define power losses of the *CDM* and *PDS*. This standard will change in the next edition to consider only power losses for the *BDM/CDM/PDS*, not efficiency. IEC 61800-9-1 and IEC 61800-9-2 should be used for power losses consideration of *CDM/PDS*. Because the *BDM* is a portion of the *CDM*, it is correct to calculate power losses for the *BDM* as well.

3.14

end user

entity who has ultimate responsibility for the *installation*, operation and maintenance of the *PDS*

SEE Figure 1.

3.15

four quadrant operation

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

See Figure 2.

Note 1 to entry: *Four quadrant operation* involves operation in quadrants I, II, III and IV as shown in Figure 2.

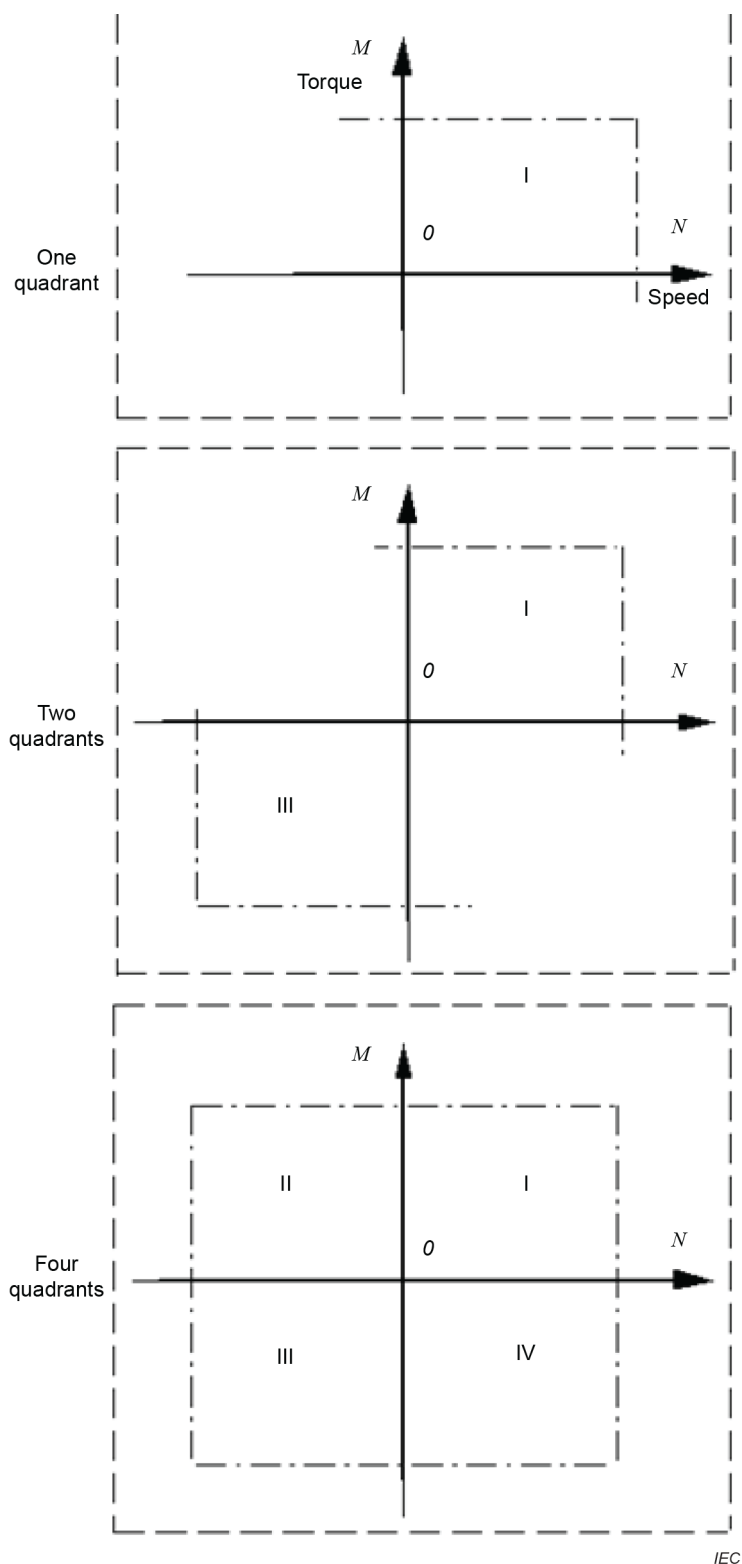


Figure 2 – Operating quadrants

3.16

high-voltage BDM/CDM/PDS

<for AC motor> basic drive module/complete drive module/power drive system having a port voltage above 1 kV AC 50 Hz or 60 Hz or above 1,5 kV DC

Note 1 to entry: "Port" generically applies to both input and output, and the scope of this document addresses only the range of voltages at the input port.

Note 2 to entry: See Table 5 for explanation.

Note 3 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 A).

Note 4 to entry: In the United States, the voltage range of the scope of this document is considered medium voltage.

Note 5 to entry: The term "high voltage" is abbreviated HV.

Table 5 – Basic classification of PDS by voltage

BDM/CDM voltage ratings		Classification of PDS by voltage
Input U_{vN}/U_{LN}	Output U_{aN1}/U_{AN1}	
Low-voltage	Low-voltage	Low-voltage
Low-voltage	High-voltage	High-voltage
High-voltage	Low-voltage	High-voltage
High-voltage	High-voltage	High-voltage

3.17

input active power

P_v

<BDM> power determined by the fundamental components of voltage and current at the supply terminals of the *BDM*

3.18

input active power

P_L

<CDM/PDS> power determined by the fundamental components of voltage and current at the supply terminals of the *CDM/PDS*

3.19

input apparent power

S_v

<BDM> power determined by the RMS values of voltage and current at the supply terminals of the *BDM*

3.20

input apparent power

S_L

<CDM/PDS> power determined by the RMS values of voltage and current at the supply terminals of *CDM/PDS*

3.21

input current

I_v

<BDM> RMS value of current at the supply terminals of the *BDM*

3.22

input current

I_L

<CDM/PDS> RMS value of current at the supply terminals of the *CDM/PDS*

3.23 input frequency

f_v

<*BDM*> frequency of the power input to the *BDM*

3.24 input frequency

f_L

<*CDM/PDS*> frequency of the power input to the *CDM/PDS*

3.25 input voltage

U_v

<*BDM*> RMS input line-to-line voltage at the supply terminals of the *BDM*

3.26 input voltage

U_L

<*CDM/PDS*> RMS input line-to-line voltage at the supply terminals of the *CDM/PDS*

3.27 installation

apparatus or a set of devices and/or apparatuses associated in a given location to fulfil specified purposes, including all means for their satisfactory operation

See Figure 3.

Note 1 to entry: The words "act of installing" are used in this document to denote the process of installing a *PDS*.

[SOURCE: IEC 60050-151:2001, 151-11-26, modified – The reference to Figure 3 has been added, as well as Note 1 to entry.]

3.28 integrated PDS

power drive system where *motor* and *BDM/CDM* are combined into a single unit

3.29 inverter

electric energy *converter* that changes direct electric current to single-phase or polyphase alternating currents

See Figure 3.

[SOURCE: IEC 60050-151:2001, 151-13-46]

3.30 low-voltage BDM/CDM/PDS

<for AC *motor*> *basic drive module/complete drive module/power drive system* having a port voltage less than or equal to 1 kV AC 50 Hz or 60 Hz or 1,5 kV DC

Note 1 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 A).

Note 2 to entry: The term "low-voltage" is abbreviated LV.

3.31 manufacturer

<of the *BDM/CDM/PDS*> entity which designs and builds all or part of a *BDM/CDM/PDS*

SEE Figure 1.

3.32

maximum rated safe speed

N_{SNMax}

<of a *motor*> 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 10 and 5.3.3.2.

3.33

maximum rated speed

N_{NMax}

<of a *motor*> 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 10 and 5.3.3.2.

3.34

minimum rated speed

N_{NMin}

<of a *motor*> 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 10 and 5.3.3.2.

3.35

minimum speed

N_{Min}

<of a *motor*> 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 10 and 5.3.3.2.

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

3.36

motor

electric motor

electric machine intended to transform electric energy into mechanical energy

SEE Figure 3.

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

3.37

original equipment manufacturer

OEM

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

SEE Figure 1.

3.38

output active power

P_a

<BDM> power determined by the fundamental components of voltage and current at the *motor* side of the *BDM*

3.39

output active power

P_A

<CDM> power determined by the fundamental components of voltage and current at the *motor* side of the *CDM*

3.40

output apparent power

S_a

<BDM> power determined by the RMS values of voltage and current at the *motor* side of the *BDM*

3.41

output apparent power

S_A

<CDM> power determined by the RMS values of voltage and current at the *motor* side of the *CDM*

3.42

output current

I_a

<BDM> RMS value of the current at the *motor* side of the *BDM*

3.43

output current

I_A

<CDM> RMS value of the current at the *motor* side of the *CDM*

3.44

output frequency

f_a

<BDM> 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*.

3.45

output frequency

f_A

<CDM> 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*.

3.46

output overload capability

maximum *output current* which can be supplied, for a specified period of time, without exceeding established limitations under prescribed operating conditions

3.47

output power

P_s

<PDS> (mechanical) power of the *PDS* determined by the *torque* and *speed* at the *motor shaft*

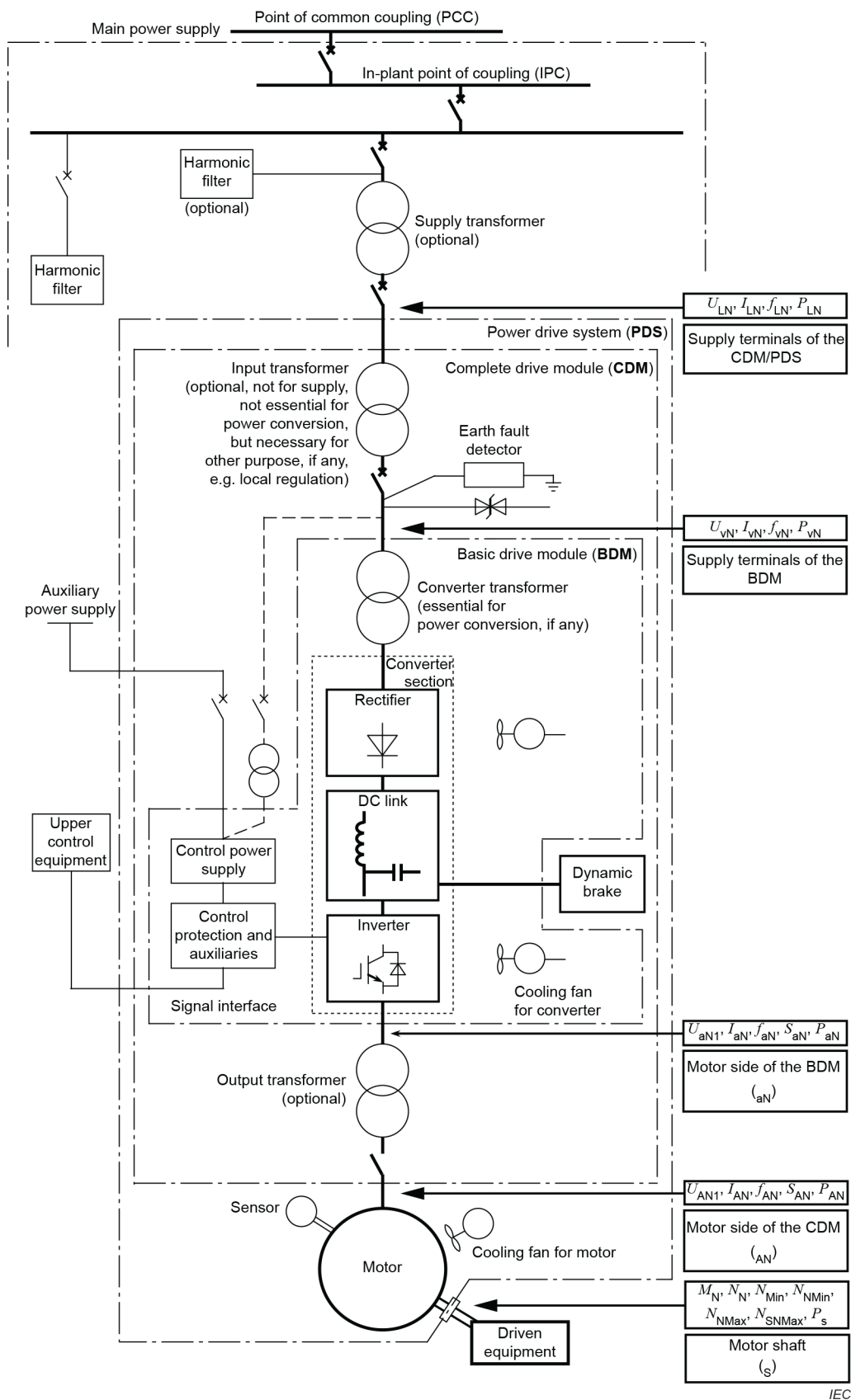
3.48
output voltage U_{a1} <*BDM*> RMS value of the rated fundamental voltage at the *motor* side of the *BDM***3.49**
output voltage U_{A1} <*CDM*> RMS value of the rated fundamental voltage at the *motor* side of the *CDM***3.50**
port

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

3.51
port for process measurement and controlinput/output (I/O) *port* for conductor or cable which connects the process to the *PDS***3.52**
power drive system
PDSsystem consisting of one or more *complete drive module(s)* (*CDM*) and a *motor* or *motors*

SEE Figure 3.

Note 1 to entry: Any sensors which are mechanically coupled to the *motor* shaft are also part of the *PDS*; however, the driven equipment is not included.



IEC

Figure 3 – Example of a power drive system

3.53 power factor

 λ

under periodic conditions, ratio of the absolute value of the active power P to the apparent power S

$$\lambda = \frac{|P|}{S}$$

[SOURCE: IEC 60050-131:2002, 131-11-46, modified – The note to entry has been deleted.]

3.54 power interface

connections needed for the distribution of electrical power within the *PDS*

3.55 power port

port which connects the *PDS* to the power supply which also feeds other equipment

3.56 product packaging

temporary protection of the *BDM/CDM/PDS* or part of it during storage and known in-house transport routes

3.57 rated input active power

 P_{VN}

<*BDM*> rated power determined by the fundamental components of voltage and current at the supply terminals of the *BDM*

3.58 rated input active power

 P_{LN}

<*CDM/PDS*> rated power determined by the fundamental components of voltage and current at the supply terminals of the *CDM/PDS*

3.59 rated input apparent power

 S_{VN}

<*BDM*> rated power determined by the RMS values of voltage and current at the supply terminals of the *BDM*

3.60 rated input apparent power

 S_{LN}

<*CDM/PDS*> rated power determined by the RMS values of voltage and current at the supply terminals of the *CDM/PDS*

3.61 rated input current

 I_{VN}

<*BDM*> maximum RMS value of current at the supply terminals of the *BDM* 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, for example line voltage and frequency deviations.

3.62 rated input current

 I_{LN}

<CDM/PDS> maximum RMS value of current at the supply terminals of the *CDM/PDS* 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, for example line voltage and frequency deviations.

3.63 rated input frequency

 f_{VN}

<BDM> rated value of the frequency at the supply terminals of the *BDM*

3.64 rated input frequency

 f_{LN}

<CDM/PDS> rated value of the frequency at the supply terminals of the *CDM/PDS*

3.65 rated input voltage

 U_{VN}

<BDM> RMS value of the rated input line-to-line voltage at the supply terminals of the *BDM*

3.66 rated input voltage

 U_{LN}

<CDM/PDS> RMS value of the rated input line-to-line voltage at the supply terminals of the *CDM/PDS*

3.67 rated output active power

 P_{aN}

<BDM> rated power determined by the fundamental components of voltage and current at the *motor* side of the *BDM*

3.68 rated output active power

 P_{AN}

<CDM> rated power determined by the fundamental components of voltage and current at the *motor* side of the *CDM*

3.69 rated output apparent power

 S_{aN}

<BDM> rated power determined by the RMS values of voltage and current at the *motor* side of the *BDM*

3.70 rated output apparent power

 S_{AN}

<CDM> rated power determined by the RMS values of voltage and current at the *motor* side of the *CDM*

3.71 rated output current

 I_{aN}

<BDM> maximum RMS value of the current at the *motor* side of the *BDM* which can be supplied continuously without exceeding established limitations, under rated operating conditions

3.72 rated output current

 I_{AN}

<CDM> maximum RMS value of the current at the *motor* side of the *CDM* which can be supplied continuously without exceeding established limitations, under rated operating conditions

3.73 rated output frequency

 f_{aN}

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

3.74 rated output frequency

 f_{AN}

<CDM> range of fundamental frequency at the *motor* side of the *CDM*

3.75 rated output power

 P_{sN}

<PDS> rated (mechanical) power of the *PDS* determined by the *torque* and *speed* at the *motor* shaft

3.76 rated output voltage

 U_{aN1}

<BDM> RMS value of the rated fundamental voltage at the *motor* side of the *BDM*

3.77 rated output voltage

 U_{AN1}

<CDM> RMS value of the rated fundamental voltage at the *motor* side of the *CDM*

3.78 rated speed

 N_N

<of a *motor*> 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 10 and 5.3.3.2.

3.79 rated torque

 M_N

<of a *motor*> *torque* the *motor* develops at its shaft end at *rated output power* and *speed*

[SOURCE: IEC 60050-411:1996, 411-48-05, modified – The symbol " M_N " has been added, as well as the word "power" and the domain.]