

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Adjustable speed electrical power drive systems –
Part 1: General requirements – Rating specifications for low voltage adjustable
speed DC power drive systems**

**Entraînements électriques de puissance à vitesse variable –
Partie 1: Exigences générales – Spécifications de dimensionnement pour
systèmes d'entraînement de puissance à vitesse variable en courant continu
et basse tension**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2021 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC online collection - oc.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC online collection - oc.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Adjustable speed electrical power drive systems –
Part 1: General requirements – Rating specifications for low voltage adjustable
speed DC power drive systems**

**Entraînements électriques de puissance à vitesse variable –
Partie 1: Exigences générales – Spécifications de dimensionnement pour
systèmes d'entraînement de puissance à vitesse variable en courant continu
et basse tension**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.160.30; 29.200

ISBN 978-2-8322-9271-6

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	8
INTRODUCTION.....	10
0.1 General.....	10
0.2 Consistency of requirement.....	10
0.3 Tool for agreement between <i>customer</i> and <i>manufacturer</i>	10
1 Scope.....	12
2 Normative references	12
3 Terms and definitions	14
3.1 System elements	14
3.2 Converters and circuit elements (see Table 2)	19
3.3 Drive system operating characteristics (see Table 3)	20
3.4 Input ratings of <i>BDM/CDM/PDS</i> (see Table 4).....	23
3.5 Output ratings of <i>BDM/CDM</i> (see Table 5)	27
3.6 <i>Motor</i> ratings (see Table 6).....	29
3.7 Control systems (see Table 7)	32
3.8 Tests (see Table 8).....	33
4 Ratings and specifications for the act of installing, commissioning and operation	34
4.1 General.....	34
4.2 <i>BDM/CDM/PDS</i> characteristics and topology	34
4.2.1 General	34
4.2.2 <i>BDM/CDM/PDS</i> characteristics	35
4.2.3 Basic topology for <i>BDM/CDM/PDS</i> 's	35
4.3 Ratings	39
4.3.1 General	39
4.3.2 Input ratings	40
4.3.3 Output ratings.....	41
4.3.4 Operating quadrants	44
4.3.5 Ratings, properties and functionalities of the <i>BDM/CDM/PDS</i>	44
4.3.6 Special ratings related to <i>BDM/CDM/PDS</i> or <i>motor</i>	45
4.4 Performance	45
4.4.1 Operational.....	45
4.4.2 Fault supervision and protection	55
4.4.3 Minimum status indication required.....	56
4.4.4 I/O devices	57
4.5 General safety	59
4.6 Functional safety	59
4.7 EMC	59
4.8 Ecodesign.....	60
4.8.1 General	60
4.8.2 Energy <i>efficiency</i> and power losses	60
4.8.3 Environmental impact	60
4.9 Environmental condition for service, transport and storage	60
4.9.1 General	60
4.9.2 Operation	60
4.9.3 Storage and transport of equipment.....	65
4.9.4 Mechanical conditions	66

4.9.5	Specific storage hazards	67
4.9.6	Environmental service tests (type test)	67
4.10	Types of load duty profiles	68
4.11	Generic interface and use of profiles for <i>PDS</i>	68
4.12	Voltage on <i>power interface</i>	70
4.13	Explosive environment	70
5	Test.....	71
5.1	General.....	71
5.2	Performance of tests.....	71
5.2.1	General conditions.....	71
5.2.2	Supply system earthing conditions.....	71
5.3	Standard tests for <i>BDM/CDM/PDS</i>	71
5.3.1	General	71
5.3.2	Test for mass produced products.....	73
5.3.3	Test for one-off products	73
5.4	Test specifications	73
5.4.1	Visual inspections (<i>type test, sample test and routine test</i>).....	73
5.4.2	Performance and rating test.....	74
5.4.3	General safety	82
5.4.4	Functional safety	82
5.4.5	EMC	82
5.4.6	Energy <i>efficiency</i> and power losses determination.....	82
5.4.7	Environmental condition tests	82
5.4.8	Communication profiles	84
5.4.9	Explosive atmosphere environment	85
6	Information and marking requirements.....	85
6.1	General.....	85
6.2	Marking on product.....	86
6.3	Information to be supplied with the PDS or BDM/CDM	87
6.4	Information to be supplied or made available	87
6.5	Safety and warning information.....	87
6.5.1	Warning labels.....	87
6.5.2	Additional safety considerations of a PDS.....	87
Annex A	(informative) <i>Motor</i> considerations	89
A.1	General.....	89
A.2	Cooling considerations.....	89
A.3	Waveform <i>ripple</i> considerations	90
A.3.1	General	90
A.3.2	<i>Converter</i> topologies	90
A.3.3	Potentials to earth	90
A.4	Torsional considerations	91
A.4.1	General	91
A.4.2	Torsional analysis.....	91
A.4.3	Remedies to torsional problems (rare with DC drives).....	91
A.4.4	Torque pulsation.....	91
A.5	Operational modes.....	91
A.5.1	General	91
A.5.2	Torque/speed characteristics	92
A.5.3	Considerations of drive regeneration	93

A.6	Acoustic noise	93
A.7	Service life of the <i>motor</i> insulation system	93
A.8	Shaft voltages	94
A.9	New drive systems	94
Annex B (informative) Line-side considerations		95
B.1	General	95
B.2	AC power source earthing	95
B.3	Introduction to harmonics and inter-harmonics	96
B.4	Results for typical <i>converters</i> phase control	98
B.4.1	General	98
B.4.2	Square wave line current	99
B.4.3	Trapezoidal line current	99
B.4.4	Current harmonic with <i>DC current ripple</i>	99
B.4.5	Diode <i>rectifiers</i>	101
B.4.6	Diode <i>rectifiers</i> without <i>DC link</i> inductance	102
B.4.7	General	104
B.5	Example of assessment of harmonic effect of a <i>PDS</i>	104
B.6	Attenuation of emission of harmonics	105
B.7	Commutation notches	106
B.8	Protection against voltage dips and short interruptions	108
Annex C (informative) Auxiliary equipment		110
C.1	General	110
C.2	Transformers	110
C.2.1	General	110
C.2.2	Voltage	110
C.2.3	Codes	110
C.2.4	Provide continuity of service for installations prone to nuisance grounding	110
C.2.5	Line voltage unbalance	111
C.2.6	Reduction of <i>converter</i> input harmonic currents	111
C.2.7	Reduction of prospective short-circuit current at <i>converter</i> input	111
C.2.8	Pulse number	111
C.3	Reactors	111
C.4	Switchgear	112
Annex D (informative) Control strategies		113
D.1	General	113
D.2	Control configurations	113
D.2.1	General	113
D.2.2	Basic structure	114
D.2.3	Optional facilities	114
D.2.4	Digital and analog control	116
D.3	Control modes	117
D.3.1	Operating modes	117
D.3.2	Loop control	117
D.3.3	Accuracy and performance	117
D.4	Steady state and transient performance	118
D.4.1	Time response	118
D.4.2	Response time	118
D.4.3	Performances of particular functions	118

D.4.4	Speed ratio control	118
D.5	List of relevant control parameters	120
D.5.1	<i>BDM/CDM</i> control parameters	120
D.5.2	<i>Motor</i> parameters	121
D.5.3	Mechanical parameters	121
D.5.4	Supply parameters	121
D.6	Structures	121
D.6.1	Functional structures	121
D.6.2	Hardware structures	123
D.6.3	Important drive performances issues	123
D.6.4	Effect of torsional elasticity	123
D.6.5	Effects of the backlash	125
Annex E (informative)	Protection	126
E.1	General	126
E.2	Equipment availability	126
E.2.1	General	126
E.2.2	Equipment protection circuits	126
E.2.3	Types of equipment alarms and faults	126
E.2.4	Alarm and fault listing	127
E.3	System protection (features and devices)	128
E.4	Protection of the drive system	128
E.4.1	Protection included in the <i>BDM/CDM</i>	128
E.4.2	Specific <i>motor</i> protection	129
E.4.3	Specific transformer protection	129
Annex F (informative)	Monitoring features	130
F.1	General	130
F.2	Technology	130
Bibliography	131
Figure 1	– <i>PDS</i> hardware configuration within an <i>installation</i>	15
Figure 2	– Example of function diagram of a <i>DC power drive system</i>	16
Figure 3	– <i>BDM/CDM/PDS manufacturer/customer</i> relationship	18
Figure 4	– Operating quadrants	22
Figure 5	– Main configurations for line-commutated <i>converters</i>	36
Figure 6	– Basic configurations of self-commutated <i>converters</i> (choppers)	37
Figure 7	– Overview of input and output ratings of the <i>BDM/CDM/PDS</i>	40
Figure 8	– Example of operating region of a <i>PDS</i>	42
Figure 9	– Overload cycle example	44
Figure 10	– Deviation band	47
Figure 11	– Time response following a step change of reference input, no change in operating variables	50
Figure 12	– Time response following a change in an operating variable – No reference change	51
Figure 13	– Time response following a reference change at specified rate	52
Figure 14	– Frequency response of the control – Reference value as <i>stimulus</i>	53
Figure 15	– Example of relationship of IEC 61800-7 (all parts) to control system software and the <i>BDM/CDM/PDS</i>	70

Figure 16 – Measuring circuit of <i>PDS</i>	76
Figure A.1 – Torque and power output of a <i>DC motor</i>	92
Figure B.1 – Thyristor <i>rectifier</i> with a large DC inductance	99
Figure B.2 – Square wave line current	99
Figure B.3 – Trapezoidal line current	99
Figure B.4 – Major harmonic components of supply current considering square wave line current with idealized DC <i>ripple</i>	100
Figure B.5 – Power <i>converter</i> with a diode <i>rectifier</i> on the line-side and a DC/DC <i>converter</i>	101
Figure B.6 – Input voltage and current waveforms of the diode <i>rectifier</i>	101
Figure B.7 – Line-side voltage and current distortion factors of a diode <i>rectifier</i>	102
Figure B.8 – Diode <i>rectifier</i> without DC <i>link</i> inductance	102
Figure B.9 – Input harmonic current (AC and DC)	103
Figure B.10 – <i>Input current</i> distortion	103
Figure B.11 – Example of simple structure	105
Figure B.12 – 3-phase, 6-pulse bridge <i>converter</i>	106
Figure B.13 – Commutation notches with a 3-phase, 6-pulse bridge <i>converter</i>	107
Figure B.14 – Equivalent circuit for assessment of commutation notch mitigation.....	108
Figure D.1 – Block diagram of feedback control system containing all basic elements	113
Figure D.2 – Functional block diagram	115
Figure D.3 – Master/follower drive system	119
Figure D.4 – Zero current inversion time	120
Figure D.5 – Structure of a drive system	122
Figure D.6 – Mechanical diagram.....	124
Figure D.7 – Simple stability criterion.....	125
Figure E.1 – Protection classification	127
Table 1 – System elements.....	14
Table 2 – Converters and circuits elements	19
Table 3 – Drive system operating characteristics	20
Table 4 – Input ratings of <i>BDM/CDM/PDS</i>	23
Table 5 – Output ratings of <i>BDM/CDM</i>	27
Table 6 – <i>Motor</i> ratings	29
Table 7 – Control system and variables	32
Table 8 – Type of tests	33
Table 9 – Standard rated voltages as specified in IEC 60038.....	40
Table 10 – Example of reduced maximum continuous load as a function of an overload	43
Table 11 – Maximum deviation bands (%).....	47
Table 12 – <i>PDS</i> protection functions	55
Table 13 – Environmental service conditions	61
Table 14 – Limit of temperature of the cooling medium for indoor equipment	62
Table 15 – Definitions of pollution degree	62
Table 16 – Environmental vibration limits for fixed <i>installation</i>	63
Table 17 – Environmental shock limits for fixed <i>installation</i>	63

Table 18 – Storage and transport limits.....	65
Table 19 – Transportation vibration limits.....	66
Table 20 – Transportation limits of free fall	66
Table 21 – Environmental service tests.....	68
Table 22 – Tests overview	72
Table 23 – Classification of commutation made by visual observation.....	74
Table 24 – Shock test	84
Table 25 – Information requirements.....	86
Table B.1 – Minimum R_{SC} requirements for low voltage systems.....	97
Table B.2 – Harmonic current – 6-pulse conversion	98
Table B.3 – Harmonic results for the drive contribution	105
Table D.1 – Typical control configurations	114
Table D.2 – Composition of the typical control configurations	116
Table D.3 – Drive system control strategies	118

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –**Part 1: General requirements –
Rating specifications for low voltage
adjustable speed DC 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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61800-1 has been prepared by subcommittee 22G: Adjustable speed electric power drive systems (PDS), of IEC technical committee 22: Power electronic systems and equipment.

This second edition cancels and replaces the first edition published in 1997. This edition constitutes a technical revision.

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

- a) the clause structure has been harmonized with IEC 61800-2;
- b) Clause 2 has been updated;
- c) Clause 3 has been updated including fundamental definitions to be used across IEC 61800 (all parts);
- 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), general 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 energy efficiency standards (IEC 61800-9) to avoid conflicting requirements (4.5, 4.6, 4.7, 4.10, 4.11, 4.12);
 - 4) update of requirement for ecodesign (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 IEC 61800 (all parts);
 - g) the Annexes have been updated.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
22G/430/FDIS	22G/433/RVD

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

This document 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 document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document 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* (*PDSs*). Since the publication of the first edition of IEC 61800-1, 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 DC *motors* and with rated *converter* input voltages (line-to-line voltage) up to and including 1 000 V AC.

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:

- AC *PDS* requirements are covered by IEC 61800-2;
- 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 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).

NOTE IEC 61800-9 series only provides requirements for AC *PDS*. Requirements for the *Energy Efficiency* classification, the set of power losses limits and measurement methods from IEC 61800-9-2 cannot be directly applicable to DC *PDS*. The Extended product approach (EPA) and Semi analytic Model (SMA) from IEC 61800-9-1 are in principle applicable to DC *PDS*.

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 IEC 61800 (all parts) as well as minimize future maintenance of the documents.

As a result of the development of the IEC 61800 series of standards, the need to reference documents outside the series has decreased.

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, industrial switchgears applications, heating and ventilation, pump, excitation systems, tidal and marine 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, explosive environmental conditions and humidity environmental condition.

ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

Part 1: General requirements – Rating specifications for low voltage adjustable speed DC power drive systems

1 Scope

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

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

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

NOTE 2 This document can be used as a reference for adjustable *speed electric power drive systems*, intended to feed *DC motors* from a *BDM/CDM* connected to line-to-line voltages up to and including 1,5 kV AC, 50 Hz or 60 Hz and/or voltages up to and including 2,25 kV DC input side.

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

This document is intended to define the following aspects of a *DC 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 document provides minimum requirements, which may be used for the development of a specification between *customer* and *manufacturer*.

Compliance with this document is possible only when each topic of this document 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.

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 60034-1:2017, *Rotating electrical machines – Part 1: Rating and performance*