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

**Entraînements électriques de puissance à vitesse variable –
Partie 3: Exigences de CEM et méthodes d'essai spécifiques**

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INTERNATIONAL STANDARD

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

**Entraînements électriques de puissance à vitesse variable –
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**ADJUSTABLE SPEED ELECTRICAL POWER
DRIVE SYSTEMS –****Part 3: EMC requirements and specific test methods**

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International Standard IEC 61800-3 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 third edition cancels and replaces the second edition published in 2004 and Amendment 1:2011. This edition constitutes a technical revision.

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

- a) clarification of requirements for the test report, particularly when a number of alternative test methods exist;
- b) introduction of a more detailed test setup for radiated emission measurements, along with the introduction of a 3 m measurement distance for small size equipment;
- c) general updates in the informative annexes.

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

FDIS	Report on voting
22G/347/FDIS	22G/350/RVD

Full information on the voting for the approval of this International 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, and with IEC Guide 107.

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.

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

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ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

Part 3: EMC requirements and specific test methods

1 Scope

This part of IEC 61800 specifies electromagnetic compatibility (EMC) requirements for power drive systems (PDSs, defined in 3.1). These are adjustable speed AC or DC motor drives. Requirements are stated for PDSs with converter input and/or output voltages (line-to-line voltage), up to 35 kV AC RMS.

PDSs covered by this document are those installed in residential, commercial and industrial locations with the exception of traction applications, and electric vehicles. PDSs can be connected to either industrial or public power distribution networks. Industrial networks are supplied by a dedicated distribution transformer, which is usually adjacent to or inside the industrial location, and supplies only industrial customers. Industrial networks can also be supplied by their own electric generating equipment. On the other hand, PDSs can be directly connected to low-voltage public mains networks which also supply residential premises, and in which the neutral is generally earthed (grounded).

The scope of this part of IEC 61800, related to EMC, includes a broad range of PDSs from a few hundred watts to hundreds of megawatts. PDSs are often included in a larger system. The system aspect is not covered by this document but guidance is provided in the informative annexes.

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The requirements have been selected so as to ensure EMC for PDSs at residential, commercial and industrial locations. The requirements cannot, however, cover extreme cases which can occur with an extremely low probability. Changes in the EMC behaviour of a PDS, as a result of fault conditions, are not taken into account.

The object of this document is to define the limits and test methods for a PDS according to its intended use. This document includes immunity requirements and requirements for electromagnetic emissions.

NOTE 1 Emission can cause interference in other electronic equipment (for example radio receivers, measuring and computing devices). Immunity is meant to protect the equipment from continuous and transient conducted and radiated disturbances including electrostatic discharges. The emission and immunity requirements are balanced against each other and against the actual environment of the PDS.

This document defines the minimum EMC requirements for a PDS.

Immunity requirements are given according to the environment classification. Low-frequency emission requirements are given according to the nature of the supply network. High-frequency emission requirements are given according to four categories of intended use, which cover both environment and bringing into operation.

As a product standard, this document can be used for the assessment of PDS. It can also be used for the assessment of complete drive modules (CDM) or basic drive modules (BDM) (see 3.1), which can be marketed separately.

This document contains

- conformity assessment requirements for products to be placed on the market, and

- recommended engineering practice (see 6.5) for cases where high frequency emissions cannot be measured before the equipment is placed on the market (such PDSs are defined in 3.2.7 as category C4).

NOTE 2 The first edition of IEC 61800-3 identified that the intended use could require engineering for putting into service. This was done by the “restricted distribution mode”. Equipment formerly identified under “restricted distribution mode” is now covered by categories C2 and C4 (see 3.2).

This document is intended as a complete EMC product standard for the EMC conformity assessment of products of categories C1, C2 and C3, when placing them on the market (see definitions 3.2.4 to 3.2.6).

Radio frequency emission of equipment of category C4 is only assessed when it is installed in its intended location. It is therefore treated as a fixed installation, for which this document gives rules of engineering practice in 6.5 and Annex E, although it gives no defined emission limits (except in case of complaint).

This document does not specify any safety requirements for the equipment such as protection against electric shocks, insulation co-ordination and related dielectric tests, unsafe operation, or unsafe consequences of a failure. It also does not cover safety and functional safety implications of electromagnetic phenomena.

In special cases, when highly susceptible apparatus is being used in proximity, additional mitigation measures can have to be employed to reduce the electromagnetic emission further below the specified levels or additional countermeasures can have to be employed to increase the immunity of the highly susceptible apparatus.

As an EMC product standard for PDSs, this document takes precedence over all aspects of the generic standards, and no additional EMC tests are performed. If a PDS is included as part of equipment covered by a separate EMC product standard, the EMC standard of the complete equipment applies.

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2 Normative references

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IEC 60146-1-1:2009, *Semiconductor convertors – General requirements and line commutated convertors – Part 1-1: Specifications of basic requirements*

IEC 61000-2-2:2002, *Electromagnetic compatibility (EMC) – Part 2-2: Environment – Compatibility levels for low-frequency conducted disturbances and signalling in public low-voltage power supply systems*

IEC 61000-2-4:2002, *Electromagnetic compatibility (EMC) – Part 2-4: Environment – Compatibility levels in industrial plants for low-frequency conducted disturbances*

IEC 61000-3-2:2014, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*

IEC 61000-3-3:2013, *Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection*

IEC 61000-3-11:2000, *Electromagnetic compatibility (EMC) – Part 3-11: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems – Equipment with rated current ≤ 75 A and subject to conditional connection*

IEC 61000-3-12: 2011, *Electromagnetic compatibility (EMC) – Part 3-12: Limits – Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and ≤ 75 A per phase*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:2009, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

IEC 61000-4-11:2004, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

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IEC 61000-4-13:2002, *Electromagnetic compatibility (EMC) – Part 4-13: Testing and measurement techniques – Harmonics and interharmonics including mains signalling at a.c. power port, low frequency immunity tests*

IEC 61000-4-34:2005, *Electromagnetic compatibility (EMC) – Part 4-34: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current more than 16 A per phase*

CISPR 11:2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*

CISPR 11:2015/AMD1:2016

CISPR 16-1-2:2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Coupling devices for conducted disturbance measurements*

CISPR 16-1-4:2010, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Antennas and test sites for radiated disturbance measurements*

CISPR 22, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

3 Terms and definitions

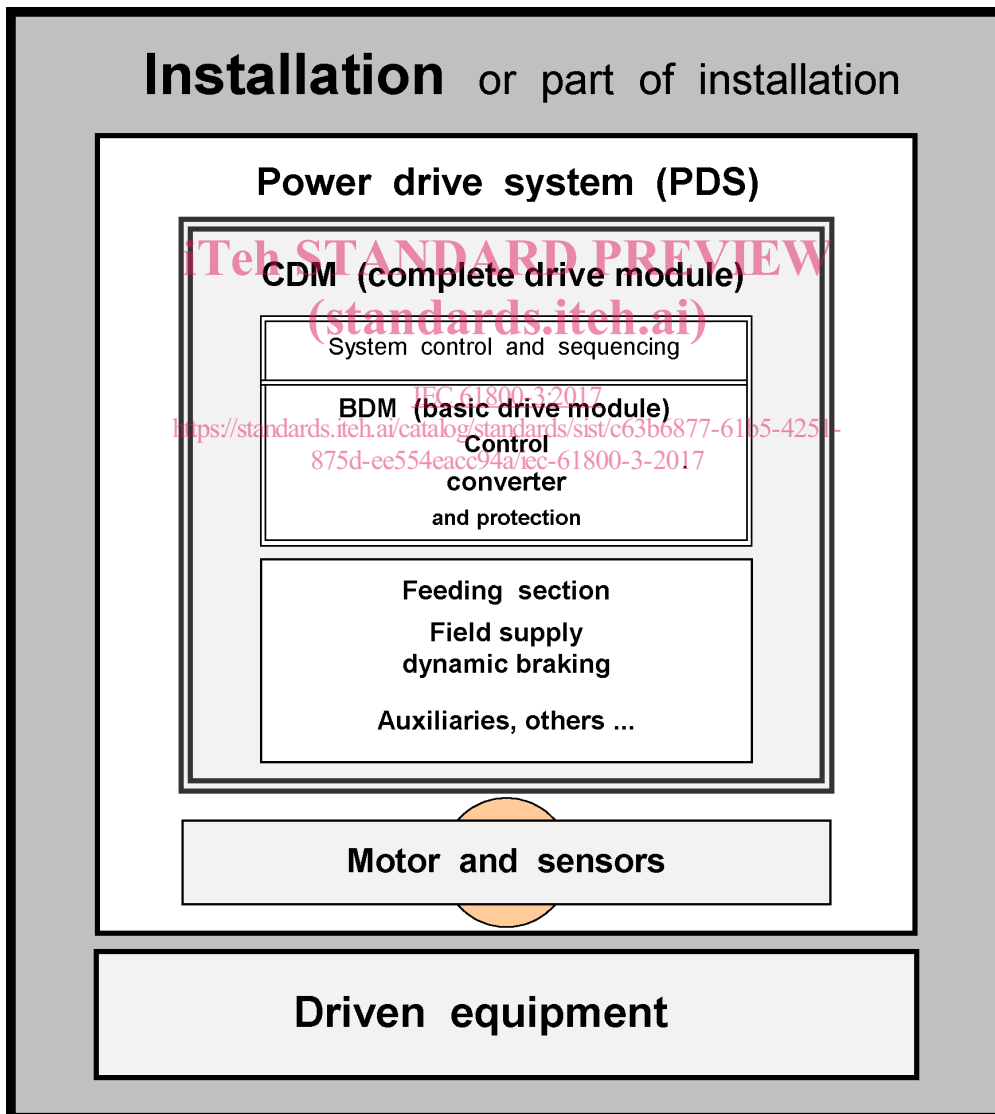
For the purposes of this document, the following terms and definitions apply.

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

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

3.1 Installation and its content

Figure 1 shows the major parts of the PDS as defined below and the rest of the installation.



IEC

Figure 1 – Installation and its content

3.1.1

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 can be capable of transmitting power from the motor to the electric supply. 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;
- position.

3.1.2

complete drive module

CDM

drive module consisting of, but not limited to, the BDM and extensions such as protection devices, transformers and auxiliaries

Note 1 to entry: The motor and the sensors which are mechanically coupled to the motor shaft are not included.

3.1.3

power drive system

PDS

system consisting of one or more complete drive module(s) (CDM) and a motor or motors

<https://standards.iteh.ai/catalog/standards/sist/c63b6877-61b5-4251->

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.

3.1.4

installation

equipment or equipments which include at least both the PDS and the driven equipment

3.1.5

small size equipment

equipment, either positioned on a table top, wall-mounted or standing on the floor which, including its cables and possible auxiliary equipment, fits in an imaginary cylindrical test volume of maximum 1,2 m in diameter and 1,5 m height (to ground plane)

Note 1 to entry: This definition has been modified to apply to measurement of radiated emissions from the enclosure port.

[SOURCE: CISPR 11:2015, 3.17, modified — The expression "wall-mounted" and "and possible auxiliary equipment" have been added, as well as the note to entry.]

3.1.6

wall-mounted equipment

CDM/BDM intended to be mounted on a vertical surface

3.2 Intended use

3.2.1

EMC plan

procedure for the EMC assessment when installing category C4 (see 3.2.7) equipment