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Adjustable speed electrical power drive systems -
Part 5-2: Safety requirements - Functional

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Adjustable speed electrical power drive systems - Part 5-2: Safety requirements - Functional

FOREWORD

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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 61800-5-2 edition 2.1 contains the second edition (2016-04) [documents 22G/332/FDIS and 22G/335/RVD] and its amendment 1 (2026-10) [documents 22G/532/CDV and 22G/535/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 61800-5-2 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 2007. This edition constitutes a technical revision.

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

a) rational added in the scope why low demand mode is not covered by this standard
b) definition added for: "*category*" and "*safety function*"
c) "Other sub-functions" sorted into "Monitoring sub-functions" and "Output functions"
d) deleted "proof test" throughout the document because for *PDS(SR)* a proof test is not applicable
e) replaced the term "safety function" by "*safety sub-function*" throughout the document
f) Updated references to IEC 61508 series Ed.2010
g) Added the principle rules of ISO 13849-1 and reference to tables of ISO 13849-2
h) 6.1.6 Text replaced by Table 2
i) 6.1.7 Integrated circuits with on-chip redundancy matched to changed requirement in IEC 61508-2: 2010, Annex E
j) 6.2.8 Design requirements for thermal immunity of a *PDS(SR)*
k) 6.2.9 Design requirements for mechanical immunity of a *PDS(SR)*
l) 6.1.6 *SIL* for multiple *safety sub-functions* within one *PDS(SR)*
m) 6.1.7 Integrated circuits with on-chip redundancy
n) 6.2.1 Basic and well-tried safety principles
o) 6.2.2.1.4 *Diagnostic test* interval when the hardware fault tolerance is greater than zero
p) 6.2.5.2.7 *PDS(SR)* parameterization
q) 9 Test requirements
r) 9.3 Electromagnetic (EM) immunity testing
s) 9.4 Thermal immunity testing
t) 9.5 Mechanical immunity testing
u) Annex A Sequential task table
v) Annex D, D.3.16, Motion and position feedback sensors updated
w) Annex E Electromagnetic immunity (EM) requirement for *PDS(SR)*
x) Annex F Estimation of PFD_{avg} value for low demand with given PFH value

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

FDIS	Report on voting
22G/332/FDIS	22G/335/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 of the IEC 61800 series, published under the general title *Adjustable speed electric drive systems*, can be found on the IEC website.

The committee has decided that the contents of this document and its amendment will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,

– withdrawn, or

– revised.

INTRODUCTION

As a result of automation, demand for increased production and reduced operator physical effort, control systems of machinery and plant items play an increasing role in the achievement of overall safety. These control systems increasingly employ complex electrical/ electronic/programmable electronic devices and systems.

Prominent amongst these devices and systems are adjustable speed electrical power drive systems (PDS) that are suitable for use in safety-related applications (*PDS(SR)*).

Examples of industrial applications are:

- machine tools, robots, production test equipment, test benches;
- papermaking machines, textile production machines, calendars in the rubber industry;
- process lines in plastics, chemicals or metal production, rolling-mills;
- cement crushing machines, cement kilns, mixers, centrifuges, extrusion machines;
- drilling machines;
- conveyors, materials handling machines, hoisting equipment (cranes, gantries, etc.);
- pumps, fans, etc.

This standard can also be used as a reference for developers using *PDS(SR)* for other applications.

Users of this standard should be aware that some type C standards for machinery currently refer to ISO 13849-1 for safety-related control systems. In this case, *PDS(SR)* manufacturers may be requested to provide further information (e.g. category and performance level PL) to facilitate the integration of a *PDS(SR)* into the safety-related control systems of such machinery.

NOTE ”Type C standards” are defined in ISO 12100 as machine safety standards dealing with detailed safety requirements for a particular machine or group of machines.

There are many situations where control systems that incorporate a *PDS(SR)* are employed, for example as part of safety measures that have been provided to achieve risk reduction. A typical case is guard interlocking in order to exclude personnel from *hazard*s where access to the dangerous area is only possible when rotating parts have stopped. This part of IEC 61800 gives a methodology to identify the contribution made by a *PDS(SR)* to identified *safety sub-function*s and to enable the appropriate design of the *PDS(SR)* and verification that it meets the required performance.

Measures are given to co-ordinate the safety performance of the *PDS(SR)* with the intended risk reduction taking into account the probabilities and consequences of its random and systematic faults.

1 Scope

This part of IEC 61800, which is a product standard, specifies requirements and makes recommendations for the design and development, integration and validation of safety related power drive systems (*PDS(SR))* in terms of their functional safety considerations. It applies to adjustable speed electrical power drive systems covered by the other parts of the IEC 61800 series of standards as referred in IEC 61800-2.

NOTE 1 The term “integration” refers to the *PDS(SR)* itself, not to its incorporation into the safety-related application.

NOTE 2 Other parts of IEC 61800 cover rating specifications, EMC, electrical safety, etc.

This International Standard is applicable where functional safety of a *PDS(SR)* is claimed and the *PDS(SR)* is operating mainly in the high demand or continuous mode (see 3.15)

While low demand mode operation is possible for a *PDS(SR)*, this standard concentrates on high demand and continuous mode. *Safety sub-function*s implemented for high demand or continuous mode can also be used in low demand mode. Requirements for low demand mode are given in IEC 61508 series. Some guidance for the estimation of average probability of dangerous failure on demand (PFD_{avg}) value is provided in Annex F.

This part of IEC 61800 sets out safety-related considerations of *PDS(SR)*s in terms of the framework of IEC 61508, and introduces requirements for *PDS(SR)*s as *subsystem*s of a safety-related system. It is intended to facilitate the realisation of the electrical/ electronic/ programmable electronic (E/E/PE) parts of a *PDS(SR)* in relation to the safety performance of *safety sub-function*(s) of a PDS.

Manufacturers and suppliers of *PDS(SR)*s by using the normative requirements of this part of IEC 61800 will indicate to users (system integrator, original equipment manufacturer) the safety performance for their equipment. This will facilitate the incorporation of a *PDS(SR)* into a safety-related control system using the principles of IEC 61508, and possibly its specific sector implementations (for example IEC 61511, IEC 61513, IEC 62061 or ISO 13849).

By applying the requirements from this part of the IEC 61800 series, the corresponding requirements of IEC 61508 that are necessary for a *PDS(SR)* are fulfilled.

This part of IEC 61800 does not specify requirements for:

- the *hazard* and risk analysis of a particular application;
- the identification of *safety sub-function*s for that application;
- the initial allocation of *SIL*s to those *safety sub-function*s;
- the driven equipment except for interface arrangements;
- secondary *hazard*s (for example from failure in a production or manufacturing process);
- the electrical, thermal and energy safety considerations, which are covered in +IEC 61800-5-1;
- the *PDS(SR)* manufacturing process;
- the validity of signals and commands to the *PDS(SR)*.
- ~~security aspects (e.g. cyber security or *PDS(SR)* security of access)~~

NOTE 3 The functional safety requirements of a *PDS(SR)* are dependent on the application, and can be considered as a part of the overall risk assessment of the *installation*. Where the supplier of the *PDS(SR)* is not responsible for the driven equipment, the *installation* designer is responsible for the risk assessment, and for specifying the functional and safety integrity requirements of the *PDS(SR)*.

This part of IEC 61800 only applies to *PDS(SR)*s implementing *safety sub-function*s with a *SIL* not greater than *SIL* 3.

Figure 1 shows the installation and the functional parts of a *PDS(SR)* that are considered in this part of IEC 61800 and shows a logical representation of a *PDS(SR)* rather than its physical description.

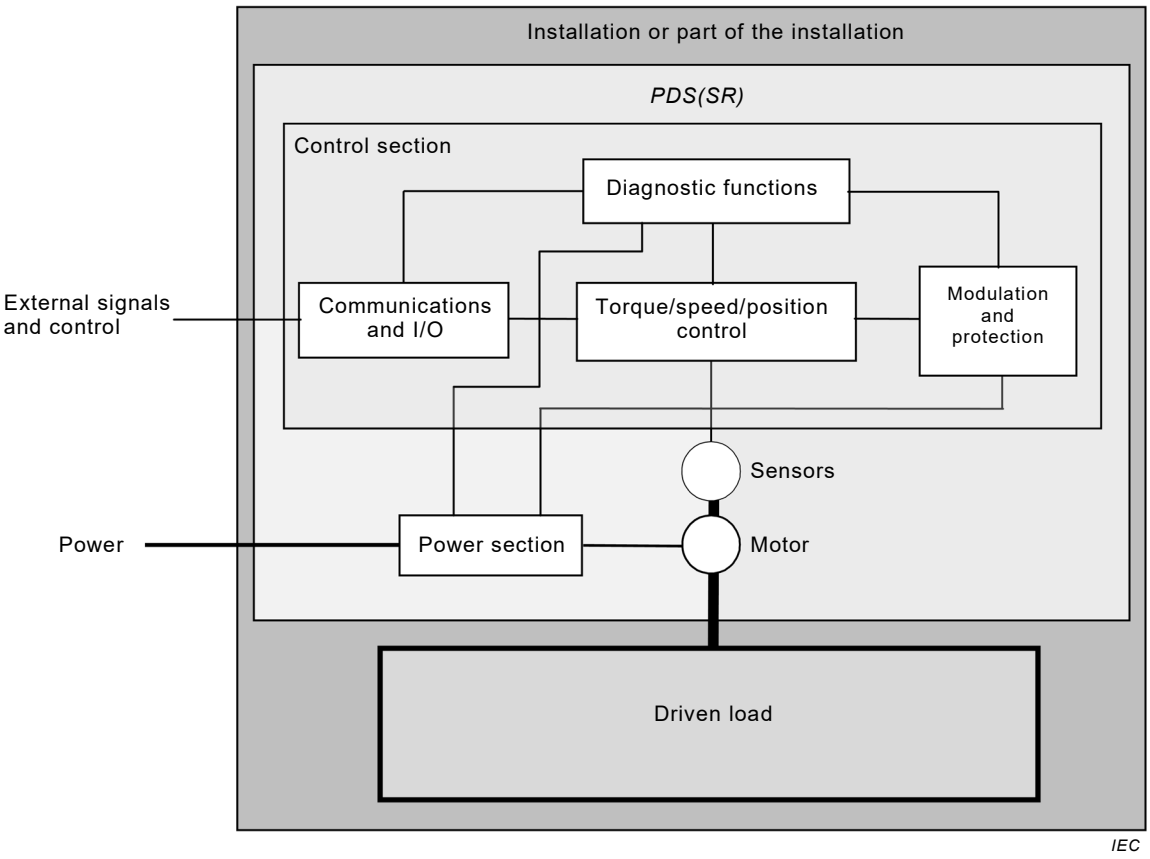


Figure 1 – Installation and functional parts of a *PDS(SR)*

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 60204-1:2016, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements*
IEC 60204-1:2016/AMD1:2021

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

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

IEC 61000-4-3:~~2006~~2020, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*
~~IEC 61000-4-3:2006/AMD1:2007~~
~~IEC 61000-4-3:2006/AMD2:2010~~

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~~2023, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-29:2000, *Electromagnetic compatibility (EMC) – Part 4-29: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations on d.c. input power port 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*
IEC 61000-4-34:2005/AMD1:2009

IEC 61000-6-7:2014, *Electromagnetic compatibility (EMC) – Part 6-7: Generic standards – Immunity requirements for equipment intended to perform functions in a safety-related system (functional safety) in industrial locations*

~~IEC 61400-21:2008, *Wind turbines – Part 21: Measurement and assessment of power quality characteristics of grid connected wind turbines*~~

IEC 61400-21-1:2019, *Wind energy generation systems - Part 21-1: Measurement and assessment of electrical characteristics - Wind turbines*

IEC 61508-1:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 1: General requirements*

IEC 61508-2:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems*

IEC 61508-3:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 3: Software requirements*

IEC 61508-6:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 6: Guidelines on the application of IEC 61508-2 and IEC 61508-3*

IEC 61508-7:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 7: Overview of techniques and measures*

IEC 61800-1:2021, *Adjustable speed electrical power drive systems – Part 1: General requirements – Rating specifications for low voltage adjustable speed ~~d.c.~~ DC power drive systems*

IEC 61800-2:~~2015~~2021, *Adjustable speed electrical power drive systems – Part 2: General requirements – Rating specifications for ~~low voltage~~ adjustable speed ~~a.c.~~ AC power drive systems*

IEC 61800-3:~~2004~~2022, *Adjustable speed electrical power drive systems – Part 3: EMC requirements and specific test methods for PDS and machine tools*
~~IEC 61800-3:2004/AMD1:2011~~

~~IEC 61800-4, *Adjustable speed electrical power drive systems – Part 4: General requirements – Rating specifications for a.c. power drive systems above 1 000 V a.c. and not exceeding 35 kV*~~

IEC 61800-5-1:~~2007~~2022, *Adjustable speed electrical power drive systems – Part 5-1: Safety requirements – Electrical, thermal and energy*

IEC TS 63074:2023, *Safety of machinery - Security aspects related to functional safety of safety-related control systems*

ISO 13849-1:~~2006~~2023, *Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design*

ISO 13849-2:2012, *Safety of machinery – Safety-related parts of control systems – Part 2: Validation*

Bibliography

IEC 60050-191:1990, *International Electrotechnical Vocabulary – Chapter 191: Dependability and quality of service*

IEC 60300-3-1:2003, *Dependability management – Part 3-1: Application guide – Analysis techniques for dependability – Guide on methodology*

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC TR 61000-2-5, *Electromagnetic compatibility (EMC) - Part 2-5: Environment - Description and classification of electromagnetic environments*

IEC 61025, *Fault tree analysis (FTA)*

IEC 61078, *Analysis techniques for dependability – Reliability block diagram and boolean methods*

IEC 61165, *Application of Markov techniques*

IEC 61400-21:2008, *Wind turbines - Part 21: Measurement and assessment of power quality characteristics of grid connected wind turbines*[1]

IEC 61508-4:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 4: Definitions and abbreviations*

IEC 61508-5:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 5: Examples of methods for the determination of safety integrity levels*

IEC 61511 (all parts), *Functional safety – Safety instrumented systems for the process industry sector*

IEC 61511-1, *Functional safety – Safety instrumented systems for the process industry sector – Part 1: Framework, definitions, system, hardware and application programming requirements*

IEC 61513, *Nuclear power plants – Instrumentation and control important to safety – General requirements for systems*

IEC 61558 (all parts), *Safety of power transformers, power supplies, reactors and similar products*

IEC 61558-1:2005, *Safety of power transformers, power supplies, reactors and similar products – Part 1: General requirements and tests*
IEC 61558-1:2005/AMD1:2009

IEC 61784-3:2021, *Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions*
IEC 61784-3:2021/AMD1:2024

[1] This publication has been withdrawn.

IEC 61800-5-1:2007, *Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy*[2]

IEC 61800-5-3:2021, *Adjustable speed electrical power drive systems - Part 5-3: Safety requirements - Functional, electrical, and environmental requirements for encoders*

IEC 62061:2021, *Safety of machinery – Functional safety of safety-related ~~electrical, electronic and programmable electronic~~ control systems*

IEC 62280-1, *Railway applications – Communication, signalling and processing systems – Part 1: Safety-related communication in closed transmission systems*

IEC 62280-2, *Railway applications – Communication, signalling and processing systems – Part 2: Safety-related communication in open transmission systems*

IEC 62425, *Railway applications – Communication, signalling and processing systems – Safety related electronic systems for signalling*

IEC TR 63069:2019, *Industrial-process measurement, control, and automation - Framework for functional safety and security*

ISO 13849-2, *Safety of machinery – Safety-related parts of control systems – Part 2: Validation*

ISO/IEC Guide 51:1999, *Safety aspects – Guidelines for their inclusion in standards*

EN 50495:2010, *Safety devices required for the safe functioning of equipment with respect to explosion risks*

IFA Report 7/2013e *"Safe drive controls with frequency converters"*
http://www.dguv.de/ifa/Publikationen/Reports-Download/Reports-2013/IFA-Report-7-2013/index-2.jsp

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2 This publication has been withdrawn.