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| <b>STN</b> | <b>Systémy elektrických výkonových pohonov<br/>s nastaviteľnou rýchlosťou<br/>Časť 5-1: Bezpečnostné požiadavky<br/>Elektrické, tepelné a energetické požiadavky</b> | <b>STN<br/>EN IEC 61800-5-1</b><br><br>35 1720 |
|------------|--|--|

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

Táto norma obsahuje anglickú verziu európskej normy.

This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 12/23

Obsahuje: EN IEC 61800-5-1:2023, IEC 61800-5-1:2022, IEC 61800-5-1/COR1:2023

Oznámením tejto normy sa od 20.10.2026 ruší  
STN EN 61800-5-1 (35 1720) z februára 2008

EUROPEAN STANDARD

**EN IEC 61800-5-1**

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2023

ICS 29.200; 29.130.99; 13.110

Supersedes EN 61800-5-1:2007; EN 61800-5-1:2007/A1:2017; EN 61800-5-1:2007/A11:2021

English Version

**Adjustable speed electrical power drive systems - Part 5-1:  
Safety requirements - Electrical, thermal and energy  
(IEC 61800-5-1:2022 + COR1:2023)**

Entraînements électriques de puissance à vitesse variable -  
Partie 5-1: Exigences de sécurité - Électrique, thermique et  
énergétique  
(IEC 61800-5-1:2022 + COR1:2023)

Elektrische Leistungsantriebssysteme mit einstellbarer  
Drehzahl - Teil 5-1: Anforderungen an die Sicherheit -  
Elektrische, thermische und energetische Anforderungen  
(IEC 61800-5-1:2022 + COR1:2023)

This European Standard was approved by CENELEC on 2022-10-05. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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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**

**EN IEC 61800-5-1:2023 (E)****European foreword**

The text of document 22G/455/FDIS, future edition 3 of IEC 61800-5-1 + COR1, 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 61800-5-1:2023.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2024-04-20 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2026-10-20 document have to be withdrawn

This document supersedes EN 61800-5-1:2007 and all of its amendments and corrigenda (if any).

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**Endorsement notice**

The text of the International Standard IEC 61800-5-1:2022 + COR1:2023 was approved by CENELEC as a European Standard without any modification.

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

|                     |      |  |
|---------------------|------|--|
| IEC 60034-9:2021    | NOTE | Approved as EN IEC 60034-9:— <sup>1</sup> (not modified) |
| IEC 60060-1:2010    | NOTE | Approved as EN 60060-1:2010 (not modified)               |
| IEC 60068-1:2013    | NOTE | Approved as EN 60068-1:2014 (not modified)               |
| IEC 60068-2-14      | NOTE | Approved as EN IEC 60068-2-14                            |
| IEC 60068-2-31:2008 | NOTE | Approved as EN 60068-2-31:2008 (not modified)            |
| IEC 60071-1:2019    | NOTE | Approved as EN IEC 60071-1:2019 (not modified)           |
| IEC 60073:2002      | NOTE | Approved as EN 60073:2002 (not modified)                 |
| IEC 60085:2007      | NOTE | Approved as EN 60085:2008 (not modified)                 |
| IEC 60112:2020      | NOTE | Approved as EN IEC 60112:2020 (not modified)             |
| IEC 60127-2:2014    | NOTE | Approved as EN 60127-2:2014 (not modified)               |
| IEC 60127-4:2005    | NOTE | Approved as EN 60127-4:2005 (not modified)               |

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<sup>1</sup> To be published. Stage at the time of publication: FprEN IEC 60034-9:2021.

**EN IEC 61800-5-1:2023 (E)**

|                             |      |  |
|-----------------------------|------|--|
| IEC 60204-1:2016            | NOTE | Approved as EN 60204-1:2018                              |
| IEC 60216 (series)          | NOTE | Approved as EN 60216 (series)                            |
| IEC 60320-1                 | NOTE | Approved as EN IEC 60320-1                               |
| IEC 60335-1:2020            | NOTE | Approved as EN IEC 60335-1:— <sup>2</sup> (not modified) |
| IEC 60364 (series)          | NOTE | Approved as HD 60364 (series)                            |
| IEC 60364-1:2005            | NOTE | Approved as HD 60364-1:2008 + A11:2017                   |
| IEC 60364-4-44:2007         | NOTE | Approved as HD 60364-4-444:2010                          |
| IEC 60364-4-44:2007/A1:2015 | NOTE | Approved as HD 60364-4-443:2016                          |
| IEC 60364-5-52:2009         | NOTE | Approved as HD 60364-5-52:2011 + A11:2017                |
| IEC 60445:2021              | NOTE | Approved as EN IEC 60445:2021 (not modified)             |
| IEC 60664 (series)          | NOTE | Approved as EN 60664 (series)                            |
| IEC 60695-10-3:2016         | NOTE | Approved as EN 60695-10-3:2016 (not modified)            |
| IEC 60695-11-5:2016         | NOTE | Approved as EN 60695-11-5:2017 (not modified)            |
| IEC 60721 (series)          | NOTE | Approved as EN 60721 (series)                            |
| IEC 60947-2:2016            | NOTE | Approved as EN 60947-2:2017 (not modified)               |
| IEC 60947-7-2:2009          | NOTE | Approved as EN 60947-7-2:2009 (not modified)             |
| IEC 61082-1:2014            | NOTE | Approved as EN 61082-1:2015 (not modified)               |
| IEC 61140:2016              | NOTE | Approved as EN 61140:2016 (not modified)                 |
| IEC 61148:2011              | NOTE | Approved as EN 61148:2012 (not modified)                 |
| IEC 61439-1:2020            | NOTE | Approved as EN IEC 61439-1:2021 (not modified)           |
| IEC 61508 (series)          | NOTE | Approved as EN 61508 (series)                            |
| IEC 61643-11:2011           | NOTE | Approved as EN 61643-11:2012 + A11:2018                  |
| IEC 61643-12                | NOTE | Approved as CLC/TS 61643-12                              |
| IEC 61800-1:2021            | NOTE | Approved as EN IEC 61800-1:2021 (not modified)           |
| IEC 61800-2:2021            | NOTE | Approved as EN IEC 61800-2:2021 (not modified)           |
| IEC 61800-3:2017            | NOTE | Approved as EN IEC 61800-3:2018 (not modified)           |
| IEC 61800-5-1:2007          | NOTE | Approved as EN 61800-5-1:2007 (not modified) + A11:2021  |
| IEC 61800-5-1:2007/A1:2016  | NOTE | Approved as EN 61800-5-1:2007/A1:2017 (not modified)     |
| IEC 61800-5-2               | NOTE | Approved as EN 61800-5-2                                 |
| IEC 61800-5-3               | NOTE | Approved as EN IEC 61800-5-3                             |
| IEC/TR 61800-6:2003         | NOTE | Approved as CLC/TR 61800-6:2007 (not modified)           |
| IEC 61800-7 (series)        | NOTE | Approved as EN 61800-7 (series)                          |

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<sup>2</sup> To be published. Stage at the time of publication: FprEN IEC 60335-1:2023.

**EN IEC 61800-5-1:2023 (E)**

|                       |      |   |
|-----------------------|------|---|
| IEC 61800-9 (series)  | NOTE | Approved as EN 61800-9 (series)                             |
| IEC 61936-1:2021      | NOTE | Approved as EN IEC 61936-1:2021 (not modified)              |
| IEC 62311:2019        | NOTE | Approved as EN IEC 62311:2020 (not modified)                |
| IEC/IEEE 82079-1:2019 | NOTE | Approved as EN IEC/IEEE 82079-1:2020 (not modified)         |
| IEC 60076-1:2011      | NOTE | Approved as EN 60076-1:2011 (not modified)                  |
| IEC 60127 (series)    | NOTE | Approved as EN IEC 60127 (series)                           |
| IEC 60309-1           | NOTE | Approved as EN IEC 60309-1                                  |
| IEC 60317 (series)    | NOTE | Approved as EN IEC 60317 (series)                           |
| IEC 60384-14:2013     | NOTE | Approved as EN 60384-14:2013 (not modified)                 |
| IEC 60691:2015        | NOTE | Approved as EN 60691:2016 (not modified)                    |
| IEC 60730 (series)    | NOTE | Approved as EN IEC 60730 (series)                           |
| IEC 60738-1:2006      | NOTE | Approved as EN 60738-1:2006 (not modified)                  |
| IEC 60747-5-5:2020    | NOTE | Approved as EN IEC 60747-5-5:2020 (not modified)            |
| IEC 60825 (series)    | NOTE | Approved as EN 60825 (series)                               |
| IEC 60940:2015        | NOTE | Approved as EN 60940:2015 (not modified)                    |
| IEC 60947 (series)    | NOTE | Approved as EN IEC 60947 (series)                           |
| IEC 60947-7-1:2009    | NOTE | Approved as EN 60947-7-1:2009 (not modified)                |
| IEC 61008 (series)    | NOTE | Approved as EN 61008 (series)                               |
| IEC 61009 (series)    | NOTE | Approved as EN 61009 (series)                               |
| IEC 61010-1:2010      | NOTE | Approved as EN 61010-1:2010 (not modified)                  |
| IEC 61051-2:2021      | NOTE | Approved as EN IEC 61051-2:2021 (not modified)              |
| IEC 61058-1:2016      | NOTE | Approved as EN IEC 61058-1:2018 (not modified)              |
| IEC 61071:2017        | NOTE | Approved as EN 61071:— <sup>3</sup> (not modified)          |
| IEC 61204-7:2016      | NOTE | Approved as EN IEC 61204-7:2018 (not modified)              |
| IEC 61558-2-16:2021   | NOTE | Approved as EN IEC 61558-2-16:— <sup>4</sup> (not modified) |
| IEC 61810-1:2015      | NOTE | Approved as EN 61810-1:2015 (not modified)                  |
| IEC 61984:2008        | NOTE | Approved as EN 61984:2009 (not modified)                    |
| IEC 62368-1:2018      | NOTE | Approved as EN IEC 62368-1:2020 (not modified) + A11:2020   |
| IEC 62423:2009        | NOTE | Approved as EN 62423:2012 + A11:2021                        |

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<sup>3</sup> To be published. Stage at the time of publication: FprEN 61071:2017.

<sup>4</sup> To be published. Stage at the time of publication: FprEN IEC 61558-2-16:2021.

## 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.cencenelec.eu](http://www.cencenelec.eu).

| <u>Publication</u> | <u>Year</u> | <u>Title</u>  | <u>EN/HD</u>   | <u>Year</u> |
|--------------------|-------------|---|----------------|-------------|
| IEC 60034          | series      | Rotating electrical machines  | -              | series      |
| IEC 60034-1        | 2022        | Rotating electrical machines - Part 1: Rating and performance   | -              | -           |
| IEC 60034-5        | 2020        | Rotating electrical machines - Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) - Classification | EN IEC 60034-5 | 2020        |
| IEC 60050-112      | -           | International Electrotechnical Vocabulary - Part 112: Quantities and units  | -              | -           |
| IEC 60050-113      | -           | International Electrotechnical Vocabulary - Part 113: Physics for electrotechnology   | -              | -           |
| IEC 60050-114      | -           | International Electrotechnical Vocabulary - Part 114: Electrochemistry  | -              | -           |
| IEC 60050-131      | -           | International Electrotechnical Vocabulary - Part 131: Circuit theory  | -              | -           |
| 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 60050-426      | -           | International Electrotechnical Vocabulary (IEV) - Part 426: Explosive atmospheres   | -              | -           |
| 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   | -              | -           |

**EN IEC 61800-5-1:2023 (E)**

| <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 60050-826        | -           | International Electrotechnical Vocabulary - Part 826: Electrical installations   | -                 | -           |
| IEC 60050-903        | -           | International electrotechnical vocabulary_ - Part_903: Risk assessment   | -                 | -           |
| IEC 60068-2-1        | 2007        | Environmental testing - Part 2-1: Tests - Test A: Cold   | EN 60068-2-1      | 2007        |
| IEC 60068-2-2        | 2007        | Environmental testing - Part 2-2: Tests - Test B: Dry heat   | EN 60068-2-2      | 2007        |
| IEC 60068-2-6        | 2007        | Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)  | EN 60068-2-6      | 2008        |
| IEC 60068-2-30       | -           | Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)  | EN 60068-2-30     | -           |
| IEC 60068-2-30       | 2005        | Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)  | EN 60068-2-30     | 2005        |
| IEC 60068-2-52       | 2017        | Environmental testing - Part 2-52: Tests - Test Kb: Salt mist, cyclic (sodium chloride solution)   | EN IEC 60068-2-52 | 2018        |
| IEC 60068-2-68       | 1994        | Environmental testing - Part 2-68: Tests - Test L: Dust and sand   | EN 60068-2-68     | 1996        |
| IEC 60068-2-78       | 2012        | Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state   | EN 60068-2-78     | 2013        |
| IEC 60204-11         | 2018        | Safety of machinery - Electrical equipment of machines - Part 11: Requirements for equipment for voltages above 1 000 V AC or 1 500 V DC and not exceeding 36 kV | EN IEC 60204-11   | 2019        |
| IEC 60320            | -           | Appliance couplers for household and similar general purposes  | -                 | -           |
| IEC 60364            | series      | Low-voltage electrical installations   | HD 60364          | series      |
| + A1                 | 2017        |  | -                 | -           |
| IEC 60364-4-41 (mod) | 2005        | Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock  | HD 60364-4-41     | 2017        |
| -                    | -           |  | + A11             | 2017        |
| -                    | -           |  | + A12             | 2019        |
| IEC 60364-5-54       | 2011        | Low-voltage electrical installations - Part 5-54: Selection and erection of electrical equipment - Earthing arrangements and protective conductors               | HD 60364-5-54     | 2011        |
| -                    | -           |  | + A11             | 2017        |
| IEC 60417            | -           | Graphical symbols for use on equipment. Index, survey and compilation of the single sheets.  | -                 | -           |

**EN IEC 61800-5-1:2023 (E)**

| <u>Publication</u> | <u>Year</u> | <u>Title</u>   | <u>EN/HD</u>       | <u>Year</u> |
|--------------------|-------------|--|--------------------|-------------|
| IEC 60529          | 1989        | Degrees of protection provided by enclosures (IP Code)   | EN 60529           | 1991        |
| -                  | -           |  | + corrigendum May  | 1993        |
| + A1               | 1999        |  | + A1               | 2000        |
| + A2               | 2013        |  | + A2               | 2013        |
| IEC 60617          | -           | Standard data element types with associated classification scheme for electric components - Part 4: IEC reference collection of standard data element types and component classes        | -                  | -           |
| IEC 60664-1        | 2020        | Insulation coordination for equipment within low-voltage supply systems - Part 1: Principles, requirements and tests   | EN IEC 60664-1     | 2020        |
| IEC 60664-3        | 2016        | Insulation coordination for equipment within low-voltage systems - Part 3: Use of coating, potting or moulding for protection against pollution  | EN 60664-3         | 2017        |
| IEC 60664-4        | 2005        | Insulation coordination for equipment within low-voltage systems - Part 4: Consideration of high-frequency voltage stress  | EN 60664-4         | 2006        |
| -                  | -           |  | + corrigendum Oct. | 2006        |
| IEC 60695-2-10     | 2021        | Fire hazard testing - Part 2-10: Glowing/hot-wire based test methods - Glow-wire apparatus and common test procedure   | EN IEC 60695-2-10  | 2021        |
| IEC 60695-2-11     | 2021        | Fire hazard testing - Part 2-11: Glowing/hot-wire based test methods - Glow-wire flammability test method for end products (GWEPT)   | EN IEC 60695-2-11  | 2021        |
| IEC 60695-2-13     | 2021        | Fire hazard testing - Part 2-13: Glowing/hot-wire based test methods - Glow-wire ignition temperature (GWIT) test method for materials   | EN IEC 60695-2-13  | 2021        |
| IEC 60695-10-2     | 2014        | Fire hazard testing - Part 10-2: Abnormal heat - Ball pressure test method   | EN 60695-10-2      | 2014        |
| IEC 60695-11-10    | 2013        | Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods  | EN 60695-11-10     | 2013        |
| IEC 60695-11-20    | 2015        | Fire hazard testing - Part 11-20: Test flames - 500 W flame test method  | EN 60695-11-20     | 2015        |
| + A1               | 1995        |  | -                  | -           |
| + A2               | 1996        |  | -                  | -           |
| 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 IEC 61800-5-1:2023 (E)**

| <u>Publication</u> | <u>Year</u> | <u>Title</u>  | <u>EN/HD</u>     | <u>Year</u> |
|--------------------|-------------|---|------------------|-------------|
| IEC 60721-3-4      | 2019        | Classification of environmental conditions - Part 3-4: Classification of groups of environmental parameters and their severities - Stationary use at non-weatherprotected locations | EN IEC 60721-3-4 | 2019        |
| IEC 60730-1 (mod)  | 2013        | Automatic electrical controls - Part 1: General requirements  | EN 60730-1       | 2016        |
| + A1               | 2015        |   | + A1             | 2019        |
| + A2               | 2020        |   | + A2             | 2022        |
| IEC 60755          | 2017        | General safety requirements for residual current operated protective devices  | -                | -           |
| IEC 60799          | 2018        | Electrical accessories - Cord sets and interconnection cord sets  | EN IEC 60799     | 2021        |
| IEC 60947-4-1      | 2018        | Low-voltage switchgear and controlgear - Part 4-1: Contactors and motor-starters - Electromechanical contactors and motor-starters  | EN IEC 60947-4-1 | 2019        |
| IEC 60990          | 2016        | Methods of measurement of touch current and protective conductor current  | EN 60990         | 2016        |
| IEC 61032          | 1997        | Protection of persons and equipment by enclosures - Probes for verification   | EN 61032         | 1998        |
| IEC 61084          | series      | Cable trunking systems and cable ducting systems for electrical installations   | -                | series      |
| IEC 61180          | 2016        | High-voltage test techniques for low-voltage equipment - Definitions, test and procedure requirements, test equipment   | EN 61180         | 2016        |
| IEC 61189-3        | 2007        | Test methods for electrical materials, printed boards and other interconnection structures and assemblies - Part 3: Test methods for interconnection structures (printed boards)    | EN 61189-3       | 2008        |
| IEC 61230          | 2008        | Live working - Portable equipment for earthing or earthing and short-circuiting   | EN 61230         | 2008        |
| IEC 61386          | series      | Conduit systems for cable management  | EN 61386         | series      |
| IEC 61558-1        | 2017        | Safety of transformers, reactors, power supply units and combinations thereof – Part 1: General requirements and tests  | EN IEC 61558-1   | 2019        |
| IEC 62109-1        | 2010        | Safety of power converters for use in photovoltaic power systems - Part 1: General requirements   | EN 62109-1       | 2010        |
| IEC 62271-102      | 2018        | High-voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches   | EN IEC 62271-102 | 2018        |
| IEC 62477-1        | 2022        | Safety requirements for power electronic converter systems and equipment - Part 1: General  | EN IEC 62477-1   | 2023        |
| IEC 62477-2        | 2018        | Safety requirements for power electronic converter systems and equipment - Part 2: Power electronic converters from 1 000 V AC or 1 500 V DC up to 36 kV AC or 54 kV DC             | EN IEC 62477-2   | 2018        |

**EN IEC 61800-5-1:2023 (E)**

| <u>Publication</u> | <u>Year</u> | <u>Title</u>  | <u>EN/HD</u>  | <u>Year</u> |
|--------------------|-------------|---|---------------|-------------|
| ISO 3746           | -           | Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane | EN ISO 3746   | -           |
| ISO 3864-1         | 2011        | Graphical symbols - Safety colours and safety signs - Part 1: Design principles for safety signs and safety markings  | -             | -           |
| ISO 7000           | -           | Graphical symbols for use on equipment - Registered symbols   | -             | -           |
| ISO 7010           | -           | Graphical symbols - Safety colours and safety signs - Registered safety signs   | -             | -           |
| ISO 9614-1         | -           | Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 1: Measurement at discrete points   | EN ISO 9614-1 | 2009        |



IEC 61800-5-1

Edition 3.0 2022-08

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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

**Entraînements électriques de puissance à vitesse variable –  
Partie 5-1: Exigences de sécurité – Électrique, thermique et énergétique**





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# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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

**Entraînements électriques de puissance à vitesse variable –  
Partie 5-1: Exigences de sécurité – Électrique, thermique et énergétique**

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## CONTENTS

|   |     |
|---|-----|
| FOREWORD.....   | 15  |
| INTRODUCTION.....   | 17  |
| 0.1    General.....   | 17  |
| 0.2    Feedback from industry and national committees.....  | 19  |
| 0.3    Requirement covered by other relevant parts of the IEC 61800 series .....                          | 19  |
| 1    Scope.....   | 20  |
| 2    Normative references .....   | 20  |
| 3    Terms and definitions .....  | 24  |
| 4    Protection against hazards .....   | 40  |
| 4.1    General.....   | 40  |
| 4.2 <i>Single-fault conditions</i> and <i>abnormal operating conditions</i> .....                         | 41  |
| 4.3    Short-circuit and overload protection.....   | 42  |
| 4.3.1    General .....  | 42  |
| 4.3.2    Input short-circuit rating and available <i>output short-circuit current</i> .....               | 43  |
| 4.3.3    Short-circuit coordination (upstream protection).....  | 44  |
| 4.3.4    Protection by several devices .....  | 44  |
| 4.3.5    Motor overload and overtemperature protection .....  | 45  |
| 4.3.6 <i>BDM/CDM</i> providing current limiting control.....  | 46  |
| 4.4    Protection against electric shock.....   | 46  |
| 4.4.1    General .....  | 46  |
| 4.4.2 <i>Decisive voltage class (DVC)</i> .....   | 46  |
| 4.4.3    Provision for <i>basic protection</i> .....  | 53  |
| 4.4.4    Provision for <i>fault protection</i> .....  | 56  |
| 4.4.5    Provisions for <i>enhanced protection</i> .....  | 64  |
| 4.4.6    Protective measures .....  | 65  |
| 4.4.7 <i>Insulation</i> .....   | 67  |
| 4.4.8    Compatibility with residual current-operated protective devices (RCD).....                       | 88  |
| 4.4.9    Capacitor discharge.....   | 89  |
| 4.4.10    Access conditions for high-voltage sections of <i>BDM/CDM/PDS</i><br>( <i>interlock</i> ) ..... | 89  |
| 4.5    Protection against electrical energy hazards .....   | 91  |
| 4.5.1    General .....  | 91  |
| 4.5.2    Determination of hazardous electrical energy level .....   | 92  |
| 4.5.3    Limited power sources .....  | 92  |
| 4.6    Protection against fire and thermal hazards .....  | 94  |
| 4.6.1    General .....  | 94  |
| 4.6.2    Circuits and <i>components</i> representing a fire hazard .....                                  | 94  |
| 4.6.3    Selection of <i>components</i> to mitigate the risk of a fire hazard .....                       | 94  |
| 4.6.4    Fire protection provided by <i>enclosures</i> .....  | 95  |
| 4.6.5    Temperature limits.....  | 96  |
| 4.7    Protection against mechanical hazards .....  | 98  |
| 4.7.1    General .....  | 98  |
| 4.7.2    Critical torsional speed .....   | 99  |
| 4.7.3    Transient torque analysis.....   | 99  |
| 4.7.4    Specific requirements for liquid cooled <i>BDM/CDM/PDS</i> .....                                 | 99  |
| 4.7.5    Mechanical hazards from rotating parts .....   | 101 |
| 4.7.6    Sharp edges .....  | 102 |

|         |   |     |
|---------|---|-----|
| 4.8     | <i>BDM/CDM/PDS</i> with multiple sources of supply .....  | 102 |
| 4.8.1   | General .....   | 102 |
| 4.8.2   | <i>Low-voltage</i> DC link sharing .....  | 103 |
| 4.9     | Protection against environmental stresses .....   | 103 |
| 4.9.1   | General .....   | 103 |
| 4.9.2   | Protection against corrosion .....  | 105 |
| 4.10    | Protection against excessive acoustic noise hazards .....   | 105 |
| 4.10.1  | General .....   | 105 |
| 4.10.2  | Acoustic noise level .....  | 105 |
| 4.11    | Wiring and connections .....  | 106 |
| 4.11.1  | General .....   | 106 |
| 4.11.2  | <i>Insulation</i> of conductors .....   | 107 |
| 4.11.3  | Stranded wire .....   | 109 |
| 4.11.4  | Routing and clamping .....  | 109 |
| 4.11.5  | Identification of conductors and terminals of <i>mains supply</i> and <i>non-mains supply</i> ..... | 109 |
| 4.11.6  | Splices and connections .....   | 110 |
| 4.11.7  | Accessible connections .....  | 110 |
| 4.11.8  | Interconnections between parts of the <i>PDS</i> .....  | 111 |
| 4.11.9  | Supply connections for <i>permanently connected BDM/CDM/PDS</i> .....                               | 111 |
| 4.11.10 | Supply connections for pluggable <i>BDM/CDM/PDS</i> .....   | 111 |
| 4.11.11 | Terminals .....   | 113 |
| 4.11.12 | Provisions for connecting the shield of shielded wire or cable .....                                | 116 |
| 4.12    | Mechanical requirements for <i>enclosures</i> .....   | 117 |
| 4.12.1  | General .....   | 117 |
| 4.12.2  | Handles and manual controls .....   | 117 |
| 4.12.3  | Cast metal <i>enclosure</i> .....   | 118 |
| 4.12.4  | Sheet metal <i>enclosure</i> .....  | 118 |
| 4.12.5  | Stability for floor-standing <i>BDM/CDM/PDS</i> .....   | 121 |
| 4.12.6  | Wiring strain relief .....  | 121 |
| 4.12.7  | Polymeric <i>enclosure</i> stress relief .....  | 122 |
| 4.12.8  | Internal condensation or accumulation of water .....  | 122 |
| 4.12.9  | Polymeric outdoor <i>enclosure</i> ultra-violet (UV) resistance .....                               | 122 |
| 4.13    | <i>Components</i> .....   | 123 |
| 4.13.1  | <i>Components</i> general .....   | 123 |
| 4.13.2  | <i>Components</i> representing a fire hazard .....  | 123 |
| 4.13.3  | <i>Components</i> being part of an <i>enclosure</i> .....   | 123 |
| 4.13.4  | <i>Components</i> representing a mechanical hazard .....  | 124 |
| 4.13.5  | Wound <i>components</i> .....   | 124 |
| 4.13.6  | Protective devices .....  | 124 |
| 4.14    | Protection against electromagnetic fields .....   | 124 |
| 5       | Test requirements .....   | 124 |
| 5.1     | General .....   | 124 |
| 5.1.1   | Test objectives and classification .....  | 124 |
| 5.1.2   | Selection of test samples .....   | 125 |
| 5.1.3   | Sequence of tests .....   | 125 |
| 5.1.4   | Earthing conditions .....   | 125 |
| 5.1.5   | General conditions for tests .....  | 125 |
| 5.1.6   | Compliance .....  | 126 |

|                     |  |     |
|---------------------|--|-----|
| 5.1.7               | Test overview .....  | 126 |
| 5.2                 | Test specifications .....  | 129 |
| 5.2.1               | <i>Visual inspections (type test, routine test and sample test)</i> .....      | 129 |
| 5.2.2               | Mechanical tests .....   | 129 |
| 5.2.3               | Electrical tests .....   | 138 |
| 5.2.4               | <i>Abnormal operation and simulated faults tests</i> .....                     | 157 |
| 5.2.5               | Material tests .....   | 170 |
| 5.2.6               | Environmental tests ( <i>type tests</i> ) .....                                | 174 |
| 5.2.7               | Hydrostatic pressure test ( <i>type test, routine test</i> ) .....             | 180 |
| 5.2.8               | Electromagnetic fields (EMF) test ( <i>type test</i> ) .....                   | 181 |
| 6                   | Information and marking requirements .....                                     | 181 |
| 6.1                 | General .....  | 181 |
| 6.1.1               | Overview .....   | 181 |
| 6.1.2               | Documentation in electronic form .....   | 184 |
| 6.1.3               | Installation Instructions .....  | 185 |
| 6.2                 | Information for selection .....  | 185 |
| 6.2.1               | General .....  | 185 |
| 6.2.2               | Instructions and markings pertaining to <i>accessories</i> .....               | 187 |
| 6.3                 | Information for installation and commissioning .....                           | 187 |
| 6.3.1               | General .....  | 187 |
| 6.3.2               | Mechanical considerations .....  | 187 |
| 6.3.3               | Environment .....  | 187 |
| 6.3.4               | Handling and mounting .....  | 188 |
| 6.3.5               | <i>Enclosure</i> temperature .....   | 188 |
| 6.3.6               | Open type <i>BDM/CDM</i> .....   | 188 |
| 6.3.7               | Connections .....  | 189 |
| 6.3.8               | Commissioning .....  | 191 |
| 6.3.9               | Protection requirements .....  | 191 |
| 6.3.10              | Motor and driven equipment .....   | 195 |
| 6.3.11              | Field installed <i>components</i> .....  | 196 |
| 6.4                 | Information for intended use .....   | 196 |
| 6.4.1               | General .....  | 196 |
| 6.4.2               | Adjustment .....   | 196 |
| 6.4.3               | Labels, signs, symbols and signals .....                                       | 196 |
| 6.4.4               | Hot surface .....  | 198 |
| 6.4.5               | Control and device marking .....   | 198 |
| 6.4.6               | Stability for floor-standing <i>BDM/CDM/PDS</i> .....                          | 199 |
| 6.5                 | Supplementary information .....  | 199 |
| 6.5.1               | General .....  | 199 |
| 6.5.2               | Capacitor discharge .....  | 199 |
| 6.5.3               | Special operation mode – Auto restart/bypass connection .....                  | 200 |
| 6.5.4               | Other hazards .....  | 200 |
| 6.5.5               | <i>BDM/CDM/PDS</i> with multiple sources of supply .....                       | 200 |
| 6.5.6               | PT/CT connection .....   | 200 |
| 6.5.7               | Access conditions for <i>high-voltage BDM/CDM/PDS</i> during maintenance ..... | 200 |
| Annex A (normative) | Additional information for protection against electric shock .....             | 202 |
| A.1                 | General .....  | 202 |
| A.2                 | Protection by means of <i>DVC As</i> .....                                     | 202 |
| A.3                 | Protection by means of <i>protective impedance</i> .....                       | 203 |



|                       |   |     |
|-----------------------|---|-----|
| A.4                   | Protection by using limited voltages .....  | 204 |
| A.5                   | Evaluation of the <i>working voltage</i> of circuits.....   | 204 |
| A.5.1                 | General .....   | 204 |
| A.5.2                 | Classification of the <i>working voltage</i> .....  | 205 |
| A.5.3                 | AC <i>working voltage</i> .....   | 205 |
| A.5.4                 | DC <i>working voltage</i> .....   | 206 |
| A.5.5                 | Pulsating <i>working voltage</i> .....  | 207 |
| A.6                   | The concept of protective measures according to 4.4.....  | 208 |
| A.6.1                 | General .....   | 208 |
| A.6.2                 | General concept of protection against electric shock .....  | 209 |
| A.6.3                 | Examples of the use of elements of protective measures .....  | 210 |
| Annex B (informative) | Considerations for the reduction of the pollution degree .....  | 215 |
| B.1                   | General.....  | 215 |
| B.2                   | Factors influencing the pollution degree .....  | 215 |
| B.3                   | Reduction of influencing factors .....  | 215 |
| Annex C (informative) | Symbols referred.....   | 216 |
| C.1                   | Symbols used .....  | 216 |
| C.2                   | Determination of contrast .....   | 218 |
| Annex D (normative)   | Evaluation of <i>clearance</i> and <i>creepage distances</i> .....                                    | 219 |
| D.1                   | Measurement.....  | 219 |
| D.2                   | Relationship of measurement to pollution degree .....   | 219 |
| D.3                   | Examples .....  | 219 |
| Annex E (normative)   | Altitude correction for <i>clearances</i> .....   | 226 |
| E.1                   | Correction factor for <i>clearances</i> at altitudes above 2 000 m .....                              | 226 |
| E.2                   | Test voltages for verifying <i>clearances</i> at different altitudes .....                            | 226 |
| Annex F (normative)   | <i>Clearance</i> and <i>creepage distance</i> determination for frequencies greater than 30 kHz ..... | 228 |
| F.1                   | General influence of the frequency on the withstand characteristics.....                              | 228 |
| F.2                   | <i>Clearance</i> .....  | 228 |
| F.2.1                 | General .....   | 228 |
| F.2.2                 | <i>Clearance</i> for inhomogenous fields .....  | 229 |
| F.2.3                 | <i>Clearance</i> for approximately homogenous fields .....  | 230 |
| F.3                   | <i>Creepage distance</i> .....  | 231 |
| F.4                   | <i>Solid insulation</i> .....   | 232 |
| F.4.1                 | General .....   | 232 |
| F.4.2                 | Approximately uniform field distribution without air gaps or voids.....                               | 232 |
| F.4.3                 | Other cases .....   | 233 |
| Annex G (informative) | Cross-sections of round conductors .....  | 234 |
| Annex H (informative) | Guidelines for RCD compatibility.....   | 235 |
| H.1                   | Selection of RCD type.....  | 235 |
| H.2                   | Fault current waveforms.....  | 236 |
| Annex I (informative) | Examples of overvoltage category reduction.....   | 240 |
| I.1                   | General.....  | 240 |
| I.2                   | Protection to the surroundings (see 4.4.7.2).....   | 240 |
| I.2.1                 | Circuits connected directly to <i>mains supply</i> (see 4.4.7.2.3).....                               | 240 |
| I.2.2                 | Circuits connected to the <i>non-mains supply</i> (see 4.4.7.2.4) .....                               | 243 |
| I.2.3                 | <i>Insulation</i> between circuits (see 4.4.7.2.5).....   | 243 |
| I.3                   | <i>Functional insulation</i> (see 4.4.7.3) .....  | 244 |

|                       |   |     |
|-----------------------|---|-----|
| I.4                   | Further examples .....  | 244 |
| Annex J (informative) | Burn thresholds for touchable surfaces .....  | 246 |
| J.1                   | General.....  | 246 |
| J.2                   | Burn thresholds .....   | 246 |
| Annex K (informative) | Table of electrochemical potentials .....   | 249 |
| Annex L (informative) | Measuring instrument for touch current measurements .....   | 250 |
| L.1                   | Measuring test circuit.....   | 250 |
| L.2                   | Requirements for measuring instruments .....  | 250 |
| Annex M (normative)   | Test probes for determining access .....  | 251 |
| Annex N (informative) | Guidance regarding short-circuit current .....  | 254 |
| Annex O (informative) | Guidance for determination of <i>clearance</i> and <i>creepage distance</i> .....                                       | 255 |
| O.1                   | Guideline for determination of <i>clearance</i> .....   | 255 |
| O.2                   | Guideline for determination of <i>creepage distance</i> .....   | 256 |
| O.3                   | Minimum <i>clearance</i> and <i>creepage distances</i> for material .....   | 257 |
| Annex P (normative)   | Protection of persons against electromagnetic fields for frequencies from 0 Hz up to 300 GHz .....                      | 258 |
| P.1                   | General influence of electromagnetic fields to persons.....   | 258 |
| P.1.1                 | General .....   | 258 |
| P.1.2                 | Low-frequency electric field effects (1 Hz to 100 kHz).....   | 258 |
| P.1.3                 | Low-frequency magnetic field effects (1 Hz to 100 kHz).....   | 258 |
| P.1.4                 | Low-frequency electric and magnetic field effects .....   | 258 |
| P.1.5                 | High-frequency electromagnetic field effects (100 kHz to 300 GHz) .....   | 258 |
| P.1.6                 | Current knowledge on low-level effects.....   | 259 |
| P.1.7                 | Biological effects versus adverse health effects .....  | 259 |
| P.1.8                 | Influence of EMF on passive and active medical implants.....  | 259 |
| P.2                   | Recommendations from ICNIRP Guidelines against exposure to EMF.....   | 259 |
| P.2.1                 | Adoption of exposure limits from ICNIRP .....   | 259 |
| P.2.2                 | Limits of EMF exposure for transportation and storage .....   | 261 |
| P.3                   | Protection of persons against exposure of EMF .....   | 261 |
| P.3.1                 | General .....   | 261 |
| P.3.2                 | EMF requirements for general public access areas.....   | 262 |
| P.3.3                 | EMF requirements for <i>general-access areas</i> , <i>service-access areas</i> and <i>restricted-access areas</i> ..... | 262 |
| P.3.4                 | EMF requirements for transportation and storage .....   | 262 |
| P.4                   | Electromagnetic fields (EMF) test ( <i>type test</i> ).....   | 263 |
| P.4.1                 | General test set up for EMF .....   | 263 |
| P.4.2                 | EMF test.....   | 263 |
| P.5                   | Electromagnetic fields (EMF) marking .....  | 263 |
| Annex Q (informative) | Automatic disconnection of supply .....   | 264 |
| Q.1                   | Maximum disconnection times .....   | 264 |
| Q.2                   | Supplementary <i>protective equipotential bonding</i> .....   | 265 |
| Annex R (informative) | Risk assessment according to IEC Guide 116 .....  | 266 |
| R.1                   | General.....  | 266 |
| R.2                   | Risk assessment.....  | 266 |
| Annex S (informative) | In-some-country requirements – United States of America voltages less than 1,5 kV AC or DC .....                        | 268 |
| S.0                   | General.....  | 268 |
| S.1                   | Scope .....   | 268 |

|                       |   |     |
|-----------------------|---|-----|
| S.2                   | Normative references.....   | 268 |
| S.3                   | Terms and definitions.....  | 268 |
| S.4                   | Protection against hazards.....                                       | 269 |
| S.4.1                 | General .....   | 269 |
| S.4.2                 | <i>Single-fault conditions and abnormal operating condition</i> ..... | 269 |
| S.4.3                 | Short-circuit and overload protection .....                           | 269 |
| S.4.4                 | Protection against electric shock .....                               | 271 |
| S.4.5                 | Protection against electrical energy hazards.....                     | 281 |
| S.4.6                 | Protection against fire and thermal hazards.....                      | 281 |
| S.4.7                 | Protection against mechanical hazards.....                            | 282 |
| S.4.8                 | <i>BDM/CDM/PDS with multiple sources of supply</i> .....              | 284 |
| S.4.9                 | Protection against environmental stresses.....                        | 284 |
| S.4.10                | Protection against excessive acoustic noise hazards.....              | 284 |
| S.4.11                | Wiring and connections .....  | 284 |
| S.4.12                | Mechanical requirements for <i>enclosures</i> .....                   | 294 |
| S.4.200               | Auxiliary device .....  | 306 |
| S.4.201               | <i>Accessories</i> .....  | 306 |
| S.4.202               | Provisions for mounting .....   | 306 |
| S.4.203               | Capacitors .....  | 306 |
| S.5                   | Test requirements.....  | 307 |
| S.5.1                 | General .....   | 307 |
| S.5.2                 | Test specifications.....  | 308 |
| S.6                   | Information and marking requirements .....                            | 328 |
| S.6.1                 | General .....   | 328 |
| S.6.2                 | Information for selection .....                                       | 328 |
| S.6.3                 | Information for installation and commissioning.....                   | 329 |
| S.6.4                 | Information for intended use .....                                    | 333 |
| S.6.5                 | Supplementary information .....                                       | 333 |
| S.200                 | Evaluation of clearance and <i>creepage distances</i> .....           | 334 |
| S.200.1               | <i>Clearance and creepage distances</i> .....                         | 335 |
| S.201                 | Normative references and component standards.....                     | 337 |
| S.202                 | IEC to USA standard references .....                                  | 340 |
| S.203                 | Isolated secondary circuits and circuits supplied by battery .....    | 343 |
| S.203.1               | Isolated secondary circuits .....                                     | 343 |
| S.203.2               | Secondary circuits test .....   | 349 |
| S.203.3               | Circuits supplied by a battery.....                                   | 351 |
| S.204                 | Full-load motor-running currents .....                                | 351 |
| Annex T (informative) | In-some-country requirements – Canada voltages up to 34,5 kV.....     | 354 |
| T.0                   | General.....  | 354 |
| T.1                   | Scope .....   | 354 |
| T.2                   | Normative references.....   | 354 |
| T.3                   | Terms and definitions.....  | 356 |
| T.4                   | Protection against hazards.....                                       | 357 |
| T.4.1                 | General .....   | 357 |
| T.4.2                 | <i>Single-fault conditions and abnormal operating condition</i> ..... | 357 |
| T.4.3                 | Short-circuit and overload protection .....                           | 357 |
| T.4.4                 | Protection against electric shock .....                               | 358 |
| T.4.5                 | Protection against electrical energy hazards.....                     | 367 |
| T.4.6                 | Protection against fire and thermal hazards.....                      | 368 |

|        |  |     |
|--------|--|-----|
| T.4.7  | Protection against mechanical hazards .....  | 369 |
| T.4.8  | <i>BDM/CDM/PDS</i> with multiple sources of supply .....   | 369 |
| T.4.9  | Protection against environmental stresses .....  | 369 |
| T.4.10 | Protection against excessive acoustic noise hazards .....  | 369 |
| T.4.11 | Wiring and connections .....   | 369 |
| T.4.12 | Mechanical requirements for <i>enclosures</i> .....  | 382 |
| T.4.13 | <i>Components</i> .....  | 386 |
| T.4.14 | Protection against electromagnetic fields .....  | 391 |
| T.5    | Test requirements .....  | 391 |
| T.5.1  | General .....  | 391 |
| T.5.2  | Test specifications .....  | 391 |
| T.6    | Information and marking requirements .....   | 416 |
| T.6.1  | General .....  | 416 |
| T.6.2  | Information for selection .....  | 418 |
| T.6.3  | Information for installation and commissioning .....   | 419 |
| T.6.4  | Information for intended use .....   | 421 |
| T.6.5  | Supplementary information .....  | 423 |
| T.200  | IEC normative references replaced by CSA standards .....   | 423 |
|        | Bibliography .....   | 426 |
|        | Figure 1 – <i>PDS</i> hardware configuration within an <i>installation</i> .....   | 35  |
|        | Figure 2 – Time-voltage zones for <i>DVC A</i> s and <i>DVC B</i> circuits – DC .....  | 50  |
|        | Figure 3 – Time-voltage zones for <i>DVC A</i> s and <i>DVC B</i> circuits – AC peak .....   | 51  |
|        | Figure 4 – Time-voltage zones for conductive <i>accessible parts</i> .....   | 52  |
|        | Figure 5 – Example of a <i>protective class I BDM/CDM</i> arrangement and its associated <i>protective equipotential bonding</i> .....                                 | 58  |
|        | Figure 6 – Example of a <i>protective class I BDM/CDM</i> arrangement and its associated <i>protective equipotential bonding</i> through direct metallic contact ..... | 59  |
|        | Figure 7 – Example for interconnections within <i>BDM/CDM</i> and between parts of the <i>PDS</i> .....  | 106 |
|        | Figure 8 – Example for interconnections between parts of the <i>PDS</i> ( <i>BDM/CDM</i> parts separated by field wiring) .....  | 107 |
|        | Figure 9 – Example arrangement of insulated conductors in a cable .....  | 108 |
|        | Figure 10 – Detachable <i>mains supply</i> cords and connections .....   | 112 |
|        | Figure 11 – Wire bending space .....   | 116 |
|        | Figure 12 – Supported and unsupported <i>enclosure</i> parts .....   | 119 |
|        | Figure 13 – Impact test using a steel ball .....   | 135 |
|        | Figure 14 – Voltage test procedures .....  | 146 |
|        | Figure 15 – Partial discharge test procedure .....   | 148 |
|        | Figure 16 – Electric strength test instrument .....  | 154 |
|        | Figure 17 – Mandrel .....  | 155 |
|        | Figure 18 – Initial position of mandrel .....  | 155 |
|        | Figure 19 – Final position of mandrel .....  | 155 |
|        | Figure 20 – Position of metal foil on insulating material .....  | 156 |
|        | Figure 21 – <i>Protective equipotential bonding</i> test set up .....  | 160 |
|        | Figure 22 – Example of short-circuit test between <i>BDM/CDM</i> motor power <i>port</i> and <i>protective earth</i> (motor separately earthed) .....                  | 162 |

|   |     |
|---|-----|
| Figure 23 – Example of short-circuit test between <i>BDM/CDM</i> motor power <i>port</i> and <i>protective earth</i> (motor earthed through <i>BDM/CDM</i> ).....                         | 162 |
| Figure 24 – Example of short-circuit test between <i>BDM/CDM</i> DC link power <i>port</i> and <i>protective earth</i> .....  | 163 |
| Figure 25 – Interpolated values for Table 37 .....  | 165 |
| Figure 26 – Circuit for high-current arcing test .....  | 171 |
| Figure 27 – Test fixture for hot-wire ignition test .....   | 172 |
| Figure A.1 – Protection by <i>DVC As</i> with <i>enhanced protection</i> .....  | 202 |
| Figure A.2 – Protection by means of <i>protective impedance</i> .....   | 203 |
| Figure A.3 – Protection by using limited voltages .....   | 204 |
| Figure A.4 – Typical waveform for AC <i>working voltage</i> .....   | 205 |
| Figure A.5 – Typical waveform for DC <i>working voltage</i> .....   | 206 |
| Figure A.6 – Typical waveform for pulsating <i>working voltage</i> .....  | 207 |
| Figure A.7 – Protective measures according to 4.4.1 to 4.4.5 for protection against electric shock considering <i>protective class I</i> and <i>protective class II BDM/CDM/PDS</i> ..... | 209 |
| Figure A.8 – Protective measures according to 4.4.1 to 4.4.5 for protection against electric shock considering <i>protective class III BDM/CDM/PDS</i> and <i>DVC As</i> circuits .....   | 210 |
| Figure D.1 – Example of measurements including a groove .....   | 220 |
| Figure D.2 – Example of measurements including a groove .....   | 220 |
| Figure D.3 – Example of measurements including a groove .....   | 220 |
| Figure D.4 – Example of measurements including a rib.....   | 220 |
| Figure D.5 – Example of measurements providing protection of type 2.....  | 221 |
| Figure D.6 – Example of measurements providing protection of type 1.....  | 221 |
| Figure D.7 – Example of measurements providing protection of type 1.....  | 221 |
| Figure D.8 – Example of measurements providing protection of type 1.....  | 222 |
| Figure D.9 – Example of measurements including a barrier (cemented joint).....  | 222 |
| Figure D.10 – Example of measurements including a barrier.....  | 222 |
| Figure D.11 – Example of measurements including a gap .....   | 223 |
| Figure D.12 – Example of measurements including a gap .....   | 223 |
| Figure D.13 – Example of measurements including an floating conductive part.....  | 224 |
| Figure D.14 – Example of measurements in inner layer of PWB.....  | 224 |
| Figure D.15 – Example of measurements in an <i>enclosure</i> of insulating material.....  | 225 |
| Figure F.1 – Diagram for dimensioning of <i>clearances</i> above 30 kHz .....   | 229 |
| Figure F.2 – Diagram for dimensioning of <i>creepage distances</i> above 30 kHz .....   | 231 |
| Figure F.3 – Permissible field strength for dimensioning of <i>solid insulation</i> according to Formula (F.1).....   | 233 |
| Figure H.1 – Flow chart leading to selection of the RCD type upstream of a <i>PDS</i> .....   | 235 |
| Figure H.2 – Symbols for marking depending on the type of RCD .....   | 236 |
| Figure H.3 – Fault current waveforms in connections with <i>BDM/CDM/PDS</i> .....   | 239 |
| Figure I.1 – <i>Basic protection</i> evaluation for circuits connected to the origin of the <i>installation mains supply</i> .....  | 240 |
| Figure I.2 – <i>Basic protection</i> evaluation for circuits connected to the <i>mains supply</i> .....   | 241 |
| Figure I.3 – <i>Basic protection</i> evaluation for single and three phase <i>BDM/CDM/PDS</i> not <i>permanently connected</i> to the <i>mains supply</i> .....                           | 241 |
| Figure I.4 – <i>Basic protection</i> evaluation for circuits connected to the origin of the <i>installation mains supply</i> where internal SPDs are used.....                            | 241 |

|   |     |
|---|-----|
| Figure I.5 – <i>Basic protection</i> evaluation for circuits connected to the <i>mains supply</i> where internal SPDs are used.....                           | 242 |
| Figure I.6 – Example of <i>enhanced protection</i> evaluation for circuits connected to the <i>mains supply</i> where internal SPDs are used .....            | 242 |
| Figure I.7 – Example of <i>enhanced protection</i> evaluation for circuits connected to the <i>mains supply</i> where internal SPDs are used .....            | 242 |
| Figure I.8 – Example of <i>enhanced protection</i> evaluation for circuits connected to the <i>mains supply</i> where internal SPDs are used .....            | 243 |
| Figure I.9 – <i>Basic protection</i> evaluation for circuits connected to the <i>non-mains supply</i> .....   | 243 |
| Figure I.10 – <i>Basic protection</i> evaluation for circuits connected to the origin of the <i>installation non-mains supply</i> .....                       | 243 |
| Figure I.11 – <i>Functional insulation</i> evaluation within circuits affected by external transients.....  | 244 |
| Figure I.12 – <i>Basic protection</i> evaluation for circuits connected to the <i>mains supply</i> and a non-mains circuit .....                              | 244 |
| Figure I.13 – <i>Insulation</i> evaluation for <i>accessible circuit</i> of <i>DVC As</i> .....   | 245 |
| Figure J.1 – Burn threshold spread when the skin is in contact with a hot smooth surface made of bare (uncoated) metal.....                                   | 246 |
| Figure J.2 – Rise in the burn threshold spread from Figure J.1 for metals which are coated by shellac varnish of a thickness of 50 µm, 100 µm and 150 µm..... | 247 |
| Figure J.3 – Rise in the burn threshold spread from Figure J.1 for metals coated with the specific materials .....  | 247 |
| Figure J.4 – Burn threshold spread when the skin is in contact with a hot smooth surface made of ceramics, glass and stone materials .....                    | 248 |
| Figure J.5 – Burn threshold spread when the skin is in contact with a hot smooth surface made of plastics .....   | 248 |
| Figure L.1 – Measuring test circuit .....   | 250 |
| Figure M.1 – Sphere 50 mm probe according to IEC 61032:1997, test probe A.....  | 251 |
| Figure M.2 – Jointed test finger according to IEC 61032:1997, test probe B.....   | 252 |
| Figure M.3 – Test rod 2,5 mm according to IEC 61032:1997, test probe C .....  | 253 |
| Figure M.4 – Sphere 12,5 mm test probe according to IEC 61032:1997, test probe 2.....   | 253 |
| Figure O.1 – Flowchart <i>clearance</i> .....   | 255 |
| Figure O.2 – Flowchart <i>creepage distance</i> .....   | 256 |
| Figure S.1 – Articulate probe with web stop .....   | 298 |
| Figure S.2 – Determination of current for circuits of 10 000 A and less .....   | 318 |
| Figure S.3 – Peak let-through current .....   | 322 |
| Figure S.4 – Application of Simpson's rule to fuse current oscillogram to obtain let-through $I^2t$ .....   | 323 |
| Figure S.5 – Clamped joint.....   | 334 |
| Figure T.1 – Routing conductors through a metal barrier.....  | 376 |
| Figure T.2 – Wire bending space .....   | 381 |
| Figure T.3 – Test circuit using Formula T.1 .....   | 400 |
| Figure T.4 – Test circuit using Formula T.2 .....   | 401 |
| Figure T.5 – Test circuit using Formula T.3.....  | 401 |
| Figure T.6 – Test circuit using Formula T.4 .....   | 402 |
| Figure T.7 – Typical test set sensitivity .....   | 403 |
| Figure T.8 – Determination of current and power factor for circuits of 10 000 A and less.....   | 412 |

|  |     |
|--|-----|
| Table 1 – Alphabetical list of terms .....   | 25  |
| Table 2 – Voltage limits for the <i>decisive voltage classes</i> .....   | 49  |
| Table 3 – Protection requirements for circuits under consideration .....   | 53  |
| Table 4 – <i>PE conductor</i> cross-section .....  | 60  |
| Table 5 – Definitions of pollution degrees .....   | 68  |
| Table 6 – <i>Impulse withstand voltage</i> and <i>temporary overvoltage</i> versus <i>system voltage</i> for <i>low-voltage</i> circuits ..... | 71  |
| Table 7 – <i>Impulse withstand voltage</i> and <i>temporary overvoltage</i> versus <i>system voltage</i> for high-voltage circuits .....       | 71  |
| Table 8 – <i>Clearance</i> for <i>functional insulation</i> , <i>basic insulation</i> or <i>supplementary insulation</i> .....                 | 76  |
| Table 9 – Insulating materials classification .....  | 79  |
| Table 10 – <i>Creepage distances</i> .....   | 80  |
| Table 11 – <i>Insulation</i> material requirements .....   | 83  |
| Table 12 – Distance to uninsulated <i>live parts</i> for consideration of HWI, HAI and CTI .....   | 83  |
| Table 13 – Generic materials for <i>insulation</i> material .....  | 84  |
| Table 14 – Requirements based on thin sheet material thickness .....   | 85  |
| Table 15 – Limits for power sources without an <i>overcurrent</i> protective device .....  | 93  |
| Table 16 – Limits for power sources with an <i>overcurrent</i> protective device .....   | 93  |
| Table 17 – Maximum measured temperatures for internal materials and <i>components</i> .....  | 96  |
| Table 18 – Maximum measured temperatures for <i>accessible parts</i> of <i>BDM/CDM/PDS</i> .....   | 98  |
| Table 19 – Minimum tubing wall thickness .....   | 100 |
| Table 20 – Environmental service conditions .....  | 104 |
| Table 21 – Wire bending space from terminals to <i>enclosure</i> .....   | 115 |
| Table 22 – Thickness of sheet metal for <i>enclosures</i> : carbon steel or stainless steel .....  | 120 |
| Table 23 – Thickness of sheet metal for <i>enclosures</i> : aluminium, copper or brass .....   | 121 |
| Table 24 – Environmental conditions for tests .....  | 126 |
| Table 25 – Test overview .....   | 127 |
| Table 26 – Pull values for handles and manual control securement .....   | 136 |
| Table 27 – Values for physical tests on strain relief of <i>enclosure</i> .....  | 137 |
| Table 28 – <i>Impulse withstand voltage</i> test .....   | 139 |
| Table 29 – <i>Impulse withstand voltage</i> test voltage for <i>low-voltage BDM/CDM/PDS</i> .....  | 140 |
| Table 30 – <i>Impulse withstand voltage</i> test voltage for <i>high-voltage BDM/CDM/PDS</i> .....   | 141 |
| Table 31 – AC or DC test voltage for circuits connected directly to <i>low-voltage mains supply</i> .....                                      | 142 |
| Table 32 – AC or DC test voltage for circuits connected directly to <i>high-voltage mains supply</i> .....                                     | 143 |
| Table 33 – AC or DC test voltage for circuits connected to <i>non-mains supply</i> without <i>temporary overvoltages</i> .....                 | 144 |
| Table 34 – Parameter for <i>BDM/CDM/PDS</i> AC or DC voltage test .....  | 147 |
| Table 35 – Partial discharge test .....  | 148 |
| Table 36 – <i>Prospective short-circuit current</i> for test vs <i>BDM/CDM</i> rated input current .....                                       | 158 |
| Table 37 – Maximum tripping time for <i>electronic motor overload protection</i> test .....  | 164 |
| Table 38 – Environmental tests .....   | 175 |

|   |     |
|---|-----|
| Table 39 – Preconditioning or recovery procedure for climatic tests ( <i>type test</i> ) .....  | 176 |
| Table 40 – Dry heat test (steady state) ( <i>type test</i> ).....   | 176 |
| Table 41 – Cold test ( <i>type test</i> ).....  | 177 |
| Table 42 – Damp heat test (steady state) ( <i>type test</i> ).....  | 177 |
| Table 43 – Damp heat test (cyclic) ( <i>type test</i> ).....  | 178 |
| Table 44 – Vibration test.....  | 179 |
| Table 45 – Salt mist test.....  | 179 |
| Table 46 – Dust test.....   | 180 |
| Table 47 – Sand test.....   | 180 |
| Table 48 – Marking location.....  | 182 |
| Table A.1 – Configurations for protection against electric shock.....   | 212 |
| Table C.1 – Symbols used.....   | 216 |
| Table D.1 – Width of grooves by pollution degree.....   | 219 |
| Table E.1 – Correction factor for <i>clearances</i> at altitudes between 2 000 m and 20 000 m.....  | 226 |
| Table E.2 – Test voltages for verifying <i>clearances</i> at different altitudes.....   | 227 |
| Table F.1 – Minimum values of <i>clearances</i> in air at atmospheric pressure for inhomogeneous field conditions.....                      | 230 |
| Table F.2 – Multiplication factors for <i>clearances</i> in air at atmospheric pressure for approximately homogeneous field conditions..... | 230 |
| Table F.3 – Minimum values of <i>creepage distances</i> for different frequency ranges.....   | 232 |
| Table G.1 – Standard cross-sections of round conductors.....  | 234 |
| Table K.1 – Table of electrochemical potentials.....  | 249 |
| Table O.1 – Minimum <i>clearance</i> and <i>creepage distances</i> for material.....  | 257 |
| Table P.1 – Limits of EMF for general public exposure.....  | 260 |
| Table P.2 – Limits of EMF for occupational exposure.....  | 261 |
| Table P.3 – Limits for magnetic flux density of static magnetic fields.....   | 261 |
| Table P.4 – EMF test overview.....  | 263 |
| Table 41.1 – Maximum disconnection times.....   | 264 |
| Table R.1 – Risk assessment.....  | 266 |
| Table S.1 – Size of bonding conductor.....  | 273 |
| Table S.2 – Duration of current flow for bonding-conductor test.....  | 273 |
| Table S.3 – Bonding conductor short-circuit test capacity.....  | 273 |
| Table S.4 – Maximum rating of <i>overcurrent</i> device.....  | 275 |
| Table S.5 – Dimensions of bushings.....   | 277 |
| Table S.6 – <i>BDM/CDM/PDS</i> intended for installation in a feeder circuit.....   | 277 |
| Table S.7 – <i>Generic materials for barriers</i> .....   | 279 |
| Table S.8 – Tubing wall thickness.....  | 283 |
| Table S.9 – Ampacity of flexible cord.....  | 286 |
| Table S.10 – Ampacities of insulated conductors.....  | 289 |
| Table S.11 – Wire bending space at the terminals of enclosed power conversion equipment.....  | 291 |
| Table S.12 – <i>Overcurrent</i> protective device.....  | 292 |
| Table S.13 – Branch-circuit <i>short-circuit protective device</i> .....  | 293 |



|   |     |
|---|-----|
| Table S.14 – Openings in <i>enclosures</i> .....  | 299 |
| Table S.15 – Addition to Table 3 of UL 50:2015: Thickness of sheet metal for <i>enclosures</i> – Carbon steel or stainless steel .....                                      | 301 |
| Table S.16 – Addition to Table 4 of UL 50:2015: Thickness of sheet metal for <i>enclosures</i> – Aluminum, copper or brass.....   | 301 |
| Table S.17 – Dimensions of knockout .....   | 304 |
| Table S.18 – Values of voltage for tests.....   | 307 |
| Table S.19 – AC or DC voltage test voltages .....   | 310 |
| Table S.20 – Width of copper bus bars .....   | 311 |
| Table S.21 – Production-line test conditions .....  | 312 |
| Table S.22 – Power factor of test circuits for devices rated 600 V or less.....   | 326 |
| Table S.23 – Minimum <i>clearances</i> and <i>creepage distances</i> at <i>field wiring terminals</i> up to 600 V.....  | 335 |
| Table S.24 – Minimum <i>clearances</i> and <i>creepage distances</i> for <i>field wiring terminals</i> over 600 V.....  | 336 |
| Table S.25 – <i>Clearances</i> and <i>creepage distances</i> at <i>field wiring terminals</i> for pollution degree 2 environments .....                                     | 337 |
| Table S.26 – IEC normative reference standards that do not apply .....  | 341 |
| Table S.27 – IEC normative references replaced by USA standards .....   | 342 |
| Table S.28 – Secondary circuits, differences in evaluation.....   | 344 |
| Table S.29 – Full-load motor-running currents in amperes corresponding to various AC horsepower ratings .....   | 352 |
| Table S.30 – Full-load motor-running currents in amperes corresponding to various DC horsepower ratings .....   | 353 |
| Table T.1 – Size and number of bonding conductors per termination .....   | 359 |
| Table T.2 – Size of bonding conductor .....   | 359 |
| Table T.3 – Minimum <i>clearance</i> and <i>creepage distances</i> on <i>field wiring terminals</i> .....   | 361 |
| Table T.4 – Dimensions of bushings .....  | 362 |
| Table T.5 – Test voltages for verifying <i>clearances</i> .....   | 365 |
| Table T.6 – Test voltages for verifying <i>clearances</i> using AC RMS.....   | 365 |
| Table T.7 – Generic material acceptable as a barrier .....  | 366 |
| Table T.8 – Allowable ampacities of insulated copper conductors inside industrial control equipment <i>enclosures</i> (based on a <i>ambient temperature</i> of 40 °C)..... | 370 |
| Table T.9 – Ampacity correction factors for multiple conductor groupings .....  | 370 |
| Table T.10 – Wiring space .....   | 371 |
| Table T.11 – Wire-bending space .....   | 372 |
| Table T.12 – Full-load motor-running currents in amperes corresponding to AC horsepower ratings .....   | 373 |
| Table T.13 – Full-load motor-running currents in amperes corresponding to DC horsepower ratings .....   | 374 |
| Table T.14 – Wire-bending space .....   | 376 |
| Table T.15 – Test values for <i>BDM/CDM/PDS</i> wiring terminals.....   | 378 |
| Table T.16 – Ampacity of conductors based on resistor duty cycle ratings .....  | 379 |
| Table T.17 – Thickness of sheet metal for <i>enclosures</i> – Carbon steel or stainless steel.....  | 383 |
| Table T.18 – Thickness of sheet metal for <i>enclosures</i> – Aluminum, copper, or brass .....  | 384 |
| Table T.19 – Maximum acceptable rating of primary <i>overcurrent</i> device.....  | 388 |

|  |     |
|--|-----|
| Table T.20 – Minimum acceptable rating of secondary <i>overcurrent</i> device .....          | 388 |
| Table T.21 – <i>Overcurrent</i> protective device – Copper conductors .....                  | 389 |
| Table T.22 – <i>High-Voltage BDM/CDM/PDS</i> dielectric strength test values, kV .....       | 391 |
| Table T.23 – Tightening torque for testing conduit hubs of polymeric <i>enclosures</i> ..... | 394 |
| Table T.24 – Bending moment .....  | 394 |
| Table T.25 – Test circuit sensitivity formulas.....  | 400 |
| Table T.26 – Ampacities of insulated conductors .....  | 405 |
| Table T.27 – Size of copper busbar connections for temperature test .....                    | 406 |
| Table T.28 – Short-circuit test values .....   | 407 |
| Table T.29 – Short-circuit power factor .....  | 411 |
| Table T.30 – Translation of markings .....   | 416 |
| Table T.31 – IEC normative references replaced by CSA standards.....                         | 423 |

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –****Part 5-1: Safety requirements – Electrical, thermal and energy**

## FOREWORD

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IEC 61800-5-1 has been prepared by subcommittee 22G: Adjustable speed electric power drive systems (PDS), of IEC technical committee 22: Power electronic systems and equipment. It is an International Standard.

This third edition cancels and replaces the second edition published in 2007 and Amendment 1:2016. This edition constitutes a technical revision.

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

- a) harmonization with IEC 62477-1:2022;
- b) harmonization with UL 61800-5-1 and CSA C22.2 No. 274, including an annex with a list of national deviation which was considered not possible to harmonize within a reasonable timeframe;
- c) more detailed information about the evaluation of components according to this document and relevant safety component standards;
- d) updated requirement for mechanical hazards including multiple IP ratings.

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

| Draft        | Report on voting |
|--------------|------------------|
| 22G/455/FDIS | 22G/457/RVD      |

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

In this document, terms in *italic* are defined in Clause 3.

The reader's attention is drawn to the fact that

- Annex S and Annex T list all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this document.
- Due to the rules of ISO/IEC Directives, Part 2, the term "must" instead of the term "shall" is used in Annex S and Annex T.

A list of all parts of the IEC 61800 series, published under the general title *Adjustable speed electrical power drive systems*, is available 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 [webstore.iec.ch](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.

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## INTRODUCTION

### 0.1 General

This document contains the revision of IEC 61800-5-1:2007 and IEC 61800-5-1:2007/AMD1:2016.

Several important issues have influenced the scope and the chosen approach of the maintenance of IEC 61800-5-1:2007 in the development of this document.

The most significant changes compared to IEC 61800-5-1:2007 are the following.

#### a) Structure and content is based on IEC 62477-1 considering modifications and new topics such as the following

- Clause 1: Scope updated to include radio emitting/transmitting *BDM/CDM/PDS*.
- 4.1, 5.1, 6.1: "Intended use" included.
- 4.2: Single fault/abnormal operation analysis (significantly reworked).
- 4.3: Short-circuit and overload protection included as new subclause.
- 4.4 and Annex A: Protection against electric shock updated according to IEC 61140:2016 and IEC 60364-4-41, including insulation coordination according to IEC 60664 (all parts) considering the following:
  - 4.4.2 – Decisive voltage classification (especially DVC As for dry, wet and salt-water wet); Table 2 and Table 3 reworked;
  - 4.4.3 – Basic protection (reworked);
  - 4.4.4 – Fault protection (reworked);
  - 4.4.5 – Enhanced protection (reworked);
  - 4.4.7 – Insulation (reworked):
    - 4.4.7.1.2 – Working voltage (new);
    - 4.4.7.1.8 – Components bridging insulation (new);
    - 4.4.7.7 – *clearance* and *creepage distances* for functional insulation on PWB and component assemblies (reworked);
    - 4.4.7.8 – Solid insulation (new/reworked);
    - 4.4.7.9 – Connection of parts of solid insulation (cemented joints) (new);
  - 4.4.8/Annex H – Compatibility with RCD (reworked);
  - 4.4.10 – Access conditions for *high-voltage PDS* (new).
- 4.5: Protection against energy hazards (new).
- 4.6: Protection against fire and thermal hazards (new).
- 4.7: Protection against mechanical hazards (new).
- 4.8: *BDM/CDM/PDS* with multiple sources of supply (new).
- 4.9: Protection against environmental stresses (new) (in alignment with IEC 61800-2).
- 4.11: Wiring and connections updated (significantly reworked).
- 4.12: Enclosure updated (significantly reworked).
- 4.13 Bibliography: Evaluation of components (new).
- 4.14 Annex P: Protection against electromagnetic fields (new).
- Clause 5: Updated with some additional/modified test requirement:
  - 5.2.2.2 – Non-accessibility test (significantly reworked);
  - 5.2.2.3 – Ingress protection test (IP rating) (significantly reworked);

- 5.2.2.4 – Enclosure integrity tests (new);
  - 5.2.2.5 – Wall or ceiling mounted *BDM/CDM/PDS* test (new);
  - 5.2.2.6 – Handles and manual control securement test (new);
  - 5.2.2.7 – Strain relief test (new);
  - 5.2.3.7 – Touch current measurement test (reworked);
  - 5.2.3.9 – Limited power source (new);
  - 5.2.3.11 – Protective equipotential bonding test (new);
  - 5.2.3.12 – Input test (new);
  - 5.2.3.13 – Thin sheet material test (new);
  - 5.2.3.14 – Test procedure for determination of working voltage (new);
  - 5.2.3.16 – Preconditioning of material (reworked);
  - 5.2.4.4 – Protective equipotential bonding short-circuit test (new);
  - 5.2.4.9 – Output overload test (new);
  - 5.2.4.13.5 – Covering of openings for cooling air test (type test) (new);
  - 5.2.5.6 – Cemented joints test (new);
  - 5.2.7 – Hydrostatic pressure test (new);
  - 5.2.8 – Electromagnetic fields (EMF) test (new).
- Clause 6: – Update with more specific marking.
    - Structure aligned with IEC 62477-1 as close as possible;
    - Table 48 simplified.
  - Annex A – Additional information for protection against electric shock (reworked).
  - Annex C – Symbols referred (reworked).
  - Annex E – Altitude correction for *clearances* (reworked).
  - Annex F – *Clearance* and *creepage distance* determination for frequencies greater than 30 kHz (reworked).
  - Annex H – Guidelines for RCD compatibility (reworked).
  - Annex M – Test probes for determining access (new).
  - Annex O – Guidance for determination of *clearance* and *creepage distance* (new).
  - Annex P – Protection of persons against electromagnetic fields for frequencies from 0 Hz up to 300 GHz (new).
  - Annex Q – Automatic disconnection of supply (new).
  - Annex R – Guide 116 risk evaluation included (new).
  - Bibliography – Relevant component safety standards (new).

#### **b) Harmonization with UL 61800-5-1**

Complete document is modified taken into consideration UL 61800-5-1 US National deviations. US National deviations from UL 61800-5-1 not possible to harmonize have been placed in Annex S.

#### **c) Harmonization with CSA C22.2 No. 274**

- Due to a short time frame, only some few topics have been harmonized.
- Canadian National deviations from CSA C22.2 No. 274 not possible to harmonize have been placed in Annex T.

#### **d) Harmonization with UL 347A**

- Some few relevant topics have been harmonized considering safety aspects related to *high-voltage BDM/CDM/PDS*.

Further harmonization is expected to be adopted in IEC 61800-5-1 considering the content of UL 61800-5-1, CSA C22.2 No 274 and UL 347A in future editions of IEC 61800-5-1.

## 0.2 Feedback from industry and national committees

The use of IEC 61800-5-1:2007 by manufacturers and test institutes since its release has identified several topics which are considered useful to implement, or topics which need further information for a better understanding of the intent of the specific requirement. These topics are also implemented in this document.

## 0.3 Requirement covered by other relevant parts of the IEC 61800 series

- general requirements for DC *power drive systems* are covered in IEC 61800-1;
- general requirements for AC *power drive systems* are covered in IEC 61800-2;
- EMC aspects are covered in IEC 61800-3;
- functional safety aspects are covered in IEC 61800-5-2;
- functional safety aspects for encoders are covered in IEC 61800-5-3;
- type of load duty aspects are covered in IEC TR 61800-6;
- communication profiles aspects are covered in IEC 61800-7 (all parts);
- *power interface* voltage aspects are covered in IEC TS 61800-8;
- ecodesign aspects are covered in IEC 61800-9 (all parts);

The following document is not part of the IEC 61800 series, but is used often as part of the BDM:

- active infeed converters in IEC TS 62578.

# ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

## Part 5-1: Safety requirements – Electrical, thermal and energy

### 1 Scope

This part of IEC 61800 specifies requirements for adjustable speed electrical *power drive systems (PDS)* or their elements, with respect to electrical, thermal, fire, mechanical, energy and other relevant hazards. It does not cover the driven equipment except for interface requirements. It applies to adjustable speed electrical *PDS* which include the power conversion, *basic drive module (BDM)/complete drive module (CDM)* control, and a motor or motors.

Excluded are traction and electric vehicle *BDM/CDM*.

It applies to low-voltage adjustable speed electrical *PDS* intended to feed a motor or motors from a *BDM/CDM* connected to phase-to-phase voltages of up to and including 1,0 kV AC (50 Hz or 60 Hz) and up to and including 1,5 kV DC.

It also applies to high-voltage adjustable speed electrical *PDS* intended to feed a motor or motors from a *BDM/CDM* connected to phase-to-phase voltages of up to and including 35 kV AC (50 Hz or 60 Hz) and up to and including 52 kV DC.

NOTE 1 At the time of publication of this document, the technical upper voltage limit for DC motors is 2,25 kV DC.

NOTE 2 Above voltage and frequency limits reflect the scope of IEC 61800-1 and IEC 61800-2.

NOTE 3 For adjustable speed electrical *PDS* not covered by the scope of this document, applicable requirements of other standards, for example IEC 62477-1 and IEC 62477-2, can be used.

This document also applies to *PDS* which intentionally emit or receive radio waves for the purpose of radio communication.

Motors for driven equipment (see Figure 1) are covered by IEC 60034 (all parts).

NOTE 4 In some cases, safety requirements of the *PDS* (for example, protection against access to hazardous parts) can necessitate the use of special components and/or additional measures.

### 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 60034-1:2022, *Rotating electrical machines – Part 1: Rating and performance*

IEC 60034-5:2020, *Rotating electrical machines – Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) – Classification*

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



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

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

IEC 60050-131, *International Electrotechnical Vocabulary (IEV) – Part 131: Circuit theory* (available at [www.electropedia.org](http://www.electropedia.org))

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

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

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

IEC 60050-426, *International Electrotechnical Vocabulary (IEV) – Part 426: Explosive atmospheres* (available at [www.electropedia.org](http://www.electropedia.org))

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

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

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

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

IEC 60050-826, *International Electrotechnical Vocabulary (IEV) – Part 826: Electrical installations* (available at [www.electropedia.org](http://www.electropedia.org))

IEC 60050-903, *International Electrotechnical Vocabulary (IEV) – Part 903: Risk assessment* (available at [www.electropedia.org](http://www.electropedia.org))

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

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

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

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-52:2017, *Environmental testing – Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)*

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

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

IEC 60204-11:2018, *Safety of machinery – Electrical equipment of machines – Part 11: Requirements for equipment for voltages above 1 000 V AC or 1 500 V DC and not exceeding 36 kV*

IEC 60320 (all parts), *Appliance couplers for household and similar general purposes*

IEC 60364 (all parts), *Low-voltage electrical installations*

IEC 60364-4-41:2005, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*  
IEC 60364-4-41:2005/AMD1:2017

IEC 60364-5-54:2011, *Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors*  
IEC 60364-5-54:2011/AMD1:2021

IEC 60417, *Graphical symbols for use on equipment* (available at <https://www.graphical-symbols.info/equipment>)

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*  
IEC 60529:1989/AMD1:1999  
IEC 60529:1989/AMD2:2013

IEC 60617, *Graphical symbols for diagrams* (available at <http://std.iec.ch/iec60617>)

IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3:2016, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60664-4:2005, *Insulation coordination for equipment within low-voltage systems – Part 4: Consideration of high-frequency voltage stress*

IEC 60695-2-10:2021, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60695-2-11:2021, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products (GWEPT)*

IEC 60695-2-13:2021, *Fire hazard testing – Part 2-13: Glowing/hot-wire based test methods – Glow-wire ignition temperature (GWIT) test method for materials*

IEC 60695-10-2:2014, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test method*

IEC 60695-11-10:2013, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

IEC 60695-11-20:2015, *Fire hazard testing – Part 11-20: Test flames – 500 W flame test method*

IEC 60721-3-3:1994, *Classification of environmental conditions – Part 3-3: Classification of groups of environmental parameters and their severities – Stationary use at weatherprotected locations*<sup>1</sup>

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

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

IEC 60721-3-4:2019, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Stationary use at non-weatherprotected locations*

IEC 60730-1:2013, *Automatic electrical controls – Part 1: General requirements*

IEC 60730-1:2013/AMD1:2015

IEC 60730-1:2013/AMD2:2020

IEC 60755:2017, *General safety requirements for residual current operated protective devices*

IEC 60799:2018, *Electrical accessories – Cord sets and interconnection cord sets*

IEC 60947-4-1:2018, *Low-voltage switchgear and controlgear – Part 4-1: Contactors and motor-starters – Electromechanical contactors and motor-starters*

IEC 60990:2016, *Methods of measurement of touch current and protective conductor current*

IEC 61032:1997, *Protection of persons and equipment by enclosures – Probes for verification*

IEC 61084 (all parts), *Cable trunking systems and cable ducting systems for electrical installations*

IEC 61180:2016, *High-voltage test techniques for low-voltage equipment – Definitions, test and procedure requirements, test equipment*

IEC 61189-3:2007, *Test methods for electrical materials, printed boards and other interconnection structures and assemblies – Part 3: Test methods for interconnection structures (printed boards)*

IEC 61230:2008, *Live working – Portable equipment for earthing or earthing and short-circuiting*

IEC 61386 (all parts), *Conduit systems for cable management*

IEC 61558-1:2017, *Safety of power transformers, reactors, power supply units and combinations thereof – Part 1: General requirements and tests*

IEC 62109-1:2010, *Safety of power converters for use in photovoltaic power systems – Part 1: General requirements*

IEC 62271-102:2018, *High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches*

IEC 62477-1:2022, *Safety requirements for power electronic converter systems and equipment – Part 1: General*

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<sup>1</sup> This publication has been withdrawn.

IEC 62477-2:2018, *Safety requirements for power electronic converter systems and equipment – Part 2: Power electronic converters from 1 000 V AC or 1 500 V DC up to 36 kV AC or 54 kV DC*

ISO 3864-1:2011, *Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs and safety markings*

ISO 3746:2010, *Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Survey method using an enveloping measurement surface over a reflecting plane*

ISO 7000, *Graphical symbols for use on equipment* (available at <http://www.graphical-symbols.info/equipment>)

ISO 7010, *Graphical symbols – Safety colours and safety signs – Registered safety signs* (available at <https://www.iso.org/obp>)

ISO 9614-1:1993, *Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 1: Measurement at discrete points*

**koniec náhľadu – text ďalej pokračuje v platenej verzii STN**