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Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1:2016 , modified + IEC 60204-1:2016/AMD1:2021)

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NATIONAL FOREWORD

See Eesti standard EVS-EN 60204-1:2018 +A1:2025 sisaldab Euroopa standardi EN 60204-1:2018 ja selle muudatuse A1:2025 ingliskeelset teksti.	This Estonian standard EVS-EN 60204-1:2018+A1:2025 consists of the English text of the European standard EN 60204-1:2018 and its amendment A1:2025.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas. Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 14.09.2018, muudatus A1 04.04.2025.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation. Date of Availability of the European standard is 14.09.2018, for A1 04.04.2025.
Muudatusega A1 lisatud või muudetud teksti algus ja lõpp on tekstis tähistatud sümbolitega [A1] ⟨A1⟩. Selles standardis on rahvusvahelise standardi ühismuudatused tähistatud püstkriipsuga teksti vasakul veerisel. Standard on kättesaadav Eesti Standardimis-ja Akrediteerimiskeskusest.	The start and finish of text introduced or altered by amendment A1 is indicated in the text by tags [A1] ⟨A1⟩. In this document, the common modifications to the International Standard are indicated by a vertical line in the left margin of the text. The standard is available from the Estonian Centre for Standardisation and Accreditation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 13.110; 29.020

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60204-1 + A1

September 2018, April 2025

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Supersedes EN 60204-1:2006

English Version

Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1:2016 , modified + IEC 60204-1:2016/AMD1:2021)

Sécurité des machines - Équipement électrique des machines - Partie 1: Exigences générales (IEC 60204-1:2016 , modifiée + IEC 60204-1:2016/AMD1:2021)

Sicherheit von Maschinen - Elektrische Ausrüstung von Maschinen - Teil 1: Allgemeine Anforderungen (IEC 60204-1:2016 , modifiziert + IEC 60204-1:2016/AMD1:2021)

This European Standard was approved by CENELEC on 2018-03-19. Amendment A1 was approved by CENELEC on 2024-10-16. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard and its amendment the status of a national standard without any alteration.

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+ EN 60204-1:2018/A1:2025 E

European foreword

This document (EN 60204-1:2018) consists of the text of IEC 60204-1:2016, prepared by IEC/TC 44 "Safety of machinery - Electrotechnical aspects", together with the common modifications prepared by CLC/TC 44X "Safety of machinery: electrotechnical aspects".

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2019-03-14
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2021-09-14

This document supersedes EN 60204-1:2006.

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Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 60204-1:2016 are prefixed “Z”.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directives, see informative Annexes ZZA and ZZB, which are integral parts of this document.

Endorsement notice

The text of the International Standard IEC 60204-1:2016 was approved by CENELEC as a European Standard with agreed common modifications.

A1 Amendment A1 European foreword

The text of document 44/884/CDV, future edition 6 of IEC 60204-1/AMD1, prepared by TC 44 "Safety of machinery - Electrotechnical aspects" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60204-1:2018/A1:2025.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2026-04-30
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2028-04-30

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The text of the International Standard IEC 60204-1:2016/AMD1:2021 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 60034-1	NOTE	Approved as EN 60034-1
IEC 60204-11:2018	NOTE	Approved as EN IEC 60204-11:2019 (not modified)
IEC 60909-0:2016	NOTE	Approved as EN 60909-0:2016 (not modified)
IEC 60947-5-2:2019	NOTE	Approved as EN IEC 60947-5-2:2020 (not modified) + A11:2022
IEC 61000-6-1:2016	NOTE	Approved as EN IEC 61000-6-1:2019 (not modified)
IEC 61000-6-2:2016	NOTE	Approved as EN IEC 61000-6-2:2019 (not modified)
IEC 61000-6-4:2018	NOTE	Approved as EN IEC 61000-6-4:2019 (not modified)
IEC 61180	NOTE	Approved as EN 61180
IEC 61496-1:2020	NOTE	Approved as EN IEC 61496-1:2020 (not modified)
IEC 62745	NOTE	Approved as EN 62745
IEC 81346-2:2019	NOTE	Approved as EN IEC 81346-2:2019 (not modified)
ISO 13851:2019	NOTE	Approved as EN ISO 13851:2019 (not modified)
ISO 14118:2017	NOTE	Approved as EN ISO 14118:2018 (not modified)
ISO 14119	NOTE	Approved as EN ISO 14119
ISO 14122-1:2016	NOTE	Approved as EN ISO 14122-1:2016 (not modified)

ISO 14122-2:2016	NOTE	Approved as EN ISO 14122-2:2016 (not modified)
ISO 14122-3:2016	NOTE	Approved as EN ISO 14122-3:2016 (not modified)

〈A1

IEC 60204-1

Edition 6.1 2021-09
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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Safety of machinery – Part 1: General requirements

Sécurité des machines – Partie 1: Exigences générales

IEC 60204-1:2016-10+AMD1:2021-09 CSV(en-fr)

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IEC 60204-1

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Safety of machinery – Part 1: General requirements

Sécurité des machines – Partie 1: Exigences générales

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 13.110; 29.020

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SAFETY OF MACHINERY – ELECTRICAL EQUIPMENT OF MACHINES –

Part 1: General requirements

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60204-1 has been prepared by IEC technical committee 44: Safety of machinery – Electrotechnical aspects.

This sixth edition cancels and replaces the fifth edition published in 2005. It constitutes a technical revision.

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

a) added requirements to address applications involving power drive systems (PDS);
b) revised electromagnetic compatibility (EMC) requirements;
c) clarified overcurrent protection requirements;
d) requirements for determination of the short circuit current rating of the electrical equipment;
e) revised protective bonding requirements and terminology;

f) reorganization and revision to Clause 9, including requirements pertaining to safe torque off of PDS, emergency stop, and control circuit protection;

g) revised symbols for actuators of control devices;

h) revised technical documentation requirements;

i) general updating to current special national conditions, normative standards, and bibliographical references.

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

FDIS	Report on voting
44/765/FDIS	44/771/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 60204 series, published under the general title *Safety of machinery – Electrical equipment of machines*, can be found on the IEC website.

The following differing practices of a less permanent nature exist in the countries indicated below.

4.3.1: The voltage characteristics of electricity supplied by public distribution systems in Europe are given in EN 50160:2010.

5.1: Exception is not allowed (USA).

5.1: TN-C systems are not permitted in low-voltage installations in buildings (Norway).

5.2: Terminals for the connection of the protective earthing conductors may be identified by the colour green, the letters “G” or “GR” or “GRD” or “GND”, or the word “ground” or “grounding”, or with the graphical symbol IEC 60417-5019:2006-08 or any combination (USA).

6.3.3 b), 13.4.5 b), 18.2.1: TT power systems are not allowed (USA).

6.3.3, 18.2, Annex A: TN systems are not used. TT systems are the national standard (Japan).

〚A1〛 6.3.3 b): The use of residual current protective devices with a rated residual operating current which is coordinated with the earth electrode resistance is mandatory in TT systems as a means for fault protection by automatic disconnection of supply (Italy). 〈A1〉

〚A1〛 7.2.3: Disconnection of the neutral conductor is mandatory in a TN-S system (France). 〈A1〉

〚A1〛 7.2.3: Disconnection of the neutral conductor is mandatory in TN-systems (Norway). 〈A1〉

7.2.3: Third paragraph: distribution of a neutral conductor with an IT system is not allowed (USA and Norway).

7.10: For evaluation of short circuit ratings the requirements of UL 508A Supplement SB, may be used (USA).

8.2.2: See IEC 60364-5-54:2011, Annex E List of notes concerning certain countries.

9.1.2: Maximum nominal AC control circuit voltage is 120 V (USA).

12.2: Only stranded conductors are allowed on machines, except for 0,2 mm^2 solid conductors within enclosures (USA).

12.2: The smallest power circuit conductor allowed on machines is 0,82 mm^2 (AWG 18) in multiconductor cables or in enclosures (USA).

Table 5: Cross-sectional area is specified in NFPA 79 using American Wire Gauge (AWG) (USA). See Annex G.

13.2.2: For the protective conductor, the colour identification GREEN (with or without YELLOW stripes) is used as equivalent to the bicolour combination GREEN-AND-YELLOW (USA and Canada).

13.2.3: The colour identification WHITE or GREY is used for earthed neutral conductors instead of the colour identification BLUE (USA and Canada).

15.2.2: First paragraph: Maximum value between conductors 150 V (USA).

15.2.2: Second paragraph, 5th bullet: The full load current rating of lighting circuits does not exceed 15 A (USA).

16.4: Nameplate marking requirements (USA).

A.2.2.2: The permissible maximum value of R_A is regulated (e.g. when $U_0 \geq$ 300V, R_A shall be less than 10 Ω, when $U_0 <$ 300 V, R_A shall be less than 100 Ω, U_0 is the nominal AC line to earth voltage in volts (V) (Japan).

A.2.2.2: The maximum permissible value of R_A is 83 Ω (Netherlands).

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A1 Amendment A1 FOREWORD

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Amendment 1 to IEC 60204-1:2016 has been prepared by IEC technical committee 44: Safety of machinery – Electrotechnical aspects.

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

Draft	Report on voting
44/884/CDV	44/913/RVC

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 Amendment 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. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications/.

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INTRODUCTION

This part of IEC 60204 provides requirements and recommendations relating to the electrical equipment of machines so as to promote:

– safety of persons and property;

– consistency of control response;

– ease of operation and maintenance.

More guidance on the use of this part of IEC 60204 is given in Annex F.

Figure 1 has been provided as an aid to the understanding of the inter-relationship of the various elements of a machine and its associated equipment. Figure 1 is a block diagram of a typical machine and associated equipment showing the various elements of the electrical equipment addressed in this part of IEC 60204. Numbers in parentheses ( ) refer to Clauses and Subclauses in this part of IEC 60204. It is understood in Figure 1 that all of the elements taken together including the safeguards, tooling/fixturing, software, and the documentation, constitute the machine, and that one or more machines working together with usually at least one level of supervisory control constitute a manufacturing cell or system.

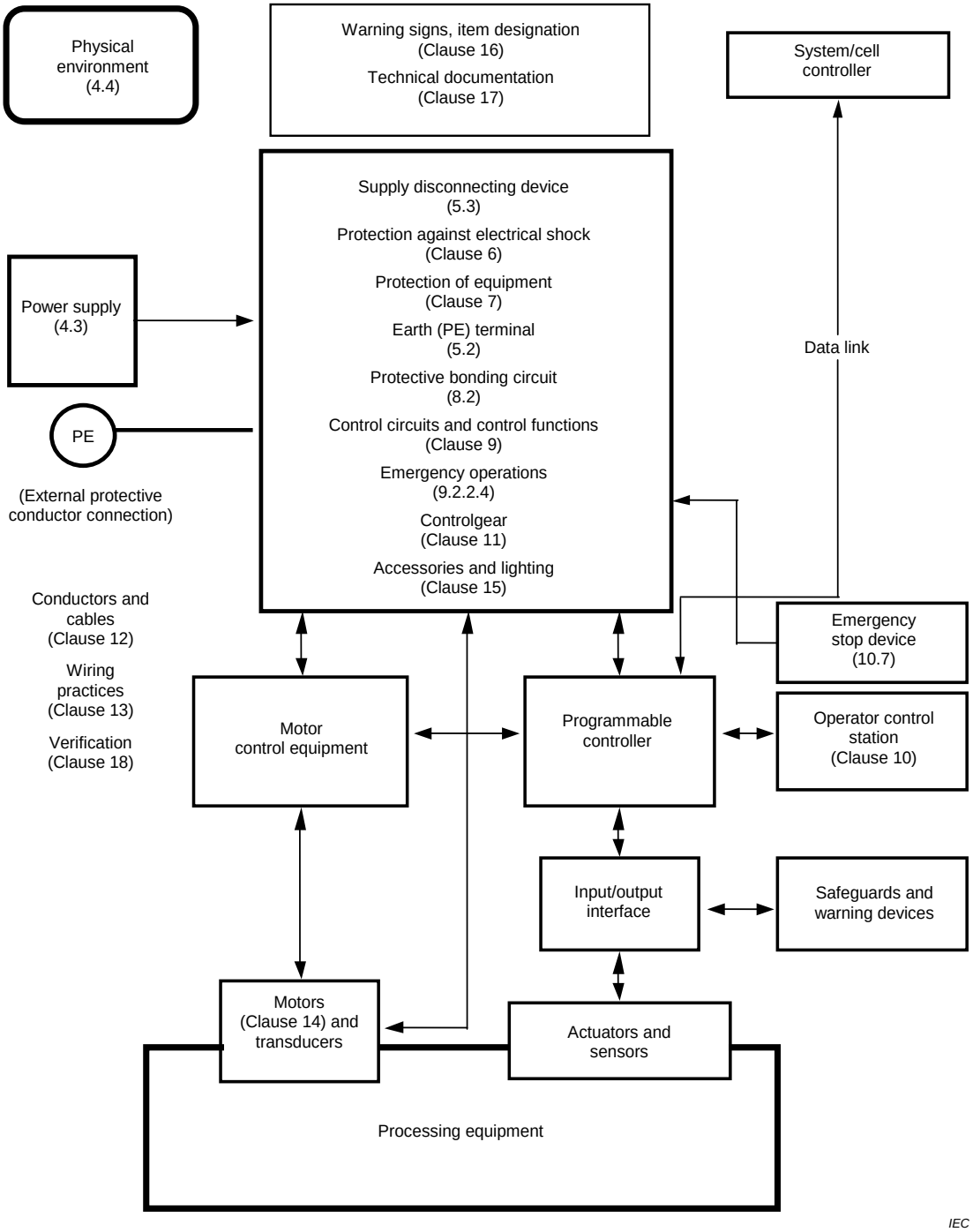

Figure 1 – Block diagram of a typical machine

SAFETY OF MACHINERY – ELECTRICAL EQUIPMENT OF MACHINES –

Part 1: General requirements

1 Scope

This part of IEC 60204 applies to electrical, electronic and programmable electronic equipment and systems to machines not portable by hand while working, including a group of machines working together in a co-ordinated manner.

NOTE 1 This part of IEC 60204 is an application standard and is not intended to limit or inhibit technological advancement.

NOTE 2 In this part of IEC 60204, the term “electrical” includes electrical, electronic and programmable electronic matters (i.e. “electrical equipment” means electrical, electronic and programmable electronic equipment).

NOTE 3 In the context of this part of IEC 60204, the term “person” refers to any individual and includes those persons who are assigned and instructed by the user or his agent(s) in the use and care of the machine in question.

The equipment covered by this part of IEC 60204 commences at the point of connection of the supply to the electrical equipment of the machine (see 5.1).

NOTE 4 The requirements for the electrical supply installation are given in the IEC 60364 series.

This part of IEC 60204 is applicable to the electrical equipment or parts of the electrical equipment that operate with nominal supply voltages not exceeding 1 000 V for alternating current (AC) and not exceeding 1 500 V for direct current (DC), and with nominal supply frequencies not exceeding 200 Hz.

NOTE 5 Information on electrical equipment or parts of the electrical equipment that operate with higher nominal supply voltages can be found in IEC 60204-11.

This part of IEC 60204 does not cover all the requirements (for example guarding, interlocking, or control) that are needed or required by other standards or regulations in order to protect persons from hazards other than electrical hazards. Each type of machine has unique requirements to be accommodated to provide adequate safety.

This part of IEC 60204 specifically includes, but is not limited to, the electrical equipment of machines as defined in 3.1.40.

NOTE 6 Annex C lists examples of machines whose electrical equipment can be covered by this part of IEC 60204.

This part of IEC 60204 does not specify additional and special requirements that can apply to the electrical equipment of machines that, for example:

– are intended for use in open air (i.e. outside buildings or other protective structures);
– use, process, or produce potentially explosive material (for example paint or sawdust);
– are intended for use in potentially explosive and/or flammable atmospheres;
– have special risks when producing or using certain materials;
– are intended for use in mines;
– are sewing machines, units, and systems (which are covered by IEC 60204-31);
– are hoisting machines (which are covered by IEC 60204-32);
– are semiconductor fabrication equipment (which are covered by IEC 60204-33).

Power circuits where electrical energy is directly used as a working tool are excluded from this part of IEC 60204.

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.

NOTE In CENELEC, Annex ZA applies instead of Clause 2.

〖A1〗 *deleted text* 〈A1〗

IEC 60072 (all parts), *Dimensions and output series for rotating electrical machines*

IEC 60309-1, *Plugs, socket-outlets, and couplers for industrial purposes – Part 1: General requirements*

IEC 60364-1, *Low-voltage electrical installations – Part 1: Fundamental principles, assessment of general characteristics, definitions*

〖A1〗 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 〈A1〗

IEC 60364-4-43:2008, *Low-voltage electrical installations – Part 4-43: Protection for safety – Protection against overcurrent*

IEC 60364-5-52:2009, *Low-voltage electrical installations – Part 5-52: Selection and erection of electrical equipment – Wiring systems*

〖A1〗 IEC 60364-5-53:2019, *Low-voltage electrical installations – Part 5-53: Selection and erection of electrical equipment – Devices for protection for safety, isolation, switching, control and monitoring* 〈A1〗

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

〖A1〗 IEC 60364-6:2016, *Low-voltage electrical installations – Part 6: Verification* 〈A1〗

IEC 60417, *Graphical symbols for use on equipment*. Available from: http://www.graphical-symbols.info/equipment

〖A1〗 IEC 60445:2017, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors* 〈A1〗

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

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

IEC 60947-2, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*

IEC 60947-3, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors, and fuse-combination units*

〚A1〛 IEC 60947-5-1:2016, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices* 〚A1〛

IEC 60947-5-5, *Low-voltage switchgear and controlgear – Part 5-5: Control circuit devices and switching elements – Electrical emergency stop device with mechanical latching function*

IEC 60947-6-2, *Low-voltage switchgear and controlgear – Part 6-2: Multiple function equipment – Control and protective switching devices(or equipment) (CPS)*

IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61310 (all parts), *Safety of machinery – Indication, marking and actuation*

IEC 61439-1, *Low-voltage switchgear and controlgear assemblies – Part 1: General rules*

〚A1〛 IEC 61558-1:2017, *Safety of transformers, reactors, power supply units and combinations thereof – Part 1: General requirements and tests* 〚A1〛

IEC 61558-2-6, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers*

IEC 61984, *Connectors – Safety requirements and tests*

IEC 62023, *Structuring of technical information and documentation*

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

〚A1〛 ISO 7010:2019, *Graphical symbols – Safety colours and safety signs – Registered safety signs*
ISO 7010:2019/AMD1:2020 〚A1〛

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

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

〚A1〛 ISO 13850:2015, *Safety of machinery – Emergency stop function – Principles for design* 〚A1〛

3 Terms,definitions and abbreviated terms

3.1 Terms and definitions

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

3.1.1
actuator
part of a device to which an external action is to be applied

Note 1 to entry: The actuator may take the form of a handle, knob, push-button, roller, plunger, etc.