BSI Standards Publication

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 60204-11:2018)

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Full document details: BS EN IEC 60204-11:2019

National foreword

This British Standard is the UK implementation of EN IEC 60204-11:2019. It is identical to IEC 60204-11:2018. It supersedes BS EN 60204-11:2000, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee MCE/3, Safeguarding of machinery.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Amendments/corrigenda issued since publication

Date	Text affected

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 60204-11

January 2019

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English Version

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 60204-11:2018)

Sécurité des machines - Équipement électrique des machines - Partie 11: Exigences pour les équipements fonctionnant à des tensions supérieures à 1 000 V en courant alternatif ou 1 500 V en courant continu et ne dépassant pas 36 kV
(IEC 60204-11:2018)

Sicherheit von Maschinen - Elektrische Ausrüstung von Maschinen - Teil 11: Anforderungen an Hochspannungsausrüstung für Spannungen über 1000 V Wechselspannung oder 1500 V Gleichspannung aber nicht über 36 kV
(IEC 60204-11:2018)

This European Standard was approved by CENELEC on 2019-01-09. 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

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European foreword

The text of document 44/819/FDIS, future edition 2 of IEC 60204-11, prepared by IEC/TC 44 "Safety of machinery - Electrotechnical aspects" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60204-11:2019.

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) 2019-10-09
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-01-09

This document supersedes EN 60204-11:2000.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

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 Directive(s) see informative Annex ZZ, which is an integral part of this document.

Endorsement notice

The text of the International Standard IEC 60204-11:2018 was approved by CENELEC as a European Standard without any modification.

IEC 60038	NOTE	Harmonized as EN 60038
IEC 60034 (series)	NOTE	Harmonized as EN 60034 (series)
IEC 60034-1:2017	NOTE	Harmonized as EN 60034-1 (not modified)[1]
IEC 60034-15	NOTE	Harmonized as EN 60034-15
IEC 60071-1	NOTE	Harmonized as EN 60071-1
IEC 60273	NOTE	Harmonized as HD 578 S1
IEC 60364-4-41	NOTE	Harmonized as HD 60364-4-41
IEC 60364-4-42	NOTE	Harmonized as HD 60364-4-42
IEC 60660	NOTE	Harmonized as EN 60660
IEC 61230	NOTE	Harmonized as EN 61230
IEC 61800-5-2	NOTE	Harmonized as EN 61800-5-2
IEC 62271-1	NOTE	Harmonized as EN 62271-1
IEC 62271-100	NOTE	Harmonized as EN 62271-100
IEC 62271-200	NOTE	Harmonized as EN 62271-200
IEC 62305 (series)	NOTE	H armonized as EN 62305 (series)

[1] To be published. Stage at time of publication: FprEN 60034-1:2017.

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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.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60071-2	1996	Insulation co-ordination - Part 2: Application guide	EN 60071-2	1997
IEC 60076-5	-	Power transformers - Part 5: Ability to withstand short circuit	EN 60076-5	2006
IEC 60204-1 (mod)	2016	Safety of machinery - Electrical equipment of machines - Part 1: General requirements	EN 60204-1	2018
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	1973[2]	Graphical symbols for use on equipment. Index, survey and compilation of the single sheets.	-	-
IEC 60445	-	Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors	EN 60445	2010
IEC 60529	2001[2]	Degrees of protection provided by enclosures (IP Code)	-	-
IEC 60865-1	-	Short-circuit currents - Calculation of effects - Part 1: Definitions and calculation methods	EN 60865-1	2012
IEC 61800	series	Adjustable speed electrical power drive systems - Part 1: General requirments - Rating specifications for low voltage adjustables speed d.c. power drive systems	EN 61800	series

[2] Dated as no equivalent European Standard exists.

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Publication	Year	Title	EN/HD	Year
IEC 61936-1 (mod)	2010	Power installations exceeding 1 kV a.c. - Part 1: Common rules	EN 61936-1	2010
-	-		+ AC	2013
+ A1	2014		+ A1	2014
IEC 62061	-	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems	EN 62061	2005
			+A1	2013
			+A2	2015
IEC 62271-102	-	High-voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches	EN IEC 62271-102	2018
IEC 62271-103	-	High-voltage switchgear and controlgear - Part 103: Switches for rated voltages above 1 kV up to and including 52 kV	EN 62271-103	2011
IEC 62271-105	-	High-voltage switchgear and controlgear - Part 105: Alternating current switch-fuse combinations for rated voltages above 1 kV up to and including 52 kV	EN 62271-105	2012
IEC 62271-107	-	High-voltage switchgear and controlgear - Part 107: Alternating current fused circuit-switchers for rated voltages above 1 kV up to and including 52 kV	EN 62271-107	2012
IEC 62271-200	2011	High-voltage switchgear and controlgear - Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV	EN 62271-200	2012
IEC 62271-201	-	High-voltage switchgear and controlgear - Part 201: AC solid-insulation enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV	EN 62271-201	2014
IEC 62745	-	Safety of machinery - Requirements for cableless control systems of machinery	EN 62745	2017
ISO 3864-1	2011	Graphical symbols - Safety colours and safety signs - Part 1: Design principles for safety signs and safety markings	-	-
ISO 3864-2	2016	Graphical symbols_- Safety colours and safety signs_- Part_2: Design principles for product safety labels	-	-
ISO 7010	2011	Graphical symbols - Safety colours and safety signs - Registered safety signs	EN ISO 7010	2012
ISO 12100		Safety of machinery_- General principles for design_- Risk assessment and risk reduction	EN ISO 12100	2010
ISO 13849-1	-	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design	EN ISO 13849-1	2016

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Annex ZZ
(informative)

Relationship between this European standard and the essential health and safety requirements of Directive 2006/42/EC aimed to be covered

This European Standard has been prepared under a Commission's standardization request in the field of machinery "M/396" to provide one voluntary means of conforming to Essential health and safety requirements relating to the design and construction of machinery of Directive 2006/42/EC.

Once this standard is cited in the Official Journal of the European Union under that Directive 2006/42/EC, compliance with the normative clauses of this standard given in Table ZZ.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding health and safety requirements of that Directive 2006/42/EC, and associated EFTA regulations.

Table ZZ.1 – Correspondence between this European standard and *Annex I of Directive 2006/42/EC* [OJ No L 157, 9 June 2006]

Essential health and safety requirements of Directive 2006/42/EC	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
1.1.3	7.10	By reference to EN 61936-1
1.1.4	4.7; 18	By reference to sub-clauses 7.2.6 and 15.2 of EN 60204-1.
1.1.5	4.6	
1.1.6	4.7; 18	Ergonomics refers to installation of HV equipment. HV equipment is not for frequent handling by operators; ergonomics must be considered at installation.
1.2.1	5.3 to 5.6, 6, 7, 9	Amended by references to IEC 61936-1 and IEC 60204-1.
1.2.2	5.3, 5.4, 5.5, 5.6, 10, 11	
1.2.4	9	In conjunction with clause 9 of Part 1, IEC 60204
1.2.4.1	5.3 to 5.6, 9	
1.2.4.2	5.3 to 5.6, 9	
1.2.4.3	9	
1.2.4.4	9	
1.2.5	9	
1.2.6	7.5, 9	
1.3.1	18	
1.3.2	18	This requirement is covered by maintenance instructions on ageing materials.
1.3.3	7.9	
1.3.7	4.2, 6.2, 12.3, 13.8.1	HV equipment provides protection against hazardous mechanical (moving) and electrical parts.
1.4.1	4.2, 6.2, 12.3, 13.8.1	With HV equipment the protection against hazardous mechanical (moving) electrical parts is

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Essential health and safety requirements of Directive 2006/42/EC	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
1.4.2 1.4.2.1 1.4.2.2		combined.
1.5.1	4.2; 4.3; 5; 6; 7; 8; 9; 10; 11; 12; 13; 14; 15;16	Protection against electrical hazards is essential subject of the entire document.
1.5.2	4.1, 5.5	
1.5.5	12.4	
1.5.6	7.11	
1.5.7	7.10; 7.11	
1.5.11	4.4.2	
1.5.16	7.8	
1.6.1	12	
1.6.2	12	
1.6.3	5	
1.7.1	17	
1.7.1.1	18	
1.7.1.2	9; 10	
1.7.2	17; 18	
1.7.3	17.1	
1.7.4	18	

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

Documents
Document Sharing Hub

Full document details: BS EN IEC 60204-11:2019

CONTENTS

FOREWORD....6
INTRODUCTION....8
1 Scope....10
2 Normative references....11
3 Terms and definitions....12
4 General requirements....18
4.1 General....18
4.2 Selection of electrical equipment....19
4.3 Electrical power supply....20
4.3.1 General....20
4.3.2 Voltage characteristics....20
4.3.3 On-board power supply....20
4.4 Physical environment and operating conditions....20
4.4.1 General....20
4.4.2 Electromagnetic compatibility (EMC)....20
4.5 Transportation and storage....21
4.6 Provisions for handling....21
4.7 Installation....21
4.7.1 General....21
4.7.2 Assembly and mounting....21
5 Incoming supply conductor terminations and devices for disconnecting and switching off....21
5.1 Incoming high-voltage conductor terminations....21
5.2 Earthing terminal of high-voltage equipment....21
5.3 Supply disconnecting devices and means for earthing....22
5.3.1 General....22
5.3.2 Type....22
5.3.3 Requirements for disconnectors....23
5.3.4 Requirements for earthing and short-circuiting....23
5.3.5 Arrangement of disconnecting and earthing devices....24
5.4 Devices for switching off for prevention of unexpected start-up....24
5.5 Devices for disconnecting and means for earthing HV equipment....24
5.6 Protection against unauthorized, inadvertent and/or mistaken operation....25
6 Protection against electric shock....25
6.1 General....25
6.2 Protection against direct contact....26
6.3 Protection against indirect contact....26
6.3.1 General....26
6.3.2 Measures to prevent the occurrence of a hazardous touch voltage for an unlimited time of fault duration....26
6.3.3 Protection by automatic disconnection of supply within a limited time of fault duration....27
6.3.4 Protection for mobile machines....27
7 Protection of HV equipment....28
7.1 General....28
7.2 Overcurrent protection....28

AVA Documents
Document Sharing Hub
Full document details: BS EN IEC 60204-11:2019

7.2.1 General 28
7.2.2 Supply conductors 28
7.2.3 Power circuits 28
7.2.4 Transformers 28
7.2.5 Overcurrent protective devices 29
7.2.6 Rating and setting of overcurrent protective devices 29
7.3 Protection of motors against overheating 29
7.4 Protection against abnormal temperature 29
7.5 Protection against the effects of supply interruption or voltage reduction and subsequent restoration 29
7.6 Motor overspeed protection 29
7.7 Earth fault protection 30
7.8 Protection against overvoltage due to lightning and switching surges 30
7.9 Protection against hazards due to arc faults 30
7.10 Protection against overpressure and leakage 30
7.11 Protection against fire 30
8 Equipotential bonding 30
8.1 General 30
8.2 Protective bonding circuit 33
8.2.1 General 33
8.2.2 Protective conductors 34
8.2.3 Continuity of the protective bonding circuit 34
8.2.4 Mobile machines 35
8.2.5 Protective bonding circuit connecting points 35
8.2.6 Supplementary protective bonding conductors 36
9 Control systems, control circuits and control functions 36
10 Operator interface and machine-mounted control devices 36
11 Electronic equipment 36
12 Controlgear: location, mounting, and enclosures 36
12.1 General requirements 36
12.2 Location and mounting 37
12.2.1 Accessibility and maintenance 37
12.2.2 Physical separation 37
12.3 Degrees of protection 37
12.4 Enclosures, doors and openings 38
12.5 Access to HV equipment 39
13 Conductors and cables 39
13.1 General requirements 39
13.2 Conductors 39
13.3 Insulation and sheath materials 40
13.4 Current-carrying capacity in normal service 40
13.5 Conductor and cable voltage drop 40
13.6 Minimum cross-sectional area 40
13.7 Flexible cables 40
13.7.1 General 40
13.7.2 Mechanical rating 41
13.7.3 Current-carrying capacity of cables wound on drums 41
13.8 Conductor wires, conductor bars and slip-ring assemblies 41

AVA Documents
Document Sharing Hub

Full document details: BS EN IEC 60204-11:2019

13.8.1 Protection against direct contact 41
13.8.2 Protective bonding circuit 42
13.8.3 Protective conductor current collectors 42
13.8.4 Clearances in air 42
13.8.5 Creepage distances 42
13.8.6 Conductor system sectioning 43
13.8.7 Construction and installation of conductor wire, conductor bar systems and slip-ring assemblies 43
14 Wiring practices 44
14.1 Connections and routing 44
14.1.1 General requirements 44
14.1.2 Cable runs 44
14.2 Identification of conductors 45
14.3 Flexible cables 45
14.4 Plug-socket combinations 46
14.5 Dismantling for shipment 46
14.6 Cable trays 46
15 Electric motors and associated equipment 46
15.1 General 46
15.2 Motor connection boxes 46
16 Means to protect persons working on electrical installations 47
16.1 General 47
16.2 Equipment for isolating installations or apparatus 47
16.3 Devices to prevent reclosing of isolating devices 47
16.4 Devices for determining the de-energized state 47
16.5 Devices for earthing and short-circuiting 47
16.6 Equipment acting as protective barriers against adjacent live parts 47
16.7 Storage of personal protection equipment 47
17 Marking, warning signs and reference designations 47
17.1 General 47
17.2 Warning signs 47
18 Technical documentation 48
18.1 General 48
18.2 Instructions for use 48
18.2.1 General 48
18.2.2 Provisions for handling 48
18.2.3 Assembly and mounting 48
18.2.4 Connections 49
18.2.5 Final installation inspection 49
18.2.6 Warning sign 49
19 Testing and verification 49
19.1 General 49
19.2 Earthing system tests 49
19.3 Insulation resistance tests 50
19.4 Voltage tests 50
19.5 Functional tests 50
19.6 IP tests for HV equipment outside electrical operating areas 50
19.7 Retesting 50

AVA Documents
Document Sharing Hub

Full document details: BS EN IEC 60204-11:2019

Annex A (informative) Examples of machines covered by IEC 60204-11 51
Annex B (informative) Inquiry form for the HV equipment of machines 52
Annex C (informative) Relationship between cable rated voltages and highest voltage for HV equipment 56
Bibliography 57

Figure 1 – Block diagram of a machine containing HV equipment 9
Figure 2 – Example of equipotential bonding for electrical equipment of a machine 33
Figure 3 – Symbol for protective earth (protective ground) 35
Figure 4 – Warning sign “high voltage” 48
Figure 5 – DANGER hazard severity panel 48

Table 1 – Maximum allowable conductor temperatures under normal and short-circuit conditions 39
Table 2 – De-rating factors for cables wound on drums 41
Table 3 – Selection of the pollution level depending on the degree of protection and insulator material 43
Table 4 – Minimum creepage distance of conductor lines and slip ring assemblies 43
Table B.1 – Overvoltage protection for HV equipment of machinery 54
Table C.1 – Rated voltages of cable and highest voltage for HV equipment 56

Documents
Document Sharing Hub

Full document details: BS EN IEC 60204-11:2019

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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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

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 60204-11 has been prepared by IEC technical committee 44: Safety of machinery – Electrotechnical aspects.

This second edition cancels and replaces the first edition, published in 2000. This edition constitutes a technical revision.

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

– aspects of risk assessment, which are mirrored from ISO 12100;
– equipotential bonding and earthing;
– EMC and power quality;
– HV switchgear and controlgear;

Documents
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– creepage distances for conductors and slip-ring assemblies;
– a list of machinery using HV equipment, in Annex A.

This second edition of IEC 60204-11 has been updated and improved to reflect the experience gained with the first edition and the evolution of high-voltage equipment reflected in the relevant standards.

Regarding formal requirements, IEC 60204-11 has been aligned with

– IEC 60204-1:2016,
– IEC 61936-1:2010 and IEC 61936-1:2010/AMD1:2014,
– IEC 62271 (all parts).

This document is intended to be used in conjunction with IEC 60204-1.

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

FDIS	Report on voting
44/819/FDIS	44/828/RVD

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

This document 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 committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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INTRODUCTION

This part of IEC 60204 provides requirements and recommendations relating to the high-voltage electrical equipment (HV equipment) of machines together with its associated low-voltage electrical equipment (LV equipment) so as to promote

– safety of persons and property,

– consistency of control response,

– maintainability.

Figure 1 is a block diagram of a machine and associated equipment showing the various elements of the electrical equipment addressed in this document. Numbers in parentheses (…) refer to clauses and subclauses in this document. It is understood that all of the elements taken together including the safeguards, software and the documentation constitute the machine or group of machines working together with usually at least one level of supervisory control.

This document should be used in conjunction with IEC 60204-1. HV equipment can include LV control parts in the same general enclosure or in separate compartments.

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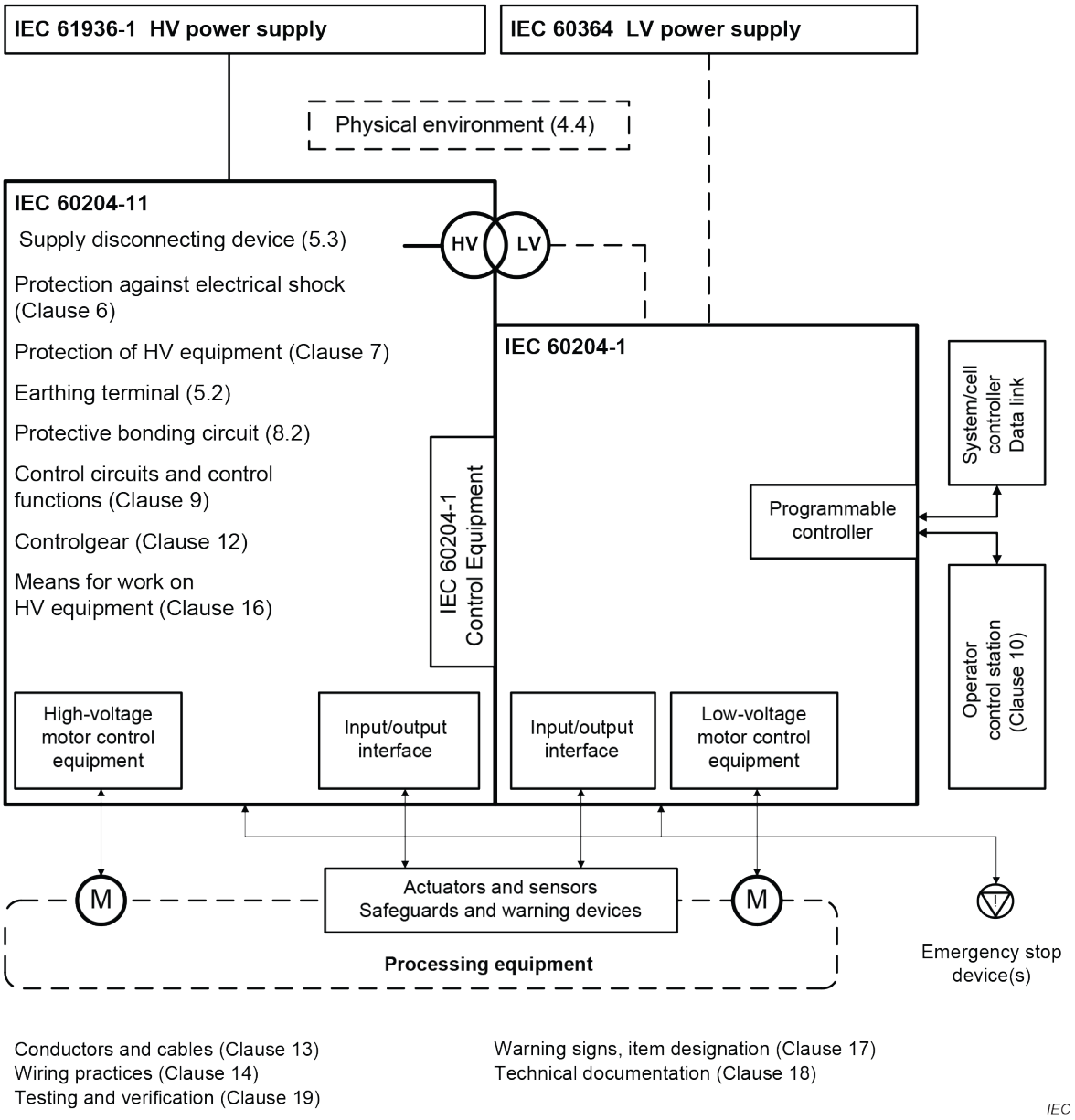

Figure 1 – Block diagram of a machine containing HV equipment

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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

1 Scope

This part of IEC 60204 applies to electrical and electronic equipment and systems to machines, including a group of machines working together in a co-ordinated manner, which operate at nominal voltages above 1 000 V AC or 1 500 V DC and not exceeding 36 kV AC or DC with nominal frequencies not exceeding 60 Hz.

In this document, the term HV equipment also covers the LV equipment forming an integral part of the equipment operating at high voltage. The requirements in this document primarily cover the parts operating at high-voltage except where explicitly stated otherwise.

NOTE 1 LV equipment not forming part of the HV equipment is covered by IEC 60204-1:2016.

NOTE 2 In this document, the term "electrical" includes both electrical and electronic matters (i.e. electrical equipment means both the electrical and the electronic equipment).

NOTE 3 This document does not apply to independent high-voltage power supply installations for which separate IEC standards exist.

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

NOTE 4 For the requirements for high-voltage power supply installations, see IEC 61936-1.

This document is a generic safety standard. It does not cover all the requirements (e.g. guarding, interlocking or control) which are needed or required by other standards or regulations in order to safeguard personnel from hazards other than electrical hazards. Each type of machine has unique requirements to be accommodated to provide adequate safety.

NOTE 5 In some machines the high-voltage power supply can be produced by a step-up transformer (autotransformer), supplied by a low-voltage system (e.g. by a LV generator).

NOTE 6 In the context of this document, the term "person" refers to any individual; "personnel" are those persons who are assigned and instructed by the user or his agent(s) in the use and care of the machine in question.

This part of IEC 60204 specifically includes, but is not limited to, machines as defined in 3.29 (Annex A lists examples of machines whose electrical equipment can be covered by this document).

For protection against electric shock from high-voltage equipment, this document refers to IEC 61936-1. When it comes to low-voltage equipment, this document refers to IEC 60204-1:2016.

NOTE 7 High- and low-voltage standards use different terms regarding protection against electric shock. Whereas high-voltage standards use the terms “direct contact” and “indirect contact”, low-voltage standards correspondingly use “basic protection” and “fault protection”.

Additional and special requirements can apply to the electrical equipment of machines that

– are used in the open air (i.e. outside buildings or other protective structures);
– use, process or produce potentially explosive material (e.g. paint or sawdust);
– are used in potentially explosive and/or flammable atmospheres;

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– have special risks when producing or using certain materials;
– are used in mines.

Hazards as a result of noise and vibration are excluded from the scope of this document.

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 60071-2:1996, *Insulation co-ordination – Part 2: Application guide*

IEC 60076-5, *Power transformers – Part 5: Ability to withstand short-circuit*

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

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

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

IEC 60445, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors.*

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

IEC 60865-1, *Short-circuit currents – Calculation of effects – Part 1: Definitions and calculation methods*

IEC 61800 (all parts), *Adjustable speed electrical power drive systems*

IEC 61936-1:2010, *Power installations exceeding 1 kV a.c. – Part 1: Common rules*
IEC 61936-1:2010/AMD1:2014

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

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

IEC 62271-103, *High-voltage switchgear and controlgear – Part 103: Switches for rated voltages above 1 kV up to and including 52 kV*

IEC 62271-105, *High-voltage switchgear and controlgear – Part 105: Alternating current switch-fuse combinations for rated voltages above 1 kV up to and including 52 kV*

IEC 62271-107, *High-voltage switchgear and controlgear – Part 107: Alternating current fused circuit-switchers for rated voltages above 1 kV up to and including 52 kV*

IEC 62271-200:2011, *High-voltage switchgear and controlgear – Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV*

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IEC 62271-201, *High-voltage switchgear and controlgear – Part 201: AC solid-insulation enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV*

IEC 62745, *Safety of machinery – Requirements for cableless control systems of machinery*

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

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

ISO 3864-2:2016, *Graphical symbols –Safety colours and safety signs – Part 2: Design principles for product safety labels*

ISO 7010:2011, *Graphical symbols – Safety colours and safety signs – Registered safety signs*

ISO 12100, *Safety of machinery –General principles for design – Risk assessment and risk reduction*

3 Terms and definitions

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

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

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

3.1
ambient temperature
temperature of the air or other medium where the equipment is to be used

3.2
barrier
part providing protection against contact with live parts from any usual direction of access

3.3
basic protection
protection against electric shock under fault-free conditions

Note 1 to entry: Previously referred to as “protection against direct contact”.

[SOURCE: IEC 60050-195:1998, 195-06-01, modified – The note has been added.]

3.4
cable tray
cable support consisting of a continuous base with raised edges but no covering

Note 1 to entry: A cable tray may be perforated or mesh.

[SOURCE: IEC 60050-826:2004, 826-15-08]

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3.5
conductor wire
conductor bar
conductor rail
conductive wire, bar or rail of a feeder system with a sliding current collector

3.6
control circuit
<of a machine> circuit used for the control, including monitoring, of a machine and the electrical equipment

3.7
control device
device connected into the control circuit and used for controlling the operation of the machine

EXAMPLE Position sensor, manual control switch, relay, magnetically operated valve.

3.8
controlgear
general term covering switching devices and their combination with associated control, measuring, protective, and regulating equipment, also assemblies of such devices and equipment with associated interconnections, accessories, enclosures, and supporting structures, intended in principle for the control of electrical energy consuming equipment

[SOURCE: IEC 60050-441:2000, 441-11-03]

3.9
duct
enclosed channel designed expressly for holding and protecting electrical conductors, cables, and busbars

Note 1 to entry: Conduits, cable trunking systems and underfloor channels are types of duct.

3.10
earthing system
all the electric connections and devices involved in the earthing of a system, an installation and equipment

[SOURCE: IEC 60050-826:2004, 826-13-04, modified – The preferred terms have been deleted and the deprecated term is used as a preferred term.]

3.11
electrical operating area
room or location for electrical equipment to which access is intended to be restricted to skilled or instructed persons, by the opening of a door or the removal of a barrier without the use of a key or tool, and which is clearly marked by appropriate warning signs

Note 1 to entry: An (electrically) instructed person is a person adequately advised or supervised by an electrically skilled person to enable him or her to perceive risks and to avoid hazards which electricity can create (see IEC 60050-826:2004, 826-18-02.

Note 2 to entry: An (electrically) skilled person is a person with relevant education and experience to enable him or her to perceive risks and to avoid hazards which electricity can create (see IEC 60050-826:2004, 826-18-01)

3.12
electronic equipment
part of the electrical equipment containing circuitry mainly based on electronic devices and components

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