

**MASINATE OHUTUS. MASINATE ELEKTRISEADMED.  
OSA 1: ÜLDNÕUDED**

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

**EESTI STANDARDI EESSÕNA****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.
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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)

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Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

## 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- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2021-09-14

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

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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.

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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)
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ISO 14119	NOTE Approved as EN ISO 14119
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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)



# INTERNATIONAL STANDARD

## NORME INTERNATIONALE



**Safety of machinery –  
Part 1: General requirements**

**Sécurité des machines –  
Partie 1: Exigences générales**



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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**

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## CONTENTS

FOREWORD.....	10
▣ Amendment A1 FOREWORD ▣.....	13
INTRODUCTION.....	15
1 Scope.....	17
2 Normative references.....	18
3 Terms, definitions and abbreviated terms .....	19
3.1 Terms and definitions .....	19
3.2 Abbreviated terms .....	28
4 General requirements .....	29
4.1 General.....	29
4.2 Selection of equipment .....	30
4.2.1 General .....	30
4.2.2 Switchgear.....	30
4.3 Electrical supply .....	30
4.3.1 General .....	30
4.3.2 AC supplies .....	30
4.3.3 DC supplies .....	30
4.3.4 Special supply systems .....	31
4.4 Physical environment and operating conditions .....	31
4.4.1 General .....	31
4.4.2 Electromagnetic compatibility (EMC) .....	31
4.4.3 Ambient air temperature .....	31
4.4.4 Humidity .....	31
4.4.5 Altitude .....	31
4.4.6 Contaminants.....	32
4.4.7 Ionizing and non-ionizing radiation .....	32
4.4.8 Vibration, shock, and bump .....	32
4.5 Transportation and storage.....	32
4.6 Provisions for handling .....	32
5 Incoming supply conductor terminations and devices for disconnecting and switching off .....	32
5.1 Incoming supply conductor terminations .....	32
5.2 Terminal for connection of the external protective conductor .....	33
5.3 Supply disconnecting (isolating) device.....	33
5.3.1 General .....	33
5.3.2 Type .....	34
5.3.3 Requirements .....	34
5.3.4 Operating means of the supply disconnecting device .....	35
5.3.5 Excepted circuits.....	35
5.4 Devices for removal of power for prevention of unexpected start-up .....	36
5.5 Devices for isolating electrical equipment .....	37
5.6 Protection against unauthorized, inadvertent and/or mistaken connection .....	37
6 Protection against electric shock.....	37
6.1 General.....	37
6.2 Basic protection .....	38

6.2.1	General .....	38
6.2.2	Protection by enclosures .....	38
6.2.3	Protection by insulation of live parts .....	39
6.2.4	Protection against residual voltages .....	39
6.2.5	Protection by barriers .....	39
6.2.6	Protection by placing out of reach or protection by obstacles .....	39
6.3	Fault protection .....	40
6.3.1	General .....	40
6.3.2	Prevention of the occurrence of a touch voltage .....	40
6.3.3	Protection by automatic disconnection of supply .....	40
6.4	Protection by the use of PELV .....	41
6.4.1	General requirements .....	41
6.4.2	Sources for PELV .....	42
7	Protection of equipment .....	42
7.1	General .....	42
7.2	Overcurrent protection .....	43
7.2.1	General .....	43
7.2.2	Supply conductors .....	43
7.2.3	Power circuits .....	43
7.2.4	Control circuits .....	43
7.2.5	Socket outlets and their associated conductors .....	44
7.2.6	Lighting circuits .....	44
7.2.7	Transformers .....	44
7.2.8	Location of overcurrent protective devices .....	44
7.2.9	Overcurrent protective devices .....	44
7.2.10	Rating and setting of overcurrent protective devices .....	44
7.3	Protection of motors against overheating .....	45
7.3.1	General .....	45
7.3.2	Overload protection .....	45
7.3.3	Over-temperature protection .....	46
7.4	Protection against abnormal temperature .....	46
7.5	Protection against the effects of supply interruption or voltage reduction and subsequent restoration .....	46
7.6	Motor overspeed protection .....	46
7.7	Additional earth fault/residual current protection .....	46
7.8	Phase sequence protection .....	47
7.9	Protection against overvoltages due to lightning and to switching surges .....	47
7.10	Short-circuit current rating .....	47
8	Equipotential bonding .....	47
8.1	General .....	47
8.2	Protective bonding circuit .....	49
8.2.1	General .....	49
8.2.2	Protective conductors .....	49
8.2.3	Continuity of the protective bonding circuit .....	50
8.2.4	Protective conductor connecting points .....	51
8.2.5	Mobile machines .....	51
8.2.6	Additional requirements for electrical equipment having earth leakage currents higher than 10 mA .....	51
8.3	Measures to restrict the effects of high leakage current .....	52

8.4	Functional bonding .....	52
9	Control circuits and control functions .....	52
9.1	Control circuits .....	52
9.1.1	Control circuit supply .....	52
9.1.2	Control circuit voltages .....	53
9.1.3	Protection .....	53
9.2	Control functions .....	53
9.2.1	General .....	53
9.2.2	Categories of stop functions .....	53
9.2.3	Operation .....	54
9.2.4	Cableless control system (CCS) .....	57
9.3	Protective interlocks .....	59
9.3.1	Reclosing or resetting of an interlocking safeguard .....	59
9.3.2	Exceeding operating limits .....	59
9.3.3	Operation of auxiliary functions .....	59
9.3.4	Interlocks between different operations and for contrary motions .....	59
9.3.5	Reverse current braking .....	60
9.3.6	Suspension of safety functions and/or protective measures .....	60
9.4	Control functions in the event of failure .....	60
9.4.1	General requirements .....	60
9.4.2	Measures to minimize risk in the event of failure .....	61
9.4.3	Protection against malfunction of control circuits .....	62
10	Operator interface and machine-mounted control devices .....	68
10.1	General .....	68
10.1.1	General requirements .....	68
10.1.2	Location and mounting .....	68
10.1.3	Protection .....	68
10.1.4	Position sensors .....	68
10.1.5	Portable and pendant control stations .....	69
10.2	Actuators .....	69
10.2.1	Colours .....	69
10.2.2	Markings .....	69
10.3	Indicator lights and displays .....	70
10.3.1	General .....	70
10.3.2	Colours .....	70
10.3.3	Flashing lights and displays .....	71
10.4	Illuminated push-buttons .....	71
10.5	Rotary control devices .....	71
10.6	Start devices .....	71
10.7	Emergency stop devices .....	72
10.7.1	Location of emergency stop devices .....	72
10.7.2	Types of emergency stop device .....	72
10.7.3	Operation of the supply disconnecting device to effect emergency stop .....	72
10.8	Emergency switching off devices .....	72
10.8.1	Location of emergency switching off devices .....	72
10.8.2	Types of emergency switching off device .....	72
10.8.3	Local operation of the supply disconnecting device to effect emergency switching off .....	73
10.9	Enabling control device .....	73

11	Controlgear: location, mounting, and enclosures .....	73
11.1	General requirements .....	73
11.2	Location and mounting .....	73
11.2.1	Accessibility and maintenance .....	73
11.2.2	Physical separation or grouping .....	74
11.2.3	Heating effects .....	74
11.3	Degrees of protection .....	75
11.4	Enclosures, doors and openings .....	75
11.5	Access to electrical equipment .....	76
12	Conductors and cables .....	76
12.1	General requirements .....	76
12.2	Conductors .....	76
12.3	Insulation .....	77
12.4	Current-carrying capacity in normal service .....	78
12.5	Conductor and cable voltage drop .....	79
12.6	Flexible cables .....	79
12.6.1	General .....	79
12.6.2	Mechanical rating .....	79
12.6.3	Current-carrying capacity of cables wound on drums .....	80
12.7	Conductor wires, conductor bars and slip-ring assemblies .....	80
12.7.1	Basic protection .....	80
12.7.2	Protective conductors .....	81
12.7.3	Protective conductor current collectors .....	81
12.7.4	Removable current collectors with a disconnecter function .....	81
12.7.5	Clearances in air .....	81
12.7.6	Creepage distances .....	81
12.7.7	Conductor system sectioning .....	81
12.7.8	Construction and installation of conductor wire, conductor bar systems and slip-ring assemblies .....	81
13	Wiring practices .....	82
13.1	Connections and routing .....	82
13.1.1	General requirements .....	82
13.1.2	Conductor and cable runs .....	83
13.1.3	Conductors of different circuits .....	83
13.1.4	AC circuits – Electromagnetic effects (prevention of eddy currents) .....	83
13.1.5	Connection between pick-up and pick-up converter of an inductive power supply system .....	83
13.2	Identification of conductors .....	84
13.2.1	General requirements .....	84
13.2.2	Identification of the protective conductor / protective bonding conductor .....	84
13.2.3	Identification of the neutral conductor .....	85
13.2.4	Identification by colour .....	85
13.3	Wiring inside enclosures .....	86
13.4	Wiring outside enclosures .....	86
13.4.1	General requirements .....	86
13.4.2	External ducts .....	86
13.4.3	Connection to moving elements of the machine .....	87
13.4.4	Interconnection of devices on the machine .....	88
13.4.5	Plug/socket combinations .....	88

13.4.6	Dismantling for shipment .....	89
13.4.7	Additional conductors .....	89
13.5	Ducts, connection boxes and other boxes .....	89
13.5.1	General requirements .....	89
13.5.2	Rigid metal conduit and fittings .....	90
13.5.3	Flexible metal conduit and fittings .....	90
13.5.4	Flexible non-metallic conduit and fittings .....	90
13.5.5	Cable trunking systems .....	90
13.5.6	Machine compartments and cable trunking systems .....	90
13.5.7	Connection boxes and other boxes .....	91
13.5.8	Motor connection boxes .....	91
14	Electric motors and associated equipment .....	91
14.1	General requirements .....	91
14.2	Motor enclosures .....	91
14.3	Motor dimensions .....	91
14.4	Motor mounting and compartments .....	91
14.5	Criteria for motor selection .....	92
14.6	Protective devices for mechanical brakes .....	92
15	Socket-outlets and lighting .....	92
15.1	Socket-outlets for accessories .....	92
15.2	Local lighting of the machine and of the equipment .....	93
15.2.1	General .....	93
15.2.2	Supply .....	93
15.2.3	Protection .....	93
15.2.4	Fittings .....	93
16	Marking, warning signs and reference designations .....	94
16.1	General .....	94
16.2	Warning signs .....	94
16.2.1	Electric shock hazard .....	94
16.2.2	Hot surfaces hazard .....	94
16.3	Functional identification .....	95
16.4	Marking of enclosures of electrical equipment .....	95
16.5	Reference designations .....	95
17	Technical documentation .....	95
17.1	General .....	95
17.2	Information related to the electrical equipment .....	95
18	Verification .....	97
18.1	General .....	97
18.2	Verification of conditions for protection by automatic disconnection of supply .....	97
18.2.1	General .....	97
18.2.2	Test 1 – Verification of the continuity of the protective bonding circuit .....	98
18.2.3	Test 2 – Fault loop impedance verification and suitability of the associated overcurrent protective device .....	98
18.2.4	Application of the test methods for TN-systems .....	98
18.3	Insulation resistance tests .....	100
18.4	Voltage tests .....	101
18.5	Protection against residual voltages .....	101
18.6	Functional tests .....	101

18.7	Retesting .....	101
Annex A (normative)	Fault protection by automatic disconnection of supply .....	102
A.1	Fault protection for machines supplied from TN-systems .....	102
A.1.1	General .....	102
A.1.2	Conditions for protection by automatic disconnection of the supply by overcurrent protective devices .....	102
A.1.3	Condition for protection by reducing the touch voltage below 50 V .....	103
A.1.4	Verification of conditions for protection by automatic disconnection of the supply .....	104
A.2	Fault protection for machines supplied from TT-systems .....	106
A.2.1	Connection to earth .....	106
A.2.2	Fault protection for TT systems .....	106
A.2.3	Verification of protection by automatic disconnection of supply using a residual current protective device .....	108
A.2.4	Measurement of the fault loop impedance ( $Z_S$ ) .....	108
Annex B (informative)	Enquiry form for the electrical equipment of machines .....	110
Annex C (informative)	Examples of machines covered by this part of IEC 60204 .....	114
Annex D (informative)	Current-carrying capacity and overcurrent protection of conductors and cables in the electrical equipment of machines .....	116
D.1	General .....	116
D.2	General operating conditions .....	116
D.2.1	Ambient air temperature .....	116
D.2.2	Methods of installation .....	116
D.2.3	Grouping .....	118
D.2.4	Classification of conductors .....	119
D.3	Co-ordination between conductors and protective devices providing overload protection .....	119
D.4	Overcurrent protection of conductors .....	120
D.5	Effect of harmonic currents on balanced three-phase systems .....	121
Annex E (informative)	Explanation of emergency operation functions .....	122
Annex F (informative)	Guide for the use of this part of IEC 60204 .....	123
Annex G (informative)	Comparison of typical conductor cross-sectional areas .....	125
Annex H (informative)	Measures to reduce the effects of electromagnetic influences .....	127
H.1	Definitions .....	127
H.1.1	apparatus .....	127
H.1.2	fixed installation .....	127
H.2	General .....	127
H.3	Mitigation of electromagnetic interference (EMI) .....	128
H.3.1	General .....	128
H.3.2	Measures to reduce EMI .....	128
H.4	Separation and segregation of cables .....	129
H.5	Power supply of a machine by parallel sources .....	132
H.6	Supply impedance where a Power Drive System (PDS) is used .....	132
Annex I (informative)	Documentation / Information .....	133
Annex ZA (normative)	Normative references to international publications with their corresponding European publications .....	135
Annex ZZA (informative)	Relationship between this European Standard and the essential requirements of Directive 2006/42/EC [2006 OJ L 157] aimed to be covered .....	138

Annex ZZB (informative) Relationship between this European Standard and the safety objectives of Directive 2014/35/EU [2014 OJ L96] aimed to be covered .....	140
Bibliography .....	142
Figure 1 – Block diagram of a typical machine .....	16
Figure 2 – Disconnecter isolator .....	35
Figure 3 – Disconnecting circuit breaker .....	35
Figure 4 – Example of equipotential bonding for electrical equipment of a machine .....	48
Figure 5 – Symbol IEC 60417-5019: Protective earth .....	51
Figure 6 – Symbol IEC 60417-5020: Frame or chassis .....	52
Figure 7 – Method a) Earthed control circuit fed by a transformer .....	62
Figure 8 – Method b1) Non-earthed control circuit fed by transformer .....	63
Figure 9 – Method b2) Non-earthed control circuit fed by transformer .....	64
Figure 10 – Method b3) Non-earthed control circuit fed by transformer .....	64
Figure 11 – Method c) Control circuits fed by transformer with an earthed centre-tap winding .....	65
Figure 12 – Method d1a) Control circuit without transformer connected between a phase and the neutral of an earthed supply system .....	66
Figure 13 – Method d1b) Control circuit without transformer connected between two phases of an earthed supply system .....	66
Figure 14 – Method d2a) Control circuit without transformer connected between phase and neutral of a non-earthed supply system .....	67
Figure 15 – Method d2b) control circuit without transformer connected between two phases of a non-earthed supply system .....	67
Figure 16 – Symbol IEC 60417-5019 .....	84
Figure 17 – Symbol IEC 60417-5021 .....	85
Figure 18 – Symbol ISO 7010-W012 .....	94
Figure 19 – Symbol ISO 7010-W017 .....	94
Figure A.1 – Typical arrangement for fault loop impedance ( $Z_S$ ) measurement in TN systems .....	105
Figure A.2 – Typical arrangement for fault loop impedance ( $Z_S$ ) measurement for power drive system circuits in TN systems .....	105
Figure A.3 – Typical arrangement for fault loop impedance ( $Z_S$ ) measurement in TT systems .....	109
Figure A.4 – Typical arrangement for fault loop impedance ( $Z_S$ ) measurement for power drive system circuits in TT systems .....	109
Figure D.1 – Methods of conductor and cable installation independent of number of conductors/cables .....	117
Figure D.2 – Parameters of conductors and protective devices .....	119
Figure H.1 – By-pass conductor for screen reinforcement .....	128
Figure H.2 – Examples of vertical separation and segregation .....	130
Figure H.3 – Examples of horizontal separation and segregation .....	130
Figure H.4 – Cable arrangements in metal cable trays .....	131
Figure H.5 – Connections between metal cable trays or cable trunking systems .....	131
Figure H.6 – Interruption of metal cable trays at fire barriers .....	132



Table 1 – Minimum cross-sectional area of copper protective conductors .....	33
Table 2 – Symbols for actuators (Power) .....	70
Table 3 – Symbols for actuators (Machine operation).....	70
Table 4 – Colours for indicator lights and their meanings with respect to the condition of the machine .....	71
Table 5 – Minimum cross-sectional areas of copper conductors .....	77
Table 6 – Examples of current-carrying capacity ( $I_Z$ ) of PVC insulated copper conductors or cables under steady-state conditions in an ambient air temperature of +40 °C for different methods of installation .....	78
Table 7 – Derating factors for cables wound on drums .....	80
Table 8 – Minimum permitted bending radii for the forced guiding of flexible cables .....	88
Table 9 – Application of the test methods for TN-systems .....	99
Table 10 – Examples of maximum cable lengths from protective devices to their loads for TN-systems .....	100
Table A.1 – Maximum disconnecting times for TN systems .....	102
Table A.2 – Maximum disconnecting time for TT-systems .....	107
Table D.1 – Correction factors.....	116
Table D.2 – Derating factors for $I_Z$ for grouping .....	118
Table D.3 – Derating factors for $I_Z$ for multicore cables up to 10 mm <sup>2</sup> .....	118
Table D.4 – Classification of conductors .....	119
Table D.5 – Maximum allowable conductor temperatures under normal and short-circuit conditions.....	120
Table F.1 – Application options .....	124
Table G.1 – Comparison of conductor sizes.....	125
Table H.1 – Minimum separation distances using metallic containment as illustrated in Figure H.2 .....	129
Table I.1 – Documentation / Information that can be applicable .....	133
Table ZZA.1 – Correspondence between this European Standard and Annex 1 of Directive 2006/42/EC [2006 OJ L 157].....	138
Table ZZB.1 – Correspondence between this European Standard and Annex I of Directive 2014/35/EU [2014 OJ L96].....	140

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**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).
- <sub>A1</sub> 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). ■<sub>A1</sub>
- <sub>A1</sub> 7.2.3: Disconnection of the neutral conductor is mandatory in a TN-S system (France). ■<sub>A1</sub>
- <sub>A1</sub> 7.2.3: Disconnection of the neutral conductor is mandatory in TN-systems (Norway). ■<sub>A1</sub>
- 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<sup>2</sup> solid conductors within enclosures (USA).
- 12.2: The smallest power circuit conductor allowed on machines is 0,82 mm<sup>2</sup> (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, 5<sup>th</sup> 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  $U_o \geq 300V$ ,  $R_A$  shall be less than  $10 \Omega$ , when  $U_o < 300 V$ ,  $R_A$  shall be less than  $100 \Omega$ ,  $U_o$  is the nominal AC line to earth voltage in volts (V) (Japan).
- A.2.2.2: The maximum permissible value of  $R_A$  is  $83 \Omega$  (Netherlands).

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

- reconfirmed,
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**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.**

## 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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications/](http://www.iec.ch/standardsdev/publications/).

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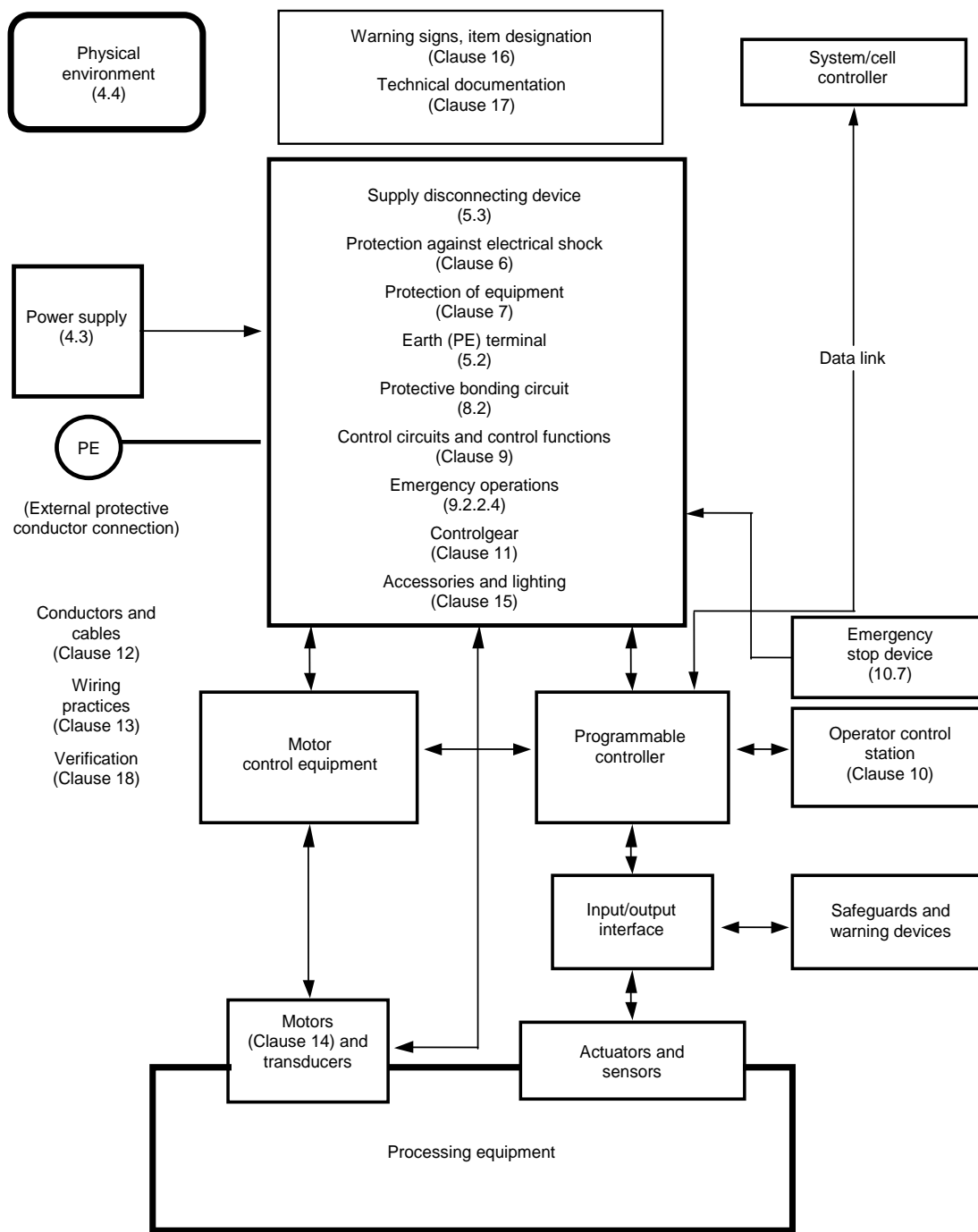
## INTRODUCTION

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/fixtures, 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.



IEC

**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.

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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*

 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 60364-4-43:2008, *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*

 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* 

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

 IEC 60364-6:2016, *Low-voltage electrical installations – Part 6: Verification* 

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

 IEC 60445:2017, *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 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*

☐<sup>A1</sup> IEC 60947-5-1:2016, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices* ☐<sup>A1</sup>

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*

☐<sup>A1</sup> IEC 61558-1:2017, *Safety of transformers, reactors, power supply units and combinations thereof – Part 1: General requirements and tests* ☐<sup>A1</sup>

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*

☐<sup>A1</sup> ISO 7010:2019, *Graphical symbols – Safety colours and safety signs – Registered safety signs*  
ISO 7010:2019/AMD1:2020 ☐<sup>A1</sup>

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*

☐<sup>A1</sup> ISO 13850:2015, *Safety of machinery – Emergency stop function – Principles for design* ☐<sup>A1</sup>

### **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.