

STN	Bezpečnosť strojových zariadení Elektrické zariadenia strojov Časť 1: Všeobecné požiadavky	STN EN 60204-1 33 2200
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Safety of machinery - Electrical equipment of machines - Part 1: General requirements

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 01/19

Obsahuje: EN 60204-1:2018, IEC 60204-1:2016

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EUROPEAN STANDARD

EN 60204-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

September 2018

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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)**

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

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

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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EN 60204-1:2018 (E)

Contents		Page
European foreword		3
1	Modification to Clause 2, Normative references	4
2	Modifications to Clause 4	4
3	Modifications to Clause 6	4
4	Modifications to Clause 9	4
5	Modifications to Clause 11	5
6	Modifications to Clause 12	5
7	Modifications to Clause 13	5
8	Modifications to Clause 16	5
9	Modifications to Clause 18	6
10	Modification to annexes	6
Annex ZA (normative) Normative references to international publications with their corresponding European publications		7
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		10
Annex ZZB (informative) Relationship between this European Standard and the safety objectives of Directive 2014/35/EU [2014 OJ L96] aimed to be covered		12
11	Modification to Bibliography	14

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.

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.

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.

EN 60204-1:2018 (E)**COMMON MODIFICATIONS****1 Modification to Clause 2, Normative references**

Add the following note after the first paragraph:

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

2 Modifications to Clause 4**4.4.2 Electromagnetic Compatibility**

Delete the 2nd paragraph and related bulleted list.

4.4.5 Altitude

Replace the text of the 2nd paragraph before the hyphenated list with:

“For equipment to be used at higher altitudes, it is necessary to take into account changes in parameters for example, the reduction of:”.

Add the start of the 3rd paragraph:

“Other parameters of different components can also alter with altitude.”.

3 Modifications to Clause 6**6.3.1 General**

Replace the text of Note 1 with:

“The risk of harmful physiological effects from touch voltages depends upon a number of factors. These include but are not limited to; value of touch voltage, duration of possible exposure, environmental factors, skin condition”.

4 Modifications to Clause 9**9.2.3.2 Start**

Replace the 4th paragraph with:

“The provision of acoustic and/or visual warning signals before the starting of hazardous machine operation shall be considered during the risk assessment. Where the risk assessment determines that either or both are required the emission level of noise/light shall be suitable for the intended environment.”.

9.2.4.1 General requirements

Replace the 2nd paragraph with:

“Where a safety function of a CCS relies on data transmission the transmission reliability shall be considered.”.

9.2.4.8 Emergency stop reset

Replace the last paragraph with:

“Where the risk assessment show that resetting of an emergency stop actuator on the portable cableless operator control station is not adequate then one or more supplementary fixed resets shall be provided.”.

5 Modifications to Clause 11

11.4 Enclosures, doors and openings

In the 8th paragraph, replace “harmful” with “detrimental”.

6 Modifications to Clause 12

12.3 Insulation

In the 1st paragraph, replace “should” with “shall”.

7 Modifications to Clause 13

13.5.2 Rigid metal conduit fittings

First paragraph, 2nd sentence, replace with “Where galvanic action is possible between dissimilar metals these metal combinations shall not be used”.

8 Modifications to Clause 16

16.1 General

Add to the first paragraph: “The markings shall be sufficiently durable to remain legible for the foreseen lifetime of the machine.”.

16.4 Marking of enclosures of electrical equipment

Delete the 2nd bullet.

EN 60204-1:2018 (E)**9 Modifications to Clause 18****18.1 General**

Add to paragraph 2: “Where the sequence cannot be followed verification a) and b) shall be conducted first.”.

18.4 Voltage tests

Replace the first paragraph with “When voltage tests are performed, tests and test equipment shall be in accordance with EN 61180.”.

10 Modification to annexes

Add the following annexes.

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 60034-1 (mod)	2010	Rotating electrical machines - Part 1: Rating and performance	EN 60034-1	2010
-	-		+ corr. October	2010
IEC 60072	series	Dimensions and output series for rotating electrical machines	-	-
IEC 60309-1	1999	Plugs, socket-outlets and couplers for industrial purposes -	EN 60309-1	1999
+ A1 (mod)	2005	Part 1: General requirements	+ A1	2007
+ A2	2012		+ A2	2012
IEC 60364-1 (mod)	2005	Low-voltage electrical installations - Part 1: Fundamental principles, assessment of general characteristics, definitions	HD 60364-1	2008
IEC 60364-4-41 (mod)	2005	Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock	HD 60364-4-41	2007
-	-		+ corr. July	2007
IEC 60364-4-43 (mod)	2008	Low voltage electrical installations - Part 4-43: Protection for safety - Protection against overcurrent	HD 60364-4-43	2010
IEC 60364-5-52 (mod)	2009	Low-voltage electrical installations - Part 5-52: Selection and erection of electrical equipment - Wiring systems	HD 60364-5-52	2011
IEC 60364-5-53	2001	Electrical installations of buildings - Part 5-53: Selection and erection of electrical equipment - Isolation, switching and control	-	-
+ A1 (mod)	2002		HD 60364-5-534	2008 ¹⁾
+ A2 (mod)	2015		HD 60364-5-534	2016 ²⁾

1) IEC 60364-5-53:2001/A1:2002, Clause 534: "Devices for protection against overvoltages" is harmonized as HD 60364-5-534:2008. HD 60364-5-534:2008 will be superseded by HD 60364-5-534:2016 on 2018-12-14.

2) IEC 60364-5-53:2001/A2:2015, Clause 534: "Devices for protection against overvoltages" is harmonized as HD 60364-5-534:2016.

EN 60204-1:2018 (E)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
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
IEC 60417-DB	2002	Graphical symbols for use on equipment	-	-
IEC 60445	2010	Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals, conductor terminations and conductors	EN 60445	2010
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529	1991
-	-		+ corr. May	1993
+ A1	1999		+ A1	2000
+ A2	2013		+ A2	2013
IEC 60664-1	2007	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests	EN 60664-1	2007
IEC 60947-2	2016	Low voltage switchgear and controlgear - Part 2: Circuit-breakers	EN 60947-2	2017
IEC 60947-3	2008	Low-voltage switchgear and controlgear -	EN 60947-3	2009
+ A1	2012	Part 3: Switches, disconnectors,	+ A1	2012
+ A2	2015	switch-disconnectors and fuse-combination units	+ A2	2015
IEC 60947-5-1	2003	Low-voltage switchgear and controlgear -	EN 60947-5-1	2004
-	-	Part 5-1: Control circuit devices and	+ corr. November	2004
-	-	switching elements - Electromechanical	+ corr. July	2005
+ A1	2009	control circuit devices	+ A1	2009
IEC 60947-5-5	1997	Low-voltage switchgear and controlgear -	EN 60947-5-5	1997
+ A1	2005	Part 5-5: Control circuit devices and	+ A1	2005
-	-	switching elements - Electrical	+ A11	2013
+ A2	2016	emergency stop device with mechanical latching function	+ A2	2017
IEC 60947-6-2	2002	Low-voltage switchgear and controlgear -	EN 60947-6-2	2003
+ A1	2007	Part 6-2: Multiple function equipment - Control and protective switching devices (or equipment) (CPS)	+ A1	2007
IEC 61140	2016	Protection against electric shock - Common aspects for installation and equipment	EN 61140	2016
IEC 61310	series	Safety of machinery - Indication, marking and actuation	EN 61310	series

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61439-1	2011	Low-voltage switchgear and controlgear assemblies - Part 1: General rules	EN 61439-1	2011
IEC 61558-1	2005	Safety of power transformers, power supplies, reactors and similar products -	EN 61558-1	2005
-	-		+ corr. August	2006
+ A1	2009	Part 1: General requirements and tests	+ A1	2009
IEC 61558-2-6	2009	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	EN 61558-2-6	2009
IEC 61984	2008	Connectors - Safety requirements and tests	EN 61984	2009
IEC 62023	2011	Structuring of technical information and documentation	EN 62023	2012
IEC 62061	2005	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems	EN 62061	2005
-	-		+ corr. February	2010
+ A1	2012		+ A1	2013
+ A2	2015		+ A2	2015
ISO 7010	2011	Graphical symbols - Safety colours and safety signs - Registered safety signs	EN ISO 7010	2012
+ A1	2012		+ A1	2014
+ A2	2012		+ A2	2014
+ A3	2012		+ A3	2014
+ A4	2013		+ A4	2014
+ A5	2014		+ A5	2015
+ A6	2014		+ A6	2016
+ A7	2016		+ A7	2017
ISO 13849-1	2015	Safety of machinery - Safety-related Parts of control systems - Part 1: General principles for design	EN ISO 13849-1	2015
ISO 13849-2	2012	Safety of machinery - Safety-related Parts of control systems - Part 2: Validation	EN ISO 13849-2	2012
ISO 13850	2006 ³⁾	Safety of machinery - Emergency stop - Principles for design	EN ISO 13850	2006 ⁴⁾

³⁾ Superseded by ISO 13850:2015, *Safety of machinery - Emergency stop function - Principles for design*.

⁴⁾ EN ISO 13850:2006 is superseded by EN ISO 13850:2015, which is based on ISO 13850:2015.

EN 60204-1:2018 (E)**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**

This European Standard has been prepared under a Commission's standardization request M/396 EN to provide one voluntary means of conforming to essential requirements of Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast) [2006 OJ L 157].

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

Table ZZA.1 – Correspondence between this European Standard and Annex 1 of Directive 2006/42/EC [2006 OJ L 157]

Essential Requirements of Directive 2006/42/EC	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
1.2.1	Clause 4, 5.4, 7.4, 7.5, 7.6, 7.8, 7.10, 8.4, Clause 9, 10.6, 10.9, 11.2.3	
1.2.2	4.4, Clause 10, Clause 11, 16.3	
1.2.3	7.3.1, 7.5, 9.2.3.2, 9.3.1	
1.2.4.1	9.2.2, 9.2.3.3	
1.2.4.2	9.2.2, 9.2.3.3, 9.2.3.6, 9.4	
1.2.4.3	9.2.3.4.2, 10.7	
1.2.4.4	9.2.3.3, 9.2.3.4.2	
1.2.5	9.2.3.5	
1.2.6	5.4, 7.5	
1.5.1	All	
1.5.4	13.4.5(d), Clause 17	
1.5.5	7.4, 16.2.2	
1.6.3	5.3, 10.8	
1.6.4	Clause 11	
1.7.1.	Clause 16, Clause 17	
1.7.1.1	Clause 16, Clause 17	
1.7.1.2	10.1.1, 10.3, 10.4, Clause 16	
1.7.2	Clause 16, Clause 17	
1.7.4.2 (e,g, i,j,m,p,r,s,t)	Clause 17	
1.7.4.2 u, 1.5.8		These essential requirements are specifically excluded as noise has not been considered

Essential Requirements of Directive 2006/42/EC	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
		during the development of the standard
1.5.10, 1.5.11		These essential requirements have been excluded as the electromagnetic compliance information only gives methods that have proved useful and are supplied as guidance.

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.

Annex ZZB (informative)

Relationship between this European Standard and the safety objectives of Directive 2014/35/EU [2014 OJ L96] aimed to be covered

This European standard has been prepared under a Commission's standardization request relating to harmonised standards in the field of the Low Voltage Directive, M/511, to provide one voluntary means of conforming to safety objectives of Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits [2014 OJ L96].

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

Table ZZB.1 – Correspondence between this European Standard and Annex I of Directive 2014/35/EU [2014 OJ L96]

Safety objectives of Directive 2014/35/EU	Clause(s) / sub-clause(s) of this EN	Remarks/note
1 a)	Clause 16, 5.1, 5.2, 5.3, 5.6, 6.2, 8.2, 8.3, 10.2, 10.8, 11.1, 11.2, 13.1, 13.2	
1 b)	4.2, 5.3, 5.5, 6.2, 6.2.4, 7.2, 7.2.2, 8.2, 9.2, , 11.2, Clause 12, 13, 13.4.4, 13.4.5, 14.4, Clause 15, Clause 17, Clause 18	
1 c)	<i>Introduction</i> , 1, 3, 11.1, 11.2	Refer to 2a) to 2d) and 3a) to 3c)in this table
2 a)	4.1, 4.2, Clause 5, Clause 6, 7.1, 7.2, 7.7, 7.8, 7.10, Clause 8, Clause 9, 11.3, 11.4, Clause 12, 13.2, Clause 15, Clause 16, Clause 18, Annex A	
2 b)	Clause 4, 4.4.3, 4.5, 7.2, 7.3, 7.4, 7.9, 7.10, 11.2.3, 11.4, Clause 12, 13.1.4, 14.4, 14.5, 16.2.2	For electromagnetic fields, this standard does not provide performance requirements for either immunity or emissions. Only general advice is given. EMF is not covered. Ionizing radiation is not considered.
2 c)	4.1, 4.4.8, 5.3, 5.4, 5.5, 5.6, 7.5, 7.6, Clause 9, Clause 10, 13.1, Clause 14, 15.2	Noise is not considered in this standard. Functional safety is not fully covered. Explosion of batteries has not been covered by this standard. Optical radiation is not covered.
2 d)	6.2.3, 6.3, 6.4, 7.2.7, 9.4, Clause 12, 13.3, 13.4.3, 13.5,	

Safety objectives of Directive 2014/35/EU	Clause(s) / sub-clause(s) of this EN	Remarks/note
	14.4, Clause 18	
3 a)	6.2.2, 6.2.3, 8.2.1, 8.2.2, 8.2.3, 11.4, 12.2, 12.3, 12.6.1, 12.6.2, 13.3, 13.4, 13.5, 14.2 14.6	The standard only considers the mechanical requirements for electrical parts of a machine.
3 b)	4.6, 6.2.3, 10.1.3, 11.3, 11.4, 12.7.6	For EMC, this standard does not provide performance requirements for either immunity or emissions. Only general advice is given Hazard associated with EMC and functional safety are not covered. Safety-related security is not covered
3 c)	3, Clause 7, Clause 8, 9.2, 11.4, 14.6, 15.1	

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.

EN 60204-1:2018 (E)**11 Modification to Bibliography**

Add the following notes for the standards indicated:

IEC 60034-5	NOTE	Harmonized as EN 60034-5.
IEC 60034-11	NOTE	Harmonized as EN 60034-11.
IEC 60038:2009	NOTE	Harmonized as EN 60038:2011 (modified).
IEC 60073:2002	NOTE	Harmonized as EN 60073:2002 (not modified).
IEC 60085	NOTE	Harmonized as EN 60085.
IEC 60204-11:2000	NOTE	Harmonized as EN 60204-11:2000 (not modified).
IEC 60204-31:2013	NOTE	Harmonized as EN 60204-31:2013 (not modified).
IEC 60204-32:2008	NOTE	Harmonized as EN 60204-32:2008 (not modified).
IEC 60204-33:2009	NOTE	Harmonized as EN 60204-33:2011 (modified).
IEC 60216	NOTE	Harmonized in EN 60216 series.
IEC 60228:2004	NOTE	Harmonized as EN 60228:2005 (not modified).
IEC 60269-1:2006	NOTE	Harmonized as EN 60269-1:2007 (not modified).
IEC 60320-1	NOTE	Harmonized as EN 60320-1.
IEC 60332	NOTE	Harmonized in EN 60332 series.
IEC 60335	NOTE	Harmonized in EN 60335 series.
IEC 60364	NOTE	Harmonized in HD 60364 series.
IEC 60447:2004	NOTE	Harmonized as EN 60447:2004 (not modified).
IEC 60757:1983	NOTE	Harmonized as HD 457 S1:1985 (not modified).
IEC TR 60890	NOTE	Harmonized as CLC/TR 60890.
IEC 60909-0:2001	NOTE	Harmonized as EN 60909-0:2001 (not modified).
IEC 60947-1:2007	NOTE	Harmonized as EN 60947-1:2007 (not modified).
IEC 60947-4-1	NOTE	Harmonized as EN 60947-4-1.
IEC 60947-5-2:2007	NOTE	Harmonized as EN 60947-5-2:2007 (not modified).
IEC 60947-5-8	NOTE	Harmonized as EN 60947-5-8.
IEC 60947-7-1:2009	NOTE	Harmonized as EN 60947-7-1:2009 (not modified).
IEC 61000-6-1:2005	NOTE	Harmonized as EN 61000-6-1:2007 (not modified).
IEC 61000-6-2:2005	NOTE	Harmonized as EN 61000-6-2:2005 (not modified).
IEC 61000-6-3:2006	NOTE	Harmonized as EN 61000-6-3:2007 (not modified).

IEC 61000-6-4:1997	NOTE	Harmonized as EN 61000-6-4:2001 ⁵⁾ (modified).
IEC 61082-1:2014	NOTE	Harmonized as EN 61082-1:2015 (not modified).
IEC 61175	NOTE	Harmonized as EN 61175.
IEC 61180	NOTE	Harmonized in EN 61180 series.
IEC 61496-1:2004	NOTE	Harmonized as EN 61496-1:2004 ⁶⁾ (modified).
IEC 61557	NOTE	Harmonized in EN 61557 series.
IEC 61558-2-2	NOTE	Harmonized as EN 61558-2-2.
IEC 61558-2-16	NOTE	Harmonized as EN 61558-2-16.
IEC 61643-12:2008	NOTE	Harmonized as CLC/TS 61643-12:2009 (modified).
IEC 61666	NOTE	Harmonized as EN 61666.
IEC 61800	NOTE	Harmonized in EN 61800 series.
IEC 62020	NOTE	Harmonized as EN 62020.
IEC 62027:2011	NOTE	Harmonized as EN 62027:2012 (not modified).
IEC 62305-1:2010	NOTE	Harmonized as EN 62305-1:2011 (modified).
IEC 62305-4:2010	NOTE	Harmonized as EN 62305-4:2011 (modified).
IEC 62491	NOTE	Harmonized as EN 62491.
IEC 62507-1	NOTE	Harmonized as EN 62507-1.
IEC 62745	NOTE	Harmonized as EN 62745.
IEC 81346-1:2009	NOTE	Harmonized as EN 81346-1:2009 (not modified).
IEC 81346-2:2009	NOTE	Harmonized as EN 81346-2:2009 (not modified).
IEC 82079-1:2012	NOTE	Harmonized as EN 82079-1:2012 (not modified).
ISO 12100:2010	NOTE	Harmonized as EN ISO 12100:2010 (not modified).
ISO 13732-1	NOTE	Harmonized as EN ISO 13732-1.

⁵⁾ Superseded by EN 61000-6-4:2007, which is based on IEC 61000-6-4:2006.

⁶⁾ Superseded by EN 61496-1:2013, which is based on IEC 61496-1:2012.



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Edition 6.0 2016-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Safety of machinery – Electrical equipment of machines –
Part 1: General requirements**

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





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IEC 60204-1

Edition 6.0 2016-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Safety of machinery – Electrical equipment of machines –
Part 1: General requirements**

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

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CONTENTS

FOREWORD.....	10
INTRODUCTION.....	13
1 Scope.....	15
2 Normative references.....	16
3 Terms, definitions and abbreviated terms	17
3.1 Terms and definitions	17
3.2 Abbreviated terms	26
4 General requirements	26
4.1 General.....	26
4.2 Selection of equipment.....	27
4.2.1 General	27
4.2.2 Switchgear.....	27
4.3 Electrical supply.....	28
4.3.1 General	28
4.3.2 AC supplies	28
4.3.3 DC supplies	28
4.3.4 Special supply systems	28
4.4 Physical environment and operating conditions	28
4.4.1 General	28
4.4.2 Electromagnetic compatibility (EMC)	29
4.4.3 Ambient air temperature	29
4.4.4 Humidity	29
4.4.5 Altitude	29
4.4.6 Contaminants.....	29
4.4.7 Ionizing and non-ionizing radiation	30
4.4.8 Vibration, shock, and bump	30
4.5 Transportation and storage.....	30
4.6 Provisions for handling.....	30
5 Incoming supply conductor terminations and devices for disconnecting and switching off	30
5.1 Incoming supply conductor terminations	30
5.2 Terminal for connection of the external protective conductor	31
5.3 Supply disconnecting (isolating) device.....	31
5.3.1 General	31
5.3.2 Type	31
5.3.3 Requirements	32
5.3.4 Operating means of the supply disconnecting device	32
5.3.5 Excepted circuits.....	33
5.4 Devices for removal of power for prevention of unexpected start-up	34
5.5 Devices for isolating electrical equipment	34
5.6 Protection against unauthorized, inadvertent and/or mistaken connection.....	35
6 Protection against electric shock.....	35
6.1 General.....	35
6.2 Basic protection	35
6.2.1 General	35
6.2.2 Protection by enclosures	36

6.2.3	Protection by insulation of live parts	37
6.2.4	Protection against residual voltages	37
6.2.5	Protection by barriers	37
6.2.6	Protection by placing out of reach or protection by obstacles	37
6.3	Fault protection	37
6.3.1	General	37
6.3.2	Prevention of the occurrence of a touch voltage	38
6.3.3	Protection by automatic disconnection of supply	38
6.4	Protection by the use of PELV	39
6.4.1	General requirements	39
6.4.2	Sources for PELV	40
7	Protection of equipment	40
7.1	General	40
7.2	Overcurrent protection	40
7.2.1	General	40
7.2.2	Supply conductors	40
7.2.3	Power circuits	41
7.2.4	Control circuits	41
7.2.5	Socket outlets and their associated conductors	41
7.2.6	Lighting circuits	41
7.2.7	Transformers	42
7.2.8	Location of overcurrent protective devices	42
7.2.9	Overcurrent protective devices	42
7.2.10	Rating and setting of overcurrent protective devices	42
7.3	Protection of motors against overheating	42
7.3.1	General	42
7.3.2	Overload protection	43
7.3.3	Over-temperature protection	43
7.4	Protection against abnormal temperature	43
7.5	Protection against the effects of supply interruption or voltage reduction and subsequent restoration	44
7.6	Motor overspeed protection	44
7.7	Additional earth fault/residual current protection	44
7.8	Phase sequence protection	44
7.9	Protection against overvoltages due to lightning and to switching surges	44
7.10	Short-circuit current rating	45
8	Equipotential bonding	45
8.1	General	45
8.2	Protective bonding circuit	47
8.2.1	General	47
8.2.2	Protective conductors	47
8.2.3	Continuity of the protective bonding circuit	48
8.2.4	Protective conductor connecting points	49
8.2.5	Mobile machines	49
8.2.6	Additional requirements for electrical equipment having earth leakage currents higher than 10 mA	49
8.3	Measures to restrict the effects of high leakage current	50
8.4	Functional bonding	50
9	Control circuits and control functions	50

9.1	Control circuits	50
9.1.1	Control circuit supply.....	50
9.1.2	Control circuit voltages.....	51
9.1.3	Protection	51
9.2	Control functions	51
9.2.1	General	51
9.2.2	Categories of stop functions	51
9.2.3	Operation.....	51
9.2.4	Cableless control system (CCS)	55
9.3	Protective interlocks	57
9.3.1	Reclosing or resetting of an interlocking safeguard	57
9.3.2	Exceeding operating limits.....	57
9.3.3	Operation of auxiliary functions	57
9.3.4	Interlocks between different operations and for contrary motions	57
9.3.5	Reverse current braking	57
9.3.6	Suspension of safety functions and/or protective measures.....	58
9.4	Control functions in the event of failure	58
9.4.1	General requirements.....	58
9.4.2	Measures to minimize risk in the event of failure	59
9.4.3	Protection against malfunction of control circuits.....	60
10	Operator interface and machine-mounted control devices	66
10.1	General.....	66
10.1.1	General requirements.....	66
10.1.2	Location and mounting	66
10.1.3	Protection	66
10.1.4	Position sensors	66
10.1.5	Portable and pendant control stations.....	67
10.2	Actuators	67
10.2.1	Colours.....	67
10.2.2	Markings.....	67
10.3	Indicator lights and displays	68
10.3.1	General	68
10.3.2	Colours.....	68
10.3.3	Flashing lights and displays.....	69
10.4	Illuminated push-buttons	69
10.5	Rotary control devices.....	69
10.6	Start devices	69
10.7	Emergency stop devices.....	70
10.7.1	Location of emergency stop devices	70
10.7.2	Types of emergency stop device	70
10.7.3	Operation of the supply disconnecting device to effect emergency stop.....	70
10.8	Emergency switching off devices	70
10.8.1	Location of emergency switching off devices.....	70
10.8.2	Types of emergency switching off device	70
10.8.3	Local operation of the supply disconnecting device to effect emergency switching off.....	71
10.9	Enabling control device	71
11	Controlgear: location, mounting, and enclosures	71
11.1	General requirements.....	71

11.2	Location and mounting	71
11.2.1	Accessibility and maintenance	71
11.2.2	Physical separation or grouping	72
11.2.3	Heating effects	72
11.3	Degrees of protection	73
11.4	Enclosures, doors and openings	73
11.5	Access to electrical equipment	74
12	Conductors and cables	74
12.1	General requirements	74
12.2	Conductors	74
12.3	Insulation	75
12.4	Current-carrying capacity in normal service	75
12.5	Conductor and cable voltage drop	76
12.6	Flexible cables	77
12.6.1	General	77
12.6.2	Mechanical rating	77
12.6.3	Current-carrying capacity of cables wound on drums	77
12.7	Conductor wires, conductor bars and slip-ring assemblies	78
12.7.1	Basic protection	78
12.7.2	Protective conductors	78
12.7.3	Protective conductor current collectors	78
12.7.4	Removable current collectors with a disconnecter function	79
12.7.5	Clearances in air	79
12.7.6	Creepage distances	79
12.7.7	Conductor system sectioning	79
12.7.8	Construction and installation of conductor wire, conductor bar systems and slip-ring assemblies	79
13	Wiring practices	80
13.1	Connections and routing	80
13.1.1	General requirements	80
13.1.2	Conductor and cable runs	80
13.1.3	Conductors of different circuits	81
13.1.4	AC circuits – Electromagnetic effects (prevention of eddy currents)	81
13.1.5	Connection between pick-up and pick-up converter of an inductive power supply system	81
13.2	Identification of conductors	81
13.2.1	General requirements	81
13.2.2	Identification of the protective conductor / protective bonding conductor	82
13.2.3	Identification of the neutral conductor	82
13.2.4	Identification by colour	83
13.3	Wiring inside enclosures	83
13.4	Wiring outside enclosures	84
13.4.1	General requirements	84
13.4.2	External ducts	84
13.4.3	Connection to moving elements of the machine	84
13.4.4	Interconnection of devices on the machine	85
13.4.5	Plug/socket combinations	85
13.4.6	Dismantling for shipment	86
13.4.7	Additional conductors	86

13.5	Ducts, connection boxes and other boxes	86
13.5.1	General requirements.....	86
13.5.2	Rigid metal conduit and fittings.....	87
13.5.3	Flexible metal conduit and fittings.....	87
13.5.4	Flexible non-metallic conduit and fittings	87
13.5.5	Cable trunking systems	87
13.5.6	Machine compartments and cable trunking systems	88
13.5.7	Connection boxes and other boxes	88
13.5.8	Motor connection boxes	88
14	Electric motors and associated equipment.....	88
14.1	General requirements.....	88
14.2	Motor enclosures	88
14.3	Motor dimensions.....	89
14.4	Motor mounting and compartments	89
14.5	Criteria for motor selection	89
14.6	Protective devices for mechanical brakes	89
15	Socket-outlets and lighting.....	90
15.1	Socket-outlets for accessories	90
15.2	Local lighting of the machine and of the equipment	90
15.2.1	General	90
15.2.2	Supply	90
15.2.3	Protection	91
15.2.4	Fittings	91
16	Marking, warning signs and reference designations	91
16.1	General.....	91
16.2	Warning signs	91
16.2.1	Electric shock hazard	91
16.2.2	Hot surfaces hazard	92
16.3	Functional identification.....	92
16.4	Marking of enclosures of electrical equipment.....	92
16.5	Reference designations	92
17	Technical documentation	92
17.1	General.....	92
17.2	Information related to the electrical equipment.....	93
18	Verification	94
18.1	General.....	94
18.2	Verification of conditions for protection by automatic disconnection of supply	94
18.2.1	General	94
18.2.2	Test 1 – Verification of the continuity of the protective bonding circuit	95
18.2.3	Test 2 – Fault loop impedance verification and suitability of the associated overcurrent protective device	95
18.2.4	Application of the test methods for TN-systems.....	95
18.3	Insulation resistance tests	97
18.4	Voltage tests	98
18.5	Protection against residual voltages	98
18.6	Functional tests.....	98
18.7	Retesting	98
Annex A	(normative) Fault protection by automatic disconnection of supply.....	99

A.1	Fault protection for machines supplied from TN-systems	99
A.1.1	General	99
A.1.2	Conditions for protection by automatic disconnection of the supply by overcurrent protective devices	99
A.1.3	Condition for protection by reducing the touch voltage below 50 V	100
A.1.4	Verification of conditions for protection by automatic disconnection of the supply	101
A.2	Fault protection for machines supplied from TT-systems	103
A.2.1	Connection to earth	103
A.2.2	Fault protection for TT systems	103
A.2.3	Verification of protection by automatic disconnection of supply using a residual current protective device	104
A.2.4	Measurement of the fault loop impedance (Z_S)	105
Annex B (informative)	Enquiry form for the electrical equipment of machines	107
Annex C (informative)	Examples of machines covered by this part of IEC 60204	111
Annex D (informative)	Current-carrying capacity and overcurrent protection of conductors and cables in the electrical equipment of machines	113
D.1	General	113
D.2	General operating conditions	113
D.2.1	Ambient air temperature	113
D.2.2	Methods of installation	113
D.2.3	Grouping	115
D.2.4	Classification of conductors	116
D.3	Co-ordination between conductors and protective devices providing overload protection	116
D.4	Overcurrent protection of conductors	117
D.5	Effect of harmonic currents on balanced three-phase systems	118
Annex E (informative)	Explanation of emergency operation functions	119
Annex F (informative)	Guide for the use of this part of IEC 60204	120
Annex G (informative)	Comparison of typical conductor cross-sectional areas	122
Annex H (informative)	Measures to reduce the effects of electromagnetic influences	124
H.1	Definitions	124
H.1.1	apparatus	124
H.1.2	fixed installation	124
H.2	General	124
H.3	Mitigation of electromagnetic interference (EMI)	124
H.3.1	General	124
H.3.2	Measures to reduce EMI	125
H.4	Separation and segregation of cables	125
H.5	Power supply of a machine by parallel sources	129
H.6	Supply impedance where a Power Drive System (PDS) is used	129
Annex I (informative)	Documentation / Information	130
Bibliography	132
Figure 1	– Block diagram of a typical machine	14
Figure 2	– Disconnecter isolator	33
Figure 3	– Disconnecting circuit breaker	33
Figure 4	– Example of equipotential bonding for electrical equipment of a machine	46

Figure 5 – Symbol IEC 60417-5019: Protective earth	49
Figure 6 – Symbol IEC 60417-5020: Frame or chassis	50
Figure 7 – Method a) Earthed control circuit fed by a transformer	60
Figure 8 – Method b1) Non-earthed control circuit fed by transformer	61
Figure 9 – Method b2) Non-earthed control circuit fed by transformer	62
Figure 10 – Method b3) Non-earthed control circuit fed by transformer	62
Figure 11 – Method c) Control circuits fed by transformer with an earthed centre-tap winding	63
Figure 12 – Method d1a) Control circuit without transformer connected between a phase and the neutral of an earthed supply system	64
Figure 13 – Method d1b) Control circuit without transformer connected between two phases of an earthed supply system	64
Figure 14 – Method d2a) Control circuit without transformer connected between phase and neutral of a non-earthed supply system	65
Figure 15 – Method d2b) control circuit without transformer connected between two phases of a non-earthed supply system	65
Figure 16 – Symbol IEC 60417-5019	82
Figure 17 – Symbol IEC 60417-5021	82
Figure 18 – Symbol ISO 7010-W012	91
Figure 19 – Symbol ISO 7010-W017	92
Figure A.1 – Typical arrangement for fault loop impedance (Z_S) measurement in TN systems	102
Figure A.2 – Typical arrangement for fault loop impedance (Z_S) measurement for power drive system circuits in TN systems	102
Figure A.3 – Typical arrangement for fault loop impedance (Z_S) measurement in TT systems	105
Figure A.4 – Typical arrangement for fault loop impedance (Z_S) measurement for power drive system circuits in TT systems	106
Figure D.1 – Methods of conductor and cable installation independent of number of conductors/cables	114
Figure D.2 – Parameters of conductors and protective devices	116
Figure H.1 – By-pass conductor for screen reinforcement	125
Figure H.2 – Examples of vertical separation and segregation	127
Figure H.3 – Examples of horizontal separation and segregation	127
Figure H.4 – Cable arrangements in metal cable trays	128
Figure H.5 – Connections between metal cable trays or cable trunking systems	128
Figure H.6 – Interruption of metal cable trays at fire barriers	129
Table 1 – Minimum cross-sectional area of copper protective conductors	31
Table 2 – Symbols for actuators (Power)	68
Table 3 – Symbols for actuators (Machine operation)	68
Table 4 – Colours for indicator lights and their meanings with respect to the condition of the machine	69
Table 5 – Minimum cross-sectional areas of copper conductors	75

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	76
Table 7 – Derating factors for cables wound on drums	78
Table 8 – Minimum permitted bending radii for the forced guiding of flexible cables.....	85
Table 9 – Application of the test methods for TN-systems	96
Table 10 – Examples of maximum cable lengths from protective devices to their loads for TN-systems	97
Table A.1 – Maximum disconnecting times for TN systems	99
Table A.2 – Maximum disconnecting time for TT-systems	104
Table D.1 – Correction factors.....	113
Table D.2 – Derating factors for I_Z for grouping	115
Table D.3 – Derating factors for I_Z for multicore cables up to 10 mm ²	115
Table D.4 – Classification of conductors.....	116
Table D.5 – Maximum allowable conductor temperatures under normal and short-circuit conditions.....	117
Table F.1 – Application options	121
Table G.1 – Comparison of conductor sizes.....	122
Table H.1 – Minimum separation distances using metallic containment as illustrated in Figure H.2	126
Table I.1 – Documentation / Information that can be applicable.....	130

INTERNATIONAL ELECTROTECHNICAL COMMISSION

SAFETY OF MACHINERY – ELECTRICAL EQUIPMENT OF MACHINES –

Part 1: General requirements

FOREWORD

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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).
- 6.3.3 b): The use of residual current protective devices with a rated residual operating current not exceeding 1 A is mandatory in TT systems as a means for fault protection by automatic disconnection of supply (Italy).
- 7.2.3: Disconnection of the neutral conductor is mandatory in a TN-S system (France and Norway).
- 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 mm² solid conductors within enclosures (USA).
- 12.2: The smallest power circuit conductor allowed on machines is 0,82 mm² (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 $U_o \geq 300V$, R_A shall be less than 10Ω , when $U_o < 300 V$, R_A shall be less than 100Ω , 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 83Ω (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,
- withdrawn,
- replaced by a revised edition, or
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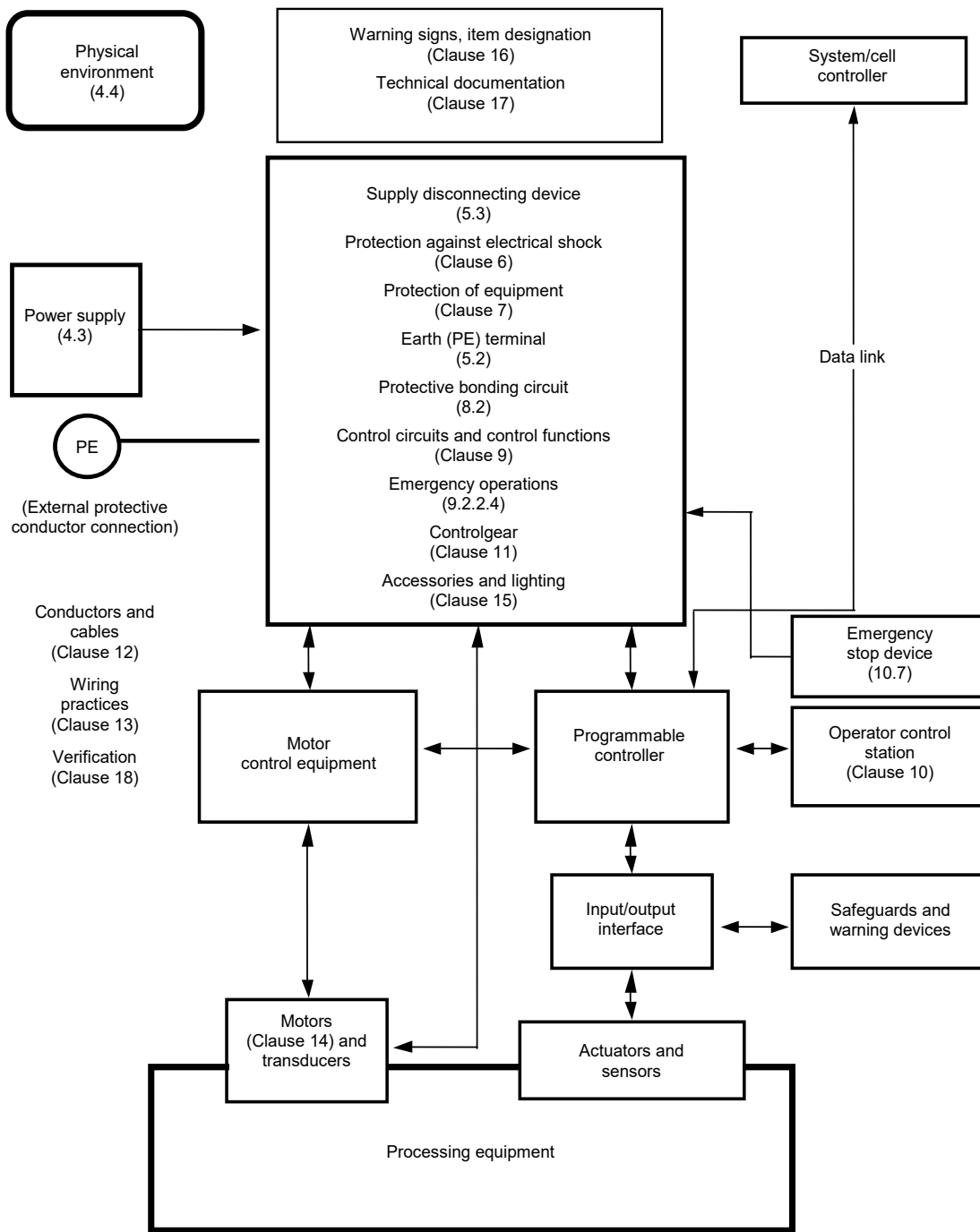
INTRODUCTION

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.



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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.

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

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 60364-4-43:2008, *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 60364-5-53:2001, *Electrical installations of buildings – Part 5-53: Selection and erection of electrical equipment – Isolation, switching and control*
IEC 60364-5-53:2001/AMD1:2002

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 from: <http://www.graphical-symbols.info/equipment>

IEC 60445:2010, *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*

IEC 60947-5-1:2003, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*
IEC 60947-5-1:2003/AMD1:2009

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– 17 –

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*

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

IEC 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*

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

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*

ISO 13850:2006, *Safety of machinery – Emergency stop function – Principles for design*

koniec náhľadu – text ďalej pokračuje v platenej verzii STN