

## REDLINE VERSION



**Safety of machinery – Electrical equipment of machines –  
Part 11: Requirements for ~~HV~~ equipment for voltages above 1 000 V AC or  
1 500 V DC and not exceeding 36 kV**

Preview

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IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

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# REDLINE VERSION



**Safety of machinery – Electrical equipment of machines –  
Part 11: Requirements for ~~HV~~ equipment for voltages above 1 000 V AC or  
1 500 V DC and not exceeding 36 kV**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## SAFETY OF MACHINERY – ELECTRICAL EQUIPMENT OF MACHINES –

### Part 11: Requirements for ~~HV~~ equipment for voltages above 1 000 V AC or 1 500 V DC and not exceeding 36 kV

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**This Redline version provides you with a quick and easy way to compare all the changes between this standard and its previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.**



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;
- 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

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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,
- ~~ease of maintenance~~ maintainability.

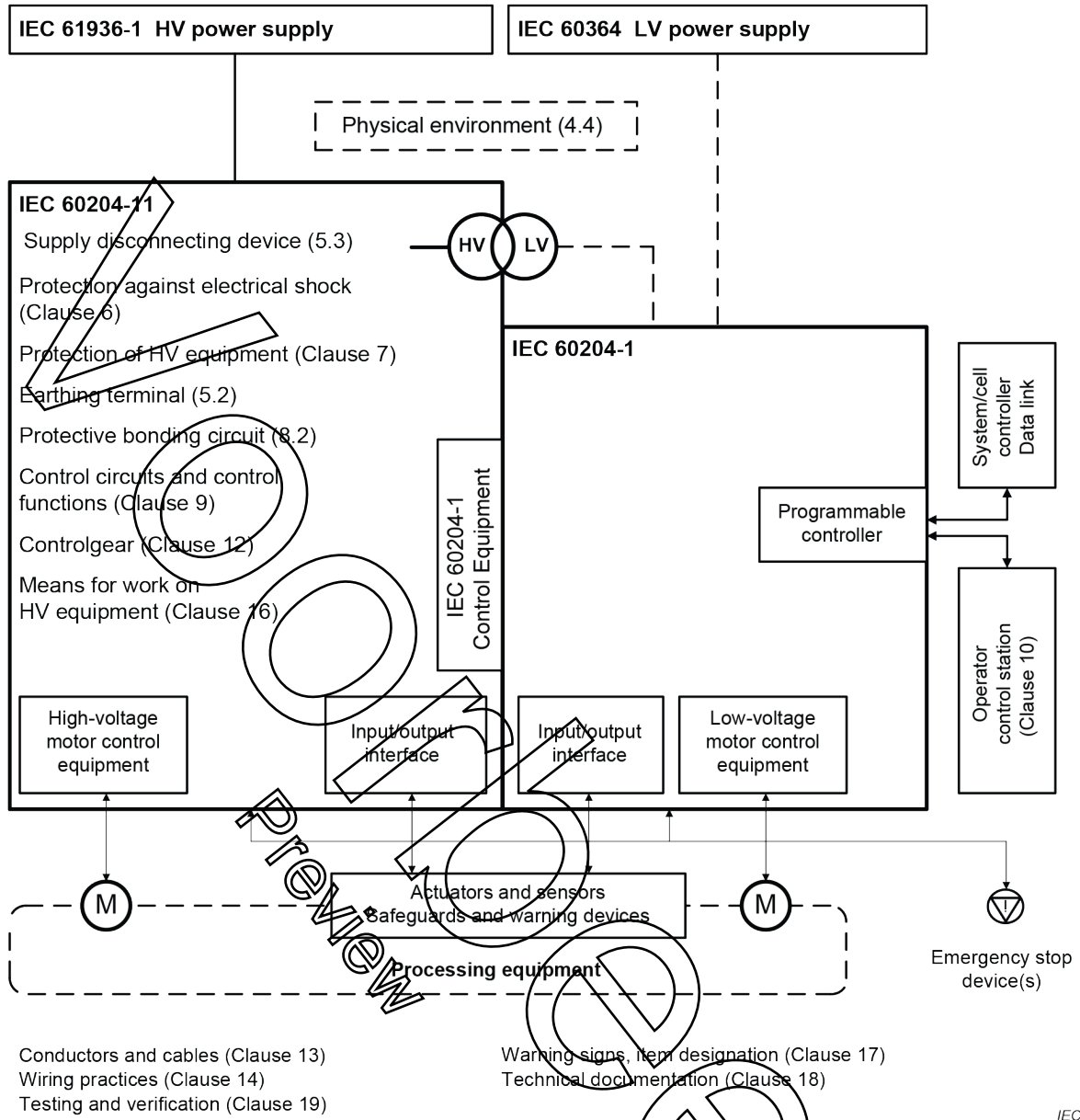
~~High performance is not to be obtained at the expense of the essential factors mentioned above.~~

~~An example of a possible application of these requirements is a machine or group of machines used for the processing of a material where a failure in such machinery can have serious economic consequences.~~

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.

~~More guidance on the use of this standard is given in annex F of IEC 60204-1.~~

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.



**Figure 1 – Block diagram of a machine containing HV equipment**

IEC

## SAFETY OF MACHINERY – ELECTRICAL EQUIPMENT OF MACHINES –

### Part 11: Requirements for ~~HV~~ 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, ~~but excluding higher level system aspects (i.e. communications between systems)~~ 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.

~~This part of IEC 60204 is applicable to equipment, or parts of equipment, which operate with nominal supply voltages above 1 000 V a.c. or 1 500 V d.c. and not exceeding 36 kV a.c. or d.c. with nominal frequencies not exceeding 200 Hz. For higher voltages or frequencies, special requirements may be needed.~~

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. ~~Reference is made to IEC 60204-1 for those requirements which also apply to HV equipment.~~

NOTE 1 ~~Other LV equipment not forming part of the HV equipment and defined as operating at voltages not exceeding 1 000 V a.c. or 1 500 V d.c. are~~ 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 For the requirements for power supply installations, see HD 6037.~~

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

This document is ~~an application~~ a generic safety standard ~~and is not intended to limit or inhibit technological advancement~~. 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 ~~may~~ 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;
- have special risks when producing or using certain materials;
- are used in mines.

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

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 60034-1:1996, Rotating electrical machines – Part 1: Rating and performance~~

~~IEC 60050(191):1990, International Electrotechnical Vocabulary (IEV) – Chapter 191: Dependability and quality of service~~

~~IEC 60050-195:1998, International Electrotechnical Vocabulary (IEV) – Part 195: Earthing and protection against electric shock~~

~~IEC 60050(441):1984, International Electrotechnical Vocabulary (IEV) – Chapter 441: Switchgear, controlgear and fuses~~

~~IEC 60050(826):1982, International Electrotechnical Vocabulary (IEV) – Chapter 826: Electrical installations of buildings~~

~~IEC 60050(826):1995, amendment No. 2~~

~~IEC 60071-1:1993, Insulation co-ordination – Part 1: Definitions, principles and rules~~

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

IEC 60076-5:1976, *Power transformers – Part 5: Ability to withstand short-circuit*

~~IEC 60129:1984, Alternating current disconnectors and earthing switches~~

~~IEC 60298:1990, A.C. metal enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV~~

~~IEC 60364-4-41:1992, Electrical installations of buildings – Part 4: Protection for safety – Chapter 41: Protection against electric shock~~

~~IEC 60364-4-42:1980, Electrical installations of buildings – Part 4: Protection for safety – Chapter 42: Protection against thermal effects~~

IEC 60204-1:1997 2016, Safety of machinery – Electrical equipment of machines – Part 1: General requirements

IEC 60364-5-54:1980 2011, Low-voltage electrical installations ~~of buildings~~ – 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 60420:1990, High-voltage alternating current switch-fuse combinations~~

IEC 60445:1999, Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals ~~and of terminations of certain designated, conductor terminations and conductors, including general rules for an alphanumeric system~~

~~IEC 60466:1987, A.C. insulation-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 38 kV~~

IEC 60529:1989, Degrees of protection provided by enclosures (IP Code)

~~IEC 60621-3:1979, Electrical installations for outdoor sites under heavy conditions (including open-cast mines and quarries) – Part 3: General requirements for equipment and ancillaries~~

~~IEC 60694:1996, Common specifications for high voltage switchgear and controlgear standards~~

IEC 60865-1:1993, Short-circuit currents – Calculation of effects – Part 1: Definitions and calculation methods

~~IEC 61230:1993, Live working – Portable equipment for earthing or earthing and short-circuiting~~

~~IEC 61243-1:1993, Live working – Voltage detectors – Part 1: Capacitive type to be used for voltages exceeding 1 kV a.c.~~

~~IEC 61310-1:1995, Safety of machinery – Indication, marking and actuation – Part 1: Requirements for visual, auditory and tactile signals~~

~~IEC 61310-3:1999, Safety of machinery – Indication, marking and actuation – Part 3: Requirements for the location and operation of actuators~~

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*

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 3864-1:1984 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*

~~ISO/TR 12100-1:1992, *Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology*~~

~~EN 50178:1997, *Electronic equipment for use in power stations*~~

~~HD 637:1999, *Power installations exceeding 1 kV a.c.*~~

### 3 Terms and definitions

~~NOTE The index lists, in alphabetical order, the terms defined in this clause and indicates where they are used in the text of this part of IEC 60204.~~

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:

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## Heeft u vragen?

Onze Klantenservice is bereikbaar maandag tot en met vrijdag, van 8.30 tot 17.00 uur.

Telefoon: 015 2 690 391

E-mail: [klantenservice@nen.nl](mailto:klantenservice@nen.nl)

