INTERNATIONAL STANDARD

IEC 60204-1

Edition 4.1
2000-05

Edition 4:1997 consolidated with amendment 1:1999

Safety of machinery – Electrical equipment of machines –

Part 1: General requirements

*This **English-language** version is derived from the original **bilingual** publication by leaving out all French-language pages. Missing page numbers correspond to the French-language pages.*

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SAFETY OF MACHINERY –

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Part 1: General requirements

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60204-1 has been prepared by technical committee 44: Safety of machinery – Electrotechnical aspects.

This fourth edition replaces the third edition issued in 1992. It incorporates material from the third edition, amended to provide general requirements for machines, including mobile machines and complex (e.g. large) machine installations.

This consolidated version of IEC 60204-1 is based on the fourth edition (1997) [documents 44/205/FDIS and 44/211/RVD], the corrigendum of March (1998) and its amendment 1 (1999) [documents 44/247/FDIS and 44/256/RVD].

It bears the edition number 4.1

A vertical line in the margin shows where the base publication has been modified by amendment 1.

Annexes A, B, C, D, E and F are informative.

The contents of the corrigendum of March 1998 have been included in this copy.

The following differences exist in some countries:

– 4.3.1: The voltage characteristics of electricity supplied by public distribution systems are given in EN 50160: 1994, *Voltage characteristics of electricity supplied by public distribution systems* (Europe).

– 7.2.3: Disconnection of the neutral conductor is mandatory in a TN-S system (France).

– 10.7.2: The use of non-latching emergency stop devices in conjunction with separate reset devices is considered acceptable practice (USA).

– 13.6, table 6: Cross-sectional area is specified according to American Wire Gauge (AWG) (USA).

– 14.2.2: 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).

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

– 14.2.4: The colour YELLOW is used instead of ORANGE for that purpose (USA).

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 maintenance.

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 group of machines used in the production of discrete parts where a failure in such production machines or manufacturing systems or cells can have serious economic consequences.

Figures 1 and 2 have 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 an overall block diagram of a typical manufacturing system (a group of machines working together in a co-ordinated manner) and figure 2 is a block diagram of a typical machine and associated equipment showing the various elements of the electrical equipment addressed in this standard. Numbers in parentheses ( ) refer to clauses and subclauses in this standard. It is understood in figures 1 and 2 that all of the elements taken together including the safeguards, tooling/fixturing, software, and the documentation, constitute the machine, and that one or more machines working together with usually at least one level of supervisory control constitute a manufacturing cell or system.

More guidance on the use of this part is given in annex F.

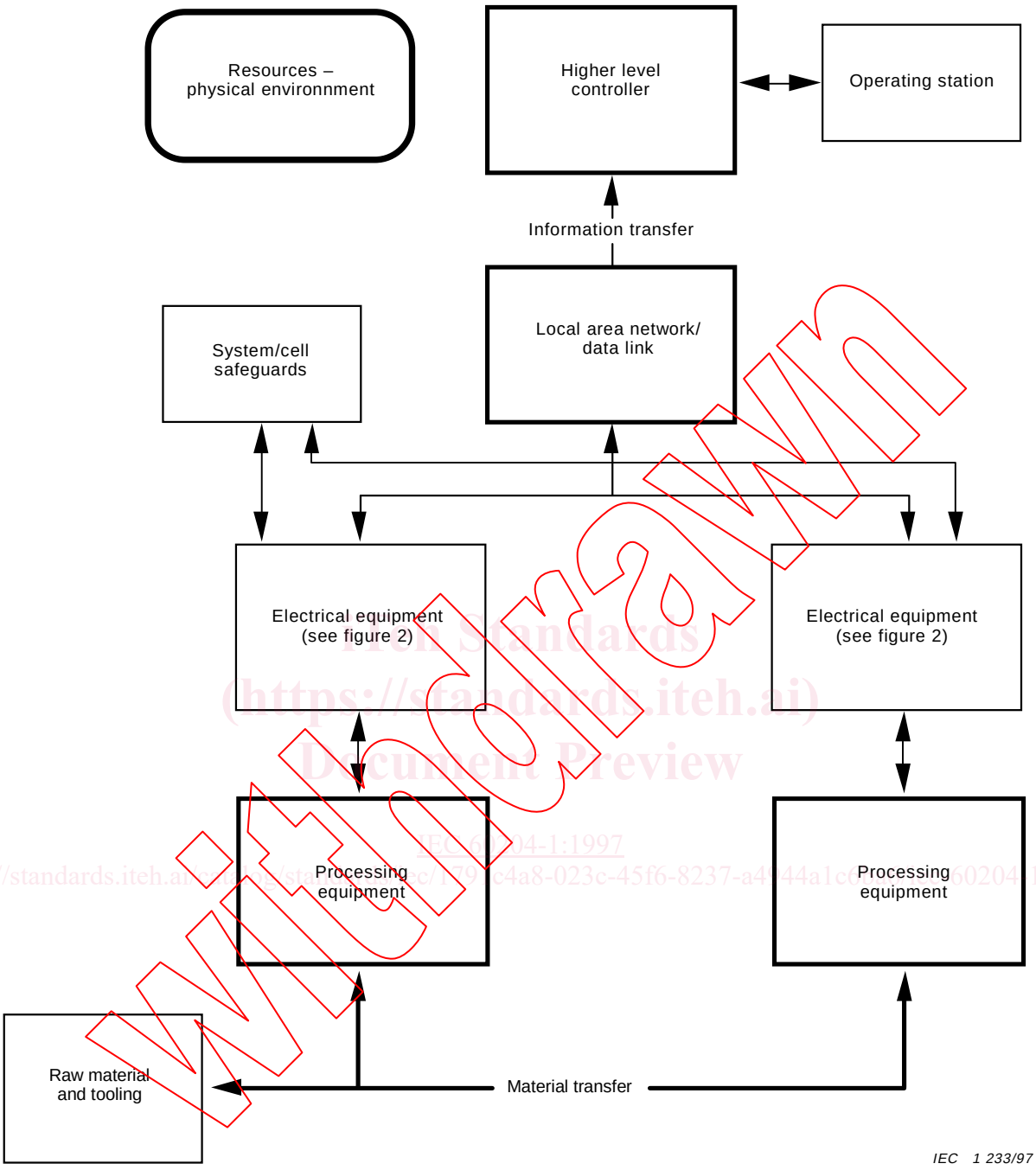

Figure 1 – Block diagram of a typical manufacturing system

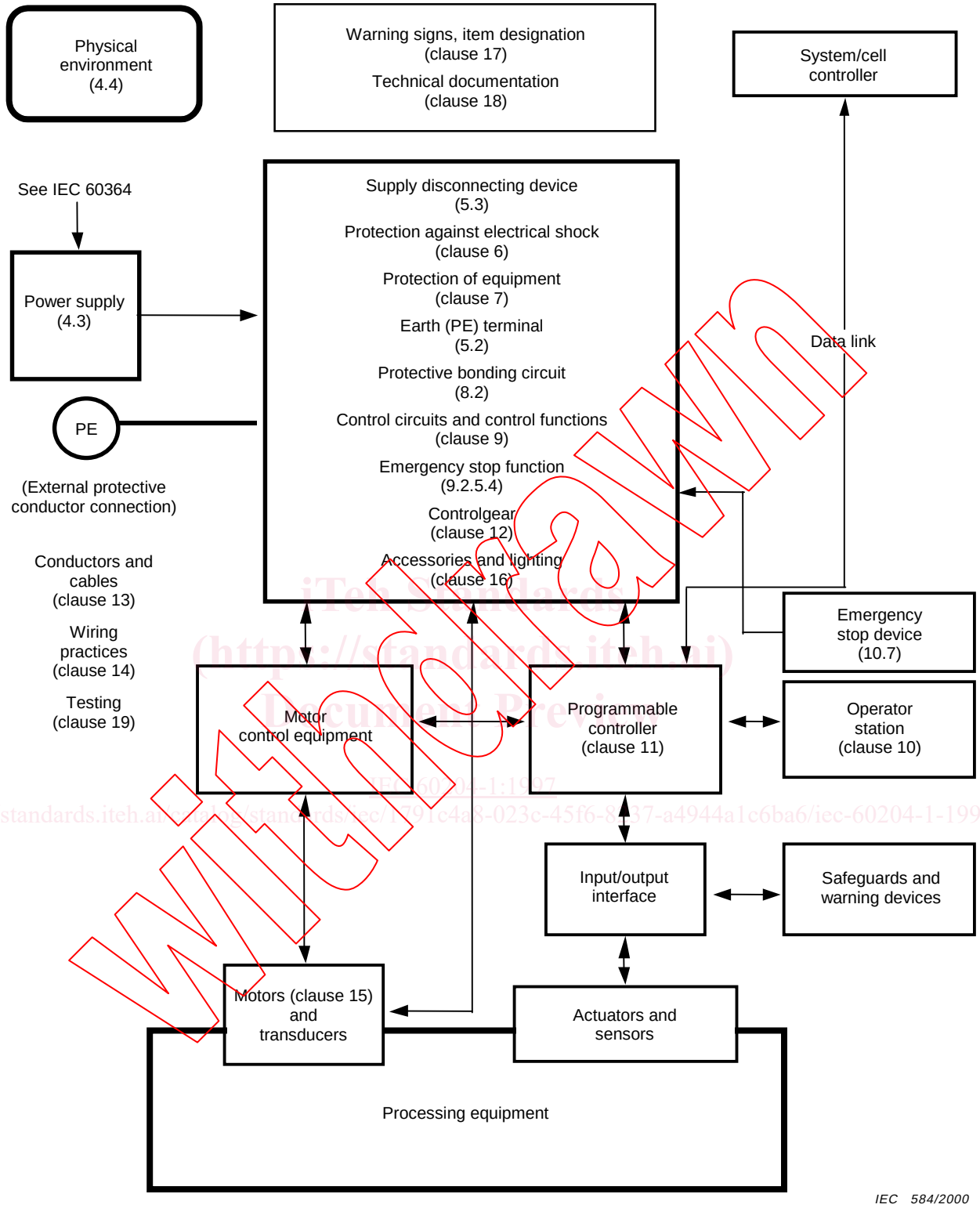

Figure 2 – Block diagram of a typical machine

SAFETY OF MACHINERY – ELECTRICAL EQUIPMENT OF MACHINES – Part 1: General requirements

1 Scope

This part of IEC 60204 applies to the application of electrical and electronic equipment and systems to machines not portable by hand while working, including a group of machines working together in a co-ordinated manner but excluding higher level systems aspects (i.e. communications between systems).

NOTE 1 In this standard, the term *electrical* includes both electrical and electronic matters (i.e. *electrical equipment* means both the electrical and the electronic equipment).

NOTE 2 In the context of this standard, 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 standard commences at the point of connection of the supply to the electrical equipment of the machine (see 5.1).

NOTE 3 For the requirements for the electrical supply installation in buildings, see IEC 60364.

This part 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 and not exceeding 1 500 V for direct current, and with nominal frequencies not exceeding 200 Hz. For higher voltages or frequencies, special requirements may be needed.

This part is an application standard and is not intended to limit or inhibit technological advancement. It does not cover all the requirements (e.g. guarding, interlocking, or control) that are needed or required by other standards or regulations in order to safeguard persons from hazards other than electrical hazards. Each type of machine has unique requirements to be accommodated to provide adequate safety.

This part specifically includes, but is not limited to, the electrical equipment of machines as defined in 3.33 (annex A lists examples of machines whose electrical equipment may be covered by this standard).

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

– are used in 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;
– are sewing machines, units, and systems (which are covered by IEC 60204-31);
– are hoisting machines (which are covered by 60204-32).

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 normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60204. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60204 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

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

IEC 60034-5:1991, *Rotating electrical machines – Part 5: Classification of degrees of protection provided by enclosures of rotating electrical machines (IP code)*

IEC 60034-11:1978, *Rotating electrical machines – Part 11: Built-in thermal protection – Chapter 1: Rules for protection of rotating electrical machines*

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

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 60072-1:1991, *Dimensions and output series for rotating electrical machines – Frame numbers 56 to 400 and flange numbers 55 to 1 080*

IEC 60072-2:1990, *Dimensions and output series for rotating electrical machines – Part 2: Frame numbers 355 to 1 000 and flange numbers 1 180 to 2 360*

IEC 60073:1996, *Basic and safety principles for man-machine interface, marking and identification – Coding principles for indication devices and actuators*

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

IEC 60146-1-1:1991, *General requirements and line commutated connectors – Part 1-1: Specifications of basic requirements*

IEC 60204-31:1996, *Electrical equipment of industrial machines – Part 31: Particular requirements for sewing machines, units, and systems*

IEC 60309-1:1988, *Plugs, socket-outlets, and couplers for industrial purposes – Part 1: General requirements*

IEC 60332-1:1993, *Tests on electric cables under fire conditions – Part 1: Test on a single vertical insulated wire or cable*

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

IEC 60364-4-46:1981, *Electrical installations of buildings – Part 4: Protection for safety – Chapter 46: Isolation and switching*

IEC 60364-4-47:1981, *Electrical installations of buildings – Part 4: Protection for safety – Chapter 47: Application of protective measures for safety – Section 470: General – Section 471: Measures of protection against electric shock*

IEC 60364-4-473:1977, *Electrical installations of buildings – Part 4: Protection for safety – Chapter 47: Application of protective measures for safety – Section 473: Measures of protection against overcurrent*